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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/924,354	09/24/2010	3616	910		7	2

CONFIRMATION NO. 8323

CORRECTED FILING RECEIPT

118361
Arjuna Indraeswaran Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

OC000000093496198

Date Mailed: 08/16/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Arjuna Indraeswaran Rajasingham, Bethesda, MD;

Applicant(s)

Arjuna Indraeswaran Rajasingham, Bethesda, MD;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of 11/185,784 07/21/2005 PAT 8020658
and is a CIP of 11/639,088 12/14/2006 PAT 8251444
which is a CIP of 11/113,028 04/25/2005 PAT 8138908
which is a CIP of 10/109,674 04/01/2002 PAT 7159923
which is a CIP of 09/779,591 02/09/2001 PAT 6609754
and is a CIP of 09/779,592 02/09/2001 PAT 6742833
and is a CIP of 09/779,593 02/09/2001 PAT 6715816
and is a CIP of 09/779,594 02/09/2001 PAT 7255389
and is a CIP of 09/435,830 11/08/1999 PAT 6609749
and is a CIP of 09/404,475 09/24/1999 PAT 6547315
and said 11/113,028 04/25/2005
is a CIP of 10/681,304 10/09/2003 PAT 7175221
which is a DIV of 09/779,592 02/09/2001 PAT 6742833
and is a CIP of 10/279,171 10/24/2002 PAT 7156416
and said 09/779,594 02/09/2001
is a CIP of 09/404,475 09/24/1999 PAT 6547315
and said 11/639,088 12/14/2006
is a CIP of 11/185,784 07/21/2005 PAT 8020658
and is a CIP of 10/279,171 10/24/2002 PAT 7156416

and claims benefit of 60/849,685 10/05/2006
and claims benefit of 60/848,804 09/29/2006
and claims benefit of 60/751,305 12/19/2005
and is a CIP of 09/779,594 02/09/2001 PAT 7255389
and said 11/113,028 04/25/2005
is a CIP of 10/279,171 10/24/2002 PAT 7156416
and is a CIP of 09/779,594 02/09/2001 PAT 7255389
and said 10/279,171 10/24/2002
is a DIV of 09/404,475 09/24/1999 PAT 6547315
and is a DIV of 09/435,830 11/08/1999 PAT 6609749
and said 09/779,594 02/09/2001
is a CIP of 09/435,830 11/08/1999 PAT 6609749
and said 11/639,088 12/14/2006
is a CIP of 10/681,304 10/09/2003 PAT 7175221
which claims benefit of 60/461,434 04/10/2003
and said 09/779,594 02/09/2001
claims benefit of 60/226,570 08/21/2000
and claims benefit of 60/195,298 04/10/2000
and said 10/109,674 04/01/2002
claims benefit of 60/338,466 12/03/2001
and claims benefit of 60/332,419 11/14/2001
and claims benefit of 60/286,629 04/26/2001
and claims benefit of 60/282,105 04/09/2001
and claims benefit of 60/280,470 04/02/2001

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 10/12/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/924,354**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
** **SMALL ENTITY** **

Title

EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM

Preliminary Class

280

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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AUG 16 2017

INTERNATIONAL PATENT LEGAL ADM.

Arjuna Indraeswaran Rajasingham
6024 Bradley Boulevard
Bethesda MD 20817

In re Application of
Arjuna Indraeswaran Rajasingham
Application No.: 12/924,354
Filing Date: September 24, 2010
Attorney Docket No.:

DECISION ON PETITION
UNDER 37 CFR 1.78(c)
AND 1.78(e)

This is a decision on the petition under 37 CFR 1.78(c) and (e), filed June 13, 2017, to accept an unintentionally delayed claim under 35 U.S.C. 119(e) and 120 for the benefit of priority to one or more prior-filed provisional and nonprovisional/international applications.

Under 37 CFR 1.78(c) and (e), a petition to accept an unintentionally delayed claim under 35 U.S.C. 119(e) and 120 for the benefit of a prior-filed application must be accompanied by:

(i) the reference required by 35 U.S.C. 119(e) and 120 and 37 CFR 1.78(a)(3) and 1.78(d)(2) to the prior-filed applications, unless previously submitted;

(ii) the petition fee set forth in 37 CFR 1.17(m); and

(iii) a statement that the entire delay between the date the claim was due under 37 CFR 1.78(a)(4) and (d)(3) and the date the claim was filed was unintentional. The Director may require additional information where there is a question whether the delay was unintentional.

With regard to item (i), a proper reference to the prior-filed applications has been included in an application data sheet or in an amendment to the first sentence of the specification as required by 37 CFR 1.78(a)(3) and (d)(2). See also 37 CFR 1.78(h).

With regard to item (ii), the petition fee set forth in 37 CFR 1.17(m) has been submitted.

With regard to item (iii), the statement of unintentional delay contained in the petition differs slightly from the language contained in 37 CFR 1.78(c)(3) and (e)(3) and is hereby construed as a statement that the entire delay between the date the claim was due under 1.78(a)(4) and (d)(3) and the date the claim was filed was unintentional. If this interpretation is incorrect, applicant is required to immediately notify the Office. As construed, the provided statement of unintentional delay is acceptable.

For the reasons above, the petition under 37 CFR 1.78(c) and (e) is **GRANTED**.

Patentee is advised that the inclusion of a prior-filed application on any patent, published application, or certificate of correction should not be construed as meaning that the present application is necessarily entitled to the benefit of the prior-filed application. In order for an application to be entitled to the benefit of the prior-filed application, all other requirements under 35 U.S.C. 119(e) and 120 and 37 CFR 1.78 must be met.

This application is being forwarded to the Office of Data Management, Certificates of Correction Branch, for treatment of patentee's request for a certificate of correction.

/Anish Gupta/
Anish Gupta
PCT Legal Examiner
International Patent Legal Administration
571-272-0965

ATTACHMENT: corrected filing receipt

CORRECTION - SUPPLEMENTARY

Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
Dr.	ARJUNA	INDRAESWARAN	RAJASINGHAM	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	BETHESDA	State/Province	MD	Country of Residence	US

Mailing Address of Inventor:

Address 1	6024 BRADLEY BOULEVARD		
Address 2			
City	BETHESDA	State/Province	MD
Postal Code	20817	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ An Address is being provided for the correspondence Information of this application.

Customer Number	118361		
Email Address	AIR@MMMMG.COM	Add Email	Remove Email

Application Information:

Title of the Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354		
Attorney Docket Number		Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	39	Suggested Figure for Publication (if any)	

Filing By Reference :

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☒ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	118361		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the application number blank.

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/113028	Continuation in part of	10/109674	2002-04-01	7159923	2007-01-09
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/779591	2001-02-09	6609754	2003-08-26

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/779592	2001-02-09	6742833	2004-06-01

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/779593	2001-02-09	6715816	2004-04-06

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/779594	2001-02-09	7255389	2007-08-14

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/435830	1999-11-08	6609749	2003-08-26

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/404475	1999-09-24	6547315	2003-04-15

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/113028	Continuation in part of	10/681304	2003-10-09	7175221	2007-02-13

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/681304	Division of	09/779592	2001-02-09	6742833	2004-02-09

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/681304	Continuation in part of	10/279171	2002-10-24	7156416	2002-10-24

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
09/779594	Continuation in part of	09/404475	1999-09-24	6547315	2003-04-15

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/639088	Continuation in part of	11/185784	2005-07-21	8020658	2011-09-20

Prior Application Status: Patented — Remove

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/639088	Continuation in part of	11/113028	2005-04-25	8138908	2012-03-20
Prior Application Status	Expired			Remove	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
11/639088	Claims benefit of provisional	60/751305	2005-12-19
Prior Application Status	Expired		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
11/639088	Claims benefit of provisional	60/848804	2006-09-29
Prior Application Status	Expired		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
11/639088	Claims benefit of provisional	60/849685	2006-10-05
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/639088	Continuation in part of	10/279171	2002-10-24	7156416	2007-01-02
Prior Application Status	Patented			Remove	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/639088	Continuation in part of	09/779594	2001-02-09	7255389	2007-08-14
Prior Application Status	Patented			Remove	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/113028	Continuation in part of	10/279171	2002-10-24	7156416	2007-01-02
Prior Application Status	Patented			Remove	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/279171	Division of	09/435830	1999-11-08	6609749	2003-08-26
Prior Application Status	Patented			Remove	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/279171	Division of	09/404475	1999-09-24	6547315	2003-04-15
Prior Application Status	Patented			Remove	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/113028	Continuation in part of	09/779594	2001-02-09	7255389	2007-08-14
Prior Application Status	Patented			Remove	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
09/779594	Continuation in part of	09/435830	1999-11-08	6609749	2003-08-26

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/109674	Claims benefit of provisional	60/280470	2001-04-02
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/109674	Claims benefit of provisional	60/282105	2001-04-09
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/109674	Claims benefit of provisional	60/286629	2001-04-26
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/109674	Claims benefit of provisional	60/332419	2001-11-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/109674	Claims benefit of provisional	60/338466	2001-12-03
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
09/779594	Claims benefit of provisional	60/195298	2000-04-10
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
09/779594	Claims benefit of provisional	60/226570	2000-08-21
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/681304	Claims benefit of provisional	60/461434	2003-04-10
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/639088	Continuation in part of	10/681304	2003-10-09	7175221	2007-02-13
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12/924354	Continuation in part of	11/639088	2006-12-14	8251444	2012-08-28
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
~~12/924354~~	~~Division of~~	~~11/185784~~	~~2005-07-21~~	~~8020658~~	~~2011-09-20~~
Prior Application Status	Patented				Remove

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12/924354	Continuation in part of	11/185784	2005-07-21	8020658	2011-09-20

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[1] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[1]	Filing Date (YYYY-MM-DD)	Access Code[1] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

PTO/AIA/14 (07-13)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◯ Assignee	◯ Legal Representative under 35 U.S.C. 117	◯ Joint Inventor
◯ Person to whom the inventor is obligated to assign.	◯ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

PTO/AIA/14 (07-14)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Mailing Address Information For Applicant:			
Address 1			
Address 2			
City		**State/Province**	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication . An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:			
Address 1			
Address 2			
City		**State/Province**	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.					
Signature	/Arjuna Indraeswaran Rajasingham/			Date (YYYY-MM-DD)	2017-07-31
First Name	ARJUNA	Last Name	RAJASINGHAM	Registration Number	
Additional Signature may be generated within this form by selecting the Add button.					

Electronic Acknowledgement Receipt

EFS ID:	29937146
Application Number:	12924354
International Application Number:	
Confirmation Number:	8323
Title of Invention:	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM
First Named Inventor/Applicant Name:	Arjuna Indraeswaran Rajasingham
Customer Number:	118361
Filer:	Arjuna Indraeswaran Rajasingham
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	31-JUL-2017
Filing Date:	24-SEP-2010
Time Stamp:	15:58:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition for review by the PCT legal office	ADS_12-924354_July-31-2017.pdf	3020615 612f9a219b2c1bd475129c9cce6d1cb73704cee1	no	9

Warnings:

Information:	
Total Files Size (in bytes):	3020615

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

118361 7590 07/05/2017

Arjuna Indraeswaran Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

EXAMINER
FLEMING, FAYE M

ART UNIT	PAPER NUMBER
3616	

MAIL DATE	DELIVERY MODE
07/05/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

In re Patent No. 8,136,835	:	
Issue Date: March 20, 2012	:	
Application No. 12/924,354	:	ON PETITION
Filed: September 24, 2010	:	
For: EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM	:	

This is a decision on the renewed petition under 37 CFR 1.378(b), filed June 22, 2017, to accept the unintentionally delayed payment of a maintenance fee for the above-identified patent.

The petition is **GRANTED**.

This patent expired on March 21, 2016 for failure to pay the first maintenance fee.

The maintenance fee is hereby accepted and the above-identified patent is reinstated as of the mail date of this decision.

Telephone inquiries concerning this decision should be directed to the undersigned at (571) 272-3208.

/KOC/
Karen Creasy
Paralegal Specialist
Office of Petitions

Office of Petitions: Routing Sheet

Application No. 12/924,354

This application is being forwarded to your office for further processing. A decision has been rendered on a petition filed in this application, as indicated below. For details of this decision, please see the document PET.OP.DEC filed on the same date as this document.

[x] **GRANTED**

[ ] **DISMISSED**

[ ] **DENIED**

Office of Petitions: Decision Count Sheet

Mailing Month

Application No. 12924354

12924354

For US serial numbers: enter number only, no slashes or commas. Ex: 10123456

For PCT: enter "51+single digit of year of filing+last 5 numbers", Ex. for PCT/US05/12345, enter 51512345

Deciding Official: KAREN CREASY

Count (1) - Palm Credit 12/924,354

Decision: GRANT

FINANCE WORK NEEDED

☐ Select Check Box for YES

GRANT

Decision Type: 533 - 37 CFR 1.378(c) - TO ACCEPT UNINTENTIONAL DE

533

Notes:

Count (2)

Decision: n/a

FINANCE WORK NEEDED

☐ Select Check Box for YES

Decision Type: NONE

Notes:

Count (3)

Decision: n/a

FINANCE WORK NEEDED

☐ Select Check Box for YES

Decision Type: NONE

Notes:

Initials of Approving Official (if required)

If more than 3 decisions, attach 2nd count sheet & mark this box ☐

Printed on: *6/29/2017*

finance

C

Application Number Information

Application Number: **12/924354** **Assignments**

Filing or 371(c) Date: **09/24/2010** **DAV**

Effective Date: **09/24/2010**

Application Received: **09/27/2010**

Pat. Num./Pub. Num: **8136835/20110031055**

Issue Date: **03/20/2012**

Date of Abandonment: **00/00/0000**

Attorney Docket Number:

AIA (First Inventor to File): **NO**

Examiner Number: **75412 / FLEMING, FAYE**

Group Art Unit: **3616**

Class/Subclass: **280/736.000**

Interference Number:

Unmatched Petition: **NO**

L&R Code: Secrecy Code:**1**

Third Level Review: **NO**

TYPE ENT: **S**

IFW Madras

Secrecy Order: **NO**

Status: **250 /PATENT EXPIRED DUE TO NONPAYMENT OF MAINTENANCE FEES UNDER 37 CFR 1.362**

Status Date: **06/13/2017**

Confirmation Number: **8323**

Oral Hearing: **NO**

Lost Case: **NO**

Title of Invention: **EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM**

Bar Code | PALM Location | Location Date | Charge to Loc | Charge to Name | Employee Name | Location

Appln Info | Contents | Petition Info | Atty/Agent Info | Continuity Data | Foreign Data | Inventors | Appli

Search Another: Application # [ ] Search **or Patent #** [ ] Search **or International Registration #** [ ] Search

PCT / [ ] / [ ] Search **or PG PUBS #** [ ] Search

Attorney Docket # [ ] Search

Bar Code # [ ] Search

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http://palmapps.uspto.gov/cgi-bin/expo/GenInfo/snquery.pl?APPL_ID=12924354

06/27/2017 DALLEN 00000014 8136835

01 FC:1599 800.00 OP

02 FC:9999 50.00 OP

ARJUNA I. RAJASINGHAM
B.Tech.(IIT), A.M. (Stanford), M.B.A. (Stanford), Ph.D.(Berkeley).

6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

In the United States Patent and Trademark Office

Patent Number:	8, 136, 835
Application Number:	12/924, 354
Applicant:	Arjuna Indraeswaran Rajasingham
Examiner :	Faye Fleming
Art Unit:	3616

June 22, 2017

Kind attention: Ms. Karen Creasy. Office of Petitions

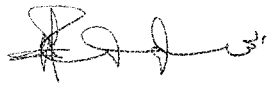
Commissioner of Patents
Washington, DC 20231

Sir,

Renewed Petition under 37 CFR 1.378(b)

The applicant hereby renews the previously granted petition, subsequently vacated for lack of fee payments.
The Petition Fee ($850) is submitted herewith.
As there is no provision to submit the maintenance fee ($800) and the $50 returned check fee in EFSWeb a credit card form has been submitted for these payments and the receipt attached hereto.

Very respectfully,



A.I. Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

Att:

USPTO Notice
Fax Receipt – Maintenance fee, Check Fee.

TO:Auto-reply fax to 3013208800 COMPANY:

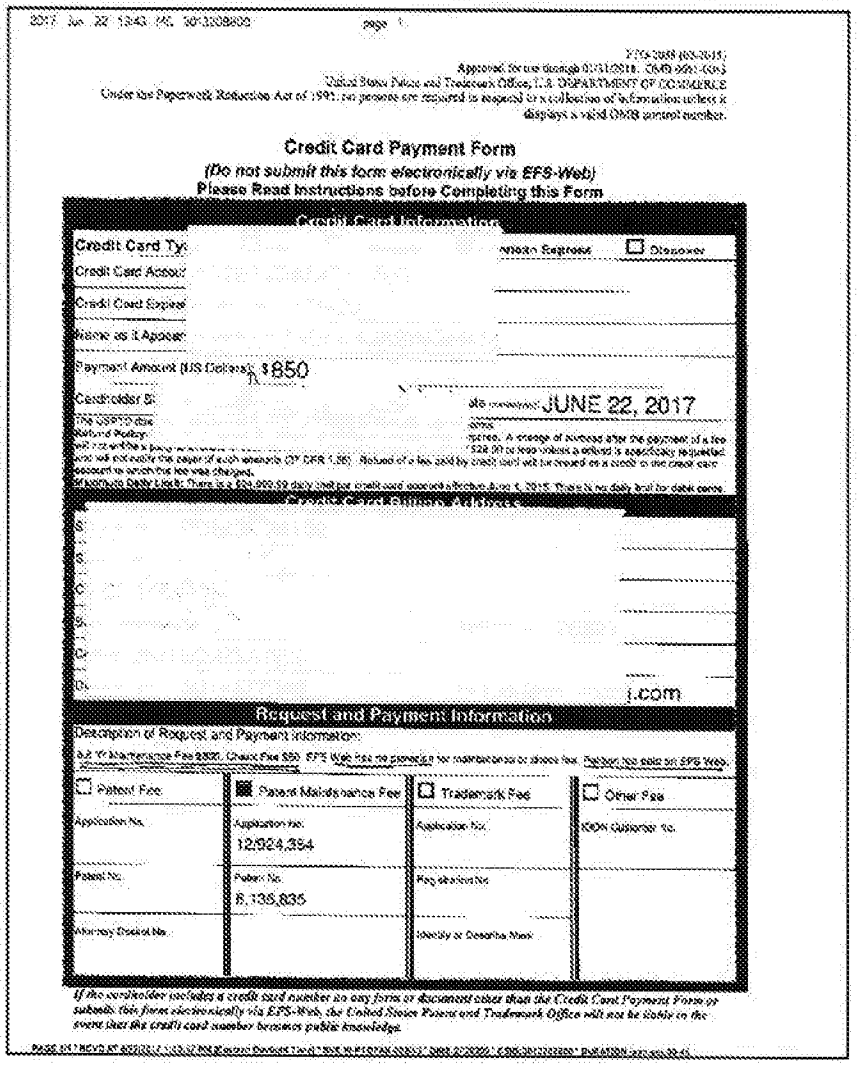
Auto-Reply Facsimile Transmission

TO: Fax Sender at 3013208800

Fax Information
Date Received: 6/22/2017 1:40 PM [Eastern Daylight Time]
Total Pages: 1 (including cover page)

ADVISORY: This is an automatically generated return receipt confirmation of the facsimile transmission received by the Office. Please check to make sure that the number of pages listed as received in Total Pages above matches what was intended to be sent. Applicants are advised to retain this receipt in the unlikely event that proof of this facsimile transmission is necessary. Applicants are also advised to use the certificate of facsimile transmission procedures set forth in 37 CFR 1.8(a) and (b), 37 CFR 1.6(f). Trademark Applicants, also see the Trademark Manual of Examining Procedure (TMEP) section 306 et seq.

Received Cover Page ========>



Credit Card Payment Form

(Do not submit this form electronically via EFS-Web)

Please Read Instructions before Completing this Form

Credit Card Information

Credit Card Ty: ... Discover

Credit Card Accou:

Credit Card Expire:

Name as It Appear:

Payment Amount (US Dollars): $850

Cardholder Si: ... JUNE 22, 2017

Request and Payment Information

Description of Request and Payment Information:

Patent Fee | Patent Maintenance Fee | Trademark Fee | Other Fee

Application No.: 12/924,394

Patent No.: 8,136,835

If the cardholder includes a credit card number on any form or document other than the Credit Card Payment Form or submits this form electronically via EFS-Web, the United States Patent and Trademark Office will not be liable in the event that the credit card number becomes public knowledge.

Electronic Patent Application Fee Transmittal

Application Number:	12924354
Filing Date:	24-Sep-2010
Title of Invention:	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM
First Named Inventor/Applicant Name:	Arjuna Indraeswaran Rajasingham
Filer:	Arjuna Indraeswaran Rajasingham
Attorney Docket Number:	

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
PET. REVIVE ABANDON APP, DELAY PYMT-RESP	2453	1	850	850
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**850**

Electronic Acknowledgement Receipt

EFS ID:	29577394
Application Number:	12924354
International Application Number:	
Confirmation Number:	8323
Title of Invention:	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM
First Named Inventor/Applicant Name:	Arjuna Indraeswaran Rajasingham
Customer Number:	118361
Filer:	Arjuna Indraeswaran Rajasingham
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	22-JUN-2017
Filing Date:	24-SEP-2010
Time Stamp:	13:55:09
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	EFT
Payment was successfully received in RAM	$850
RAM confirmation Number	062317INTEFSW13561300
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition for review by the Office of Petitions	Rajasingham_Petition-Delayed-Maintenence-Fee_12924354_2017-06-22.pdf	524452 66ca17ebca10784f3e9b7d575b4e848a977f a98c	no	1
Warnings:					
Information:					
2	Petition for review by the Office of Petitions	12924354_MaintenanceCheckFeeFaxReceipt.pdf	236645 791efb59513ad1724c6c3fdb653089df6abe 96bc	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30568 21f9c9217c3d6ef92ec6e0f88a1e71ff2f6cce 4b	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	791665		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

118361 7590 06/16/2017

Arjuna Indraeswaran Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

EXAMINER
FLEMING, FAYE M

ART UNIT	PAPER NUMBER
3616	

MAIL DATE	DELIVERY MODE
06/16/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

In re Patent No. 8,136,835	:	
Issue Date: March 20, 2012	:	
Application No. 12/924,354	:	NOTICE
Filed: September 24, 2010	:	
For: EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM	:	

The purpose of this notice is to advise you that the decision automatically granted by Electronic Filing System (EFS) on June 2, 2017, is hereby **VACATED** for the reasons indicated below:

The record discloses the following:

- An e-Petition To Accept Unintentionally Delayed Payment Of Maintenance Fee In An Expired Patent (37 CFR 1.378(b)) was electronically filed on June 2, 2017, with payment of $1650 by electronic transfer for the 3.5 year maintenance fee ($800.00) and the petition fee ($850.00).

- The petition was automatically granted on June 2, 2017.

However, the electronic transfer payment ($1650.00) made on June 2, 2017, was returned due to insufficient funds.

In view of the above, the petition automatically granted by EFS on June 2, 2017, is vacated and the patent remains expired.

A response to this letter must be submitted within **TWO (2) MONTHS** from the mail date of this decision. The petition should include a cover letter entitled "Renewed Petition under 37 CFR 1.378(b)," **along with the payment of $50 for a returned check fee.**

Further correspondence with respect to this matter should be delivered through one of the following mediums:

By mail: Mail Stop PETITIONS
Commissioner for Patents
Post Office Box 1450
Alexandria, VA 22313-1450

By hand: Customer Service Window
Mail Stop Petitions
Randolph Building
40l Dulany Street
Alexandria, VA 22314

By fax: (571) 273-8300
ATTN: Office of Petitions

By internet: EFS-Web
www.uspto.gov/ebc/efs_help.html
(for help using EFS-Web call the
Patent Electronic Business Center
at (866) 217-9197)

Any questions concerning this matter may be directed to the undersigned at (571) 272-3208.

/KOC/
Karen Creasy
Paralegal Specialist
Office of Petitions

Office of Petitions: Routing Sheet

Application No. 12/924,354

This application is being forwarded to your office for further processing. A decision has been rendered on a petition filed in this application, as indicated below. For details of this decision, please see the document PET.OP.DEC filed on the same date as this document.

- [ ] **GRANTED**
- [x] **DISMISSED**
- [ ] **DENIED**

Office of Petitions: Decision Count Sheet

Mailing Month

Application No. 12924354

12924354

For US serial numbers: enter number only, no slashes or commas. Ex: 10123456
For PCT: enter "51+single digit of year of filing+last 5 numbers", Ex. for PCT/US05/12345, enter 51512345

Deciding Official: KAREN CREASY

Count (1) - Palm Credit 12/924,354

Decision: DISMISSED

FINANCE WORK NEEDED
☐ Select Check Box for YES

DISMISSED

Decision Type: 533 - 37 CFR 1.378(c) - TO ACCEPT UNINTENTIONAL DE

533

Notes:

Count (2)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Count (3)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Initials of Approving Official (if required)

If more than 3 decisions, attach 2nd count sheet & mark this box ☐

Printed on: *6/15/2017*

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

118361 7590 06/16/2017

Arjuna Indraeswaran Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

EXAMINER
FLEMING, FAYE M

ART UNIT	PAPER NUMBER
3616	

MAIL DATE	DELIVERY MODE
06/16/2017	PAPER

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United States Patent and Trademark Office
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Alexandria, VA 22313-1450
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In re Patent No. 8,136,835	:	
Issue Date: March 20, 2012	:	
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Alexandria, VA 22314

By fax: (571) 273-8300
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By internet: EFS-Web
www.uspto.gov/ebc/efs_help.html
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/KOC/
Karen Creasy
Paralegal Specialist
Office of Petitions

Office of Petitions: Routing Sheet

Application No. 12/924,354

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- [ ] **GRANTED**
- [x] **DISMISSED**
- [ ] **DENIED**

Office of Petitions: Decision Count Sheet

Mailing Month

Application No. 12924354

12924354

For US serial numbers: enter number only, no slashes or commas. Ex: 10123456
For PCT: enter "51+single digit of year of filing+last 5 numbers", Ex. for PCT/US05/12345, enter 51512345

Deciding Official: KAREN CREASY

Count (1) - Palm Credit 12/924,354

Decision: DISMISSED

FINANCE WORK NEEDED
☐ Select Check Box for YES

DISMISSED

Decision Type: 533 - 37 CFR 1.378(c) - TO ACCEPT UNINTENTIONAL DE

533

Notes:

Count (2)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Count (3)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Initials of Approving Official (if required)

If more than 3 decisions, attach 2nd count sheet & mark this box ☐

Printed on: *6/15/2017*

ARJUNA I. RAJASINGHAM
B.Tech.(IIT), A.M. (Stanford), M.B.A. (Stanford), Ph.D.(Berkeley).

6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

In the United States Patent and Trademark Office

Application Number: 12/924,354
Applicant: Arjuna Indraeswaran Rajasingham

June 13, 2017

Assistant Commissioner of Patents
Washington, DC 20231

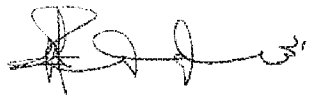
PETITION 37 CFR 1.78
DELAYED BENEFIT CLAIMS

Sir,

The applicant respectfully submits that the entire delay between the date the benefit claim was due under 37 CFR1.78 and the date the claim is filed was unintentional and respectfully submits herewith:

1. Proper references in an ADS.
2. Petition fee under 37 CFR 1.17(m) $850.

Very respectfully,



A.I. Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
Dr.	ARJUNA	INDRAESWARAN	RAJASINGHAM	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	BETHESDA	State/Province	MD	Country of Residence	US

Mailing Address of Inventor:

Address 1	6024 BRADLEY BOULEVARD		
Address 2			
City	BETHESDA	State/Province	MD
Postal Code	20817	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	118361		
Email Address	AIR@MMMMG.COM	Add Email	Remove Email

Application Information:

Title of the Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354		
Attorney Docket Number		Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	39	Suggested Figure for Publication (if any)	

Filing By Reference :

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☒ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	118361		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the application number blank.

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/113028	Continuation in part of	10/109674	2002-04-01	7159923	2007-01-09
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/779591	2001-02-09	6609754	2003-08-26

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/779592	2001-02-09	6742833	2004-06-01

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/779593	2001-02-09	6715816	2004-04-06

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/779594	2001-02-09	7255389	2007-08-14

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/435830	1999-11-08	6609749	2003-08-26

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/109674	Continuation in part of	09/404475	1999-09-24	6547315	2003-04-15

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/113028	Continuation in part of	10/681304	2003-10-09	7175221	2007-02-13

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/681304	Division of	09/779592	2001-02-09	6742833	2004-02-09

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/681304	Continuation in part of	10/279171	2002-10-24	7156416	2002-10-24

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
09/779594	Continuation in part of	09/404475	1999-09-24	6547315	2003-04-15

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/639088	Continuation in part of	11/185784	2005-07-21	8020658	2011-09-20

Prior Application Status: Patented — Remove

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/639088	Continuation in part of	11/113028	2005-04-25	8138908	2012-03-20
Prior Application Status	Expired			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
11/639088	Claims benefit of provisional	60/751305	2005-12-19		
Prior Application Status	Expired			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
11/639088	Claims benefit of provisional	60/848804	2006-09-29		
Prior Application Status	Expired			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		
11/639088	Claims benefit of provisional	60/849685	2006-10-05		
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/639088	Continuation in part of	10/279171	2002-10-24	7156416	2007-01-02
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/639088	Continuation in part of	09/779594	2001-02-09	7255389	2007-08-14
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/113028	Continuation in part of	10/279171	2002-10-24	7156416	2007-01-02
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/279171	Division of	09/435830	1999-11-08	6609749	2003-08-26
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
10/279171	Division of	09/404475	1999-09-24	6547315	2003-04-15
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/113028	Continuation in part of	09/779594	2001-02-09	7255389	2007-08-14
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
09/779594	Continuation in part of	09/435830	1999-11-08	6609749	2003-08-26

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/109674	Claims benefit of provisional	60/280470	2001-04-02
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/109674	Claims benefit of provisional	60/282105	2001-04-09
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/109674	Claims benefit of provisional	60/286629	2001-04-26
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/109674	Claims benefit of provisional	60/332419	2001-11-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/109674	Claims benefit of provisional	60/338466	2001-12-03
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
09/779594	Claims benefit of provisional	60/195298	2000-04-10
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
09/779594	Claims benefit of provisional	60/226570	2000-08-21
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
10/681304	Claims benefit of provisional	60/461434	2003-04-10
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11/639088	Continuation in part of	10/681304	2003-10-09	7175221	2007-02-13
Prior Application Status	Patented				Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12/924354	Continuation in part of	11/639088	2006-12-14	8251444	2012-08-28
Prior Application Status	Patented				Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12/924354	Continuation in part of	11/185784	2005-07-21	8020658	2011-09-20

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/624,354	

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

Approved for use through 04/30/2017, OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◯ Assignee	◯ Legal Representative under 35 U.S.C. 117	◯ Joint Inventor
◯ Person to whom the inventor is obligated to assign.	◯ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. ☐

Prefix	Given Name	Middle Name	Family Name	Suffix

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Mailing Address Information For Applicant:			
Address 1			
Address 2			
City		State/Province	
Country[i]		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication . An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:			
Address 1			
Address 2			
City		State/Province	
Country[i]		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM Ser No: 12/924,354	

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.					
Signature	/Arjuna Indraeswaran Rajasingham/			Date (YYYY-MM-DD)	2017-06-13
First Name	ARJUNA	Last Name	RAJASINGHAM	Registration Number	
Additional Signature may be generated within this form by selecting the Add button.					

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Arjuna Indraeswaran Rajasingham	Primary Examiner: Faye M. Fleming
Application Serial No. 12/924,354	Patent No. 8, 136, 835
Filed: 2010-09-24	Issued: 2012-03-20
Title: EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM	

REQUEST FOR CERTIFICATE OF CORRECTION UNDER 35 U.S.C. § 255

Commissioner for Patents
Office of Patent Publication
ATTN: Certificate of Correction Branch
P.O. Box 1450
Alexandria, VA 22313-1450

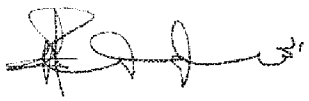
Dear Sir or Madam:

Pursuant to 35 U.S.C. § 255, Applicant hereby respectfully requests a Certificate of Correction for the above-referenced patent. Applicant's mistakes were made in good faith and without deceptive intent. The following corrections are requested to clarify the relationships and/or filing dates of priority applications and patents previously listed in the originally submitted application.

Under the provisions of 37 C.P.R. 1.78 Applicant submits herewith a duly completed form PTO/SB/44 and request that a Certificate of Correction be issued in connection with the above-identified patent. All requirements set forth in 37 CFR 1.78 were met in Appl. Serial No. 11/113, 028, which became the above-identified patent.
It is clear from the record of the above-identified patent that priority is appropriate. The correct priority information is reflected for example in Filing Receipt of 2005-06-20; the Transmittal sheet of 2005-04-25; the first paragraph of the original Specification; and under (63) on the first page of the published application US2006/0043766 A1 published 2006-03-02.
The required fee under 37 C.F.R. § 1.20(a) is included herewith.

Dated: June 13, 2017

Sincerely,



Arjuna Indraeswaran Rajasingham Ph. D.
ProSe Applicant
6024 Bradley Boulevard
Bethesda, MD 20817

Attachment: PTO/SB/44 form

PTO/SB/44 (09-07)
Approved for use through 08/31/2013. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 8,136,835

APPLICATION NO. : 12/924,354

ISSUE DATE : MARCH 20, 2012

INVENTOR(S) : ARJUNA INDRAESWARAN RAJASINGHAM

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

(63) Continuation-in-part of Serial Nos: 11/639,088 filed December 14, 2006 now U.S. Patent No. 8,251,444; and 11/185,784 filed July 21, 2005 now US Patent No. 8,020,658. Serial No. 11/639,088 is a Continuation-in-part of Serial Nos: 11/113,028 filed April 25, 2005 now U.S. Patent No. 8,138,908; and 11/185,784 filed July 21, 2005 now US Patent No. 8,020,658. Serial No. 11/113,028 is Continuation-in-part of Serial No. 10,109/674 filed April 1, 2002 now U.S. Patent No. 7,159,923 which is a Continuation-in-part of Serial No. 09/779,591 filed February 9, 2001 now U.S.Patent No.6,609,754, and a Continuation-in-part of Serial No. 09/779,592 filed February 9, 2001 now U.S.Patent No.6,742,833., and a Continuation-in-part of Serial No. 09/779,593 filed February 9, 2001 now U.S.Patent No.6,715,816., and a Continuation-in-part of Serial No. 09/779,594 filed February 9, 2001 now U.S.Patent No.7,255,389., and a Continuation-in-part of Serial No. 09/435,830 filed November 8, 1999 now U.S.Patent No.6,609,749 and a Continuation-in-part of Serial No. 09/404,475 filed September 24, 1999 now U.S.Patent No. 6,547,315. Serial No. 09/779,594 is a Continuation-in-part of Serial No. 09/435,830 filed November 8, 1999 now U.S.Patent No.6,609,749 and a Continuation-in-part of Serial No. 09/404,475 filed September24, 1999 now U.S.Patent No.6,547,315. Serial No. 11/113, 028 is also a Continuation-in-part of Serial No. 10/681,304 filed October 9, 2003 now U.S. Patent No. 7,175,221 which is a Divisional of Serial No. 09/779,592 filed February 9, 2001 now U.S. Patent No. 6,742,833, and is a Continuation-in-part of Serial No. 10/279,171 filed October 24, 2002 now U.S. Patent No. 7,156,416. Serial No. 11/113, 028 is also a Continuation-in-part of Serial No. 10/279,171 filed October 24, 2002 now U.S. Patent No. 7,156,416, and a Continuation-in-part of Serial No. 09/779,594 filed February 9, 2001 now U.S.Patent No.7,255,389. Serial No. 11/639,088 is also a Continuation-in-part of Serial No. 10/279,171 filed October 24, 2002 now U.S. Patent No. 7,156,416, and also a Continuation-in-part of Serial No. 09/779,594 filed February 9, 2001 now U.S. Patent No. 7,255,389 and also a Continuation-in-part of Serial No. 10/681,304 filed October 9, 2003 now U.S. Patent No. 7,175,221. Serial No. 10/279,171 is a Divisional of Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749, and a Divisional of Serial No. 09/404,475 filed September24, 1999 now U.S.Patent No.6,547,315.

(60) Prov. Serial Nos. 60/751 305 filed December 19, 2005; 60/848 804 filed September 29, 2006; 60/849 685 filed October 5, 2006; 60/280470 filed April 2, 2001; 60/282105 filed April 9, 2001; 60/286629 filed April 26, 2001; 60/332419 filed November 14, 2001; 60/338466 filed December 3, 2001; 60/195298 filed April 10, 2000; 60/226570 filed August 21, 2000; 60/461434 filed April 10, 2003.

END OF CORRECTION

MAILING ADDRESS OF SENDER (Please do not use customer number below):

Electronic Patent Application Fee Transmittal

Application Number:	12924354
Filing Date:	24-Sep-2010
Title of Invention:	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM
First Named Inventor/Applicant Name:	Arjuna Indraeswaran Rajasingham
Filer:	Arjuna Indraeswaran Rajasingham
Attorney Docket Number:	

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
PET. DELAY SUB OR RESTORE PRIORITY-CLAIM	2454	1	850	850
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
CERTIFICATE OF CORRECTION	2811	1	100	100
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**950**

Electronic Acknowledgement Receipt

EFS ID:	29480054
Application Number:	12924354
International Application Number:	
Confirmation Number:	8323
Title of Invention:	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM
First Named Inventor/Applicant Name:	Arjuna Indraeswaran Rajasingham
Customer Number:	118361
Filer:	Arjuna Indraeswaran Rajasingham
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	13-JUN-2017
Filing Date:	24-SEP-2010
Time Stamp:	14:13:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	EFT
Payment was successfully received in RAM	$950
RAM confirmation Number	061417INTEFSW14140600
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition for review by the PCT legal office	RAJASINGHAM_PETITION-78_12-924354.pdf	518109 8ac8a23655619e2ce124724a58fc65b9734f5bde	no	1
Warnings:					
Information:					
2	Petition for review by the PCT legal office	ADS_12-924354_June_13_2017.pdf	2898355 96591a1de58c7051e453f16ad33e224b41246bbd	no	9
Warnings:					
Information:					
3	Petition for review by the PCT legal office	CofC-request_8-136835_12_924354_JUN_13_2017.pdf	956493 e4560f5135f6fb00ba7a5525be54b434a8f747cc	no	2
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	32183 0d95eda35e508924d32ec0e6abbbe4052956cb0f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	4405140		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PETITION TO ACCEPT UNINTENTIONALLY DELAYED PAYMENT OF MAINTENANCE FEE IN AN EXPIRED PATENT (37 CFR 1.378(b))

Patent Number	Issue Date	Application Number	Filing Date	Docket Number (if applicable)
8136835	20-Mar-2012	12924354	24-Sep-2010	

CAUTION: Maintenance fee (and surcharge, if any) payment must correctly identify: (1) the patent number and (2) the application number of the actual U.S. application leading to issuance of that patent to ensure the fee(s) is/are associated with the correct patent. 37 CFR 1.366(c) and (d).

Applicants claims the following fee status:

- (●) Small Entity
- ( ) Micro Entity
- ( ) Regular Undiscounted

Applicants selects the following :

(●) 3 1/2	( ) 7 1/2	( ) 11 1/2

PETITION FEE
The petition fee required by 37 CFR 1.17(m) (Fee Code 1558/2558) must be paid as a condition of accepting unintentionally delayed payment of the maintenance fee.

MAINTENANCE FEE (37 CFR 1.20(e)-(g))
The appropriate maintenance fee must be submitted with this petition.

STATEMENT
THE UNDERSIGNED CERTIFIES THAT THE DELAY IN PAYMENT OF THE MAINTENANCE FEE TO THIS PATENT WAS UNINTENTIONAL

PETITIONER(S) REQUEST THAT THE DELAYED PAYMENT OF THE MAINTENANCE FEE BE ACCEPTED AND THE PATENT REINSTATED

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

37 CFR 1.378(c) states: "Any petition under this section must be signed in compliance with 37 CFR 1.33(b) ."

I certify, in accordance with 37 CFR 1.4(d)(4) that I am

- ( ) An attorney or agent registered to practice before the Patent and Trademark Office who has been given power of attorney in this application.
- ( ) An attorney or agent registered to practice before the Patent and Trademark Office
- (●) A sole patentee
- ( ) A joint patentee; I certify that I am authorized to sign this submission on behalf of all the other patentees as evidenced by the power of attorney in the application
- ( ) A joint patentee; all of whom are signing this e-petition
- ( ) The assignee of record of the entire interest that qualifies as an authorized party under 37 CFR 1.33(b)

Sole Patentee	
A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.	
Signature	/A.I.Rajasingham/
Name	Arjuna Indraeswaran Rajasingham

Electronic Patent Application Fee Transmittal

Application Number:	12924354
Filing Date:	24-Sep-2010
Title of Invention:	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM
First Named Inventor/Applicant Name:	Arjuna Indraeswaran Rajasingham
Filer:	Arjuna Indraeswaran Rajasingham
Attorney Docket Number:	

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
MAINTENANCE FEE DUE AT 3.5 YEARS	2551	1	800	800
PET. DELAY PYMT MAINTAIN PATENT IN FORCE	2558	1	850	850
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1650**

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

In re Patent No. 8136835
Issue Date: March 20,2012
Application No. 12924354
Filed: September 24,2010
Attorney Docket No.

:
:DECISION GRANTING PETITION
:UNDER 37 CFR 1.378(b)
:

This is a decision on the electronic petition, filed June 2,2017 ,under 37 CFR 1.378(b) to accept the unintentionally delayed payment of the 3.5 year maintenance fee for the above-identified patent.

The petition is **GRANTED**.

The maintenance fee is accepted, and the above-identified patent reinstated as of June 2,2017 . This decision also constitutes notice that the fee has been accepted. An electronic copy of the petition and this decision has been created as an entry in the Image File Wrapper. Nevertheless, petitioner should print and retain an independent copy.

Telephone inquiries related to this electronic decision should be directed to the Electronic Business Center at 1-866-217-9197.

Electronic Acknowledgement Receipt

EFS ID:	29381560
Application Number:	12924354
Patent Number:	8136835
Confirmation Number:	8323
Petition Issued Date:	June 2,2017
Title of Invention:	EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM
First Named Inventor/Applicant Name:	Arjuna Indraeswaran Rajasingham
Customer Number:	118361
Filer:	Arjuna Indraeswaran Rajasingham
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	02-JUN-2017
Filing Date:	24-SEP-2010
Time Stamp:	14:20:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	EFT
Payment was successfully received in RAM	$1650
RAM confirmation Number	060517INTEFSW14213100
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition automatically granted by EFS	petition-request.pdf	32059 f722a474551d5b7e5d4ad9f4eaf63aeb11586a07	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	31972 f35f66baefd9557c425177855eda233d5118a426	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	64031		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
12/924,354	8136835	3616	9200

OC000000064612281

Correspondence Address/Fee Address Change

The following fields have been set to Customer Number 118361 on 10/24/2013

- **Correspondence Address**
- **Maintenance Fee Address**

The address of record for Customer Number 118361 is:

118361
Arjuna Indraeswaran Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 8,136,835 B2
APPLICATION NO. : 12/924354
DATED : March 20, 2012
INVENTOR(S) : Arjuna Indraeswaran Rajasingham

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 1, lines 10-20 should be changed to the following and reproduced on the first page of the Patent:

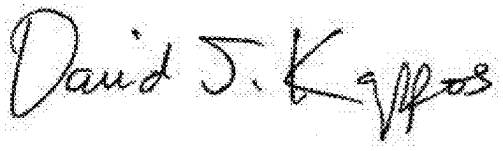
Each of the foregoing applications are incorporated by reference herein.

This application is a divisional of Serial No. 11/185,784 filed July 21, 2005 now U.S. Patent No. 8,020,658.

U.S. Patent No. 8,020,658 is a continuation of: Serial No. 10/681,304 filed October 9, 2003 now U.S. Patent No. 7,175,221; Serial No. 09/779,594 filed February 9, 2001 now U.S. Patent No. 7,255,389; and Serial No. 10,109/674 filed April 1, 2002 now U.S. Patent No. 7,159,923. U.S. Patent No. 8,020,658 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320.

CONTINUED ON PAGE 2

Signed and Sealed this
Eighteenth Day of December, 2012



David J. Kappos
Director of the United States Patent and Trademark Office

Patent No. 7,175,221 also claims priority to: Serial No. 09/779,594 filed February 9, 2001 now U.S. Patent No. 7,255,389; and Serial No. 09/779,593 filed February 9, 2001 now U.S. Patent No. 6,715,816. U.S. Patent No. 7,175,221 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320. U.S. Patent No. 7,175,221 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000; 60/226,570 filed August 21, 2000; 60/280,470 filed April 2, 2001; 60/282,105 filed April 9, 2001; 60/286,629 filed April 26, 2001; 60/332,419 filed November 14, 2001; 60/338,466 filed December 3, 2001; 60/367,644 filed February 20, 2002; 60/362,450 filed March 8, 2002; and 60/461,434 filed April 10, 2003.

U.S. Patent No. 7,255,389 is a continuation in-part of: Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354; Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; and Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749. U.S. Patent No. 7,255,389 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320. U.S. Patent No. 7,255,389 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000; and 60/226,570 filed August 21, 2000.

U.S. Patent No. 7,159,923 is a continuation-in-part of: Serial No. 09/779,591 filed February 9, 2001 now U.S. Patent No. 6,609,754; Serial No. 09/779,592 filed February 9, 2001 now U.S. Patent No. 6,742,833; Serial No. 09/779,594 filed February 9, 2001 now U.S. Patent No. 7,255,389; Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749; Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; and Serial No. 09/779,593 filed February 9, 2001 now U.S. Patent No. 6,715,816. U.S. Patent No. 7,159,923 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320. U.S. Patent No. 7,159,923 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000; 60/226,570 filed August 21, 2000; 60/280,470 filed April 2, 2001; 60/282,105 filed April 9, 2001; 60/286,629 filed April 26, 2001; 60/332,419 filed November 14, 2001; 60/338,466 filed December 3, 2001; 60/367,644 filed February 20, 2002; and 60/362,450 filed March 8, 2002.

EP Application No. 00203896 claims priority to: Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749; and Prov. Serial Nos. 60,195,298 filed April 10, 2000 and 60/226,570 filed August 21, 2000.

EP Application No. 98948260 claims priority to Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354.

U.S. Patent No. 7,156,416 is a divisional of: Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; and Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749. U.S. Patent No. 7,156,416 also claims priority to: Serial

No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354; Serial No. 09/779,594 filed February 9, 2001 now U.S. Patent No. 7,255,389; and Serial No. 10,109/674 filed April 1, 2002 now U.S. Patent No. 7,159,923.

U.S. Patent No. 6,547,315 is a continuation of Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354.

U.S. Patent No. 6,609,749 is a continuation-in-part of Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354.

U.S. Patent No. 6,609,754 is a continuation-in-part of: Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749; and Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354. U.S. Patent No. 6,609,754 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000 and 60/226,570 filed August 21, 2000. U.S. Patent No. 6,609,754 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320.

U.S. Patent No. 6,742,833 is a continuation-in-part of: Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749; and Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354. U.S. Patent No. 6,742,833 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000 and 60/226,570 filed August 21, 2000. U.S. Patent No. 6,742,833 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320.

U.S. Patent No. 6,715,816 is a continuation-in-part of: Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749; and Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354. U.S. Patent No. 6,715,816 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000 and 60/226,570 filed August 21, 2000. U.S. Patent No. 6,715,816 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320.

END OF CORRECTION

Cof

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Arjuna Indraeswaran Rajasingham	Serial No. 12/ 924, 354
Filed: September 24, 2010	Patent No. 8, 136, 835
Title: EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM	Primary Examiner: Faye M. Fleming

REQUEST FOR CERTIFICATE OF CORRECTION UNDER 35 U.S.C. § 255

Commissioner for Patents
Office of Patent Publication
ATTN: Certificate of Correction Branch
P.O. Box 1450
Alexandria, VA 22313-1450

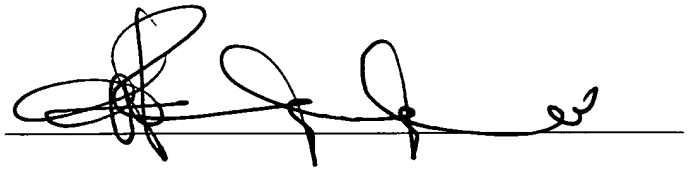
Dear Sir or Madam:

Pursuant to 35 U.S.C. § 255, Applicant hereby respectfully requests a Certificate of Correction for the above-referenced patent. Applicant's mistakes were made in good faith and without deceptive intent. The following corrections are requested to clarify the relationships and/or filing dates of priority applications and patents previously listed in the originally submitted application.

The required fee under 37 C.F.R. § 1.20(a) is included herewith.

Dated: September 17, 2012

Sincerely,



Arjuna Indraeswaran Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

Attachment: PTO/SB/44 form

PTO/SB/44 (09-07)
Approved for use through 08/31/2013. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.
(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 8, 136, 835

APPLICATION NO.: 12/924, 354

ISSUE DATE : MARCH 20 2012

INVENTOR(S) : ARJUNA INDRAESWARAN RAJASINGHAM

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 1, lines 10-20 should be changed to the following and reproduced on the first page of the Patent:

Each of the foregoing applications are incorporated by reference herein.

This application is a divisional of Serial No. 11/185,784 filed July 21, 2005 now U.S. Patent No. 8,020,658.

U.S. Patent No. 8,020,658 is a continuation of: Serial No. 10/681,304 filed October 9, 2003 now U.S. Patent No. 7,175,221; Serial No. 09/779,594 filed February 9, 2001 now U.S. Patent No. 7,255,389; and Serial No. 10,109/674 filed April 1, 2002 now U.S. Patent No. 7,159,923. U.S. Patent No. 8,020,658 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320.

CONTINUED ON PAGE 2

MAILING ADDRESS OF SENDER (Please do not use customer number below):

Patent No. 7,175,221 also claims priority to: Serial No. 09/779,594 filed February 9, 2001 now U.S. Patent No. 7,255,389; and Serial No. 09/779,593 filed February 9, 2001 now U.S. Patent No. 6,715,816. U.S. Patent No. 7,175,221 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320. U.S. Patent No. 7,175,221 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000; 60/226,570 filed August 21, 2000; 60/280,470 filed April 2, 2001; 60/282,105 filed April 9, 2001; 60/286,629 filed April 26, 2001; 60/332,419 filed November 14, 2001; 60/338,466 filed December 3, 2001; 60/367,644 filed February 20, 2002; 60/362,450 filed March 8, 2002; and 60/461,434 filed April 10, 2003.

U.S. Patent No. 7,255,389 is a continuation in-part of: Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354; Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; and Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749. U.S. Patent No. 7,255,389 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320. U.S. Patent No. 7,255,389 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000; and 60/226,570 filed August 21, 2000.

U.S. Patent No. 7,159,923 is a continuation-in-part of: Serial No. 09/779,591 filed February 9, 2001 now U.S. Patent No. 6,609,754; Serial No. 09/779,592 filed February 9, 2001 now U.S. Patent No. 6,742,833; Serial No. 09/779,594 filed February 9, 2001 now U.S. Patent No. 7,255,389; Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749; Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; and Serial No. 09/779,593 filed February 9, 2001 now U.S. Patent No. 6,715,816. U.S. Patent No. 7,159,923 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320. U.S. Patent No. 7,159,923 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000; 60/226,570 filed August 21, 2000; 60/280,470 filed April 2, 2001; 60/282,105 filed April 9, 2001; 60/286,629 filed April 26, 2001; 60/332,419 filed November 14, 2001; 60/338,466 filed December 3, 2001; 60/367,644 filed February 20, 2002; and 60/362,450 filed March 8, 2002.

EP Application No. 00203896 claims priority to: Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749; and Prov. Serial Nos. 60,195,298 filed April 10, 2000 and 60/226,570 filed August 21, 2000.

EP Application No. 98948260 claims priority to Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354.

U.S. Patent No. 7,156,416 is a divisional of: Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; and Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749. U.S. Patent No. 7,156,416 also claims priority to: Serial

No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354; Serial No. 09/779,594 filed February 9, 2001 now U.S. Patent No. 7,255,389; and Serial No. 10,109/674 filed April 1, 2002 now U.S. Patent No. 7,159,923.

U.S. Patent No. 6,547,315 is a continuation of Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354.

U.S. Patent No. 6,609,749 is a continuation-in-part of Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354.

U.S. Patent No. 6,609,754 is a continuation-in-part of: Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749; and Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354. U.S. Patent No. 6,609,754 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000 and 60/226,570 filed August 21, 2000. U.S. Patent No. 6,609,754 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320.

U.S. Patent No. 6,742,833 is a continuation-in-part of: Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749; and Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354. U.S. Patent No. 6,742,833 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000 and 60/226,570 filed August 21, 2000. U.S. Patent No. 6,742,833 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320.

U.S. Patent No. 6,715,816 is a continuation-in-part of: Serial No. 09/404,475 filed September 24, 1999 now U.S. Patent No. 6,547,315; Serial No. 09/435,830 filed November 8, 1999 now U.S. Patent No. 6,609,749; and Serial No. 08/936,626 filed September 24, 1997 now U.S. Patent No. 6,059,354. U.S. Patent No. 6,715,816 also claims priority to: Prov. Serial Nos. 60,195,298 filed April 10, 2000 and 60/226,570 filed August 21, 2000. U.S. Patent No. 6,715,816 also claims priority to: EP Application No. 00203896 filed November 7, 2000 now EP Patent No. 1099607; and EP Application No. 98948260 filed September 17, 1998 now EP Patent No. 1021320.

END OF CORRECTION

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	03/20/2012	8136835		8323

7590 02/29/2012

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Arjuna Indraeswaran Rajasingham, Bethesda, MD;

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United States Patent and Trademark Office
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Bib Data Sheet

CONFIRMATION NO. 8323

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/924,354	09/24/2010 RULE	280	3616	

APPLICANTS

Arjuna Indraeswaran Rajasingham, Bethesda, MD;

** CONTINUING DATA **********

** FOREIGN APPLICATIONS **********

IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** SMALL ENTITY **
** 10/12/2010

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☐ no	MD	39	7	2
35 USC 119 (a-d) conditions met ☐ yes ☐ no ☐ Met after Allowance				
Verified and Acknowledged Examiner's Signature Initials				

ADDRESS

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD20817

TITLE

EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
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7590 11/28/2011
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6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

OPAP IAP23 FEB 10 2012 PATENT & TRADEMARK OFFICE

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A.I. RAJASINGHAM	(Depositor's name)
	(Signature)
2/10/12	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

TITLE OF INVENTION: EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$870	$300	$0	$1170	02/28/2012

EXAMINER	ART UNIT	CLASS-SUBCLASS
FLEMING, FAYE M	3616	280-736000

02/13/2012 HVUONG2 00000015 12924354
01 FC:2501 870.00 OP
02 FC:1504 300.00 OP

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
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☑ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☑ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date February 10, 2012

Typed or printed name A.I. RAJASINGHAM. Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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7590 11/28/2011

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

EXAMINER	
FLEMING, FAYE M	
ART UNIT	PAPER NUMBER
3616	

DATE MAILED: 11/28/2011

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

TITLE OF INVENTION: EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$870	$300	$0	$1170	02/28/2012

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PTOL-85 (Rev. 02/11)

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ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

EXAMINER
FLEMING, FAYE M

ART UNIT	PAPER NUMBER
3616	

DATE MAILED: 11/28/2011

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

TITLE OF INVENTION: EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$870	$300	$0	$1170	02/28/2012

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(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

TITLE OF INVENTION: EASY EJECTOR SEAT WITH SKELETAL CRASH SAFETY BEAM

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$870	$300	$0	$1170	02/28/2012

EXAMINER	ART UNIT	CLASS-SUBCLASS
FLEMING, FAYE M	3616	280-736000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

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❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

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(B) RESIDENCE: (CITY and STATE OR COUNTRY)

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❑ Publication Fee (No small entity discount permitted)

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❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

7590 11/28/2011

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

EXAMINER	
FLEMING, FAYE M	

ART UNIT	PAPER NUMBER
3616	

DATE MAILED: 11/28/2011

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No.	Applicant(s)	
	12/924,354	RAJASINGHAM, ARJUNA INDRAESWARAN	
	Examiner	Art Unit	
	Faye M. Fleming	3616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the amendment filed October 7, 2011*.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are *1-7*.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows: In claim 3, line 2, "that the subsequent inflation" has been changed to --that subsequent inflation--.

The above change has been made for clarity and consistency.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Faye M. Fleming whose telephone number is (571)272-6672. The examiner can normally be reached on M-F (9:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Dickson can be reached on (571) 272-7742. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Faye M. Fleming/
Primary Examiner, Art Unit 3616

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	vehicle and prefilled near (airbag or "air bag")and porous adj (fillings or gas)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2011/11/04 17:37

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	2	((280/736) or (280/730.2)).CCLS.	UPAD	OR	OFF	2011/11/04 17:38

11/4/2011 5:39:06 PM
C:\Users\ffleming1\Documents\EAST\Workspaces\12924354f.wsp

Issue Classification	Application/Control No.	Applicant(s)/Patent under Reexamination	
	12/924,354	RAJASINGHAM, ARJUNA INDRAESWARAN	
	Examiner	Art Unit	
	Faye M. Fleming	3616	

ISSUE CLASSIFICATION

ORIGINAL					CROSS REFERENCE(S)						
CLASS		SUBCLASS		CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)						
280		736		280	730.2						
INTERNATIONAL CLASSIFICATION											
B	6	0	R	21/26							
				/							
				/							
				/							
				/							

(Assistant Examiner) (Date)	/Faye M. Fleming/ 11/03/11	Total Claims Allowed: 7	
(Legal Instruments Examiner) (Date)	(Primary Examiner) (Date)	O.G. Print Claim(s): 1	O.G. Print Fig.: 13

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		31		61		91		121		151		181
	2		32		62		92		122		152		182
	3		33		63		93		123		153		183
	4		34		64		94		124		154		184
	5		35		65		95		125		155		185
	6		36		66		96		126		156		186
	7		37		67		97		127		157		187
	8		38		68		98		128		158		188
	9		39		69		99		129		159		189
	10		40		70		100		130		160		190
	11		41		71		101		131		161		191
	12		42		72		102		132		162		192
	13		43		73		103		133		163		193
	14		44		74		104		134		164		194
	15		45		75		105		135		165		195
	16		46		76		106		136		166		196
	17		47		77		107		137		167		197
	18		48		78		108		138		168		198
	19		49		79		109		139		169		199
	20		50		80		110		140		170		200
	21		51		81		111		141		171		201
	22		52		82		112		142		172		202
	23		53		83		113		143		173		203
	24		54		84		114		144		174		204
	25		55		85		115		145		175		205
	26		56		86		116		146		176		206
	27		57		87		117		147		177		207
	28		58		88		118		148		178		208
	29		59		89		119		149		179		209
	30		60		90		120		150		180		210

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
12/924,354	RAJASINGHAM, ARJUNA INDRAESWARAN	
Examiner	**Art Unit**	
Faye M. Fleming	3616	

SEARCHED			
Class	Subclass	Date	Examiner
280	730.2 743.1 729	1/16/2011	FF
180	271 274		
280	736	11/03/2011	FF

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner
text	**attached**	**11/03/2011**	**FF**

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
updated search	6/20/2011	FF
updated search	8/22/2011	FF
updated search	11/03/2011	FF

ARJUNA I. RAJASINGHAM
B.Tech(IIT), A.M. (Stanford), M.B.A. (Stanford), Ph.D.(Berkeley).

6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

In the United States Patent and Trademark Office

Application Number:	12/924, 354
Applicant:	Arjuna Indraeswaran Rajasingham
Examiner :	Faye Fleming
Art Unit:	3616

October 7, 2011

VIA FAX 571 2738300
Commissioner of Patents
Washington, DC 20231

Sir,

Response to Office Action of August 24, 2011

The applicant respectfully submits revised claims and a response to the above Office Action.

Title:
No change

Abstract:
No change

Drawings:

No change

Specification:

No change

Claims:
Amended claims are attached.

Remarks - General

The applicant respectfully submits the amended claims to address the comments of the examiner.

Claim rejection 35 USC Section 112:

The applicant has amended claim 2 to address the examiner's rejection as follows:

2. [CURRENTLY AMENDED] An airbag as in claim 1, wherein said airbag acts as a sacrificial chamber to release airflow following commencement of compression of said airbag ~~sacrificial chambers~~ to aircushions that are enabled to protect an occupant during impact.

The applicant has amended claim 4 to address the examiner's rejection as follows:

4. [CURRENTLY AMENDED] An airbag as in claim 3, wherein the torso of the occupant compresses the ~~sacrificial~~ airbag and said at least one aircushions protect one or both of the head and neck.

Claim rejection 35 USC Section 103:

The applicant respectfully submits amended claim 1 as follows:

. [CURRENTLY AMENDED] An airbag prefilled with ~~configured to maintain~~ at least a predetermined volume of air with porous filling materials, and comprising vents for exhaust at a metered rate during impact, said porous filling materials and vents, enabling adjustment of the compression characteristics of the airbag under impact, thereby providing protection of an occupant in a vehicle under impact conditions.

The examiner states:

> "Auman discloses an airbag configured to maintain at least a predetermined volume of air with porous filling materials....Auman discloses the claimed invention except for vents. Brown discloses an airbag 90 for the protection of occupants in vehicles comprising vents 192 for exhaust. Based on the teachings of Brown it would have been obvious to one having ordinary skill in the Art at the time the invention was made to modify the airbag of Auman to control the pressure of the airbag during deployment "

The applicant respectfully submits that Brown teaches an airbag as noted by the examiner . As correctly noted by the examiner as per the prior response, Brown does not teach an airbag with porous filling materials.

The Examiner therefore considers the airbag of Auman to provide the required porous materials.

The applicant respectfully submits that the porous material of Auman is introduced into the airbag *following* commencement of the impact with foam material that is compressed and maintained *outside* the airbag ahead of deployment.

Col 2 L 50-51 - with reference to the *housing 28 adjoining* the airbag where materials are compressed ahead of impact:

> " the housing 28 is filled with a mass of compressed blocks of discrete members 50 of foam material ."

Col3 L 26 -29 – *after impact* the porous material flow into the cushion:

> " When the fluid flows into the housing, the rapid increase in pressure easily ruptures the membrane 52. The compressed members 50 are *now released for expansion by and flow with the fluid into the cushion* 54."

Such an arrangement is unrelated to the present invention where the airbag is prefilled ahead of impact with the porous material.

Claims 2, 3, 4 are dependent on Claim 1. Claims 2, 3 and 4 have no additional features that are relevant to the combination of Auman with Brown.

Conclusion

If for any reason this application is not considered to be in full condition for allowance, the applicant respectfully requests the constructive assistance and suggestions of the examiner pursuant to MPEP Section 706.03(d) and MPEP Section 707.07(j) in order that the applicant can place this application in allowable condition as soon as possible and without a need for further proceedings.

Very respectfully,

A.T. Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

Att:
Marked up claims - 1 page

12/924 354

Claims:

1. [CURRENTLY AMENDED] An airbag prefilled with ~~configured to maintain~~ at least a predetermined volume of air with porous filling materials, and comprising vents for exhaust at a metered rate during impact, said porous filling materials and vents, enabling adjustment of the compression characteristics of the airbag under impact, thereby providing protection of an occupant in a vehicle under impact conditions.

2. [CURRENTLY AMENDED] An airbag as in claim 1, wherein said airbag acts as a sacrificial chamber to release airflow following commencement of compression of said airbag ~~sacrificial chambers~~ to aircushions that are enabled to protect an occupant during impact.

3. [ORIGINAL] An airbag as in claim 2, deployed with said airbag deployed such that its compression is enabled by contact with parts of the occupant with high inertial mass such that the subsequent inflation of the aircushions protect high priority anatomical regions of the occupant.

4. [CURRENTLY AMENDED] An airbag as in claim 3, wherein the torso of the occupant compresses the ~~sacrificial~~ airbag and said at least one aircushions protect one or both of the head and neck.

5. [PREVIOUSLY PRESENTED] A vehicle with side impact protection for occupants provided with an occupant support supported by cylindrical slides (10D1 to 10D5) comprising a first set of slides concentric with a second set of slides, wherein the egress and ingress is enabled by the activation the first set of slides and impact protection for motion into the vehicle for the occupant is enabled with the second set of slides.

6. [ORIGINAL] A vehicle with side impact protection as in claim 5, wherein the first set of slides are enabled for motion with a motorized threaded shaft concentric to the cylindrical slides.

7. [ORIGINAL] A vehicle with side impact protection as in claim 5, wherein the motion of the second set of slides move above structural elements of the vehicle in the center of the vehicle thereby enabling greater motion of the near side occupant during a side impact to the vehicle.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
12/924,354	09/24/2010	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☒ RATE ($)	SMALL ENTITY ☒ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	10/07/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 7	Minus	** 20	= 0	X $30 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $125 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/DAWN BREWER/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

7590 08/24/2011

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

EXAMINER	
FLEMING, FAYE M	

ART UNIT	PAPER NUMBER
3616	

MAIL DATE	DELIVERY MODE
08/24/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/924,354	RAJASINGHAM, ARJUNA INDRAESWARAN	
	Examiner	Art Unit	
	Faye M. Fleming	3616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 July 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *5-7* is/are allowed.

6)☒ Claim(s) *1-4* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 2 and 4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 2 recites the limitation "said sacrificial airbags" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Auman, et al. (3,853,334) in view of Brown (5,913,536).

Auman discloses an airbag configured to maintain at least a predetermined volume of air with porous filling materials 50, the porous filling materials enables adjustment of the compressing characteristics of the air bag under impact thereby providing protection of an

occupant in a vehicle under impact conditions. Auman discloses the claimed invention except for vents. Brown discloses an airbag 90 for the protection of occupants in vehicles comprising vents 192 fore exhaust. Based on the teachings of Brown, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the airbag of Auman to control the pressure of the airbag during deployment.

6. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown (5,913,536) in view of Auman, et al. (3,853,334).

Brown discloses an airbag 90 for the protection of occupants in vehicles comprising vents 192 for exhaust, thereby enabling adjustment of the compression characteristics of the airbag. The airbag 90 acts as a sacrificial chamber to release airflow during compression to aircushions that are enabled to protect an occupant during impact. The airbag 90 deployed such that its compression is enabled by contact with parts of the occupant with high inertial mass such that the subsequent inflation of the aircushions 100 protect high priority anatomical regions of the occupant, see figure 2. The torso of the occupant compresses the sacrificial airbag 110 and one or both of the head and neck are protected by the at least one air cushions 100.

Brown teaches the claimed invention except for porous filling materials. Auman discloses an occupant restraint system comprising an airbag 54 having porous filling materials 50. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Brown to have an airbag with porous filling materials to have the capability of absorbing the energy of impact forces generated by multiple occupant engagement therewith.

Allowable Subject Matter

7. Claims 5-7 are allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Faye M. Fleming whose telephone number is (571)272-6672. The examiner can normally be reached on M-F (9:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Dickson can be reached on (571) 272-7742. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Faye M. Fleming/
Primary Examiner, Art Unit 3616

Notice of References Cited	Application/Control No. 12/924,354	Applicant(s)/Patent Under Reexamination RAJASINGHAM, ARJUNA INDR	
	Examiner Faye M. Fleming	Art Unit 3616	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-3,853,334	12-1974	Auman et al.	280/728.3
*	B	US-3,917,339	11-1975	Fritz, Fred W.	296/68.1
*	C	US-3,981,520	09-1976	Pulling, Nathaniel H.	280/730.2
*	D	US-4,396,220	08-1983	Dieckmann et al.	296/68.1
*	E	US-5,110,176	05-1992	Curtis, Cass V.	296/187.12
*	F	US-5,149,165	09-1992	Woolley, Ronald L.	296/68.1
*	G	US-7,124,851	10-2006	Smith et al.	180/274
*	H	US-6,869,132	03-2005	Wang et al.	296/187.12
*	I	US-6,394,535	05-2002	Kawamura et al.	296/187.03
*	J	US-6,592,166	07-2003	Motozawa, Yasuki	296/68.1
*	K	US-7,387,327	06-2008	Tencer et al.	296/68.1
*	L	US-6,237,991	05-2001	Weber, Norbert	296/187.12
*	M	US-2,827,106	03-1958	CRAMER HENRY G et al.	248/430

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 12/924,354	Applicant(s)/Patent Under Reexamination RAJASINGHAM, ARJUNA INDR	
	Examiner Faye M. Fleming	Art Unit 3616	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-3,001,815	09-1961	WEBER ROBERT C	296/68.1
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

ARJUNA I. RAJASINGHAM
B.Tech.(IIT), A.M. (Stanford), M.B.A. (Stanford), Ph.D.(Berkeley).

6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

In the United States Patent and Trademark Office

Application Number:	12/924, 354
Applicant:	Arjuna Indraeswaran Rajasingham
Examiner :	Faye Fleming
Art Unit:	3616

OK TO ENTER: /F.F./

July 28, 2011

VIA FAX 571 2738300
Commissioner of Patents
Washington, DC 20231

Sir,

Response to Office Action of June 24, 2011 and interview of July 21, 2011

The applicant respectfully submits revised claims and a response to the above Office Action.

Title:
No change

Abstract:
No change

Drawings:

No change

Specification:

No change

Claims:
Amended claims are attached.

Remarks - General

The applicant respectfully submits the amended claims to address the comments of the examiner.

Claim rejection 35 USC Section 103:

The examiner states:

"Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown (5,913,536) in view of Yamato, et al. (2003/0019387).

Brown discloses an airbag 90 for the protection of occupants in vehicles comprising vents 192 for exhaust, thereby enabling adjustment of the compression characteristics of the airbag. The airbag 90 acts as a sacrificial chamber to release airflow during compression to aircushions that are enabled to protect an occupant during impact. The airbag 90 deployed such that its compression is enabled by contact with parts of the occupant with high inertial mass such that the subsequent inflation of the aircushions 100 protect high priority anatomical regions of the occupant, see figure 2. The torso of the occupant compresses the sacrificial airbag 110 and one or both of the head and neck are protected by the at least one air cushions 100.
Brown teaches the claimed invention except for porous filling materials. Yamato discloses a gas generator comprising porous filling materials which can be used for an airbag for a driver side airbag of various vehicles, (see paragraph [0009]). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Brown to have a gas generator

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
12/924,354	RAJASINGHAM, ARJUNA INDRAESWARAN	
Examiner	**Art Unit**	
Faye M. Fleming	3616	

SEARCHED			
Class	Subclass	Date	Examiner
280	730.2 743.1 729	1/16/2011	FF
180	271 274		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
updated search	6/20/2011	FF
updated search	8/22/2011	FF

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

7590 08/04/2011

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

EXAMINER	
FLEMING, FAYE M	

ART UNIT	PAPER NUMBER
3616	

MAIL DATE	DELIVERY MODE
08/04/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Interview Summary	Application No.	Applicant(s)	
	12/924,354	RAJASINGHAM, ARJUNA INDRAESWARAN	
	Examiner	Art Unit	
	Faye M. Fleming	3616	

All participants (applicant, applicant's representative, PTO personnel):

(1) *Faye M. Fleming*. (3)_____.

(2) *Arjuna I. Rajasingham*. (4)_____.

Date of Interview: *27 July 2011*.

Type: a)☒ Telephonic b)☐ Video Conference
c)☐ Personal [copy given to: 1)☒ applicant 2)☐ applicant's representative]

Exhibit shown or demonstration conducted: d)☐ Yes e)☐ No.
If Yes, brief description: _____.

Claim(s) discussed: *1*.

Identification of prior art discussed: *Yamato, et al. (2003/0019387)*.

Agreement with respect to the claims f)☐ was reached. g)☐ was not reached. h)☒ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: *the prior art was discussed and the applicant presented a proposed amendment*.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN A NON-EXTENDABLE PERIOD OF THE LONGER OF ONE MONTH OR THIRTY DAYS FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

/Faye M. Fleming/ Primary Examiner, Art Unit 3616	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

ARJUNA I. RAJASINGHAM
B.Tech.(IIT), A.M. (Stanford), M.B.A. (Stanford), Ph.D.(Berkeley).

6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

In the United States Patent and Trademark Office

Application Number:	12/924, 354
Applicant:	Arjuna Indraeswaran Rajasingham
Examiner :	Faye Fleming
Art Unit:	3616

July 28, 2011

VIA FAX 571 2738300
Commissioner of Patents
Washington, DC 20231

Sir,

Response to Office Action of June 24, 2011 and interview of July 21, 2011

The applicant respectfully submits revised claims and a response to the above Office Action.

Title:
No change

Abstract:
No change

Drawings:

No change

Specification:

No change

Claims:
Amended claims are attached.

Remarks - General

The applicant respectfully submits the amended claims to address the comments of the examiner.

Claim rejection 35 USC Section 103:

The examiner states:

"Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown (5,913,536) in view of Yamato, et al. (2003/0019387).

Brown discloses an airbag 90 for the protection of occupants in vehicles comprising vents 192 for exhaust, thereby enabling adjustment of the compression characteristics of the airbag. The airbag 90 acts as a sacrificial chamber to release airflow during compression to aircushions that are enabled to protect an occupant during impact. The airbag 90 deployed such that its compression is enabled by contact with parts of the occupant with high inertial mass such that the subsequent inflation of the aircushions 100 protect high priority anatomical regions of the occupant, see figure 2. The torso of the occupant compresses the sacrificial airbag 110 and one or both of the head and neck are protected by the at least one air cushions 100.
Brown teaches the claimed invention except for porous filling materials. Yamato discloses a gas generator comprising porous filling materials which can be used for an airbag for a driver side airbag of various vehicles, (see paragraph [0009]). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Brown to have a gas generator

> with porous filling materials to enhance safety and reliability since the gas generating agent has the automatic igniting and the function is not deteriorated for a long term."

The applicant respectfully submits that Brown teaches an airbag as noted by the examiner . As correctly noted by the examiner as per the prior response, Brown does not teach an airbag with porous filling materials.

The Examiner therefore considers the gas generator of Yamato to provide the required porous filling materials as it is noted that such gas generators contain porous filling materials.

However, the claimed invention is not for a gas generator but for an airbag containing porous filling materials. The applicant submits that a gas generator is a separate device that is an inflation mechanism for an airbag. Therefore even if Yamato's gas generator contained porous filling materials the combination will simply be a gas generator with porous materials and an airbag with no porous filling materials.

In the interview of July 27, 2011, the examiner stated that the reason for using the reference was the fact that material from the "porous filling materials" that are in the inflator of Yamato can go into the airbag. However, the applicant submits that what goes into the airbag from any inflator are gasses for inflation with possibly solid particles that would unavoidably be carried along with the gasses into the airbag. It is not the intent of Yamato to transport porous filling materials from the inflator into the airbag.

Further, it is not the intent to claim as stated by the examiner:

> "... enhance safety and reliability since the gas generating agent has the automatic igniting and the function is not deteriorated for a long term"

The intent is to claim the performance of the airbag with the vents and porous filling materials.

The applicant therefore respectfully submits that the combination of Yamato with Brown do not anticipate the present invention.

The applicant recognizes the possible lack of clarity and respectfully submits an amendment to claim 1 for further clarity.

> 1. [CURRENTLY AMENDED] An airbag configured to maintain at least a predetermined volume of air with porous filling materials, ~~for the protection of an occupant in a vehicle under impact conditions~~, and comprising vents for exhaust at a metered rate during impact, said porous filling materials and vents, enabling adjustment of the compression characteristics of the airbag under impact, thereby providing protection of an occupant in a vehicle under impact conditions.

Claims 2, 3, 4 are dependant on Claim 1. Claims 2, 3 and 4 have no additional features that are relevant to the combination of Yamamoto with Brown.

Conclusion

If for any reason this application is not considered to be in full condition for allowance, the applicant respectfully requests the constructive assistance and suggestions of the examiner pursuant to MPEP Section 706.03(d) and MPEP Section 707.07(j) in order that the applicant can place this application in allowable condition as soon as possible and without a need for further proceedings.

Very respectfully,

A.I. Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

Att:
Marked up claims - 1 page

12/924 354

Claims:

1. [CURRENTLY AMENDED] An airbag configured to maintain at least a predetermined volume of air with porous filling materials, ~~for the protection of an occupant in a vehicle under impact conditions~~, and comprising vents for exhaust at a metered rate during impact, said porous filling materials and vents, enabling adjustment of the compression characteristics of the airbag under impact, thereby providing protection of an occupant in a vehicle under impact conditions.

2. [PREVIOUSLY PRESENTED] An airbag as in claim 1, wherein said airbag acts as a sacrificial chamber to release airflow following commencement of compression of said sacrificial airbags to aircushions that are enabled to protect an occupant during impact.

3. [ORIGINAL] An airbag as in claim 2, deployed with said airbag deployed such that its compression is enabled by contact with parts of the occupant with high inertial mass such that the subsequent inflation of the aircushions protect high priority anatomical regions of the occupant.

4. [PREVIOUSLY PRESENTED] An airbag as in claim 3, wherein the torso of the occupant compresses the sacrificial airbag and said at least one aircushions protect one or both of the head and neck.

5. [PREVIOUSLY PRESENTED] A vehicle with side impact protection for occupants provided with an occupant support supported by cylindrical slides (10D1 to 10D5) comprising a first set of slides concentric with a second set of slides, wherein the egress and ingress is enabled by the activation the first set of slides and impact protection for motion into the vehicle for the occupant is enabled with the second set of slides.

6. [ORIGINAL] A vehicle with side impact protection as in claim 5, wherein the first set of slides are enabled for motion with a motorized threaded shaft concentric to the cylindrical slides.

7. [ORIGINAL] A vehicle with side impact protection as in claim 5, wherein the motion of the second set of slides move above structural elements of the vehicle in the center of the vehicle thereby enabling greater motion of the near side occupant during a side impact to the vehicle.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
12/924,354	09/24/2010	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☒ RATE ($)	SMALL ENTITY ☒ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	07/28/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 7	Minus	** 20	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $110 =	0	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/RENEE COLLINS/

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

7590 06/24/2011

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

EXAMINER	
FLEMING, FAYE M	

ART UNIT	PAPER NUMBER
3616	

MAIL DATE	DELIVERY MODE
06/24/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/924,354	RAJASINGHAM, ARJUNA INDRAESWARAN	
	Examiner	Art Unit	
	Faye M. Fleming	3616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 April 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *5-7* is/are allowed.

6)☒ Claim(s) *1-4* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brown (5,913,536) in view of Yamato, et al. (2003/0019387).

Brown discloses an airbag 90 for the protection of occupants in vehicles comprising vents 192 for exhaust, thereby enabling adjustment of the compression characteristics of the airbag. The airbag 90 acts as a sacrificial chamber to release airflow during compression to aircushions that are enabled to protect an occupant during impact. The airbag 90 deployed such that its compression is enabled by contact with parts of the occupant with high inertial mass such that the subsequent inflation of the aircushions 100 protect high priority anatomical regions of the occupant, see figure 2. The torso of the occupant compresses the sacrificial airbag 110 and one or both of the head and neck are protected by the at least one air cushions 100.

Brown teaches the claimed invention except for porous filling materials. Yamato discloses a gas generator comprising porous filling materials which can be used for an airbag for

a driver side airbag of various vehicles, (see paragraph [0009]). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Brown to have a gas generator with porous filling materials to enhance safety and reliability since the gas generating agent has the automatic igniting and the function is not deteriorated for a long term.

Allowable Subject Matter

4. Claims 5-7 are allowed.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Faye M. Fleming whose telephone number is (571)272-6672. The examiner can normally be reached on M-F (9:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Dickson can be reached on (571) 272-7742. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Faye M. Fleming/
Primary Examiner, Art Unit 3616

Notice of References Cited	Application/Control No. 12/924,354	Applicant(s)/Patent Under Reexamination RAJASINGHAM, ARJUNA INDR	
	Examiner Faye M. Fleming	Art Unit 3616	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2003/0019387	01-2003	Yamato et al.	102/530
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
12/924,354	RAJASINGHAM, ARJUNA INDRAESWARAN	
Examiner	**Art Unit**	
Faye M. Fleming	3616	

SEARCHED			
Class	Subclass	Date	Examiner
280	730.2 743.1 729	1/16/2011	FF
180	271 274		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
updated search	6/20/2011	FF

APR 2 1 2011

ARJUNA I. RAJASINGHAM
B.Tech.(IIT), A.M. (Stanford), M.B.A. (Stanford), Ph.D.(Berkeley)

6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

In the United States Patent and Trademark Office

Application Number:	12/924, 354
Applicant:	Arjuna Indraeswaran Rajasingham
Examiner :	Faye Fleming
Art Unit:	3616

April 20, 2011

VIA FAX 571 2738300
Commissioner of Patents
Washington, DC 20231

Sir,

Response to Office Action of 01/21/2011

The applicant respectfully submits revised claims and a response to the above Office Action.

Title:
No change

Abstract:
No change

Drawings:

No change

Specification:

No change

Claims:
Amended claims are attached.

Remarks - General

The applicant respectfully submits the amended claims to address the comments of the examiner.

Claim rejection 35 USC Section 112:

The applicant respectfully submits Claim 4 as amended dependent on amended Claim 2 which is the antecedent for the "sacrificial airbag".

Claim rejection 35 USC Section 102:

The examiner states that claims 1-4 are anticipated by Brown (5,913,536) :

> "Brown discloses an airbag 90 for the protection of occupants in vehicles, wherein the airbag is prefilled with air supplementary porous filling materials, and comprising vents 192 for exhaust, thereby enabling adjustment of the compression characteristics of the airbag. The airbag 90 acts as a sacrificial chamber to release airflow during compression to aircushions that are enabled to protect an occupant during impact. The Airbag 90 deployed such that its compression is enabled by contact with parts of the occupant's [illegible]

high inertial mass such that the subsequent inflation of the aircushions 100 protect high priority anatomical regions of the occupant, see fig 2. The torso of the occupant compresses the sacrificial airbag 110 and one or both of the head and neck are protected by the at least one aircushion 100."

Claim 1:
The applicant respectfully submits that there is no reference to filling with porous materials in Brown. Moreover, Brown discloses an airbag inflated with an inflator that at the time of inflation fills the multiple sections of the airbag and thereafter vents exhaust the air. Therefore Brown does not anticipate claim1 as amended.

Claim 2:
Brown discloses multiple sections of the airbag filled with an inflator at the time of inflation. Nothing in Brown discloses the transfer of air at the time of compression of a sacrificial airbag to an aircushion at that time. Therefore claim 2 as amended is not anticipated by Brown.

Claim 3:
Nothing in Brown discloses the compression of a sacrificial chamber leave alone a sacrificial chamber that is compressed by parts of the occupant with high inertial mass and aircushions that are located to protect high priority anatomical regions of the occupant.

Claim 4:
Nothing in Brown discloses the compression of a sacrificial chamber leave alone a sacrificial chamber that is located for compression by the torso and moreover nothing in Brown discloses aircushions that are located to protect the head and neck with air supply derived from the compression of the sacrificial chamber. All the air supply for the airbag of Brown derive their air supply at the time of inflation with an inflator and not during compression of a sacrificial airbag. Therefore claim 4 is not anticipated by Brown.

Claim rejection 35 USC Section 103:

The examiner statesthat claim 5 is anticipated by Balgobin (6,056,336:

"Balgobin discloses a vehicle with an impact protection for occupants provided with cylindrical slides 24, 26 wherein the egress and ingress is enabled by the activation a first set of slides 24 and impact protection for motion into the vehicle for the occupant is enabled with a second set of slides 26 that are concentric. With regard to the impact protection device being located on the side of the vehicle, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device to be located on the side of he vehicle, since it is a mere design choice and it would provide protection for the side of an occupant."

Claim 5:
Balgoblin discloses an airbag that has within it a expandable mechanical structure. It is deployed on the front of a vehicle. In contrast, claim 5 as amended has a set of cylindrical slides on which the occupant support is mounted and at the time of impact the slides move the occupant away from the impact. Moreover claim 5 as amended has a second set of slides that move the occupant support an occupant out of the vehicle for egress and ingress. None of these features are disclosed by Balgobin. Therefore Claim 5 is not anticipated by Balgobin.

Conclusion

If for any reason this application is not considered to be in full condition for allowance, the applicant respectfully requests the constructive assistance and suggestions of the examiner pursuant to MPEP Section 706.03(d) and MPEP Section 707.07(j) in order that the applicant can place this application in allowable condition as soon as possible and without a need for further proceedings.

Very respectfully,

A.I. Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

Att:

Marked up claims - 1 page

Claims:

1. [CURRENTLY AMENDED] An airbag configured to maintain at least a predetermined volume of air ~~for the protection of occupants in vehicles, wherein said airbag is prefilled~~ with ~~air and supplementary~~ porous filling materials, for the protection of an occupant in a vehicle under impact conditions, ~~and~~ comprising vents for exhaust at a metered rate during impact, said porous filling materials and vents, ~~thereby~~ enabling adjustment of the compression characteristics of the airbag under impact.~~,~~

2. [CURRENTLY AMENDED] ~~2.~~ An airbag as in claim 1, wherein said airbag acts as a sacrificial chamber to release airflow following commencement of ~~during~~ compression of said sacrificial airbags to aircushions that are enabled to protect an occupant during impact.

3. [ORIGINAL] An airbag as in claim 2, deployed with said airbag deployed such that its compression is enabled by contact with parts of the occupant with high inertial mass such that the subsequent inflation of the aircushions protect high priority anatomical regions of the occupant.

4. [CURRENTLY AMENDED] An airbag as in claim 3, wherein the torso of the occupant compresses the sacrificial airbag and said at least one aircushions protect one or both of the head and neck, ~~are protected by the at least one air cushions.~~

5. [CURRENTLY AMENDED] A vehicle with side impact protection for occupants provided with an occupant support supported by cylindrical slides (10D1 to 10D5) comprising a first set of slides concentric with a second set of slides, wherein the egress and ingress is enabled by the activation ~~the~~ a first set of slides and impact protection for motion into the vehicle for the occupant is enabled with ~~the~~ a second set of slides, ~~that are concentric.~~

6. [ORIGINAL] A vehicle with side impact protection as in claim 5, wherein the first set of slides are enabled for motion with a motorized threaded shaft concentric to the cylindrical slides.

7. [ORIGINAL] A vehicle with side impact protection as in claim 5, wherein the motion of the second set of slides move above structural elements of the vehicle in the center of the vehicle thereby enabling greater motion of the near side occupant during a side impact to the vehicle.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
12/924,354	09/24/2010	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☒ RATE ($)	SMALL ENTITY ☒ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 04/21/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 7	Minus	** 20	= 0	X $26 =	0	OR	X $ =	
Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $110 =	0	OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/DANTE r. SMITH/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham	

CONFIRMATION NO. 8323

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

PUBLICATION NOTICE

Title: Easy ejector seat with skeletal crash safety beam

Publication No.US-2011-0031055-A1
Publication Date:02/10/2011

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham		8323

7590 01/21/2011

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

EXAMINER	
FLEMING, FAYE M	

ART UNIT	PAPER NUMBER
3616	

MAIL DATE	DELIVERY MODE
01/21/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

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	12/924,354	RAJASINGHAM, ARJUNA INDRAESWARAN	
	Examiner	Art Unit	
	Faye M. Fleming	3616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 September 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5* is/are rejected.

7)☒ Claim(s) *6 and 7* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 4 recites the limitation "the sacrificial airbag". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by Brown (5,913,536).

Brown discloses an airbag 90 for the protection of occupants in vehicles, wherein the airbag is prefilled with air supplementary porous filling materials, and comprising vents 192 for exhaust, thereby enabling adjustment of the compression characteristics of the airbag. The airbag 90 acts as a sacrificial chamber to release airflow during compression to aircushions that are enabled to protect an occupant during impact. The airbag 90 deployed such that its

compression is enabled by contact with parts of the occupant with high inertial mass such that the subsequent inflation of the aircushions 100 protect high priority anatomical regions of the occupant, see figure 2. The torso of the occupant compresses the sacrificial airbag 110 and one or both of the head and neck are protected by the at least one air cushions 100.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Balgobin (6,056,336).

Balgobin discloses a vehicle with an impact protection for occupants provided with cylindrical slides 24, 26 wherein the egress and ingress is enabled by the activation a first set of slides 24 and impact protection for motion into the vehicle for the occupant is enabled with a second set of slides 26 that are concentric. With respect to the impact protection device being located on the side of the vehicle, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device to be located on the side of the vehicle, since it is a mere design choice and it would provide protection for the side of an occupant.

Allowable Subject Matter

7. Claims 6 and 7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Faye M. Fleming whose telephone number is (571) 272-6672. The examiner can normally be reached on M-F (9:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Dickson can be reached on (571) 272-7742. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Faye M. Fleming/
Primary Examiner, Art Unit 3616

Notice of References Cited	Application/Control No. 12/924,354	Applicant(s)/Patent Under Reexamination RAJASINGHAM, ARJUNA INDR	
	Examiner Faye M. Fleming	Art Unit 3616	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,324,072	06-1994	Olson et al.	280/730.2
*	B	US-5,531,470	07-1996	Townsend, John A.	280/730.2
*	C	US-5,913,536	06-1999	Brown, Louis R.	280/730.2
*	D	US-6,056,336	05-2000	Balgobin, Bissoondeo	293/107
*	E	US-7,232,001	06-2007	Hakki et al.	180/271
*	F	US-7,806,221	10-2010	Mishra, Indu B.	180/274
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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BIB DATA SHEET

CONFIRMATION NO. 8323

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/924,354	09/24/2010 RULE	180	3616	

APPLICANTS

Arjuna Indraeswaran Rajasingham, Bethesda, MD;

**** CONTINUING DATA ***************************

This application is a DIV of 11/185,784 07/21/2005 ABN

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **

10/12/2010

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ Yes ☑ No	☐ Yes ☐ No	/FAYE M FLEMING/ Examiner's Signature	☐ Initials	MD	39	7	2

ADDRESS

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817
UNITED STATES

TITLE

Easy ejector seat with skeletal crash safety beam

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
610	No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
12/924,354	RAJASINGHAM, ARJUNA INDRAESWARAN	
Examiner	**Art Unit**	
Faye M. Fleming	3616	

SEARCHED			
Class	Subclass	Date	Examiner
280	730.2 743.1 729	1/16/2011	FF
180	271 274		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/924,354	09/24/2010	3616	610		7	2

CONFIRMATION NO. 8323

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

UPDATED FILING RECEIPT

OC000000044323929

Date Mailed: 11/04/2010

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Arjuna Indraeswaran Rajasingham, Bethesda, MD;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a DIV of 11/185,784 07/21/2005 ABN

Foreign Applications

If Required, Foreign Filing License Granted: 10/12/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/924,354**

Projected Publication Date: 02/10/2011

Non-Publication Request: No

Early Publication Request: No
** **SMALL ENTITY** **

Title

Easy ejector seat with skeletal crash safety beam

Preliminary Class

180

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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ARJUNA I. RAJASINGHAM
B.Tech.(IIT), A.M. (Stanford), M.B.A. (Stanford), Ph.D.(Berkeley).

6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

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IFW

In the United States Patent and Trademark Office

Application Number: 12/924, 354
Applicant: Arjuna Indraeswaran Rajasingham

October 19, 2010

VIA FAX 571 273 8300
Commissioner of Patents
Washington, DC 20231

Sir,

Response to Missing Parts Notice

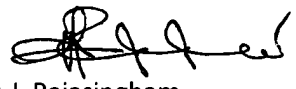
The applicant respectfully submits a substitute specification both as a marked up copy and a clean copy with the reference to Fig 21F removed and the required changes on page 9.

The applicant submits replacement drawings as required.

No new matter has been added in either of these submissions.

The applicant has attached a new credit card for with the required fees of $610.00

Very respectfully,



A.I. Rajasingham
6024 Bradley Boulevard
Bethesda, MD 20817

air@mmmmg.com

Att:
1. Marked up substitute specification - 50 pages
2. Clean substitute specification - 50 pages
3. Replacement Drawings - 39 pages
4. Credit card form

10/21/2010 HVUONG1 00000008 12924354

01 FC:2011 165.00 OP
02 FC:2111 270.00 OP
03 FC:2311 110.00 OP
04 FC:2051 65.00 OP

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/924,354	09/24/2010	3616	0.00		7	2

CONFIRMATION NO. 8323

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

FILING RECEIPT

Date Mailed: 10/14/2010

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Arjuna Indraeswaran Rajasingham, Bethesda, MD;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a DIV of 11/185,784 07/21/2005 ABN

Foreign Applications

If Required, Foreign Filing License Granted: 10/12/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/924,354**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****

Title

Easy ejector seat with skeletal crash safety beam

Preliminary Class

180

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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PATENT APPLICANT

A.I.Rajasingham. 6024 Bradley Boulevard, Bethesda, MD 20817

TITLE OF INVENTION: Easy Ejector Seat with Skeletal Crash Safety Beam

THE FOLLOWING APPLICATIONS ARE HEREBY INCORPORTATED HEREIN BY REFERENCE.

FURTHER, THIS APPLICATION CLAIMS PRIORITY FROM THE FOLLOWING APPLICATIONS: This application claims priororty from applications entitled " Easy Ejector with skeletal crash safety beam" US S/N: 08/936,626 filed 9/24/97, US S/N 09/404,475, US S/N 09/435,830 , US S/N 60/195298, US S/N 60,226,570, EPO S/N 98948260.9-2306, EPO S/N 00203896.6. and US 09/779,591, US 09/779,592, US 09/779,593, US 09/779,594; US 60/280470;US 60/282105; US 60/286629; US 60/332419; US 60/338466; US 60/367644; US 60/461,434; US 10/279,171; 60/362450; 10/109,674; ~~and~~ 10/681,304; and 10/185, 784.

STATEMENT REGARDING
FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT: Not Applicable

REFERENCE TO A MICRO FICHE APPENDIX: Not Applicable

BACKGROUND OF INVENTION

FIELD OF INVENTION

The present invention defines a means to incorporate in passenger motor vehicles, unique safety arrangements particularly for lateral or side impacts that provide energy absorption by the mass of the vehicle but decouple the passenger from the impact acceleration and deceleration that is provided by the mass of the vehicle, thereby protecting the passengers during such collisions. Moreover, the same arrangement synergistically provides utility in access, comfort and further safety in the operating position for passengers and the driver.

DESCRIPTION OF THE RELATED ART:

In the past safety of passengers was not always the priority in passenger vehicle design. In the evolution of motor vehicle design the structure moved from a chassis that held together the mechanical components of the vehicle – a structure that was then attached to a passenger compartment or to passenger seats. The design of the structure was to hold together the working components of the vehicle – a critical aspect at the time. Thereafter in more recent times right up to the present, Exo-skeletal designs have been the dominant paradigm. Here rigid shells were constructed to hold both the mechanical components and the passengers in fixed positions. However such fixed shell structures have had limited success in protecting passengers and drivers when there are lateral collisions as passengers undergo the same impact related accelerations and decelerations as the remaining parts of the vehicle, as space limitations don't allow for "crumple zones" as in the case of impact protection for head on collisions. Passengers are particularly vulnerable to side impacts as they cannot take preemptive measures as with head-on collisions where there is speed control and directional control that is available. As vehicle speeds have increased substantially in the last several decades, these safety considerations for passengers have become critical and urgent. Vehicle designers — particularly automobile designers – have risen admirably to the task by incorporating myriads of devices and additions within the rigid shell paradigm to minimize risk in the event of collisions. Such devices include restraints such as seat belts and certain types of protective air bags. However, there are limits within the rigid shell paradigm for two reasons: First, the energy of impact cannot be easily diverted away from passengers into the remaining mass of the vehicle on impact. Second, the rigid shell needs to support high shear stresses on lateral impact and related compressive loads to the passenger compartment of the vehicle a factor that can only be addressed with greater mass of the vehicle that will impact its performance.

Another area of interest in passenger vehicles is to provide, in synergy with the above contributions, utility and comfort of passengers and drivers and further synergistic head-on collision protection.

There are four areas of Background art that are related to the present invention. These are: vehicles with sliding seats, safety arrangements addressing lateral impacts on passenger vehicles, air bags and other shock absorbing devices, and miscellaneous safety devices for frontal impacts. None of the inventions in these areas individually or collectively state or imply any aspects of the present invention. Moreover, none of this Background art even addresses the issue of energy transfer away from the passengers to the mass of the vehicle on impact and concurrently provide a mechanism for easy access to the vehicle with ejector seats. This is despite the urgent need in the car industry for such safety and utility. Moreover the novelty of the present invention is underscored as it provides solutions hitherto unidentified in a very large and competitive industry that is acutely aware of these needs and is constantly in search of new solutions to them.

Sloan 3,071,407 (1963) describes a single rear bench seat (lines 4-45) – full length (C1-L55), that can slide out of either side of the vehicle. It describes a door structure that may be attached to the seat and slide across and through the passenger compartment of the vehicle as the seat slides out. This invention does not state or

imply any safety considerations in its structure, moreover such a bench seat on slides, in the event of a lateral collision on the doors will focus the impact energy on the passengers and these passengers will be the principal casualties as the mass of the vehicle slides away little harmed. This will be the case even in the embodiment described where the doors are fixed to the seat and slides through the passenger compartment with the seat. Moreover, it cannot be used in a front seat even for its limited functionality with doors fixed to the seat as driving instrumentation (steering wheel etc) will not allow a door to slide through the compartment. Finally it does not provide any comfort features for passengers over and above a bench seat. Mach 2,753,947 (1956) describes a sliding bench seat for the access of the engine of the vehicle it does not address the issue of safety of passengers or access utility. It is expected to perform similarly to Sloan in an impact on the doors or around the side profile of the passengers in the vehicle. Solomon 2,758,872 (1953) provides a sliding bench seat that goes through the doorway and for the same reasons as Sloan does not provide protection in side impacts or provide any comfort features over and above a bench seat. . Cyphert 3,944,277 (1976) describes a seat mounted on a sliding platform that has a door at the end and protective walls around it. The arrangement being designed for the utility of the operator to reach points away from the body of the vehicle without dismounting the vehicle. This invention like Sloan does not state or imply any safety considerations in its use. Moreover there is no expressed or implied reference to the utility of mounting and dismounting the vehicle or for the comfort of the operator or the passengers except for the ability for the platform to move out to give the operator greater reach away from the vehicle body. Rees 5,213,300 (1993) describes internal design structure for slide arrangements that allow forward and backward movement of the passenger seats in vehicles. This like many other inventions prior to it relate to the structure of the slides to adjust the position of the seats for passenger comfort in the direction of motion of the vehicle.

All the above items of background art relate to sliding seats. None of the above background art related to sliding seats have stated or implied safety considerations. Moreover, none of them provide utility for mounting and dismounting a vehicle except for a bench seat that slides out on either side of the vehicle, or provide comfort features except for seating arrangement on a bench seat and in one of the above – the lateral movement for convenience of the operator.

Maier US 2,148,950 (1939) provides a laterally braced passenger compartment that braces a rigid shell body of a vehicle. Barenyi 2,710,222 (1955) provides a stiffening for the bottom plate of a vehicle body. Catlin 5,660,428 (1997) provides a design for a rigid shell structure . Guertler 5,464,266 (1995) uses stiffening arrangements for the floor of the vehicle as a component of a rigid shell vehicle body. Masuda 5,671,968 (1968) describes a strengthened rigid shell for the passenger compartment Oliver 4,533,172 (1985) describes a three part rigid shell structure for motor vehicles with the central section for passengers Sinnhuber 5,000,509 (1991) describes an arrangement that transfers impact energy from lateral impacts to the rigid body of the vehicle but does so through rigid members that include elements in the seats. The seats have limited lateral movement and are not free to move independent of the vehicle body in the event of a collision, thereby placing the passengers on the direct path of the

energy transfer Maeda 4,512,604 (1985) describes a lateral brace for the seat arrangement of the vehicle within a rigid vehicle body structure thereby distributing the impact energy to other parts of the rigid body structure. Sacco 5,435618 (1995) describes a lateral stiffening element that braces the rigid vehicle body in the region of the seats. Bhalsod 5,716,094 (1998) describes a pusher block that engages the seat in the event of a lateral impact thereby providing a rigid member between the rigid body structure and the seats that can transfer impact energy to the seats.

All of the above items of background art related to bracing a rigid body structure and provide stiffening mechanisms within the rigid shell structure to distribute energy of lateral impact. None of these items of background art provide mechanisms to transfer energy away from passengers in lateral impacts. or provide other safety arrangements or provide utility for mounting and dismounting the vehicle or provide comfort features for passengers in the operating position.

Baber 5,725,265 (1998) presents airbags for front and rear vehicle bumpers that deploy on impact. Such devices cannot be implemented on the side of the vehicle as a deceleration zone is not available under operating conditions as may be made available in the front and back of the vehicle. Moreover, as this airbag deploys on impact it creates a deceleration zone by pushing its own vehicle away that may actually increase the impulse forces acting on the passengers. Mercier 3,822,076 (1974) describers similar external front and back airbags and uses probes that protrude from the vehicle at the front and back to deploy the airbags. Such apparatus cannot be installed on the sides of the vehicle, as clearances are small. Stirling 5,131,703 (1992) describes a fluid filled chamber around the vehicle that will provide a deceleration zone on impact – frontal rear or lateral. However this arrangement requires the deceleration zone to be present during normal operating conditions that will reduce the maneuverability of vehicles if deployed on the sides of the vehicle. Park 4,995,659 (1991) describes a gas filled chamber deployed around the vehicle. Such a chamber is normally inflated under normal conditions and reduces maneuverability of the vehicle. Campbell 4,815,777 (1989) describes a bumper that can be deployed selectively by filling with gas. This bumper is effective when extended only. It is not designed to be deployed when the vehicle is in motion , as it will reduce maneuverability. Hartmann 5,810, 427 (1998) describes a mechanism that transfers fluid from one airbag to another on impact. The airbag that is deployed is normally in an extended position to absorb the impact energy and provide the deceleration zone. However, such an extended airbag will reduce the maneuverability of the vehicle. There is a literature ("Extended Bumper and Glass-Plastic glazing methods to reduce intrusion and ejection in severe motor vehicle crashes". C.C.Clark 1993. 26th Symposium on Automotive Technology and Automation. Aachen Germany., "Airbag bumpers inflated just before the crash" C.C.Clark., William A. Young. 1994. SAE Technical Paper 941051., "The crash anticipating extended airbag bumper system". C.C.Clark.1994. Fourteenth International Technical Conference on the enhanced safety of vehicles. Munich Germany., "Airbags as a means to reduce crash loads and intrusion, and increase intervehicular compatibility." C.C.Clark. 1995. International Conference on Pelvic and Lower extremity injuries-Proceedings Washington DC., Human Transportation Fatalities and Protection against Rear and Side Crash Loads by the Airstop Restraint" Carl Clark and Carl Blechschmidt. 1965. The Ninth Stapp Car

Conference.) IDS, and background art on the construction of external airbags including deployment proactively with radar or other devices. This entire literature is limited to the use of proactive external airbags mounted on vehicles with rigid structures that include the passenger. There is no reference in this literature to the proactive detection of impact explicitly or implicitly creating a deceleration zone for passenger protection internally, relative to the vehicle as in the present invention. Moreover, this literature is focussed on external airbags for front impact protection with for example rigid penetration buffers to negotiate posts and trees, unlike the present invention which does not prescribe external airbags for front impacts. Furthermore, as this literature describes external airbags without perforation shields their implementability is questionable as, unlike internal airbags that are in relatively protected environments, impact with external airbags often occurs with objects with sharp points and edges that are likely to perforate the external airbags. The Present invention requires perforation shields for external airbags.

All the above items of background art relate to air bag devices for safety in vehicles. However, none of these references take the integrated approach of the present invention, as more fully explained below, which comprises proactive deployment of both internal and external air bags, together with sliding seat members and other devices. Moreover while the present invention can function even without the deployment of external airbags, either proactive or reactive, taken together these items provide protection for passengers which is more than the sum of the parts. Furthermore, none of the protection airbags disclosed, related to external air bags having protective perforation shields that further enhance their efficacy. Moreover none of these devices provide energy transferring mechanisms away from the passenger in a lateral impact or provide other safety features. Moreover they do not provide any utility features for passengers in mounting and dismounting the vehicle or provide comfort features to the passengers.

Perras 2,873,122 (1959) which describes an invention where upon a head-on collision the seat projects a curved protector around the passenger designed to protect the passenger. This curved protector retracts into the seat under normal operating conditions. It is not clear how effective such a mechanism will be as the acceleration of the passenger forward relative to the vehicle may precede that of curved protector's release from the seat. Satzinger 3,961,805 (1976) describes seat belts for frontal collisions that provide safety for vehicles. Such seat belts are in common use. However, they suffer from the drawback that they restrain the body of the passenger in the narrow regions covered by such belts which may cause injury as other parts of the body are not restrained. Moreover such belts are not popular, while in common use as the belts are in constant contact with the body- a factor that is not often relished. Pulling 3,981,520 (1976) describes an arrangement where that provides passenger movement and protection in frontal impacts. On impact the passenger moves in the vertical plane of motion to a more protected position while side firing airbags provide frontal protection. This system of deployment of airbags for frontal collision protection is similar to other frontal airbag systems. They are necessary as restraining systems during the collision but need to be retracted in conventional passenger compartments to give passengers access to their seats while mounting and dismounting the vehicle. Erickson 2,777,531 (1957) describes an invention that rotates the seat of the passenger thereby restraining and protecting the passenger on impact taking advantage of the inertia prior to impact to endow the

passenger with rotational energy that changes the position of the seat. Such rotation can injure the passenger with impacts at present day passenger vehicle speeds.

All the above items of background art relate to frontal impact protection. None of these items provide a device that is normally deployed during operation, and provides a broad area of restraint across the body for the entire upper body, head and neck, without a need for changing the orientation of the passenger. Moreover none of these items provide any protection for side impacts or provide utility for mounting and dismounting the vehicle or for the comfort of the passengers in the operating position.

SUMMARY

In view of these prior references what would be useful is an arrangement that diverts the impact energy in lateral or side impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers, and in the same arrangement provides utilitarian access to the vehicle, such utilitarian access making it possible to both install multi-element contoured surround seats for passengers and the driver, and also a safety device for head-on collision protection that obviates the need for conventional seat belts and front impact airbags. Moreover, it would be useful to have a synergistic structural arrangement for the vehicle that targets strength of the vehicle to protect passengers while minimizing other massive elements in the vehicle.

The present invention includes these objects and advantages.

OBJECTS & ADVANTAGES

Some of the objects and advantages of the present invention are, to provide an arrangement that diverts the impact energy in lateral or side impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers but decelerating the impacting object with the remaining mass of the vehicle. Moreover the arrangement synergistically provides a means for utilitarian easy access to the vehicle for passengers and drivers alike and allows the installation of multi-element surround contoured seats for the comfort and protection of passengers. This arrangement differs sharply from the Background art in that it does not simply offer to the impacting body a reinforced rigid shell where the passenger is treated as part of this integral unit, but rather provides selective and differential treatment of the mass of the passengers and driver of the vehicle vis-à-vis the remaining mass of the vehicle. Furthermore the present invention differs sharply from the Background art in that the resulting structure synergistically permits the installation of contoured multi-element surround seats and a unique safety harness that protects passengers in head-on collisions, both of which may not be implementable without the slide or other moving arrangements for seats on either side of the vehicle in the present invention.

Another object and Advantage of the present invention is the gravity slide drive and a related shock absorbing arrangement relative to the fixed body members of the vehicle ad the terrain traversed by the vehicle, for my arrangement for which there is no counterpart in the Background art. This

allows further Utility and weight and energy saving in implementing the above elements of the present invention.

Another Object and Advantage of the present invention includes External side Airbags that differ sharply from the Background art in that for the first time they proactively create a "Just in Time" deceleration zone both for the passenger relative to the vehicle and also for the vehicle relative to the impacting body, for the lateral or side impact while not remaining in an extended position under normal operating conditions of the vehicle.

Another Object and advantage of this invention is a perforation resistant shield for external airbag protection that would reduce the probability of deployment failure. The background art does not provide for this function in externally deploying airbags.

Another object and advantage of the present invention is a indo-skeletal structure of the vehicle body that permits the energy transfer from the lateral or side impact through compressive members to the body of the vehicle. Unlike the Background art this indo-skeletal structure is designed to transfer energy to the body of the vehicle without transferring it to the passengers and driver of the vehicle. The passengers are targeted for protection with "Safety zones".

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is an illustration of a front elevation of a seating arrangements in a passenger vehicle. This figure is an illustration of the invention in the normal vehicle operating condition. The impacting body is represented on the left as still distant but advancing towards the above passenger vehicle.

Figure 2 is an illustration of the same vehicle arrangement as in Figure 1, except that the impacting object has advanced towards the passenger vehicle adequately to trigger the distance and velocity sensors.

Figure 3 is an illustration of the same vehicle as in Figures 1 and 2, except that the distance and velocity sensors have deployed the external Airbags. They may also provide delayed deployment of the internal Airbags.

Figure 4 is an illustration of the same vehicle as in Figures 1,2 and 3 except that the impacting object has made impact with deceleration and energy absorption provided by the External airbags and the shock absorbers and resisted by the mass of the vehicle through compression members as noted below. The Passengers and seats are free to move away from the impact on the secondary slides as the internal Airbag deploys, pushing out the Primary slide on the side away from the impact.

Figures 1D, 2D, 3D and 4D illustrate an alternative embodiment with the shock absorbers mounted internal to the protector shield.

Figures 1C, 2C, 3C and 4C illustrate an alternative embodiment that has an auxiliary beam mounted behind the seat with a high section of the central member of the skeletal structure behind the seat to abut the auxiliary beam.

Figures 1B, 2B, 3B and 4B illustrate an alternative embodiment with a center console.

Figures 1F, 2F, 3F and 4F illustrate an alternative embodiment with a center console that is crushable and as a result decreases the need for the ejection of the passenger on the further side of the vehicle at impact.

Figures 1G, 2G, 3G and 4G illustrate an alternative embodiment with center airbags that are a part of a passive airbag system to protect passengers during lateral impact by absorbing some of the impact energy but more importantly providing a means to inflate head and neck protection airbags and other anatomical micro airbags mounted in the vicinity of the human body. This particular embodiment has a crushable center console as well.

Figure 5 and 6 is an illustration of the seating arrangement as used for loading and unloading passengers and driver. Figure 5 represents the open position and Figure 6 represents the closed position.

Figures 5A and 6A illustrate an embodiment of the current invention with the protector shield/shock absorbers/external airbag hinging down to support the primary slide. A useful feature for larger vehicles with more than a single seat on each side.

Figures 7-9 is an illustration of the Gravity slide drive that may be embodied in the invention. Figure 7 is an illustration of the Gravity Slide drive at the end of the unload cycle for passengers. Figure 8 is an illustration of the Gravity slide drive at the beginning of the Load cycle for passengers. Figure 9 is an illustration of the left side loaded and ready for operation of the vehicle and the right side at the start of the loading operation, emphasizing the independence of the two sides of the Gravity slide drive mechanism.

Figure 10 A and B are an illustration of Isometric views of the present invention on one side of the vehicle for clarity. Figure 10 C is an illustration of a Plan view of the present invention for one side of the vehicle.

Figures 10 A1, 10B1 are isometric views of an alternative embodiment with a vertical extension/"safety cage" to protect passengers further. Figure 10 C1 is a plan view of the same arrangement.

Figures 10D1 to 10 D5 represent embodiments with cylindrical slides. Fig 10D3 shows the extended position for one side of the vehicleand 10D 4 shows the impacted position for one side of the vehicle.

Figure 11. is an illustration of the position of the "Safety Zones" that are targeted for protection with the Protector shields.

Figs 12 H2, 12 I 2, 12 J 2 illustrate an isometric view of another embodiment of the safety harness, in the normal state, with front impact anatomical passive micro air bag deployed, and the head and neck anatomical micro airbags deployed respectively.

Figure 13. is an illustration of a drawing of isometric view of the present invention.

Figure 14 illustrates a horizontal cross section of an embodiment of the present invention at the level of the upper primary slides.

Figures 17 A,B show a schematic diagramof the passive air cushionsystem disclosed in this invention.

Figures 19 A-E show an embodiment of the customizable contoured multi – element seat. Figure 19 F, G show another embodiment of a customizable multi element seat.

Figures 20 A-C show an embodiment of the indo skeletal structure that includes special arrangements for front impact protection and other features for passenger convenience and comfort and Fig 20D shows an embodiment of the connections between the elements in Figures 20 A-C.

Figures 21 A-E ~~F~~ show other alternative embodiments for impact protection.

LIST OF REFERENCE NUMBERS

101 - Central Member of Indo-skeletal structure

102 – Safety Beam Lower Element

103 - Side impact shock absorbers

104 – External Air Bags

105 – Perforation Shields

106 – Protector ~~Shields~~ Shields

107 – Safety Beam Upper Element

108 – Auxiliary Beam.(fixed or sliding)

109 – Multi-element contoured passenger seat

110 – Vehicle Shell/Body

111 – Secondary Slides/Impact decouplers

112 – Locking devices

112A-Pivot for Protector shield

113 – Proactive Velocity/Distance Detectors

114 – Internal side impact airbag

115 – Spring device for manual slide

116 – Inside door open button

117 – outside door open button

118 – Beam pivot for Gravity slide drive ejector

119 - Safety Harness

120 – Support for Safety Harness

121 – Bottom of seating surface of the contoured seat

122 – Contoured arm rests

123 – Child seat attachment

124 – Impacting body

125 - Vertical extensions/ Safety Cage (fixed or sliding)

126 – Center console

127 – Secondary slide/Center console locks

128 – Instrumentation

129 – Center airbags-energy absorption/ passive head and neck anatomical airbag system

130 – Safety Harness Shield

131 – Safety Harness -Anatomical passive micro air bag and visco-elastic buffer

132 – Safety Harness elbow

133 – Safety Harness extending upper arm

134 – Safety Harness Pivoting lower arm

135 – Safety Harness Head and neck anatomical micro airbags (active or passive)

136 – Safety Harness Adjustable Head restraint

137 – Safety Harness Hinged support

138 – Safety Harness Locking Support

139 – Safety Harness passive micro airbag air reservoir

140 - Adjustable Hinge support on seat

141 – Foot rest

142 – Sacrificial chamber

143 – Micro air-cushion – displacement function

144 – Micro air cushion – support function

145 – Valves – air flow/fluid flow

146 – protected entity

147 – Fluid paths

148 – Wheel Chair Conversion - Seat lower cushion and support structure

149 – Wheel Chair Conversion – Chair Clamps

150 – Wheel Chair Conversion – Chair Cross support

151 – Wheel Chair Conversion – Primary Pivot with locks for Rear Wheel retraction

152 – Wheel Chair Conversion – Principal Rear Wheel Support

153 – Wheel Chair Conversion – Rear Wheel Support strut

154 – Wheel Chair Conversion – Secondary Pivot for Rear Wheel retraction

155 – Wheel Chair Conversion – Spring loaded locking support Sleeve

156 – Wheel Chair Conversion – Seat back

157 – Wheel Chair Conversion – Primary Pivot with locks for front wheel

158 – Wheel Chair Conversion – Wheel chair back pivot release

159 – shadow vertibra – air cell retainer

160 - shadow vertibra – lateral tilt return spring

161 - shadow vertibra –upper fixed slot fo lateral tilt return spring

162 - shadow vertibra –support flange

163 - shadow vertibra –upper slot for support flange

164 - shadow vertibra – left body

165 - shadow vertibra – right body

166 - shadow vertibra – left upper air cell socket

167 - shadow vertibra – right upper air cell socket

168 - shadow vertibra – lateral tilt air cell visco elastic damper tube

169 - shadow vertibra – lateral support arm connector

170 - shadow vertibra – - back support adjustable air cushions

171 - shadow vertibra – left lower air cell socket

172 - shadow vertibra – right lower air cell socket

173 shadow vertibra – lower slot of r support flange

174 – lower sliding slot for lateral tilt return spring

175 - shadow rib – body

176 - shadow rib – adjustable air cushions

177 - shadow rib – tilt control connectors

178 – shoulder bolster

179 – Shoulder bolster adjustable air cushions

180 - back support adjustable air cushions

181 – Neck lateral support with deploying passive micro air bag

182 – Head lateral support arms with deploying passive micro air bag

183 – Head rear support adjustable air cushions

184 – Neck rear support adjustable air cushions

185 - Lumbar support adjustable air cushions

186 – Adjustable Hip bolster

187 – Adjustable Pelvic support

188 – Axial contraction system – Central body tube

189 – Axial contraction system - Body extender tube

190 - Axial contraction system – front end connector tube

191 - Axial contraction system – back end connector tube

192 - Axial contraction system – front end

193 - Axial contraction system – back end

194 - Axial contraction system - front module

195 - Axial contraction system – rear module

196 - Axial contraction system – front module crank

197 - Axial contraction system – rear module crank

198 – passenger support plaform

199 – Elevator beam

200 – Propeller

201 – dual Elevating modules

202 – aligning wheel shockabsorber arrangement.

203 – Lower Primary slide support with decoupling key that slots into central member

204 – shadow vertibra 2 – body

205 – shadow vertibra 2 – slider insert

206 – Shadow vertibra 2 – body: first support surface for length adjustment spring

207 – Shadow vertibra 2 – body: second support surface for length adjustment spring

208 – shadow vertibra 2 – body: aperture for tension cord

209 – Shadow vertibra 2 - body: aperture for slider insert

210 - Shadow vertibra 2 - body: slot for adjoining vertibra key

211 - Shadow vertibra 2 - body: vertibra attachment key

212 - Shadow vertibra 2 - body: vertibra attachment pin socket 1

213 - Shadow vertibra 2 - body: vertibra attachment pin socket 2

214 - Shadow vertibra 2 - body: holes to accommodate spring rods

215 – Child or Infant Support Mechanism support (CISM support)

216 – Extendable spring/damper loaded attachment for CISM support

217 – Inner rotator for CISM support

218 - Outer rotator (including attached impact decoupler/secondary slide 111)

219 –reserved

220 –reserved

221 –Bottom seat support flange

222 - Back seat support flange

223 – Shoulder strap attachement for 3 point belt.

224 – Child or Infant support mechanism (CISM)

225 - CISM support pivots

226 – Lock pin – Internal Airbag equivalents (IAE) with Safety beam lower element

227 – Pin slot for lateral impact movement

228 - Internal Airbag equivalent shock absorber

229 - Slot for housing Internal Airbag Equivalent shock absorbers

230 - Pin Hole for registering Lock Pin

231 - Support Key -secondary slide to outer rotator

232 – CISM Support Bracket

233 - Pivotal support for CISM Support Bracket

234 – Pivot for Internal Airbag equivalent attached to CISM support bracket

235 – Fixed Support for safety beam lower elements and internal airbag equivalents

236 – support for secondary slides, CISM support bracket and internal airbag equivalents

237 – Support flange between Secondary slide and internal airbag equivalent active ends

238 - Internal airbag equivalents – dual movable active end at center

239 -Internal Airbag Equivalents–dual movable extremes-expansion/compression.

240 – Lock pin hole on dual internal airbag equivalent center support

241 – Top lock flanges

242 – Side lock flanges

243 - Front lock flanges

244 - Side support flange

245 – Lateral Brace

P101 – Compressible Laterally Slidable (when detached) Hip Bolster

P102 – Seat Bottom Contoured

P103 – Impact Decoupler Secondary Slide Elements

P104 – Retraction Slots for secondary slide support rails (rails not shown)

P105 – Retraction slots for Secondary slides, retracted at Egress and Ingress

P106 – Front sid of rear seat

P107 – Back of seat bottom

P108 – Side bolsters in retracted position for egress and ingress

P109 – Crushed side bolstersduring impact (does not intrude into hip space)

P110 – Side Bolster Air Bags

P111 – Shoulder bolster /support – operating position and width

P112 – Back rest

P113 – Head Rest

P114 – Head and Neck air bags (head rest is fixed to backrest so that it moves with back rest on lateral impact)

P115 – Body Air Bags to hold and move the body on lateral impact. The airbags are shaped to push the arms out of the way at deployment time.

P116 – Crushed shoulder bolster/support (controlled crush)

P117 – Back Rest

DETAILED DESCRIPTION OF INVENTION

The present invention provides a passenger vehicle a structure that synergistically incorporates two functions. First, during lateral or side impacts, a means to decouple from impact, and protect passengers while projecting the remaining mass of the vehicle to decelerate the impacting body, and second, utility to passengers and drivers, in mounting and dismounting the vehicle with the comfort of contoured surround seats. The arrangement may in some embodiments use an indo-skeletal beam that allows such embodiments to rely on compressive force transmission to transfer impact energy to the mass of the vehicle rather than shear loads that are required in the shell paradigm of construction in most current passenger vehicles.

The present invention may use Primary and Secondary slides on each side of the vehicle, to meet these objectives. The Primary slide has among other attached devices, a protector shield that bears the impact force in lateral or side impacts. Such protector shields may be hinged out for access if the sliding arrangement is not used. The Primary Slide may engage a central indo-skeletal beam in some embodiments. The Secondary slide is attached among other devices to possibly contoured surround seats. This slide may be activated under impact to guide passengers in their seats away from the impact zone.

The present invention may utilize a Safety Beam in the vicinity of the seats. However, there is an important advance over the Background art in that the Beam does not lock the passengers on the path of the energy transfer, but rather, conducts the energy of impact away from the passenger to the indo-skeletal frame or to the body members of the shell (collectively elements of the fixed body members) and thereby to the mass of the vehicle allowing independent motion of the passengers away from the impact.

The present invention may use proactively fired external airbags which for the first time provide a means to create a "Just in Time" deceleration zone on the side of a vehicle prior to impact but not deployed under normal operating conditions of the vehicle. Notably, Background art for external airbags that are either extended under normal operating conditions of the vehicle or require reactive deployment cannot function effectively, as the former will impede the maneuverability of the vehicle and the latter will not be able to create a deceleration zone in time for the impact.

Overall this invention provides a "bottom up" paradigm for the design of vehicles starting with the human environment and building outwards to the vehicle – in stark contrast to the conventional approach of design that starts with the vehicle and inserts within these constraints, the passenger environment. Moreover, this invention embodies a two level safety system. The first or the primary level is passive and has a negligible probability of failure. The second level is active and predictive or proactive, utilizing advanced technologies. However, complex advanced technology systems have the drawback of higher probabilities of failure. Therefore while the second level can reduce the level of injury in serious crashes, there is a non trivial proability of failure of this secondary system Therefore it is necessary to build a primary system that is good inough in most cases to reduce injury levels in severe crashes. The paper in the Appendix includes simulation results for an embodiment of the primary system alone with a failure of the secondary system.

The following descriptions are for embodiments of the present invention. Deviations from this description in an embodiment is possible without deviating from the present invention.

PREFERRED EMBODIMENT

The following is a detailed description of some of the components of this embodiment. The seating arrangement of a passenger vehicle is shown in Figure 1. The cross section of the central member of the indo-skeletal structure (101) is fixed to the safety beam (102') and the lower primary slide (102). The Protector Shields (106) is firmly attached to the Upper Primary slide (107), which slides on the lower Primary slide (102) . (The terms upper and lower being used for the slides to distinguish them and not representing a relative elevation of the slides). The construction of such protector shields would follow that of any impact resisting body panel member of a vehicle, with the usual weight strength tradeoffs. Such construction is well disclosed in the background art. The sliding arrangement may use single element or multiple element direct contact low friction surfaces sliding on one another, roller bearings, ball bearing structures – all of which are well disclosed in the background art. The Protector Shield(106) are designed to cover the required "safety zone" as noted on Figure 11. The Upper Primary Slide (107)

locks into the Central member of the indo-skeletal structure (101) in the operating position with locking devices (112). Such locking devices do not take any additional loads on impact, and may as a result follow the extensive background art for locking devices for example similar mechanisms to those used in automobile door locks. These locks may be activated by the ignition key switch for additional safety while the vehicle is operational. The Protector Shield (106) has attached on the outside a shock absorber (103), which may include external airbags (104). The construction of such shock absorbers follow the background art. Such external airbag (104) are protected from sharp objects on impact by a Perforation Shield (105). These perforation shields protect the external airbag (and the passenger) from sharp objects. The construction of such perforation resisting shields are well disclosed in the background art. Such Perforation shields may be attached by conventional means to the outer surface of the airbag and retained in the normal operating position using techniques used for airbags both internal and external disclosed in the background art. The Air Bag (104) is deployed with distance and velocity sensors (113) mounted on the Perforation shields (105). Distance and velocity sensors are used in other applications and their construction is well disclosed in the background art. The Upper Primary Slide (107), supports the secondary slide/Impact decouplers (111). In this embodiment this is firmly attached to the Upper Primary Slide until the impact when it is decoupled to slide away from the impact. The Secondary slide arrangement may use a friction based approach, or other approach , all of which are well disclosed in the background art. This embodiment has contoured surround Passenger Seats (109) that are mounted on the Secondary slides (111). These seats have internal Airbags (114) that deploy on impact and may "unfurl" upwards to protect the head or upper body as well. The construction of seat adjustment mechanisms are well disclosed in the background art. This Figure shows the impacting object on the left approaching the vehicle, but too distant to trigger any action.

In Figure 2, the impacting object has moved to a position that can now trigger the distance and velocity sensors (113). These sensors trigger the deployment of the External Airbags (104), and the shock absorbers (103). The internal airbags (114) may be triggered by conventional means disclosed in the prior art, explicitly or implicitly reacting to proactive or reactive impact detection. The internal air bags are designed to move the passengers and the passenger seates to the extent necessary through a Motion Space to a Safe Position on primary mpact detection, and thereafter protect the protected entity – the passenger and the seat. Thereafter as illustrated in Figure 3, the External Airbags (104) and shock absorbers (103) deploy to provide the required deceleration zone for the impact. As a result on impact the energy of impact is partially absorbed by the External Air bag (104) and the Shock Absorber (103) and the remaining energy transferred to the massive components of the vehicle through the Protector Shield (106), the Upper and Lower Primary Slide/ Safety Beam (107, 102, 102') to the Central element of the Indo-skeletal frame (101) and the body of the vehicle. Notably, the Secondary slides (111) decouple and slide the passenger seats (109) with the passengers away outside the path of the impact forces and protected by the internal Airbag (114). The Upper Primary Slide (107) on the side of the vehicle away from the impact is free to slide out with all devices mounted on it to provide a path for the secondary slide (111) and the seats (109). In this situation it may be seen that the Upper Primary slide works as an impact-resisting beam on the side of the impact and a release and support mechanism on the

side away from the impact. Figure 15 A illustrates the side impact with the deployed internal and external airbags, and the displaced passengers away from the impact in the vehicle sustaining the lateral impact. Figure 15 B illustrates the frontal impact support for the passenger on the right hand side. The Left hand passenger is shown in the normal position for comparison.

Figure 14 illustrates a horizontal cross section of the embodiment at the height of the upper primary slides (107). The central member of the indo-skeletal structure (101) is flanked by the upper primary slides (107) abutting the central member, with the protector shields (106) and the shock absorbers that include the external airbags (103,104) at the outer end of the upper primary slides. The perforation shields are shown at the outer extreme of the shock aborbers and airbags. In this embodiment there are two sets of upper primary slides on each side of the vehicle that can support two rows of seats (front and rear) one on each side with its own protection with the protection shields and shock absorbing devices.

An auxiliary slide beam structure (108) (as illustrated in figures 10A, 10B and 10C) may be attached to the central member of the Indo-skeletal beam (101) and locked into the protector shield when the vehicle is ready for operation, or be attached to the protector shield and slide out with the Upper Primary Slide (7), and get locked to the central member of the Indo-skeletal structure (1) in the operating position

Means for access for passengers in this embodiment as illustrated in Figures 5, 6, 10A, 10B and 10C. The seat (109) and secondary slide (111), slide out on the upper Primary Slide (107) to a position that lets the seat (109) protrude from the vehicle such that the passenger may simply stand in front of the seat and sit down on the seat (109). Thereafter the seat (109) is retracted on the Primary slide to the position as depicted in Figure 6, where the Upper Primary slide (107) is locked with the locking devices (112) in position for operation of the vehicle. The slide drive mechanism may be powered using approaches well disclosed in the background art such as servos, and pneumatic or hydraulic systems. The vehicle while in operation should have the Upper Primary Slide (107) retracted and locked. The ignition lock is used in this embodiment to ensure this practice.

While extended, the clearance on the side of the vehicle for the Easy Ejector will usually be in the range of about 20 inches to 30 inches. This could be substantially less than the clearance required for opening a conventional car door. This is particularly useful for parking in areas with limited clearance.

Figures 12A, 12B and 12C illustrates the detail of the seat (109). The seat (109) may be constructed with customizable multi-elements that conform to the desired shape and provide the desired support for the passenger. Such adjustments may be effected using conventional seat control devices. In this figure the Safety Harness (119) is secured to the sides of the contoured seat (109) between the arm rests (122). The safety harness (119) may be designed to protect the passenger in head-on collisions by providing a soft barrier in close proximity to the body but not necessarily touching the body. This arrangement may be preferred to seat belts that do not provide the extended surface area that the harness (119) provides and as result provides greater impact resistance for the same level of

limiting forces that the body can withstand. Moreover, this arrangement may obviate the need for a front collision airbag as the harness (119) may be high enough to support the face and neck under collision conditions. The harness may be constructed of pliable but semi-rigid material (such as high strength nylon) to provide support in a head on collision. A natural benefit of the arrangement of the harness (119) and its supports (120) is that lateral forces on the seat are also braced by the harness support (120) in the operating position. Figures 12 F 2 and 12 G2 illustrate an embodiment of the harness. Moreover the seat (109) may be constructed with reinforcing on the sides to further protect the passenger from crush injuries. The Seating surface (121) is illustrated in the same figure as are the arm rests (122). In conventional vehicle seat designs the door surface provides the only support on the external side surface which are usually limited to arm rests. This seat (109) provides surround support for the passenger particularly desirable on winding roads. The "Custom contoured seats" customized for each passenger may be created with a multi-element adjustable structure (manually with inserts or with computer controlled elements) that provide ergonomic passenger comfort providing where desired, lateral support in addition to the support that conventional seats provide, to cradle the entire lower body in the ejector seat. Similarly child seats (123) as in Figure 12D1, may be designed to protect children. Such seats can be inserted into the seat (109). The Safety harness may also have an attachment for providing greater support for infants and small children.

ADDITIONAL EMBODIMENTS

While the above embodiment uses a power slide drive, this embodiment differs in that a gravity slide drive is employed to move the slides for mounting the vehicle. Figures 7,8 and 9 describe this arrangement. This embodiment differs in the preferred embodiment above in that the Lower Primary slide/safety Beam (102, 102') are pivoted at the Central member of the indo-skeletal structure with pivots (118). As shown in Figure 7, this allows the lower slide to fall to a lower of two positions, that inclines the upper surface of the Lower Primary slide (102) adequately to allow the upper Primary slide (107) to slide outwards to the loading position assisted by the weight of a passenger in the seat and the additional assistance of the Spring arrangement (115). The passenger may dismount from the vehicle when the slide is fully extended as shown in Figure 7. Each side of the vehicle has independent slides and may be operated by passengers independently.

When the passenger dismounts from the seat the Upper Primary slide (107) in its extended position moves to the higher of two positions about the Pivot (118) as illustrated in Figure 8. This move inclines the Upper surface of the Lower Primary slide adequately to allow the weight of a passenger to work against the spring arrangement (115) and move the slide to the operating position. This move up of the Lower Primary Slide (107) may be effected by mechanisms well disclosed in the background art. The Slide as depicted in Figure 8, is now ready for a new Passengers to mount. When the passenger sits on the seat (109), the weight of the passenger works against the spring mechanism (115) to move the slide to the operating position as depicted on the left hand side of the figure 9 and lock the slide in the operating position. The Upper Primary Slide may be unlocked by the passenger by depressing the Inside Door Open Button (116). Activating this button in addition allows the lower primary slide (102) to move and be

locked to the loading inclination - the lower of two positions, and the Upper Primary Slide (107) is free to slide out with the passenger. At this point the arrangement has completed a full cycle and is in the position depicted in Figure 7.

The above cycle represents operation of the Gravity Slide Drive when there is a passenger in the seat (109) when the Slide moves to and from the operating position as on the left of Figure 9. When a passenger dismounts however, and the Slide arrangement needs to be retracted without a passenger in the seat, the weight of the passenger is no longer available for aiding the motion of the slide to the operating position, and the slide must be pushed in against the action of the Spring Arrangement (115) and locked in place at the operating position. When a new Passenger wishes to mount the vehicle, he/she will press the Outside Door Open Button (117) which releases the catch that holds the Upper Primary Slide beam in place but does not affect the movement of the Lower Primary Slide (102) about its pivot (118). The seat as a result slides out on the Upper Primary Slide assisted by the Spring arrangement (115) to the position for mounting the vehicle as depicted in Figure 7. The spring arrangement (115) is designed to be such that it provides a force just adequate to move the Upper Primary Slide out with no passenger in the seat.

Some alternative embodiments may have multiple positions for the inclinations of the safety beams from the center of the vehicle, in the loading position to accommodate the varying road inclinations that may make a single inclination of the safety beam in the loading position inadequate. In such an embodiment the operator will have the facility to switch to the best loading inclination dependant on the inclination of the road. This will overcome some of the disadvantages of regular car doors on steep hills. Moreover, this arrangement can also function as a shock absorbing device for the comfort of the passengers in vehicles under operating conditions. A possible embodiment to achieve this can have a range of angular inclinations for the operating position, the range being set so that the transfer of the compressive load on impact through to the fixed body members of the vehicle or the central beam is achieved. The Safety beams are spring or shock absorber mounted in a vertical plane relative to the central beam and the fixed body members of the vehicle. When a bump in the road is encountered the safety beams pivot on the center and swing higher at the center thereby isolating the passenger from the road.

Some embodiments of the multi-element contoured seats may have a structure that provides anatomically accurate support for the body as illustrated in Figures 19 A,B,C,D and E. This seat architecture may be used in a wide variety of application s outside vehicles as well. Conventional car seats are a set of two or possibly three rigid structures - the seat bottom, the back and the head rest. These have some mobility for comfort. However there are two factors that militate against their comfort and the level of protective support they can provide in collision situations. First, one size must fit all pawssengers and drivers. The mobility provided for the seat bottom, seat back and head rest provide limited flexibility for passengers of different sizes. Second, there is little lateral support for the body that could be vital in a side collision, and third, in a vehicle in motion on a rough surface, the shock absorbtion provided to all parts of the upper body is the same. – the seat back is rigid onece set up by the passenger – this stands in contrast with the internal shock absorbtion of the human body, where the spine provides differential shock absorbtion to different parts of the body, increasing the shock absorbtion towards the head. This last factor implies that

conventional seat backs cannot remove vibrations from both the top and the bottom of the upper body as the body's own shock absorbtion system will move differentially to the seat back along the length of the spine. The embodiments of this invention illustrated in figures 19, improve these characteristics of seats.

Figures 19 A and B show two view of a shadow vertibra of the seat. The design of this vertibra is to provide auxiliary support for the body. The structure shown is one of several possible structures for embodiments of this invention. The body of the vertibra in this embodiment is split into a left body (164) and a right body (165) these elements are permanently bonded or fixed tgether by bolts. The body has two cavities on each of the top and the bottom surface – the air cell sockets. These hold two air cells on the left and the right side. These air cells are supported on the sides by the air cell retainers (159) that slide in and out of the air cell sockets (166, 167, 171, 172). The air cells them selves are made of a pliable and inflatable material, or alternatively a material that can fold within the cell supports. Each pair of air cells are separately inflatable by a multi channel air pump that is installed in the seat embodiment. There is a connecting tube between the left and the right air cells housed in the lateral tilt air cell visco-eleastic damper tube. This tube allows limited air flow between the left and the right chambers to permit lateral tilting of the vertebrae relative to each other. This motion hover is corrected by the lateral tilt return spring (160) that ensures that in the normal position the vertebrae arealigned vertically. This lateral tilt return spring is fixed on one end to a vertibra in the upper fixed slot for lateral tilt return spring (161) and can slide within the next vertibra in the lower sliding slot for lateral tilt return spring (174).Orthogonal support is provided between the vertebrae with the support flange (162) that is fixed at one end in the lower slot for the support flange (173) and is slidably mounted in the adjoining vertibra's upper slot for support flange (163). The flnge is sized to allow limited lateral tilting as the vertibra tilts laterally, but provides firm back support. Notably the upper and lower slots for the support flange may be inclined slightly so as to take the form of the human spine. The body contact is made on the back with the back support adjustable air cushions (170), which in most embodiments are contoured to the shape of the bode and is illustrated as an ellipsoid for clarity. These air cushions are inflatable and the pressure may be adjusted to the comfort of the passenger. There may be a spring loaded cable that is threaded through the vertebrae to tie them together.The spring loading will work against the air cell pressure as the gets elongated with higher air cell pressure. Ideally there can be as many of the shadow vertebrae as vertebrae in the human body although some embodiments may choose some economy in the number of such shadow vertebrae. Figure 19C illustrates two adjoining shadow vertebrae. One of these are for supporting the thorax region and therefore have attached the shadow rib body (175) and the related shadow rib adjustable air cushions (176) (shown as ellipsoids for clarity but in most embodiments will be contoured to take the shape of the body. These air cushions are inflatable for passenger comfort. The air supply being led to the cushions along the rib body and down the shadow spine to the multiple channel control air pump which also supplies air pressure of each of the many air cushions and air cells in the seat embodiment. The shadow ribs are supported by the tilt control connectors(177) that may adjust the angle of the shadow ribs. Figures 19 D and E .illustrate one possible version of this embodiment. Here the shadow vertebrae are stacked up to provide support for the head the neck the shoulders, the thorax and the lumbar region. The head rear support adjustable air cushions (183) provide

forward support for the head while the Head lateral support arms with deploying passive air bag (182) provides lateral support particularly during side collisions with deploying passive micro airbags. Similarly the neckhas rear support from neck rear support adjustable air cushions (184) and lateral support from Neck lateral support with deploying passive micro air bag (181). The shoulders are supported by the shoulder bolster (178) and the shoulder bolster adjustable cushions (179). The shoulder bolster being pivotally attached to a vertibra of the shadow spine and allowed limited pivotal motion vertically to allow the passenger to move his/her upper arms upwards at norma speed. However, the shoulder bolster will resist rapid motion of the upper arms and shoulders as in a collision thereby supporting the passenger. This differential movement characteristics can be achieved by approaches well disclosed in the background including viscous loading of the coupling. Lumbar support is provided by the Lumbar support adjustable air cushions (185). The entire array of the shadow vertebrae may be elongated and contracted by changing the pressure in the air cells thereby provding the optimal sizing for all heights of passengers. The lateral support and back support cushions may be inflated to provide width control and support for passengers of different shapes. Adjustable hip bolsters provide lateral and forward support while the adjustable pelvic support (187) provides vertival support for the passenger. The illustrations exclude the leg and arm supports that are part of the embodiment for sake of clarity. Spring supports can substitute for the air cells in the vertebrae but will not have the advantage of viscous lateral resistance and independent height control. Overall height can however be controlled with the cable threaded through the vertebrae. Motion control of the seat elements can be achieved with devices well disclosed in the background art including servos, and pneumatic and hydraulic systems.

Considering the complexity of the seat systems including the multi channel inflators for each of the air cells and the air cushions along with the mechanical controls for inclining the shadow ribs and the pelvic and hip supports, it would normally be necessary to use a closed loop feedback with computer control. Pressure sensing of each air filled device will provide feedback on the resistant force o the human body and therefore firmness of the support. This information can be used to provide the firmness control desired by the passenger. One computer controlled scheme could be where the passenger inputs gender weight, and height and the computer alters the size of the seat by inflating and deflating aircells and cushions accordingly and the provides several alternative configurations that the customer can select. The customer can then customize firmness and variations on the seat presets.

Finally the shoulder bolsters and shadow ribs may have deploying micro aircusions that hold the passenger in the event of a collision.

Yet another computer control scheme for the seats has a "learn" mode" and a "save" mode for the computer control. When the computer control is set to the learn mode the feedback system observations are used to learn the user's preferred positions. Thereafter when in the save mode the seat is set to this position. As an additional enhancement the seat control can be voice activated to allow the user to "tell" the seat to be either in the learn or save modes.

Another embodiment of the multi element contoured seat that provides anatomically accurate support for the body comprises a shadow spine that is made up in part by an array of interlocking vertibra bodies as in 204 that are each connected to body support members that may be shadow ribs or other support members for the human body as described herein. The size of each vertibra may be scaled to accommodate the force considerations envountered by the vertibra during crash conditions. Therefore many embodiments will have larger vertibra at the lower end of the shadow spine and smaller vertibra at the top of the sipne. Each of the interlocking vertibra bodies have a slider insert 205 that has a hole to accommodate the vertibra attachment pin. The slider moves within the housing on the vertibra body to allow extension and contraction in the effective length of each vertibra. The movement in the position of the hole is accommodated by the slot in the vertibra body. Adjoining vertibra are joined by a pin that is fitten into the vertibra attachment pin socket-1 in the slider insert 213 and the vertibra attachment pin socket-2 212 on the adjoining vertibra. On assembly of the string of such vertibra there will be limited pivotal movement possible laterally as the pin holes 212 rotate relative to the pin holes 213. Such movement may be limited with the shape of the vertibra attachment key 211 and the slot for adjoining vertibra key 210. And further controlled by springs to described below. Each of the vertebrae in the shadow spine may have an angled pin hole 212 along with orthogonal surfaces of the key 211 so that the position of each of the vertebrae reflect the requied curvature of the shadow spine to accommodate the passenger spine curvature. Notably the arrangements for contraction and extension of the chain of vertebrae will allow for different sized passengers. The vertibra at the bottom of the string is connected to the lower part of the seat with a slot arrangement that fits the key on the vertibra or alternatively if the vertibra are oriented to have their keys above their slots, the lower seat will have a key to accommodate the slot on the lowest vertibra. The vertibae may extend to support the head and neck. The number and length of vertebrae will depend on the balance between the larger cost of a large number of vertebrae and the value in accuarate support with a shadow vertibra for each vertibra of the passenger and one for the head of the passenger. The shadow spine also comprises two chords of high tensile strength possibly of stranded steel, that are rigidly connected to the aperture for tension chord 208 of the top vertibra, and are each threaded through the apertures for tension chords 208, one on each side of the vertebrae along the length of the shadow spine. Springs are interspersed between the vertibrea to surround each of the chords one on each side of each vertibra, to separate the vertebrae when there is no tension in the chord and to extend the shadow spine by forcing the slider insert 205 to slide outwards to the extent possible. The two tension chords are threaded through holes in a mounting members of the shadow spine located near the lower seat, and attached to a mechanism that can loosen and tighten each of the two chords concurrently by the same amount, thereby forcing each of the springs to compress and allow a contraction of each of the vertebrae of the shadow spine. This arrangement allows adjustment of the seat back to the size of height of the passenger or operator. The characteristics of each of the pairs of springs on each of the vertebrae can be adjusted to compress by different amounts, the vertebrae at different levels of the shadow spine to reflect the relative variations in size of different vertebrae of tall and short people. In the event of a side collision, one of the tension chords will remain in tension while the other may slacken by compressing

further the springs on its side caused by the lateral force allowing limited lateral movement and bending of the shadow spine, thereby limiting the peak accelerations that are encountered by the upper body head and neck. The entire shadow spine assembly will have some controlled flexibility by design for forward and backward movement for protection of the passenger in a rear or front collision. There will also be attachment points for seat belts or safety shields on one or more of the vertebrae.

A further refinement of this embodiment of the shadow spine in the multi-element contoured seat as in fig 19 H, has additional apertures 214 on each side of each vertibra, to accommodate a spring rod on each side of the shadow spine. The spring rod will be threaded through the aperture 214 in Fig 19H and each attached at only one end either at the top or the bottom. The sizing and surface treatment of the aperture 214 will allow some lateral bending of the spring rod, and allow sliding of the spring rod. On lateral impact the spring rods will resist lateral movement and supplement the force of the springs in compression around the tension chord. Moreover, in rear impact and front impact collisions they will supplement forward and backward bending of the shadow spine and as a result the upper body of the passenger or operator. Notably the cross section of the rods may be adjusted in the lateral direction relative to the forward-backward direction to modify the relative resistive force that it applies in lateral impacts versus forward and back impact.

Yet another variation of this embodiment discharges the air in the adjustable air cushions when passengers leave the seats, and then reinflate these aircushions when the new passenger sits down with air that is preheated or precooled to the preferred temperature of the passenger. Thereafter the air cushions will provide insulation at that temperature for the seating surface.

Yet another embodiment of the multi element seat has a back and head/neck support that is supported by concentric tubes that fit within each other and can slide within each other. The longest and narrowest of these tubes supports the head rest. The tube next in length and wider, supports the neck rest, the tube next in length and still wider supports the thorax (there may also be a tube that supports the shoulders at this postion between the neck and the thorax). The next length of tube supports the lower back and the lumbar region. Each of these tubes may be independently raised or lowered to meet the user's preference and anatomy. Moreover the support for each region whether it be head, neck, shoulders, thorax or lumbar regions, may be widened or narrowed with each of these sections. While the background art provides many possible approaches for raising and lowering the sections and the wideining and narrowing of the sections defined above in this embodiment, a simple embodiment has all the control devices at the bottom of the tubes. The raising and lowering of each tube can use electric servos or pneumatic or gas lift mechanisms attached to the concentric sections that are designed such that the narrower tubes protrude below the wider tubes for access for support and control by the said lift mechanisms. The width of each of the sections may be controlled with air cells that are inflatable to the passenger's preference. This embodiment with concentric tubes may allow some limited flexing and therefore lateral movement of the body under lateral impact conditions thereby

reducing peak accelerations of the head neck and thorax regions of the body. The cross sections of the tubes that support the sections may be circular in some embodiments to allow the user the ability to twist for example to reach a child in the back seat, this embodiment however has a viscous damper or rachet arrangement with a centrifugal governor that prevents rapid twisting motion as under side collision forces. Such viscous dampers or centrifugal rachets may be attached to each of the concentric tubes that allow twisting motion. Such viscous dampers with radial vanes and rachet arrangements with centrifugal governors are well disclosed in the background art. Other embodiments that prevent twisting motion may have rectangular or other irregular cross sections.

Yet another embodiment uses a second rotating mechanism or turn table for the seat about a vertical axis mounted at the point of attachment of the seat to the fiexed elements of the vehicle when in the normal operating position, that allows the user discretion to position and lock the seat at an angle to the direction of motion of the vehicle. This is sometimes desired by drivers. The computer control system for the seats can have a learn position that learns the angular position that is desired by the user and then sets it in the save position. The user commands can be verbal with voice recognition.

Yet another embodiment has a head and neck support in a multi element adjustable seat (where the head and neck support is constructed to be light but strong), in addition to having vertical movements is pivoted along a horizontal lateral axis and is designed with spring controls to move forward and touch the head and neck without pushing the head and neck with uncomfortable forces. Radial or linear viscous dampers are attached about the horizontal axis of the head and neck support that prevents rapid movement of the head and neck in a rear end collision. The viscous dampers are well disclosed in the background art.

Embodiments, particularly those that utilize the indo-skeletal structure may include the following additional embodiments and variations thereof for frontal and rear impact protection and passenger comfort and convenience. The additional structure is illustrated in figures 20 A,B and C. The passenger support platform (198)represents the set of machinery for that purpose. It will take the shape needed to support the variety of structures that are described in this invention.It is supported either in the middle or on the edges by the Central body tubes (188). The first tube that fits into the central body tube is the Body extender tube (189) This optional tube is slidably connected to the central body tube and may be moved in and out by servo motors or pneumatic/hydraulic pistons and cylinders. However the inner tube is axially supported by a compression resistant shock absorber which in turn is mounted rigidly with regard to the outer central body tube in all poitions that the body extender tube can take. The Body extender tube has functions that include extending the wheel base of the vehicle under computer control particularly in drive by wire vehicles, thereby improving the comfort of the vehicle and second increasing the wheel base contingent on vehicle speed such that in the event of a collision there is a longer deceleration space. The shock absorber will become longer and and shorter to accomodate this need and can for example be air shock absorbers. The correlation of speed and length will normally be computer controlled to provide statistically appropriate deceleration

distances for the speed of the vehicle at any time. Notably the steering arrangements and other vehicle systems may also need to be compensated to accommodate the change in wheel base to ensure driver convenience and precise control of the vehicle. The Front end connector tube (190) has a shock absorber in series with a servo or pneumatic/hydraulic controlled actuator for axial movement in and out of the body extender tube (189) as does the back end connector tube ((191). 190 and 191 are connected to the front and back ends respectively which include the front and back wheels.and bumper arrangements. The front module – which may be the engine or hybrid unit is pivoted on brackets at the front end of the front end connector tube, thereby allowing the module to rotate upwards about this pivot. Notably the module will be signifivcantly massive and will require strong supports and pivots. The front module crank is pivotally attached to the body extender tube and also pivotally attached to the front module as shown in figure 20 A. Therefore if there is a movement of the front end towards the body extender tube the front module crank would swing the front module about its pivot in the front towards the vertical direction.

There are at least two functions for this motion. First in the event of a front collision the force will compress the shock absorbers on the end of the front end connector tube and thereby force the crank to pivot up the front module. This angular acceleration of the massive front module will absorb energy of the impact and acting as a "fly wheel", remove acceleration spikes that the passenger would otherwise sustain and in addition due to its vertical acceleration increase the traction on the front wheels thereby increasing the braking friction resistance that can be offered. Finally in the event of a collision the inclining front module will divert the impacting vehicle over the passenger space. This action is illustrated in figure 20 C. Second, particulary for drive by wire vehicles, the front and back end connector tubes may be retracted by servo or pneumatic/hydraulic rrangements, to pivot up the front and back modules thereby reducing the vehicle length substantially and providing better curb visibility to the driver particularly while paaking. This is illustrated in Figure 20 B. Notably the wheels are maintained in the same orientation to the road surface and may be steered as desired with the same mechanisms. For conventional vehicle architectures the pivot of the front module and engine with the front end connector tube should be near the wheel axis to facilitate this additional feature.

The same value is derived in the rear structure as the front structure for rear collisions and in front collisions and in parking. The arguments are similar.

Another embodiment may have a single but broad set of central body tube body extender tube and the back/front end connector tubes with a split front or back module and connection of the front / back connector tube with the front /back ends respectively in the middle. Yet another configuration may have a single central body tube and body extender tube but then have a "T" shaped structure on the back or the front to have seperate left and right front and/or back end connector tubes connected with the front end at either side. In the event the body extender tube in not used the connection of the front/back module cranks will be to the central body tubes.

For embodiments that use an exoskeletal or shell design, an additional embodiment deploys airbags in the space surrounding the engine components to change the characteristics of the crumple zone. Moreover in addition some of these embodiments have the passenger cabin slidably and detachably connected to the rest of the vehicle and mounted behind these deploying airbags such that on impact, the cabin detaches from the vehicle and slides backwards in a controlled fashion to ensure the integrity of the cabin.

Yet another additional embodiment has a rear seat that has a unique bench configuration with sections that maintain their integrity and width in a side collision and other sections that collapse or compress in predefined controlled ways, to absorb the impact accelleration that would otherwise be transmitted to the passengers. The present invention and in particular embodiments of the rear seat are not limited to these figures. There are many embodiments that differ from these figures.

The hip bolster P101 that is compressible to a pre defined width P109 and providing a predefined resistive force to compression, in the event of a lateral force being applied to the hip bolster in a side impact, and designed to compress to a minimum width that still protects the hip of the passengers, is mounted adjacent to and on either side of the contoured seat bottoms P102 which are designed not to compress substantially in the event of lateral compressive forces being applied to it in the event of a side impact. The shapes and widths of the uncompressed hip bolsters may vary depending on whether the hip bolster is at the end of a seat or in between the seat bottoms P102.

The collinear mounting of the hip bolsters and seat bottoms along a lateral axis is in some embodiments achieved with impact decoupler/secondary slides P103 that connect the hip bolsters and the seat bottoms to the fixed elements of the vehicle. These impact decouplers are under normal operating conditions, fixedly attached to each of the seat bottoms and each of the hip bolsters and under a predefined lateral force decouple the seat bottoms and hip bolsters to slide along a lateral axis relative to the fixed elements of the vehicle. The impact decoupler/secondary slides are mounted on the hip bolsters such that under compression to the predefined width, the impact decouplers/secondary slides do not obstruct the compression process.

Some of these embodiments have a further feature to lower and raise the hip bolsters to facilitate egress and ingress. In some such embodiments Slots in the hip bolster accommodate the secondary slides at the time of withdrawal of the hip bolsters to approximately the level of the seat bottoms. In addition there are slots to accommodate the sliding surfaces on the fixed elements of the vehicle, that are attached to the impact decouplers/secondary slides. This arrangement for lowering and raising the hip bolsters may be activated when the doors are opened and closed, raising the hip bolsters to the operating position when the doors are closed and lowering the hip bolsters when the doors are opened thereby facilitating egress and ingress. The lowering and raising arrangement can also be disabled to allow more passengers to use the back seat but without the using the side impact protection system.

-The arrangement for raising and lowering the hip bolsters may also be used to change the width of the seat bottom within limits by changing the height of the bolsters, each having an angled edge on the sides facing the seat bottoms.

The back rest P112 and the shoulder bolster/support P111, support the back and shoulders/arms respectively of the passengers. The seat bottom P102 and the back rest P112 are located in the same lateral position for each of the passengers. Similarly, the hip bolsters and the shoulder bolsters are located in the same lateral position so that the shoulder bolster lies substantially above the hip bolster. The shoulder bolster is controllably crushable like the hip bolster, to be reduced under compressive lateral forces to a predefined narrow width. The back rest and the shoulder bolster support are mounted on impact decoupler/secondary slides in an analogous fashion to the seat bottom and the hip bolster respectively. Moreover, the back rest and the seat bottom are connected so that the movement of the seat bottom and the back rest when decoupled and thereafter laterally slidably attached to the fixed members of the vehicle, follow each other exactly so that the passenger support position is maintained under lateral impact conditions. Some embodiments have retracting arrangements of the shoulder bolster analogous to the hip bolster.

In some embodiments the sliding surfaces on the fixed elements of the vehicle, that the impact decoupler/secondary slides are restrained to following during impact, may be segmented into sections across the vehicle so that sections of the seat back may be folded down along with these surfaces to provide enhanced storage space in the trunk of the vehicle or for other utility purposes. Moreover the members of the fixed elements of the vehicle that provide these sliding surfaces may be constructed in telescoping elements so that on lateral impact they decouple and telescope together rather than buckle under lateral forces thereby maintaining the integrity of the lateral sliding surfaces. These telescoping sections may also form a part of the impact decoupling arrangement of the secondary slides.

The head rest P113 is connected to the back rest and is vertically adjustable but is laterally fixed to the back rest, and therefore will move laterally with the back rest in the event of a side impact of sufficient magnitude, thereby ensuring that the head and the back of the passenger are supported at the same lateral position ensuring that there is little differential movement of the head relative to the body of the passenger during impact.

Under lateral impact conditions, forces on the protector shields which may consist of the vehicle body sides and/or the back door and/or the rear wheels and sections of the wheel wells of the vehicle, all of which have surfaces that abut the sides of the passengers, the hip bolsters and the shoulder bolsters on the impact side of the vehicle, provide impact resistance. As a controlled crush commences in a lateral direction, internal airbags are deployed adjoining the hip bolsters and shoulder bolsters on the impact side of the vehicle but on the inside of the protector shield elements, thereby transferring impact forces through the airbag to the hip bolster and shoulder bolster on the impact side of the vehicle. The inside airbag in some embodiments may be in several sections with one or more of these sections mounted inside the rear wheel well of the vehicle.

Head and neck airbags P114, Body air bags P115 and side bolster airbags P110 are deployed on impact to hold the passengers in the survival space contained by the seat bottom, the back rest and the head rest.

Thereafter the movement of the passengers laterally will be with minimal differential movement of the body elements as they are held by the airbags that are in turn attached to the head rest the back rest and the seat bottom respectively, which in turn are constrained to move together laterally on impact.

The airbags may be constructed as micro-air cushions that are driven by the internal airbag as the sacrificial chamber. They may also be separately deployed airbags.

Some of the chambers of the inside airbags may be preinflated and therefore completely passive.

The body airbags may be shaped to be inclined downwards on the top surface to gently push the arms of the passengers forward, while maintaining relatively even support for the arms down from the shoulder.

In the compressed position of the hip bolsters and shoulder bolsters, it is likely that the shoulder space will be very limited. Therefore, some embodiments may have the center seat back offset forward relative to the seat backs on either side, thereby moving the passenger in the central seat to be slightly ahead of the passengers on the side in the operating position. Therefore under impact, the shoulders of the center passenger will not abut the shoulders of the passengers on the side but will lie ahead of the shoulders of the passengers on the sides, thereby allowing adequate space for shoulders of all passengers under impact. The body air bags on deployment will push all the arms forward and upward and hold the torsos of passengers on both sides. If the center passenger shoulder is in front of the side passenger shoulders the inner arm of each of the side passengers will push up the arms of the center passenger when the air bag deploys.

The shapes of the body airbags may be such that they hold both passengers on either side, or be designed to hold only one of the two passengers adjoining the hip bolster or shoulder bolster from which it is deployed. In the latter case there will be two bags to support each of the two passengers on either side the hip bolster and the shoulder bolster. The hip bolster and shoulder bolsters on the ends of the rear seat assembly will need only one air bag on each as there is only one adjoining passenger.

Some car architectures have the rear wheel well partially straddling the rear seat. As a result an outward displacement of the rear seat on the further side from the impact can be prevented. Some embodiments of the present invention that are in these architectures, have specially constructed wheel wells and componentry that are placed between the seats and the wheel wells to allow a compression of the wheel wells as the rear seat moves outwards on the side opposite the collision. Some of these arrangements may include a perforation or weakening of the wheel well along the profile of the seat in the outward extended position of the seat under impact of the side further from the impact, to allow the lateral force of the seat on the wheel well to separate and crush the section in the way of the seat to allow the movement of the seat. To assist with this process of separation of the section of the wheel well in the way of the seat, the seat may have mounted to its edge in a position facing the wheel well a cutting edge, so that the wheel well may be cut or separated more easily during collision conditions as described above.

Yet other embodiments in architectures of cars that have wheel wells partially straddling the rear seat, have airbags that deploy in the wheel well on the impact side to control the forces on the rear seat, and would provide the function of the inside airbags in other embodiments.

Yet other embodiments of the present invention have a raised and/or forward shifted section of the middle seat on the rear seat assembly so that in the normal operating position the passenger in the center seat, has his/her shoulders in a position that will not engage the shoulders of the side passengers under impact. As a result the present invention will under side impact conditions, compress the side bolsters and back /shoulder bolsters, while maintaining the survival space of the back and bottom rests of the seats, while the shoulders overlap and thereby permit the compression of the arrangement of the passengers under side impact.

Another additional embodiment provides for the convertion of the vehicle as described in the present invention into an aircraft with the same robust safety arrangements, but also adapted for functioning as a helicopter type vehicle with the necessary changes in the architecture to provide for the power source at the top of the passenger cab, while retaining a reduced wheel base if necessary for balance and manouvering considerations. Notably the present invention can therefore have embodiments that are aircraft with the side, front and back impact protection that is required for use of such vehicles on conventional roads exceeding the stringent minimum safety standards of all road vehicles.

One version of this additional embodiment has the front module 194, along with the crank 196, and the pivoting socket for pivoting about a pin on the front end 190, 192 mounted on a pair of elevator beams 199, each supported pivotally near the center of the vehicle 188 or in its vicinity, and constructed such that they support the front module when in the near horizontal position when the vehicle functions as a ground vehicle. Each of the cranks 196 have one of their pivots mounted on the corresponding elevator beam 199. the other pivot of the ctrank being on the module 194. The module in the near horizontal position during functioning as a surface vehicle will have the notches at the front end resting in the pivot pins on the front end 190 and locked adequately in place.This arrangement, ensures that in the event of a collision at the front end, the pivot pin engages the slot and pushes the front module backwards at the pin position, thereby forcing the crank 196, that is fixed on the stationary elevator beam 199 at the rear end, to move the rear pivot on the front module upwardsand thereby ensure the performance of the present invention with this structure as noted herein. When elevated by mechanical, pneumatic or hydraulic means well disclosed in the background art, the elevator beam inclines the front module to an adjustable angle to the vertical. Threby allowing a folded propeller that may be mounted at the front end of the said front module and the vanes of which may be folded in a storage position on the sides of the front module and its top and bottom in recesses designed for the purpose (the length of the vanes /blades can be greater for those stored on the sides of the front module and shorter for those stored at the top and bottom of the front module. Figures do not show the folded propeller) this propeller can be engaged to the motor and/or engine that is in the front module to provide loft for the vehicle to fly. In addition the front end 192 and back end 193 may be retracted as described in the present invention, to fold the back end upwards and to reduce the wheel base and the maneuverability of the airbourne vehicle. The position of the rear module can be varied with controls on the retraction of the back end to provide the right balace characteristics of the vehicle when air bourne. This additional embodiment is bewst suited for a drive by wire vehicle as the front module is

not directly connected to the wheels and a transmission system to the wheels is not necessary, thereby reducing the weight of the vehicle. Low mass wheel motors are another useful addition to propel the vehicle as a ground vehicle. Such wheel motors may be used to drive small propellers to provide lateral thrust needed for the vehicle when in flight. (in some embodiments after being disengaged from the wheels)Forward thrust can be provided from the main propeller with an inclined elevator beam.

Moreover, in this additional flying embodiment and in an embodiment for a standard ground vehicle, the shock absorbtion systems in 189, 190 may have shock absorbers that may be decoupled to provide even greater retraction movement under servo control.

Yet other flying embodiments of the present invention have dual elevating beams that engage both the front and the back modules thereby permitting both modules to to be elevated and drive the propellers or rotors. These embodiments will have the modules in the elevated position to be at a small angle to each other so that the rotors do not collide while rotating.. Moreover they have contra rotating rotors or propellers. The inclination of the rotors or propellers may be changed to facilitate forward sideward or backward movement of the vehicle.

Yet other flying embodiments have dual elevator beams on each side for each module so that they may elevate the moduled to a position substantially above the passenger cabin without rotating the modules substantially.

Yet other flying embodiments of the present invention maintain the modules in the normal operating position as in a surface vehicle as noted herein, but with rotor or propeller shafts that may be angled upwards to a substantially vertical orientation. These embodiments may have rotor or prpeller shafts that are long so that the center of lift or the point at which the upward thrust of the rotors applies will be well above the center of gravity of the vehicle thereby providing greater stability.

Yet another flying embodiment of the present invention, has each of the seats on one or more mounts (these mounts can be the secondary & primary slide arrangements noted herein), such that under substantial vertical load as encountered in a vertical crash situation the mounts tilt so that the seat support for the back or spine of the passenger or operator inclines backwards so that the axial load on the spine due to the vertical deceleration is reduced by supporting the upper body in a substantially horizontal or inclined position. These tilting mounts may be attached to the fixed body members of the vehicle and maintained in the operating position using friction or impact shear load induced decoupling arrangements. One such embodiment has a pair of primary and secondary slides as in a conventional non-flying embodiment as in figures 10 D1 – 10D4 but in addition has the central mount of the primary slide rearward on the vehicle attached to the central body member with a key and slot arrangement with a key on the lower primary slide mount and the slot on the central body member 201 in Fig 10D5, such that under vertical impact the key decouples and slide into the slot vertically thereby rotating the seat about the primary slide on the forward side of the seat resulting in a "cradle" position for the seat that protects the passenger from a axial load on the spine. Yet another embodiment may use the two center mounts of the lower primary slide in Fig 10 D1-10D4, linked rigidly together by a member that is shaped in the arc of a circle in the vertical plane of the central body member with center

above the central body member, said rigid member housed in a slot in the fixed central member, such that under normal operation and under lateral impact the linking member is not detached from the fixed central body member of the vehicle and transfers the lateral load to the fixed body members, but under vertical loading of the seat (and the primary slide) the linking member detaches and slides in the housing slot to describean arc of the same circles that defines the profiles of the slot and the linking member, the center of said circles being so arranged that with this circular movement of the linking member in the slot the center of gravity of the passenger or operator and the seat are lowered, and the seat rotates in a direction to a cradle position where the passenger or operator is in a reclining position or the upper body of said passenger is in a near horizontal position.

Yet another additional embodiment of the present invention has the passenger support mechanism (the seat in many embodiments) supported by a pivot substantially in the center of the seat and nea r the lower support element of the support mechanism and the occupant contact surface thereof, with an axis along the direction of motion of the vehicle, and motion about this pivot being spring controlled to return the seat to the operating position under no external forces. The pivotal movement is also heavily damped to absorb energy as the seat is moved in either lateral direction from the operating vertical position. The pivot is attached on its other end to the impact decoupler/secondary slides that have been previously disclosed. In the event of the side impact, the internal airbags or equivalents that may be damped springs, will initially move the passenger support mechanism pivotally prior to the impact decouplers of the secondary slide being decoupled. Therefore following impact, the head and thorax start moving first towards the impacted surface of the vehicle (or accelerate more slowly than the impacted surface of the vehicle) and then the body rotates with the passenger support mechanism away from the impact, and finally if the impact is severe enough, the entire body with the passenger support mechanism moves when the impact decouplers are decoupled. This additional embodiment gives the head and thorax a greater motion space than the pelvic region as the body accelerates, and is particularly useful if the movement of the lower seat is constrained by fixed elements of the vehicle such as a center tunnel that is not designed to collapse. The longer time (and distance) allowed for the head and thorax to accerate give them a potentially lower peak acceleration of the acceleration is designed to be as near constant as possible be design of the springs and dampers controlling the pivotal movement and the resistance to motion caused by the secondary slides when decoupled. Notably in this additional embodiment the head and neck are well supported by elements of the passenger support mechanism.

Yet another additional embodiment extends the embodiment shown in figures 10D1-10D4 where the safety beam upper element is concentric to the safety beam lower element. Here the safety beam lower and upper elements have an interlocking worm drive that is driven at one of the ends of these elements to move the safety beam upper element into the access position and back from the operating position. Thre can be multiple concentric telescoping tubes that constitute the safety beam upper element provide an accordian type extension the drive in this embodiment may be between the safety beam lower element and the section of the safety beam upper element sections

that supports the passenger support mechanism directly or indirectly through the impact decouplers/secondary slides. Furthermore in this embodiment the inside airbag equivalents may be damped spring assemblies that engage the cylindrical safety beam lower and upper elements when in the operating position. This will be particularly useful for hinged protector shields that move separately to the passenger support mechanism such as in gull wing dorrs. Such hinged protector shields may have pins to engage the safety beam lower and upper element in the operating position.

ALTERNATIVE EMBODIMENTS

In an alternative embodiment to the preferred embodiment, the present invention may use hinged Protector Shields (106) that lock into the Primary Slide (107) when closed. This will allow the arrangement to work for mounting and dismounting the vehicle with either the Primary Slides deactivated or non-operational as well as when they are functional. The seats may also be mounted on rotating mechanisms or extension arms rather than a primary slide, to assist passengers in mounting and dismounting.

Another alternative embodiment utilizes co-axial sliding mechanisms that constitute said rotating mechanisms rather than the primary slides such that the fixed and rotating members of said rotating mechanisms have an adequate area of contact and reaction to support lateral collision forces.

Another alternative embodiment is illustrated in Figures 5A and 6A. The "door" that contains the perforation shield (105) with distance/velocity sensors (113), the external airbags (104), the shock absorbers (103) and the protector shields (106), hinges down on the pivot (112A) to provide support for the upper primary slide. The inner surface of the Protector shield is designed to perform the function of the lower Primary slide (102). This embodiment will be particularly useful for larger vehicles with a plurality of seats on each side of the vehicle. These multiple seats may be mounted on separate sections of upper primary and secondary slides.

Yet another embodiment has the at least one shock absorbing device and the at least one force distributing protector shield comprising a deformable protective shell mounted to the fixed elements of the vehicle on the outside of the passengers so that in the event of a side impact, the shell distributes the impact force to the fixed body members of the vehicle while by deforming, absorbs some of the energy of impact.

Another alternative embodiment is illustrated in figures 1D to 4D where the Shock Absorbers (103) excluding the External Air bags (104) are mounted on the inner surface of the protector shields (106). As may be seen from the drawings, in this particular embodiment, the shock absorber excluding the external air bags are locked directly to the lower primary slide (102, 102') in the operating position, although in another configuration the locks my be between the protector shield and the lower primary slide in the operating position. Such embodiments may be designed to allow limited intrusion of the protector shield with resistance provided by the shock absorber (103) thereby reducing the peak acceleration sustained by the vehicle body under impact. Notably, as the passenger environment is protected and moves away from the impact, crush injury to the passenger is avoided. This is a unique feature of this invention where both the crush injury of the passenger and the peak acceleration of the vehicle (and the passenger as a

result) may be minimized at the same time. Conventional designs try to minimize intrusion by bracing the side of the vehicle with beams and thereby increasing the peak acceleration of the vehicle, or increasing intrusion to reduce the peak acceleration but allowing greater crush injury.

Another alternative embodiment may have a contoured safety harness with a different shape to that of the preferred embodiment. Figures 12 A 1 to 12 C1 illustrate an embodiment of a safety harness using a slightly different geometry but performing the same function in the same way as in the preferred embodiment.

Some embodiments of the multi-element contoured seat may have sides that fold downand away from the passenger. This feature is useful particularly for the inner side of the passengers near the side of the vehicle and for both sides of the passengers in the middle of the vehicle, if the center seats are fixed and not ejectable. Notably however, the sides lock in the operating position and brace the seat from lateral compression, thereby protecting the passenger.

Some embodiments have seat bottoms comprising two symmetrical elements each with a support surface for supporting the pelvis of the passenger, where the said support surface may be laterally displaced to space out the symmetric elements and/or angled about an axis horizontal and in the direction of motion of the vehicle. Such an arrangement for the seat bottom allows adjustment of the supprt provided by the seat to be lateral as well as vertical to the preference of the user. Moreover, if the said symmetrical elements are designed to be curved to accommodate the pelvis of the user, there can be substantial lateral support for the pelvis of the user, in many of the preferred angular orientations of the seat elements, in the event of a lateral impact.

Some embodiments of the seats may have sides that could include arm rests, side bolsters and other elements as disclosed in this invention, that that drop down or back on the door or access side at the time of egress and ingress, particularly in embodiments that use conventional doors for access. Activation for these movements can be with the switching on and off of the ignition switch for the vehicle.

Yet another embodiment raises he seat bottom at the time of egress and ingress with servos or pneumatic/hydraulic systems, so that the seat members on the sides of the sat are relatively lower to the seat bottom thereby facilitating egress and ingeress of the passenger. . Moreover, arrangements to raise the seat bottom may in addition in some embodiments help negotiate a high "door" sill by the sliding or rotating seats at egress and ingress.

Yet another embodiment using conventional doors, has the arm rests on the door side integrated in to the doors but protected and decoupled from the door members on its outside by inside air bags. This design would have these arm rests locking into the seat when the door is closedthereby providing the decoupling for the entire seat with the inside airbag during lateral impact.

Another alternaive embodiment uses shock absorbing devices mounted at each end on each of the two surfaces of the impact decoupler/secondary slide substituting or supplementing the inside airbags.

Another alternative embodiment may have an auxiliary slide behind the seat and of any convenient height. This embodiment is shown in figures 1C -4 C. The figures illustrate the working of the current

invention with a high section of the central member of the indo skeletal structure behind the seats, but abutting the auxiliary beams in the operating position. As the High section of the central member (101) is behind the seats and the secondary slides (111), the seats and the secondary slides are free to move across the vehicle under impact as shown in figure 4 C.

Yet another alternative embodiment has an external seat profile as illustrated in figure 12 E 1. The higher rectangular external profile provides greater protection to the passenger.

Yet another alternative embodiment has a vertical extension/ "safety cage" (125) as shown in figure 10 A1, 10B1 and 10C1. Here the vertical extension/safety cage engages a beam across the top of the vehicle that may be supported by the shell structure of the vehicle (the figure shows only half the width of the vehicle). Such a safety cage/vertical extension can provide protection in a roll over situation and also provide additional compressive strength for the vehicle, and may function as a fixed or retractable roll bar. In some embodiments such a vertical extension "safety cage" will perform the function of the "B" pillar of the vehicle under lateral impact. Notably no "B" pillar is needed to support rear door hinges in the present invention. Moreover, in some embodiments the beam arrangement across the top of the vehicle or other support structures on the roof section of the shell may be designed to be rigid on compression but telescope out with the secondary slides under impact using appropriate logic to drive the locking mechanisms, thereby providing a protective cage even when the seat is in the ejected state.

Yet another embodiment, deters a roll over following side impact, by implementing an "outrigger" arrangement having reinforced upper primary slides and/or secondary slides and bracing brackets anchored to the fixed members of the vehicle that hold these slides in their extended substantially horizontal position after extension under impact, without permitting them to buckle under a vertical forces encountered under the initial stage of a roll over situation.

The preferred embodiment has the external airbags or shock absorbers triggered on detection of an expected impact as noted. This implies that on the far side (non-impact side) if there is possible secondary impact from a second object, the same mechanisms will deploy the external airbags on the second side, thereby protecting the far side occupant in the event of a second object hitting the vehicle soon after the first. An alternative embodiment can have distance/velocity sensors mounted in positions on the front and back edge of the perforation shields or protector shields to facilitate better detection of objects approaching the vehicle at wide angles to the perpendicular direction. Yet another alternative embodiment to this will have both impact side and far side external airbags deploy on detection of the first impact.

Another alternative embodiment has a safety harness/shield as illustrated in Figure 12H2. This embodiment of the safety harness is mounted on spring loaded hinged supports at the head support section of the multi element adjustable seat (137) - similar to conventional supports for the headrest, and to lockable supports between the arm rests (138) or on the side bolsters of the multi element adjustable seat. The spring loading will support the weight of the harness and thereby retract the harness when unlocked. The harness includes a hinged and spring mounted shield (130) that may pivot on the lower safety harness support (138), The passenger side of the shield, has on its

surface an implementation of a Passive Air Cushion System that uses the pressure in one or more sacrificial chambers which under pressure transfer air to one or more micro-air cushionsthat protect high priority anatomical regions. In this embodiment, the passive anatomical micro air cushion (131), derives it inflation source from the sacrificial chamber (139) at the lower end of the shield of the safety harness, that is compressed by a much greater body mass under impact. In a frontal collision the force of the more massive parts of the body on the sacrificial chamber will deploy the passive anatomical micro-air cushions to protect the face and the neck. The narrower sections of the aircushions and flow control mechanisms if installed, will cause some visco-elastic behavior and in addition cause air speed amplification to create faster deployment. While this mechanism activates the shield (130) may pivot down to take some of the impact energy. The shield is shaped to the contour of the human body head and neck when it is forced forward as in a frontal collision. This embodiment may in addition have multiple or variable postion harness support anchor points on the arm rests or the side bolsters that are part of the multi-element seat, to accommodate people of different proportions. Moreover this embodiment may have in addition an additional bracket that moves the anchor point of the lower safety harness locking supports substantially forward, and provides a supplementary passive anatomical micro-air-cushion that can be mounted on the permanent micro-air-cushion on the shield, to accommodate pregnant women, and the special critical force distribution they can withstand.

In this embodiment, the two pivoted arms swing forward under collision forces the moment created by the shield with the body pressure against it, and extends the upper extending arms (133) to absorb some of the shock and to provide a space for the forward movement of the upper body. The elbows (132) facilitate the relative angular movement of the upper arms and lower arms of the safety harness (133,134). They are spring loaded to ensure that they support the lower parts of the harness when unlocked to allow the entire harness to move up and away from the body when unlocked without any force being applied. Under side impact the passiveanatomical head and neck micro-air-cushions deploy to protect the head and neck under relative lateral acceleration. Notably the passive anatomical head and neck micro-air-cushions can be actively deployed or as in this embodiment passively deployed by a discharge of air from sacrificial chambers between the seats or on the outer surface of the seats and mounted on each of the seats, so that lateral pressure will inflate the anatomical head and neck micro-air-cushions. The sacrificial chambers offer secondary impact protection by cushioning the seat. Notably this embodiment does not use any active airbags in the vicinity of the human body, reducing the risks associated with the high energy external deployment devices. The adjustable head rest (136) follows conventional design but is here mounted on the safety harness hinged mounts.

Figure 12 I 2 shows the passive anatomical micro-air-cushions deployed (the sacrificial chamber has been compressed and the top region is full and ready to protect the face and neck in a frontal impact. Figure 12 J 2 shows the anatomical head and neck passive micro airbags deployed under side impact, ready to support the head and neck in a side collision. Notably this embodiment uses a new concept where the impact energy is redeployed for protecting vital parts of the impacted object which are often embedded inside the object, using fluid transfer – in this case air transfer. Force and velocity amplification or deamplification can be acheieved with the geometry of the

interconnections, the sacrificial chambers and the micro-air-cushions. The sacrificial chambers can be used for secondary impact protection as well by carefully controlling the flow parameters. This is illustrated in Figure 17. The approach obviates the need for active airbag technologies in the vicinity of sensitive equipment, living organisms and indeed people.

This embodiment of the harness allows movement within the vehicle for passengers when it is unlocked and allowed to swing up within the vehicle as shown in Figure 16D. However, visibility is somewhat obstructed preventing the driver from driving without locking the harness in place.

In this embodiment of the safety harness entering and leaving the vehicle are facilitated by the entire device swinging away from the body as shown in Figures 16 A,B and C. The passenger simply needs to stand up to leave. To enter the passenger simply sit down and place his/her feet on the foot rest (141) and retract the slider mechanism. This embodiment also has radar or infrared detectors as on elevator doors to detect limbs in the way of the retracting sliding mechanism for the protection of the passengers.

Figure 15C shows the parts of this embodiment and the adjustable arm rests.

Another embodiment of the shield on the safety harness has a folding section at the top that can be straightened and locked in place for adults and folded down for children.

Another embodiment uses flexible netting on part of the shield surface to protect passengers under impact. In this embodiment, the shield.has a frame on which the netting is deployed. The upper end of the frame is adequately bent forward and then downwards to ensure that the passenger head and neck do not strike the frame under frontal collision. In yet another embodiment of this arrangement, the shield of flexible netting is designed for the head and neck and is normally retracted forward, and deployed on impact by initial forces by the lower torso of the passenger against the lower part of the safety harness/shield.

Yet another variation of this safety harness with netting on a frame, has telescoping frame members on the sides so that the height of the frame is adjustable by retraction of the telescoping members to accommodate children and small adults.

Yet another embodiment of the harness has an upper section of the safety harness consisting of spring mounted support arms mounted in the vicinity of the head rest and designed --when pulled down by the passenger --to swing down and over the passenger head and in front of the passenger. The support arms each having telescoping sections that connect to the shield, such telescoping sections having arrangements for an inertial racheting that prevent extension of these telescoping arms in the event of a sudden tension as in an impact. The lower section of the harness consists of short adjustable belts or arms that can be locked on the sides of the seat or on the inside of the arm rests as in a four point seat belt. This embodiment provides all the benefits of a four point seat belt but in addition has the benefit of head and neck support in the event of a collision. This arrangement allows protection with the telescoping sections and the adjustments on the lower end of the harness for different sized passengers.

Yet another embodiment utilizes the passive anatomical micro air cushion (131) at the top of the shield/harness that derives its inflation source from the sacrificial chamber (139) at the lower end of the safety shield/ harness. However, in this embodiment the anatomical micro air cushion is limited to only the top edge of the shield to support the head, neck and the upper thorax when deployed under collision conditions. This anatomical micro air cushion (131) is supported by pairs of telescoping tubes the lower member of each such tubes being fixed to the harness/shield support in the vicinity of the sacrificial chamber, and the upper member of each pair of telescoping tubes are attached to the passive anatomical micro air cushion (131). The outer tubes have contoured semi-rigid materials to conform broadly to the body shape. The lower and upper membersof each pair telescope into one another co-axially, and are lockable in different longtitudinal positions relative to the other member of the pair, thereby providing for a variable height anatomical micro air cushion. Airflow under deployment conditions is conducted either directly through said telescoping tubes or seperate tubes that have an "accordian" collapsible structure that can extend as the telescoping tubes do, and may be placed inside said telescoping tubes. The length of the telescoping tubes may be manually set with the locks or in other embodiments set by automated or computer controls that sense the size of the passenge from selected elements of the multi-element contoured seat.

Yet another embodiment has a harness as in figure 12H2 except that there is a safety harness support arm only on the outer side of the passenger towards the side of the vehicle. (i.e in sonme of these embodiments there is one Safety Harness elbow (132), one Safety Harness extending upper arm (133) and one Safety Harness Pivoting lower arm (134). Moreover the safety harness/shield support arm is designed such that upon release from across the lap of the passenger, the shield flips to a vertical plane in the vicinity of the vertical plane of said support arm. Thereby permitting the safety harness to swing over the head of the passenger even when the seat is only partially displaced for entry or exit from the vehicle. Often this may be useful when there is limted access space next to the vehicle.

Yet another embodiment , principally for vehicles with drive by wire technologies, has the vehicle controls mounted on the shield . If a steering wheel is used this may be mounted on the front surface of the shield (on the surface opposite the passenger). Thesteering wheel or other controls may have distance adjustments for ergonomic positioning.

Yet another embodiment principally for drive by wire technologies , has the driver controls mounted on the contoured arm rests of the car. Adjustments for the arm rests will include further controls for the ergonomic positioning of these controls on the arm rests.

Vehicles, principally those that utilize drive by wire technologies with either of the above configurations, will have the entire area below the windshied free of controls. This embodiment utilizes this area for a GPS driven positioning display that mimics the view ahead of the driver. The display system may use vector imaging techniques or non-linear image mapping techniques that are well disclosed in the background art that provide the same perspective to the driver on the display as what he sees on the road ahead, thereby minimizing mental processing of

information in establishing a correspondence between the image and the actual physical position and orientation of the vehicle thereby reducing reaction time for action by the driver. Furthermore, the positioning of the display just below the screen ensures that there is minimal spacial disorientation of the driver in turning his/her head to look at the screen thereby reducing further the mental information processing needs and improving further the reaction time of the driver. In some embodiments when there are controls such as a steering wheel in front of the driver, a fixed or a "pop up" screen just below the windshield or a projection onto the lower windshield may be utilized. The image may include the destination and path to that destination and may be at a different scale to the perspective of the driver ahead of the vehicle. This embodiment and variations provide a unique system that conventional GPS navigation systems do not provide in speeding up driver reaction times.

Another embodiment has air conditioning micro-ducts on the seating surfaces and the safety harness/shields, for the comfort of passengers, particularly in open vehicles.

Another alternative embodiment has the "Open" switch for the slide on the inside of the vehicle designed the "press bar" so that the intuitive reaction of the passenger to "open the door" is harnessed. However, this can be deactivated when the vehicle is in motion.

Another alternative embodiment has a center console that is designed to crush under impact as shown in Figures 1F – 4F, thereby minimizing the ejection of the far side passenger on impact.

Yet another embodiment has a detachable center console that includes part of the center tunnel that houses the transmission shaft for rear wheel drive vehicles with front mounted engines and several cable and hydraulic systems. One such embodiment has perforated or weakened line of detachment or an interlocking arrangement on the center tunnel that delineates the section of the center tunnel that will be detached from the remaining part of the center tunnel in the event that the seat carriage with secondary slides apply sufficient shear force on this line of intended detachment. In embodiments that require the separation of the two sections of the center tunnel by cutting through the weakened tunnel material along the predefined line, a cutting edge mounted on the moving surface of the secondary slide may be used to cut through the tunnel material in the event of an impact. Notably, in the event of a side impact, the lateral torsional force system will tend to raise the impact side of the vehicle. Therefore the transmission shaft in this situation will be at the lowest level of the center tunnel within the design parameters, and therefore will not be in the way of the seared section of the center tunnel which will be at the top of the tunnel. Moreover, the pipes and cables that are mounted within the tunnel may be mounted such that they have adequate slack in the event of such a displacement of the sheared section. They may also be mounted low enough on the center tunnel to be below the line of shear on the center tunnel, which will avoid the need for special considerations for the cables and pipes in the event of the shear of the upper tunnel. In the event that the design of the vehicle requires a high center tunnel where the transmission shaft will not be low enough to allow the traverse of the sheared tunnel over it, the transmission shaft may be designed to fracture or decouple in the region of the sheared section of the center tunnel, in

the event of lateral forces as in this situation but still transfer the required torsional forces to drive the vehicle. This may be achieved with suitable couplings on the transmission shaft. Another important consideration for this embodiment is that the peak acceleration of the vehicle following impact and the resulting peak forces precede the time at which the shear of the tunnel will occur and therefore the integrity of the tunnel is maintained at the time when the strength of the tunnel and the remaining structure is most needed. The length of the detaching section of the center tunnel and indeed the other parts of the center console mounted thereon may be increased in some embodiments to accommodate the legs of the passenger as the seat moves towards the center of the vehicle.

Another alternative embodiment has the internal airbag partially filled at all times, so that in the event of no deployment of the external airbags either because of technology failure or non installation or other reason, the passenger and seat arrangement are cushioned even prior to further inflation of the internal airbag on deployment on impact. Shock absorbers may supplement the operation of the internal airbags in this embodiment with partially inflated internal airbags under normal operating conditions.

Another alternative embodiment can have the internal airbags deployed on impact as noted with such deployment effected by inflation by some of the compressed air of the external airbags on impact, thereby providing "acceleration de-amplification" for the movement of the passengers on impact.

Yet another embodiment has proactive sensors deploying the internal airbags directly, without the installation of external airbags.

Yet another embodiment of the invention has a retaracting canopy stored in the roof of the vehicle, and attachable to the protector shield or attached components such as the side window, when desired. When attached, the canopy will deploy over the seats when in the extended or loading positions, thereby protecting the seat and the passenger from rain or other snow while entering or leaving the vehicle.

Yet another embodiment has external airbags constructed using the Passive Air-Cushion System with micro chambers that are connected to each other by restricted paths that provide visco elastic energy absorbtion in the event of some sections of the airbag being impacted while others are not, thereby forcing air from the compressed micro chambers to the other micro chambers, each of the micro chambers functioning as either a sacrificial chamber or a Micro Air Cushion on impact. This embodiment may of course have external airbags proactively deployed in the manner described herein, prior to impact and their performance as Micro Air Cushion systems. Yet another variation may include one-way valves between the chamber directly connected to the inflation source and each of the micro-chambers (implementable for example with flaps against an aperture) so that inflation may be achieved rapidly, and then the Passive Air-cushion benefits realized on impact.

Yet another embodiment uses the Passive Air-cushion system to protect passengers from "Whip Lash" injury, by providing Micro Air-cushions in the vicinity of the head and neck, and providing sacrificial chambers that are compressed in the event of a rear end collision. In some embodiments the sacrificial chamber can be mounted

below the seat with one face mounted to the vehicle structure and the other face mounted to the seat of the passenger, the seat being mounted to the support structure to allow controlled limited rearward movement relative to its mountings to allow compression of the sacrificial chamber by the inertial mass of the passenger and seat on impact.

Yet another embodiment utilizes multiple adjoining but seperate Passive Air–cushion systems where on esuch system connects the external airbags (sacrificial chambers) with internal airbags (micro Air-cushions), and another such system connects different and distinct internal airbags (sacrificial chambers) to micro Air-cushions in the vicinity of the passenger's body, thereby creating a cascading system of Passive Air - cushion systems. These embodiments may of course have external airbags proactively deployed in the manner described herein, prior to impact and their performance as Micro Air Cushion systems..

Yet another embodiment utilizes the independence of the venting of micro aircushions and the venting of the sacrificial chamber, to maintain the inflation of the air cushions well after the time frame for impact absorbtion by the sacrificial chamber such that the passenger is held in a safe position for a predetermined time. Some such embodiments may hold the passenger for a period of upto say 3 seconds to protect the passenger in the event of a roll over of the vehicle. Among these embodiments, some may have rollover detection devices that sense the orientation of the vehicle that slows the venting of the micro air cushions in the event of the commencement of a rollover of the vehicle.

Yet another embodiment comprises actively inflated airbags of minimal volume each connected to a plurality of anatomical micro aircushions, mounted on the multi element adjustable seat, that deploy on either side of the head and neck, either side and ahead of the torso and thorax below the arms and either side of and above the upper legs, said airbags inflatable in the event of a detection of a side impact thereby holding the passenger in the multi element adjustable seat for translation with the motion of the multi element adjustable seat propelled by the internal airbag or the internal shock absorbing devices.

Yet another embodiment utilizes an auxiliary brake attached to the secondary slides in addition to the friction limited sliding arrangements of the secondary slide, to provide a further control on the rate of movement of the secondary slide under side or lateral impact.

Yet another embodiment utilizes a foot safety switch attached to the foot rest, that activates the sliding mechanism to move the sliding seats into and out of the vehicle. The foot rest in some such embodiments may be bar that is depressed to move the slide into and out of the vehicle. These foot rests being designed to avoid ankle injuries in the event of rear collisions sustained by the vehicle.

Yet another embodiment uses supplementary porous filling materials within prefilled internal airbags designed with suitable vents to change the compression characteristics of the inside airbags under impact.

Yet another embodiment utilizes pressure memory capable materials on the surface of the seats or passenger supports so that surround seats contour to the exact shape of the body for further comfort of passengers and also better support under collision conditions.

Yet another embodiment for proactive impact detection uses one or more of radar detection and motion detection as in machine vision using visible or infrared or ultraviolet spectral components. The use of both these approaches for detection may use algorithms that estimate the speed of approach of the impacting object and the distance, and thereby have independent measures of the required inflation of external or internal airbags. In conjunction with each other in some embodiments, the failure probability of the system is reduced by using the worst case scenario of impact –with regard to velocity and time of impact -- detected by these two systems. The two measurements may also be used in stochastic estimators to provide a better quality estimate of the distance and velocity parameters of the impacting object, when the two independent measurements are sufficiently similar to exclude the possibility of failure of either system to within a predefined error threshold. Moreover, those embodiments that use more than one camera in the machine vision system for motion detection can make 3-dimensional estimates of the impacting body and thereby from a database of known object shapes and sizes, predict the type of object and thereby its mass for better estimation of the best response with the deployment pattern and inflation levels of the external and internal air bags. Still other embodiments with a single camera in the machine vision system may utilize the divergence of the profile of the impacting vehicle as it approaches to predict relationships between the impact velocity and distance by assuming a constant velocity of the approaching object and using the non linearity of the projection of the object on the projection plane of the machine vision system. Moreover, some embodiments can use the shape of the impacting object from object recognition algorithms in the machine vision system with predefined data of known object types, to predict the type and mass density of the object and accordingly deploy the airbags appropriately. Some of these embodiments can work with distance and speed measurement in a radar based system and thereby together predict the size and mass and shape of the impacting body. Airbag deployment characteristics can thereby be optimally designed for impact with for example pedestrians, trucks or cardboard boxes at varying speeds appropriately.

Furthermore, in embodiments with one machine vision camera and one radar detector in the system, in the event of failure of the radar detector, the machine vision system alone can determine the type of impacting object (and its worst case size) and the velocity of approach for a given size of the object from the divergence of the profile of the object, and assuming a worst case size scenario, deploy the airbags appropriately, and in the event of the failure of the machine vision system the radar detector can detect velocity and distance and deploy the airbags assuming the worst type of object.

Yet another embodiment will use secondary slides whose sliding surfaces are slightly inclined upwards towards the center of the vehicle, to allow the secondary slides to negotiate a center tunnel with reduced need for any arrangements to shear a section of the tunnel. The connection surfaces of the secondary slides to the fixed

elements of the vehicle at the time of impact and the vehicle seat may be arranged to support the seat in the required substantially upright position.

Yet another embodiment, has wheel chairs as passenger support mechanisms for the disabled, with collapsible wheels such that the chairs may be backed into clamps that attach on the lower side of the chair supports. In some such embodiments (as illustrated in figures 18A to 18 J) these clamps along with the lower cushion of the car seat 148 – (which is specially made to accommodate the chair support cross members), are extended forward on tertiary slides or extension arms with hydraulic automation, such that the movement forward and if necessary down, supports the wheel chair by locking the chair clamps 149 to the chair cross supports 150, and then providing adequate support for the passenger and the wheel chair. The Teritiary Slides or extension arm are supported by the impact decoupler/ Secondary Slides which are in turn attached to the Upper Primary Slides in the extended or loading position. Figure 18B illustrates the position of the seat bottom and clams just below the wheel chair prior to attachment to the wheel chair. Once the hydraulic mechanism raises the wheel chair off the ground, the Primary Pivot of the rear wheels 151 may be unlocked and the wheel swung up backwards and locked as noted in Figure 18C. Notably the Rear wheels support much of the passenger weight when the wheel chair is used and therefore in addition to the pivoting Principal Rear Wheel Support 152 the rear wheel in addition has a Rear Wheel Support Strut 153 that supports the compressive load when the wheel chair is operational. Threafter the front wheels may be unlocked and swung back on the Primary Pivots for the Front Wheel 157. This is illustrated in Fingure 18 D.

Thereafter the space below the wheel chair is clear and the tertiary slide or arm mechanism can move the wheel chair back and lock it with and against the Seatback 156 which is specially shaped to accommodate the cross support members of the wheel chair. This is illustrated in Figure 18 E. Some such embodiments may have the option to release the rigid back support mouting of the wheel chair 158, and thereby benefit from the reclining options of the vehicle seat back. In the process of moving back to the seat back 156, the spring loaded locking sleeves 155, that support the Secondary pivot for rear wheel retraction 144 are pushed forward relative to the wheel chair body thereby releasing the Secondary Pivot for rear wheel retraction 154 to allow the wheels to swing in and lock behind the seat back 156. This is illustrated in Figure 18F. The wheel chair is then in a position on the extended impact decoupler/secondary slide to be transported into the vehicle. Notably in this wheel chair conversion embodiment, supplementary side and back air cushions may be inflated to fill in the areas where wheel chair support members are in the vicinity of the passenger and also to hold the wheel chair structure securely, thereby providing further protection in the event of a collision of the vehicle. This wheel chair conversion embodiment has all the side impact protection as the regular seat and has all the optionality for front impact protection of the safety shield/harness or more conventional options. Figure 18 G shows a plan view of the wheel chair prior to the insertion of Seat lower cushion and support structure. Figure 18 H illustrates an elevation view of the wheel chair and the seat lower cushion and support structure. Still other of these embodiments may use turn tables or other rotating mechanisms rather than the tertiary sliding

arrangements or extending arms so that the wheel chair may be directly loaded on a turn table mounted on the impact decoupler/secondary slides, and then rotated into a driving or passenger position when retracted into the vehicle.

Yet another embodiment has anatomical micro-aircushions on the left and right edges of the support surface of the safety shield connected to selected sacrificial chambers along the bottom edge of said support surface. This will provide additional support for the passenger in a side impact, by assisting in preventing body movement outside the countoured seat under collision conditions.

Yet another embodiment has anatomical micro-aircushions on the outer edges of each of the countoured seats, particularly to cover a part of the front of the shoulders the legs and torso in the event of a side collision. These anatomical air-cushions use sacrificial chambers on the sides of the seats.

Yet another embodiment minimizes ejection hazards by controlling further the lateral movement of the seats under side impact. In these embodiments, the Upper primary slide is connected to the locking mechanisms that hold it to the vehicle under operating conditions through shock absorbers or spring mechanisms that allow controlled movement of the upper primary slides out of the vehicle when the vehicle sustains a side impact from the far side. In such embodiments the locks do not disengage when there is a side impact, as the shock absorbing devices provide the required controlled lateral movement of the far side upper primary slide under impact.

Yet another embodiment has a flexible stretchable (or folded) material that is bound to the protector shield and the "doors" of the vehicle on one of its edges where it makes contact normally with the vehicle body, the other edge of the flexible and stretchable material is bound to a frame that locks to the vehicle body under operating conditions. Under normal egress and ingress the frame along with the "doors" with the flexible, stretchable material operates as one unit the frame being held together with the "door" with door impact decouplers that fracture or disengage under impact, thereby allowing the "door" and the upper primary slide on the far side to extend out of the vehicle while the frame remains locked to the vehicle, and stretching the flexible, stretchable material so that passenger body extremities are not ejected from the vehicle but are retained by the flexible stretchable material within the vehicle.

Yet another embodiment has preinflated inside airbags that are deflated when seats move outwards (on the far side) under impact, threby creating more space within the vehicle, minimizing the need for ejection on the far side under impact.

Yet another set of embodiments has a child or infant support mechanism (CISM) as the passenger support mechanism. For frontal collision protection these embodiments may have the following arrangements. One such embodiment has the CISM 224 comprising two support pins 225 that are located above the center of mass of the occupant and the support mechanism structure and engages a rotary damped spring with shock absorbing device (not shown) when inserted into the supports 215. and locked therein. The damped spring mechanism prevents rotary motion of the pins in the supports except under front collision conditions when the torque generated by the inertial mass of the occupant and the support mechanism structure with a center of mass lower than the pivot,

swing the CISM down and forward thereby bringing the occupant closer to a foetal position with the reactive force for deceleration applied to the occupant significantly from the lower support structure of the CISM. The final position of course is designed not to bring the occupant to a postion that would cause excessive spinal compression. The head and neck on the other hand, will engage and be protected by a safety harness as disclosed in this invention (not shown and the body will face substantially away from the impact. Furhtermore in a front impact, the relevant embodiment has the extendable spring damper 216 which contains a damped spring may extend to increase shock absorbtion, while other embodiments. have a pivotally mounted arrangement that extends under front impact. The Arms that constitute 216 Extendable Spring Damper loaded attachment for CISM support in these latter embodiments are air damper (internal airbag equivalents) loaded for rotary movement. For some embodiments the mounting of the CISM can be rigid in the operating position i.e. the support of the CISM support pivots 225 on the support 215 may be rigidly fixed in the operating position, and support may even be on multiple points on the arm of 216 directly supporting the CISM, as the pivotal movement may be restricted to the elbow of 216 arms and its attachment to the support members (the Outer rotator 218 in some embodiments or Support Bracket 232 in others). In both the linear and rotational embodiments of 216 noted above, we have movement restricted to a position that orients the occupant to maximize support from the seat bottom and for head and neck support from the safety harness.

This set of embodiments of CISM supports and indeed any embodiments of Passenger support mechanism may have for side impact protection, one or more of a nested set of the slidng arrangements disclosed in this invention. i.e. The embodiments can have safety beam lower and upper elements –1 attached to the impact decoupler/secondary slide –1 as disclosed herein (sliding arrangement 1), and a safetybeam lower and upper elements –2 attached to the impact decoupler secondary slide –1 with its own impact decoupler secondary slide –2 (sliding arrangement 2) which is attached to the passenger support mechanism that may be an CISM or other passenger support mechanism. Some embodiments use a first rectangular section linear slidng arrangement, and a second rectangular section curvilinear sliding arrangement (inner and outer rotators) both with shock absorbtion with internal airbag equivalents (which may be air shock absorbers or similar devices). Other embodiments use Cylindrical linear sliding arrangements (sliding arrangement 1) and a rectangular curvilinear sliding arrangement (sliding arrangement 2). Still other Embodiments, use cylindrical linear slides for sliding arrangement 1 and create a virtual curvilinear sliding arrangement by pivoting the CISM support Bracket 232 in the center and control its movement by an internal airbag equivalent for combined rotational and linear motion shock absorbtion. This particular arrangement therefore reduces the structure to a single sliding arrangement and a single pivotal arrangement rather than two sliding arrangements. These embodiments are of course general to any passenger support mechanism including seats. For example the some embodiments may be accomplished with curvilinear ssecondary slide on the second set of sliding arrnagments below the seat. Other embodiments may be accomplished with a pivotal arrangement to complement the single secondary sliding arrangment thereby creating a virtual curvilinear second sliding arrangement.

Greater detail of the lateral impact protection arrangements of this set of embodiments for the CISM are described below:

The first embodiments in Figs 10A 1- 5 have the exendable air damper loaded attachment 216 attached to the Inner rotator for the CISM 217 that mates with the Outer rotator and is slidably mouted thereto with internal airbag equivalents attached between these two elements (not shown) to keep the inner rotator in the operating position as shown in Fing 10E1, but to rotate as shown in Fig 10E3 under lateral impact, thereby orienting to the exent possible the occupant to face away from the impact and to increase the resistive force accelerating the occupant to be applied by the body of the CISM 224. The Outer rotator 218 has the secondary slide 111 attached to it. The secondary slide impact decoupler in turn is detachably attached to the safety beam upper element 107. Which is slidably mounted to the safety beam lower element 102 which is rigidly attached to the fixed body members of the vehicle which includes the rigidly attached seat.. Under a predetermined shear force the secondary slide 111 of 218 is designed to detach from the safety beam upper element 107 and thereafter be slidably attached thereon. Under operating conditions the Locking pin is in place. A lateral slide assembly assembly may be used for the linear or curvilinear sliding arrangement described herein. When the locking pin 226 engages the slot 227 in the secondary slide and the holes 230 in the safety beam lower and upper elements, the CISM is locked from lateral movement in the operating position. The Internal Airbag equivalents 228 are uncompressed and either one of them is ready for compression in the event of a side impact on the relevant side. When a side impact is encountered, the inertial mass of the CISM and the occupant may provide a lateral force larger than the critical shear force to decouple the impact decoupler between the secondary slide 111 and the safety beam upper element 107, and thereafter the CISM and attached elements to the Secondary slide 111 move against the compression of the air shock absorber or other device in the Internal Airbag equivalent 228. This provides shock absorbtion in lateral impact to the occupant in the CISM. Simpler versions of this arrangement that could be used in other embodiments may integrate the secondary slide 111 and the Safety beam upper element 107, with a matching slot in the safety beam upper element as present in the secondary slide 111. When the pin is in place, in this simpler arrangement the safey beam lower element is engaged to the ends of the two internal airbags this alone keeps the arrangement in the operating position. There is no impact decoupling in this simpler arrangement. Fig 10E2 Shows a loading or access position. This is a convenient position to load or unload the CISM with the occupant. It is achieved by removing the locking pin and sliding the Safety Beam Upper element 107 on the safety beam lower element 102.

Yet another embodiment, use cylindrical slides for lateral impact protection. Here Safety Beam Lower Elements 102 slidably support cylindrical safety beam Upper elements 107, which in this embodiment is a part of the secondary slide 111 (the safety beam upper element 107 may in other embodiments be detachably coupled to the impact decoupler secondary slides as disclosed in this invention). In this embodiment, the pin that locks the secondary slide (and safety beam upper element) to the internal airbag equivalents 228 (not shown), which are in turn housed in the cylindrical slot 229, within the secondary slide and the safety beam lower element, is located in a pin hole drilled through 231- the support key for the outer rotator from the secondary slide. The pin when locked engages a hole between two sections of the internal airbag equivalents that straddle the hole. The pin if engaged will therefore compress one or the other of the inside airbag equivalents in the event of the secondary slide moving under impact conditions relative to the

safety beam lower elements 102 and the fixed elements of the vehicle, providing shock absorbtion. However if the pin is withdrawn, the secondary slide will not engage the internal airbag equivalents 228 and will therefore slide easily to a loadiong or access position nearer the door, for placing the CISM in its supports or removing the CISM from its supports. A similar pin may be mounted on the outer rotator and engage between a pair of internal airbag equivalents 228 that are mounted inside slots between the inner and outer rotator and engaging on their outer end, the inside rotator. When the pin is engaged, it provides a surface resisting the movement of one of the internal airbag equivalents an thereby provides shock absorbtion under impact. However, when the pin is retracted back into the outer rotator, it allows free slding between the inner and outer rotators, thereby allowing the CISM mounts to be positioned to easily attach the CISM in a loading position. Moreover, in this embodiment a further refinement would be a cable activated lever that operated all the pins – in the linear and curvilinear sliding arrangements (similar to a bicycle brake cable) for ease of operation of loading and unloading the occupants.

Yet another embodiment uses cylindrical linear slides for lateral impact protection along with a virtual curvilinear slide implemetation using a pivoting arrangement between the CISM support bracket 232 and the support member 236 (support for secondary slides, CISM support bracket and internal airbag equivalents) and a dual internal airbag equivalent devicethat allows compression and expansion 239 mounted between the edge of the CISM support bracket 232 and the Fixed Support for safety beam lower elements and internal airbag equivalents 235. The 232 may have lateral support flanges for the CISM such that the CISM nests withing the 232 when in the operating position without obstructing forward deployment of the CISM in a front impact.. This embodiment has two safety beam lower elements that each slidably support on their outer surface one of the two secondary slides 111 (this embodiment uses the reduced form where the secondary slides are integrated with the safety beam upper element without impact decoupling as disclosed herein) The secondary slides are connected together and pivotally support the CISM support bracket with the support for secondary slides, CISM support bracket and internal airbag equivalents 236. The internal airbag equivalents in this embodiment is a dual element that can be compressed in both directions 238. Its center which is the active end that may be moved relative to its extreme ends under impact forces, is mouted to a support flange 237. This mount may be disconnected using a pin or other locking device to disengage the internal airbag equivalents to aid loading and unloading the occupant in the CISM. (An alternative embodiment uses single Internal airbag equivalents 228 that only compress but don't expant between their ends. Two of these may be substituted for 238, each rigidly mounted at the outer end to the fixed support flange 235 with their pistons pointing inwards and engaged into the circular slots. The Pin hole 240 for engaging the secondary slide and its attachments is also shown. This arrangement allows a single Internal Airbag Equivalent to compress while not affecting the other as the pinstons simply engage the slots and are not fixed within the slots.

In the event of a lateral impact the inertial mass of the CISM with occupant will exert a force through its center of mass that is within the substantially semicircular CISM support bracket, and will therefore compress the Internal airbag equivalents 238 attached to the Secondary slide. However, as the second internal airbag equivalent 239 is attached to the edge of the CISM support bracket this too will undergo extension or contraction depending on the side on which the impact was received. The reactive forece from the latter internal airbag equivalent will however rotate the CISM to face away from the impact.

Notably there are several possible embodiments of this CISM support mechanism in this invention. Elements of these may be used in different combinations and not all elements may be present in any one embodiment. For example any of the front impact arrangements as noted above may be used with any of the lateral impact arrangement noted above. Yet another example of a reduced content embodiment does not hav the lateral rotator for side impact to rotate the occupant but simply slides the CISM and the occupant laterally as disclosed above. Moreover, There are a number of variations of the CISM support in this invention. For example the safety beam lower element may be mounted on the bottom seat support flange 221, back seat support flange or on both. There may be multiple safety beam lower elements each with their own safety beam upper elements and other disclosed elements attached thereon, working in parallel to provide greater support. Notably an embodiment with the safety beam lower element attached to the bottom seat support flange 221 and comprising inner and outer rotators for lateral impact, will under side impact rotate the occupant to face away from the impact (the center of mass of the CISM and the occupant needs to be arranged to be below the pivot) but in so doing will incline the occupant to the vertical.

Each of these variations in the embodiment have advantages and disadvantes that performance, geometry and cost will influence. Some of these embodiments may be removable from the vehicle and attached to the seat with 3 point seat belts for example with the shoulder strap attachment points 223 on the Back seat support flange 222. Others may be designed into the vehicle as in for example a part of the center arm rest in the rear seat of a vehicle. The attachment of these embodiments of he invention may also be with methods available in the background art such as "Isofix" fasteners or other lathc arrangements such as with the top lock flanges 241, the side lock flanges 242 and front lock flanges 243.

The side impact performance will in particular will be aided with the side lock flanges 242 being locked into support points attached to the fixed members of the vehicle between the seat cushions on the back or front seats of the vehicle.

The The side support flanges 244, will aid in bracing the structure and helping transfer the load from the shock absorbing members to the structure and the lock flanges or 3 point seat belt as available in the vehicle. In some embodiments the safety beam lower element attached (by bolts not shown through the Side Support flange to the support member for the internal airbag equvalent that controls the rotational motion. However, other embodiments may have the side flanges, and the entire module attached to the side support flanges and the other structural members either in the front or rear facing arrangements for the CISM.

Some embodiments of the invention may have the safety beam upper and lower elemtns along with the secondary slides, internal airbag equivalents and attached hardware, removable and attachable at the front end of the support structure thereby allowing the installation of a rearward facing child seat. Such a seat may not require a front impact protection mechanism and therefore many such embodiments may have the CISM support

bracket directly connected to the CISM. However, further refinements of the invention may have the CISM in two sections – the first to support the head, neck, thorax, lumbar regions and the pelvis of the child and the second to support the lower limbs of the child. The CISM support bracket may be connected to the first of these and the second which supports a smaller load may be pivotally moutned to the upper section of the CISM , thereby allowing a recling position for the child. For older children – upto about 40 lbs, leg room in the rearward facing position becomes important. Embodiments that have a removable car seat cushion with the mountings and locks as discussed below this level will facilitate this.

As much of the complexity of the invention is external to the CISM, the CISM may be constructed to be very light and made inexpensively, thereby allowing a change in CISM and its support members that attach to the CISM support bracket, to suit the child as it grows older.

Finally the CISM support embodiments disclosed here include alternative support structures outside the automobile that can receive the same support pivots or lock points. Thereby making the loading and unloading of children easier. These external support structures include all types of strollers and bicycle trailers that have the suppot members that lock to the pivots or lock points. Some such laternative structures may replicate the impact protection of the CISM support in the vehicle for use in bicycle trailers and strollers.

Many aspects of the embodiments of the invention for the Child support Mechanism as the passenger support mechanism may be used for adult passengers as well. The cylindrical safety beam lower elements as in the Child support embodiment may be modified to attach either directly or pivotally to the vehicle central body member (pivotal mounting can contribute to shock absorbtion of the seat) or mounted on a member that can raise/lower and tilt the seats by suitable slidable and pivotal attachemtn to the fixed central member using well known approaches in the background art.. The remaining aspects of the embodiment for the child support case may be replicated after suitable scaling. In addition, with gull wing doors or other doors that provide clearance of the Passenger support mechanisms as well as doors attached to the secondary slides as disclosed herein, the Passenger support mechanisms can slide right out of the vehicle as disclosed elsewhere in this invention. The Front collision protection arrangement for the Child support case will be most relevant for the adult passenger support mechanism case when the steering wheel and other hardware are not in the way of a movement forward of the Passenger Support Mechanism. This may be the case in drive –by-wire vehicles where the sterring and other controls are mounted on a safety shield as disclosed herein.

Fig 10E 18, 10E19 illustrate another embodiment of the CISM and its supports. This embodiment uses multiple cylindrical slides that permet the lateral displacement of the CISM under impact. Pivoting of the CISM is under the diagonal and under the seat. Figs 10E20 and 10E21 show yet another embodinment of the CISM and its supports with a simpler arrangement where the side pivoting supports each have a preferably shock absorbing central member that can extend or contract under large axial forces or when unlocked for egress and ingress, and two pivots at each end of connection to the CISM and the CISM frame with these axes parallel to each other on both supports, said pivots being normally fixed but allowed to rotate for egress and ingress and when under large

torsional stress as in impact. These provide the reqired displacement of the center of mass of the CISM without the use of a slide. (i.e, the CISM "rocks" on these pivots to rotate away from the impact and displace the Center of gravity concurrently) under side impact and also provide shock absorbing motion in the axial direction of the vehicle in a front impact. Notably the rotation of the axis of the pivoting supports are in the same sense (ie both clockwise or both anticlockwise) in the lateral impact case and in opposite direction s in the front impact case.

CONCLUSIONS, RAMIFICATIONS & SCOPE

Thus it will become apparent that the present invention presented, provides a new paradigm for implementing key safety features and providing utility in accessing passenger vehicles and comfort in travelling in such vehicles. While the above description provides many specificities, these should not be construed as limitations on the scope of the present invention, but rather as an exemplification of the preferred, an additional and an alternative embodiment thereof. Many other variations are possible.

The present invention provides an arrangement that diverts the impact energy in impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers but decelerating the impacting object with the remaining mass of the vehicle. Moreover the arrangement synergistically provides a means for utilitarian easy access to the vehicle for passengers and drivers alike and allows the installation of multi-element surround contoured seats for the comfort and protection of passengers. Furthermore, the arrangement allows the installation of a new and unique safety harness that may obviate the need for safety belts and front impact airbags for protection in head-on collisions. This arrangement differs sharply from the Background art in that it does not simply offer to the impacting body a reinforced rigid shell where the passenger is treated as part of this integral unit, but rather provides selective and differential treatment of the mass of the passengers and driver of the vehicle vis-à-vis the remaining mass of the vehicle. Furthermore the present invention differs sharply from the Background art in that the resulting structure synergistically permits the installation of contoured multi-element surround seats that would not be implementable without the slide arrangements on either side of the vehicle in the present invention.

The present invention provides a gravity slide drive for my arrangement for which there is no counterpart in the Background art. This allows further Utility and weight and energy saving in implementing the above elements of the present invention.

The present invention includes External side Airbags that differ sharply from the Background art in that for the first time they proactively create a "Just in Time" deceleration zone for the lateral or side impact with internal and/or external side airbags while not remaining in an extended position under normal operating conditions of the vehicle.

The present invention describes an indo-skeletal structure of the vehicle body that permits the energy transfer from the lateral or side impact through compressive members to the body of the vehicle. Unlike the Background art this indo-skeletal structure is designed to transfer energy to the body of the vehicle without transferring it to the passengers and driver of the vehicle. The passengers are targeted for protection with "Safety zones".

ABSTRACT OF DISCLOSURE:

An arrangement in passenger vehicles, that diverts the impact energy in impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers, and in the same arrangement provides utilitarian access to the vehicle, such utilitarian access making it possible to both install multi-element contoured surround seats for passengers and the driver, and also safety devices and arrangements for head-on collision protection that protect the passenger. An indo-skeletal structural arrangement proposed for the vehicle, provides further benefits by targeting the strength of the vehicle to protect passengers while minimizing other massive elements in the vehicle.

PATENT APPLICANT

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TITLE OF INVENTION: Easy Ejector Seat with Skeletal Crash Safety Beam

THE FOLLOWING APPLICATIONS ARE HEREBY INCORPORTATED HEREIN BY REFERENCE.

FURTHER, THIS APPLICATION CLAIMS PRIORITY FROM THE FOLLOWING APPLICATIONS: This application claims priororty from applications entitled " Easy Ejector with skeletal crash safety beam" US S/N: 08/936,626 filed 9/24/97, US S/N 09/404,475, US S/N 09/435,830 , US S/N 60/195298, US S/N 60,226,570, EPO S/N 98948260.9-2306, EPO S/N 00203896.6. and US 09/779,591, US 09/779,592, US 09/779,593, US 09/779,594; US 60/280470;US 60/282105; US 60/286629; US 60/332419; US 60/338466; US 60/367644; US 60/461,434; US 10/279,171; 60/362450; 10/109,674; 10/681,304; and 10/185, 784.

STATEMENT REGARDING
FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT: Not Applicable

REFERENCE TO A MICRO FICHE APPENDIX: Not Applicable

BACKGROUND OF INVENTION

FIELD OF INVENTION

The present invention defines a means to incorporate in passenger motor vehicles, unique safety arrangements particularly for lateral or side impacts that provide energy absorption by the mass of the vehicle but decouple [r1] the passenger from the impact acceleration and deceleration that is provided by the mass of the vehicle, thereby protecting the passengers during such collisions. Moreover, the same arrangement synergistically provides utility [r2] in access, comfort and further safety in the operating position for passengers and the driver.

DESCRIPTION OF THE RELATED ART:

In the past safety of passengers was not always the priority in passenger vehicle design. In the evolution of motor vehicle design the structure moved from a chassis that held together the mechanical components of the vehicle – a structure that was then attached to a passenger compartment or to passenger seats. The design of the structure was to hold together the working components of the vehicle – a critical aspect at the time. Thereafter in more recent times right up to the present, Exo-skeletal designs have been the dominant paradigm. Here rigid shells were constructed to hold both the mechanical components and the passengers in fixed positions. However such fixed shell structures have had limited success in protecting passengers and drivers when there are lateral collisions as passengers undergo the same impact related accelerations and decelerations as the remaining parts of the vehicle, as space limitations don't allow for "crumple zones" as in the case of impact protection for head on collisions. Passengers are particularly vulnerable to side impacts as they cannot take preemptive measures as with head-on collisions where there is speed control and directional control that is available. As vehicle speeds have increased substantially in the last several decades, these safety considerations for passengers have become critical and urgent. Vehicle designers — particularly automobile designers – have risen admirably to the task by incorporating myriads of devices and additions within the rigid shell paradigm to minimize risk in the event of collisions. Such devices include restraints such as seat belts and certain types of protective air bags. However, there are limits within the rigid shell paradigm for two reasons: First, the energy of impact cannot be easily diverted away from passengers into the remaining mass of the vehicle on impact. Second, the rigid shell needs to support high shear stresses on lateral impact and related compressive loads to the passenger compartment of the vehicle a factor that can only be addressed with greater mass of the vehicle that will impact its performance.

Another area of interest in passenger vehicles is to provide, in synergy with the above contributions, utility and comfort of passengers and drivers and further synergistic head-on collision protection.

There are four areas of Background art that are related to the present invention. These are: vehicles with sliding seats, safety arrangements addressing lateral impacts on passenger vehicles, air bags and other shock absorbing devices, and miscellaneous safety devices for frontal impacts. None of the inventions in these areas individually or collectively state or imply any aspects of the present invention. Moreover, none of this Background art even addresses the issue of energy transfer away from the passengers to the mass of the vehicle on impact and concurrently provide a mechanism for easy access to the vehicle with ejector seats. This is despite the urgent need in the car industry for such safety and utility. Moreover the novelty of the present invention is underscored as it provides solutions hitherto unidentified in a very large and competitive industry that is acutely aware of these needs and is constantly in search of new solutions to them.

Sloan 3,071,407 (1963) describes a single rear bench seat (lines 4-45) – full length (C1-L55), that can slide out of either side of the vehicle. It describes a door structure that may be attached to the seat and slide across and through the passenger compartment of the vehicle as the seat slides out. This invention does not state or

imply any safety considerations in its structure, moreover such a bench seat on slides, in the event of a lateral collision on the doors will focus the impact energy on the passengers and these passengers will be the principal casualties as the mass of the vehicle slides away little harmed. This will be the case even in the embodiment described where the doors are fixed to the seat and slides through the passenger compartment with the seat. Moreover, it cannot be used in a front seat even for its limited functionality with doors fixed to the seat as driving instrumentation (steering wheel etc) will not allow a door to slide through the compartment. Finally it does not provide any comfort features for passengers over and above a bench seat. Mach 2,753,947 (1956) describes a sliding bench seat for the access of the engine of the vehicle it does not address the issue of safety of passengers or access utility. It is expected to perform similarly to Sloan in an impact on the doors or around the side profile of the passengers in the vehicle. Solomon 2,758,872 (1953) provides a sliding bench seat that goes through the doorway and for the same reasons as Sloan does not provide protection in side impacts or provide any comfort features over and above a bench seat. . Cyphert 3,944,277 (1976) describes a seat mounted on a sliding platform that has a door at the end and protective walls around it. The arrangement being designed for the utility of the operator to reach points away from the body of the vehicle without dismounting the vehicle. This invention like Sloan does not state or imply any safety considerations in its use. Moreover there is no expressed or implied reference to the utility of mounting and dismounting the vehicle or for the comfort of the operator or the passengers except for the ability for the platform to move out to give the operator greater reach away from the vehicle body. Rees 5,213,300 (1993) describes internal design structure for slide arrangements that allow forward and backward movement of the passenger seats in vehicles. This like many other inventions prior to it relate to the structure of the slides to adjust the position of the seats for passenger comfort in the direction of motion of the vehicle.

All the above items of background art relate to sliding seats. None of the above background art related to sliding seats have stated or implied safety considerations. Moreover, none of them provide utility for mounting and dismounting a vehicle except for a bench seat that slides out on either side of the vehicle, or provide comfort features except for seating arrangement on a bench seat and in one of the above – the lateral movement for convenience of the operator.

Maier US 2,148,950 (1939) provides a laterally braced passenger compartment that braces a rigid shell body of a vehicle. Barenyi 2,710,222 (1955) provides a stiffening for the bottom plate of a vehicle body. Catlin 5,660,428 (1997) provides a design for a rigid shell structure . Guertler 5,464,266 (1995) uses stiffening arrangements for the floor of the vehicle as a component of a rigid shell vehicle body. Masuda 5,671,968 (1968) describes a strengthened rigid shell for the passenger compartment Oliver 4,533,172 (1985) describes a three part rigid shell structure for motor vehicles with the central section for passengers Sinnhuber 5,000,509 (1991) describes an arrangement that transfers impact energy from lateral impacts to the rigid body of the vehicle but does so through rigid members that include elements in the seats. The seats have limited lateral movement and are not free to move independent of the vehicle body in the event of a collision, thereby placing the passengers on the direct path of the

energy transfer Maeda 4,512,604 (1985) describes a lateral brace for the seat arrangement of the vehicle within a rigid vehicle body structure thereby distributing the impact energy to other parts of the rigid body structure. Sacco 5,435618 (1995) describes a lateral stiffening element that braces the rigid vehicle body in the region of the seats. Bhalsod 5,716,094 (1998) describes a pusher block that engages the seat in the event of a lateral impact thereby providing a rigid member between the rigid body structure and the seats that can transfer impact energy to the seats.

All of the above items of background art related to bracing a rigid body structure and provide stiffening mechanisms within the rigid shell structure to distribute energy of lateral impact. None of these items of background art provide mechanisms to transfer energy away from passengers in lateral impacts. or provide other safety arrangements or provide utility for mounting and dismounting the vehicle or provide comfort features for passengers in the operating position.

Baber 5,725,265 (1998) presents airbags for front and rear vehicle bumpers that deploy on impact. Such devices cannot be implemented on the side of the vehicle as a deceleration zone is not available under operating conditions as may be made available in the front and back of the vehicle. Moreover, as this airbag deploys on impact it creates a deceleration zone by pushing its own vehicle away that may actually increase the impulse forces acting on the passengers. Mercier 3,822,076 (1974) describers similar external front and back airbags and uses probes that protrude from the vehicle at the front and back to deploy the airbags. Such apparatus cannot be installed on the sides of the vehicle, as clearances are small. Stirling 5,131,703 (1992) describes a fluid filled chamber around the vehicle that will provide a deceleration zone on impact – frontal rear or lateral. However this arrangement requires the deceleration zone to be present during normal operating conditions that will reduce the maneuverability of vehicles if deployed on the sides of the vehicle. Park 4,995,659 (1991) describes a gas filled chamber deployed around the vehicle. Such a chamber is normally inflated under normal conditions and reduces maneuverability of the vehicle. Campbell 4,815,777 (1989) describes a bumper that can be deployed selectively by filling with gas. This bumper is effective when extended only. It is not designed to be deployed when the vehicle is in motion , as it will reduce maneuverability. Hartmann 5,810, 427 (1998) describes a mechanism that transfers fluid from one airbag to another on impact. The airbag that is deployed is normally in an extended position to absorb the impact energy and provide the deceleration zone. However, such an extended airbag will reduce the maneuverability of the vehicle. There is a literature ("Extended Bumper and Glass-Plastic glazing methods to reduce intrusion and ejection in severe motor vehicle crashes". C.C.Clark 1993. 26th Symposium on Automotive Technology and Automation. Aachen Germany., "Airbag bumpers inflated just before the crash" C.C.Clark., William A. Young. 1994. SAE Technical Paper 941051., "The crash anticipating extended airbag bumper system". C.C.Clark.1994. Fourteenth International Technical Conference on the enhanced safety of vehicles. Munich Germany., "Airbags as a means to reduce crash loads and intrusion, and increase intervehicular compatibility." C.C.Clark. 1995. International Conference on Pelvic and Lower extremity injuries-Proceedings Washington DC., Human Transportation Fatalities and Protection against Rear and Side Crash Loads by the Airstop Restraint" Carl Clark and Carl Blechschmidt. 1965. The Ninth Stapp Car

Conference.) IDS, and background art on the construction of external airbags including deployment proactively with radar or other devices. This entire literature is limited to the use of proactive external airbags mounted on vehicles with rigid structures that include the passenger. There is no reference in this literature to the proactive detection of impact explicitly or implicitly creating a deceleration zone for passenger protection internally, relative to the vehicle as in the present invention. Moreover, this literature is focussed on external airbags for front impact protection with for example rigid penetration buffers to negotiate posts and trees, unlike the present invention which does not prescribe external airbags for front impacts. Furthermore, as this literature describes external airbags without perforation shields their implementability is questionable as, unlike internal airbags that are in relatively protected environments, impact with external airbags often occurs with objects with sharp points and edges that are likely to perforate the external airbags. The Present invention requires perforation shields for external airbags.

All the above items of background art relate to air bag devices for safety in vehicles. However, none of these references take the integrated approach of the present invention, as more fully explained below, which comprises proactive deployment of both internal and external air bags, together with sliding seat members and other devices. Moreover while the present invention can function even without the deployment of external airbags, either proactive or reactive, taken together these items provide protection for passengers which is more than the sum of the parts. Furthermore, none of the protection airbags disclosed, related to external air bags having protective perforation shields that further enhance their efficacy. Moreover none of these devices provide energy transferring mechanisms away from the passenger in a lateral impact or provide other safety features. Moreover they do not provide any utility features for passengers in mounting and dismounting the vehicle or provide comfort features to the passengers.

Perras 2,873,122 (1959) which describes an invention where upon a head-on collision the seat projects a curved protector around the passenger designed to protect the passenger. This curved protector retracts into the seat under normal operating conditions. It is not clear how effective such a mechanism will be as the acceleration of the passenger forward relative to the vehicle may precede that of curved protector's release from the seat. Satzinger 3,961,805 (1976) describes seat belts for frontal collisions that provide safety for vehicles. Such seat belts are in common use. However, they suffer from the drawback that they restrain the body of the passenger in the narrow regions covered by such belts which may cause injury as other parts of the body are not restrained. Moreover such belts are not popular, while in common use as the belts are in constant contact with the body- a factor that is not often relished. Pulling 3,981,520 (1976) describes an arrangement where that provides passenger movement and protection in frontal impacts. On impact the passenger moves in the vertical plane of motion to a more protected position while side firing airbags provide frontal protection. This system of deployment of airbags for frontal collision protection is similar to other frontal airbag systems. They are necessary as restraining systems during the collision but need to be retracted in conventional passenger compartments to give passengers access to their seats while mounting and dismounting the vehicle. Erickson 2,777,531 (1957) describes an invention that rotates the seat of the passenger thereby restraining and protecting the passenger on impact taking advantage of the inertia prior to impact to endow the

passenger with rotational energy that changes the position of the seat. Such rotation can injure the passenger with impacts at present day passenger vehicle speeds.

All the above items of background art relate to frontal impact protection. None of these items provide a device that is normally deployed during operation, and provides a broad area of restraint across the body for the entire upper body, head and neck, without a need for changing the orientation of the passenger. Moreover none of these items provide any protection for side impacts or provide utility for mounting and dismounting the vehicle or for the comfort of the passengers in the operating position.

SUMMARY

In view of these prior references what would be useful is an arrangement that diverts the impact energy in lateral or side impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers, and in the same arrangement provides utilitarian access to the vehicle, such utilitarian access making it possible to both install multi-element contoured surround seats for passengers and the driver, and also a safety device for head-on collision protection that obviates the need for conventional seat belts and front impact airbags. Moreover, it would be useful to have a synergistic structural arrangement for the vehicle that targets strength of the vehicle to protect passengers while minimizing other massive elements in the vehicle.

The present invention includes these objects and advantages.

OBJECTS & ADVANTAGES

Some of the objects and advantages of the present invention are, to provide an arrangement that diverts the impact energy in lateral or side impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers but decelerating the impacting object with the remaining mass of the vehicle. Moreover the arrangement synergistically provides a means for utilitarian easy access to the vehicle for passengers and drivers alike and allows the installation of multi-element surround contoured seats for the comfort and protection of passengers. This arrangement differs sharply from the Background art in that it does not simply offer to the impacting body a reinforced rigid shell where the passenger is treated as part of this integral unit, but rather provides selective and differential treatment of the mass of the passengers and driver of the vehicle vis-à-vis the remaining mass of the vehicle. Furthermore the present invention differs sharply from the Background art in that the resulting structure synergistically permits the installation of contoured multi-element surround seats and a unique safety harness that protects passengers in head-on collisions, both of which may not be implementable without the slide or other moving arrangements for seats on either side of the vehicle in the present invention.

Another object and Advantage of the present invention is the gravity slide drive and a related shock absorbing arrangement relative to the fixed body members of the vehicle ad the terrain traversed by the vehicle, for my arrangement for which there is no counterpart in the Background art. This

allows further Utility and weight and energy saving in implementing the above elements of the present invention.

Another Object and Advantage of the present invention includes External side Airbags that differ sharply from the Background art in that for the first time they proactively create a "Just in Time" deceleration zone both for the passenger relative to the vehicle and also for the vehicle relative to the impacting body, for the lateral or side impact while not remaining in an extended position under normal operating conditions of the vehicle.

Another Object and advantage of this invention is a perforation resistant shield for external airbag protection that would reduce the probability of deployment failure. The background art does not provide for this function in externally deploying airbags.

Another object and advantage of the present invention is a indo-skeletal structure of the vehicle body that permits the energy transfer from the lateral or side impact through compressive members to the body of the vehicle. Unlike the Background art this indo-skeletal structure is designed to transfer energy to the body of the vehicle without transferring it to the passengers and driver of the vehicle. The passengers are targeted for protection with "Safety zones".

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is an illustration of a front elevation of a seating arrangements in a passenger vehicle. This figure is an illustration of the invention in the normal vehicle operating condition. The impacting body is represented on the left as still distant but advancing towards the above passenger vehicle.

Figure 2 is an illustration of the same vehicle arrangement as in Figure 1, except that the impacting object has advanced towards the passenger vehicle adequately to trigger the distance and velocity sensors.

Figure 3 is an illustration of the same vehicle as in Figures 1 and 2, except that the distance and velocity sensors have deployed the external Airbags. They may also provide delayed deployment of the internal Airbags.

Figure 4 is an illustration of the same vehicle as in Figures 1,2 and 3 except that the impacting object has made impact with deceleration and energy absorption provided by the External airbags and the shock absorbers and resisted by the mass of the vehicle through compression members as noted below. The Passengers and seats are free to move away from the impact on the secondary slides as the internal Airbag deploys, pushing out the Primary slide on the side away from the impact.

Figures 1D, 2D, 3D and 4D illustrate an alternative embodiment with the shock absorbers mounted internal to the protector shield.

Figures 1C, 2C, 3C and 4C illustrate an alternative embodiment that has an auxiliary beam mounted behind the seat with a high section of the central member of the skeletal structure behind the seat to abut the auxiliary beam.

Figures 1B, 2B, 3B and 4B illustrate an alternative embodiment with a center console.

Figures 1F, 2F, 3F and 4F illustrate an alternative embodiment with a center console that is crushable and as a result decreases the need for the ejection of the passenger on the further side of the vehicle at impact.

Figures 1G, 2G, 3G and 4G illustrate an alternative embodiment with center airbags that are a part of a passive airbag system to protect passengers during lateral impact by absorbing some of the impact energy but more importantly providing a means to inflate head and neck protection airbags and other anatomical micro airbags mounted in the vicinity of the human body. This particular embodiment has a crushable center console as well.

Figure 5 and 6 is an illustration of the seating arrangement as used for loading and unloading passengers and driver. Figure 5 represents the open position and Figure 6 represents the closed position.

Figures 5A and 6A illustrate an embodiment of the current invention with the protector shield/shock absorbers/external airbag hinging down to support the primary slide. A useful feature for larger vehicles with more than a single seat on each side.

Figures 7-9 is an illustration of the Gravity slide drive that may be embodied in the invention. Figure 7 is an illustration of the Gravity Slide drive at the end of the unload cycle for passengers. Figure 8 is an illustration of the Gravity slide drive at the beginning of the Load cycle for passengers. Figure 9 is an illustration of the left side loaded and ready for operation of the vehicle and the right side at the start of the loading operation, emphasizing the independence of the two sides of the Gravity slide drive mechanism.

Figure 10 A and B are an illustration of Isometric views of the present invention on one side of the vehicle for clarity. Figure 10 C is an illustration of a Plan view of the present invention for one side of the vehicle.

Figures 10 A1, 10B1 are isometric views of an alternative embodiment with a vertical extension/"safety cage" to protect passengers further. Figure 10 C1 is a plan view of the same arrangement.

Figures 10D1 to 10 D5 represent embodiments with cylindrical slides. Fig 10D3 shows the extended position for one side of the vehicleand 10D 4 shows the impacted position for one side of the vehicle.

Figure 11. is an illustration of the position of the "Safety Zones" that are targeted for protection with the Protector shields.

Figs 12 H2, 12 I 2, 12 J 2 illustrate an isometric view of another embodiment of the safety harness, in the normal state, with front impact anatomical passive micro air bag deployed, and the head and neck anatomical micro airbags deployed respectively.

Figure 13. is an illustration of a drawing of isometric view of the present invention.

Figure 14 illustrates a horizontal cross section of an embodiment of the present invention at the level of the upper primary slides.

Figures 17 A,B show a schematic diagramof the passive air cushionsystem disclosed in this invention.

Figures 19 A-E show an embodiment of the customizable contoured multi – element seat. Figure 19 F, G show another embodiment of a customizable multi element seat.

Figures 20 A-C show an embodiment of the indo skeletal structure that includes special arrangements for front impact protection and other features for passenger convenience and comfort and Fig 20D shows an embodiment of the connections between the elements in Figures 20 A-C.

Figures 21 A-E show other alternative embodiments for impact protection.

LIST OF REFERENCE NUMBERS

101 - Central Member of Indo-skeletal structure

102 – Safety Beam Lower Element

103 - Side impact shock absorbers

104 – External Air Bags

105 – Perforation Shields

106 – Protector Shields

107 – Safety Beam Upper Element

108 – Auxiliary Beam.(fixed or sliding)

109 – Multi-element contoured passenger seat

110 – Vehicle Shell/Body

111 – Secondary Slides/Impact decouplers

112 – Locking devices

112A-Pivot for Protector shield

113 – Proactive Velocity/Distance Detectors

114 – Internal side impact airbag

115 – Spring device for manual slide

116 – Inside door open button

117 – outside door open button

118 – Beam pivot for Gravity slide drive ejector

119 - Safety Harness

120 – Support for Safety Harness

121 – Bottom of seating surface of the contoured seat

122 – Contoured arm rests

123 – Child seat attachment

124 – Impacting body

125 - Vertical extensions/ Safety Cage (fixed or sliding)

126 – Center console

127 – Secondary slide/Center console locks

128 – Instrumentation

129 – Center airbags-energy absorption/ passive head and neck anatomical airbag system

130 – Safety Harness Shield

131 – Safety Harness -Anatomical passive micro air bag and visco-elastic buffer

132 – Safety Harness elbow

133 – Safety Harness extending upper arm

134 – Safety Harness Pivoting lower arm

135 – Safety Harness Head and neck anatomical micro airbags (active or passive)

136 – Safety Harness Adjustable Head restraint

137 – Safety Harness Hinged support

138 – Safety Harness Locking Support

139 – Safety Harness passive micro airbag air reservoir

140 - Adjustable Hinge support on seat

141 – Foot rest

142 – Sacrificial chamber

143 – Micro air-cushion – displacement function

144 – Micro air cushion – support function

145 – Valves – air flow/fluid flow

146 – protected entity

147 – Fluid paths

148 – Wheel Chair Conversion - Seat lower cushion and support structure

149 – Wheel Chair Conversion – Chair Clamps

150 – Wheel Chair Conversion – Chair Cross support

151 – Wheel Chair Conversion – Primary Pivot with locks for Rear Wheel retraction

152 – Wheel Chair Conversion – Principal Rear Wheel Support

153 – Wheel Chair Conversion – Rear Wheel Support strut

154 – Wheel Chair Conversion – Secondary Pivot for Rear Wheel retraction

155 – Wheel Chair Conversion – Spring loaded locking support Sleeve

156 – Wheel Chair Conversion – Seat back

157 – Wheel Chair Conversion – Primary Pivot with locks for front wheel

158 – Wheel Chair Conversion – Wheel chair back pivot release

159 – shadow vertibra – air cell retainer

160 - shadow vertibra – lateral tilt return spring

161 - shadow vertibra –upper fixed slot fo lateral tilt return spring

162 - shadow vertibra –support flange

163 - shadow vertibra –upper slot for support flange

164 - shadow vertibra – left body

165 - shadow vertibra – right body

166 - shadow vertibra – left upper air cell socket

167 - shadow vertibra – right upper air cell socket

168 - shadow vertibra – lateral tilt air cell visco elastic damper tube

169 - shadow vertibra – lateral support arm connector

170 - shadow vertibra – - back support adjustable air cushions

171 - shadow vertibra – left lower air cell socket

172 - shadow vertibra – right lower air cell socket

173 shadow vertibra – lower slot of r support flange

174 – lower sliding slot for lateral tilt return spring

175 - shadow rib – body

176 - shadow rib – adjustable air cushions

177 - shadow rib – tilt control connectors

178 – shoulder bolster

179 – Shoulder bolster adjustable air cushions

180 - back support adjustable air cushions

181 – Neck lateral support with deploying passive micro air bag

182 – Head lateral support arms with deploying passive micro air bag

183 – Head rear support adjustable air cushions

184 – Neck rear support adjustable air cushions

185 - Lumbar support adjustable air cushions

186 – Adjustable Hip bolster

187 – Adjustable Pelvic support

188 – Axial contraction system – Central body tube

189 – Axial contraction system - Body extender tube

190 - Axial contraction system – front end connector tube

191 - Axial contraction system – back end connector tube

192 - Axial contraction system – front end

193 - Axial contraction system – back end

194 - Axial contraction system - front module

195 - Axial contraction system – rear module

196 - Axial contraction system – front module crank

197 - Axial contraction system – rear module crank

198 – passenger support plaform

199 – Elevator beam

200 – Propeller

201 – dual Elevating modules

202 – aligning wheel shockabsorber arrangement.

203 – Lower Primary slide support with decoupling key that slots into central member

204 – shadow vertibra 2 – body

205 – shadow vertibra 2 – slider insert

206 – Shadow vertibra 2 – body: first support surface for length adjustment spring

207 – Shadow vertibra 2 – body: second support surface for length adjustment spring

208 – shadow vertibra 2 – body: aperture for tension cord

209 – Shadow vertibra 2 - body: aperture for slider insert

210 - Shadow vertibra 2 - body: slot for adjoining vertibra key

211 - Shadow vertibra 2 - body: vertibra attachment key

212 - Shadow vertibra 2 - body: vertibra attachment pin socket 1

213 - Shadow vertibra 2 - body: vertibra attachment pin socket 2

214 - Shadow vertibra 2 - body: holes to accommodate spring rods

215 – Child or Infant Support Mechanism support (CISM support)

216 – Extendable spring/damper loaded attachment for CISM support

217 – Inner rotator for CISM support

218 - Outer rotator (including attached impact decoupler/secondary slide 111)

219 –reserved

220 –reserved

221 –Bottom seat support flange

222 - Back seat support flange

223 – Shoulder strap attachement for 3 point belt.

224 – Child or Infant support mechanism (CISM)

225 - CISM support pivots

226 – Lock pin – Internal Airbag equivalents (IAE) with Safety beam lower element

227 – Pin slot for lateral impact movement

228 - Internal Airbag equivalent shock absorber

229 - Slot for housing Internal Airbag Equivalent shock absorbers

230 - Pin Hole for registering Lock Pin

231 - Support Key -secondary slide to outer rotator

232 – CISM Support Bracket

233 - Pivotal support for CISM Support Bracket

234 – Pivot for Internal Airbag equivalent attached to CISM support bracket

235 – Fixed Support for safety beam lower elements and internal airbag equivalents

236 – support for secondary slides, CISM support bracket and internal airbag equivalents

237 – Support flange between Secondary slide and internal airbag equivalent active ends

238 - Internal airbag equivalents – dual movable active end at center

239 -Internal Airbag Equivalents–dual movable extremes-expansion/compression.

240 – Lock pin hole on dual internal airbag equivalent center support

241 – Top lock flanges

242 – Side lock flanges

243 - Front lock flanges

244 - Side support flange

245 – Lateral Brace

P101 – Compressible Laterally Slidable (when detached) Hip Bolster

P102 – Seat Bottom Contoured

P103 – Impact Decoupler Secondary Slide Elements

P104 – Retraction Slots for secondary slide support rails (rails not shown)

P105 – Retraction slots for Secondary slides, retracted at Egress and Ingress

P106 – Front sid of rear seat

P107 – Back of seat bottom

P108 – Side bolsters in retracted position for egress and ingress

P109 – Crushed side bolstersduring impact (does not intrude into hip space)

P110 – Side Bolster Air Bags

P111 – Shoulder bolster /support – operating position and width

P112 – Back rest

P113 – Head Rest

P114 – Head and Neck air bags (head rest is fixed to backrest so that it moves with back rest on lateral impact)

P115 – Body Air Bags to hold and move the body on lateral impact. The airbags are shaped to push the arms out of the way at deployment time.

P116 – Crushed shoulder bolster/support (controlled crush)

P117 – Back Rest

DETAILED DESCRIPTION OF INVENTION

The present invention provides a passenger vehicle a structure that synergistically incorporates two functions. First, during lateral or side impacts, a means to decouple from impact, and protect passengers while projecting the remaining mass of the vehicle to decelerate the impacting body, and second, utility to passengers and drivers, in mounting and dismounting the vehicle with the comfort of contoured surround seats. The arrangement may in some embodiments use an indo-skeletal beam that allows such embodiments to rely on compressive force transmission to transfer impact energy to the mass of the vehicle rather than shear loads that are required in the shell paradigm of construction in most current passenger vehicles.

The present invention may use Primary and Secondary slides on each side of the vehicle, to meet these objectives. The Primary slide has among other attached devices, a protector shield that bears the impact force in lateral or side impacts. Such protector shields may be hinged out for access if the sliding arrangement is not used. The Primary Slide may engage a central indo-skeletal beam in some embodiments. The Secondary slide is attached among other devices to possibly contoured surround seats. This slide may be activated under impact to guide passengers in their seats away from the impact zone.

The present invention may utilize a Safety Beam in the vicinity of the seats. However, there is an important advance over the Background art in that the Beam does not lock the passengers on the path of the energy transfer, but rather, conducts the energy of impact away from the passenger to the indo-skeletal frame or to the body members of the shell (collectively elements of the fixed body members) and thereby to the mass of the vehicle allowing independent motion of the passengers away from the impact.

The present invention may use proactively fired external airbags which for the first time provide a means to create a "Just in Time" deceleration zone on the side of a vehicle prior to impact but not deployed under normal operating conditions of the vehicle. Notably, Background art for external airbags that are either extended under normal operating conditions of the vehicle or require reactive deployment cannot function effectively, as the former will impede the maneuverability of the vehicle and the latter will not be able to create a deceleration zone in time for the impact.

Overall this invention provides a "bottom up" paradigm for the design of vehicles starting with the human environment and building outwards to the vehicle – in stark contrast to the conventional approach of design that starts with the vehicle and inserts within these constraints, the passenger environment. Moreover, this invention embodies a two level safety system. The first or the primary level is passive and has a negligible probability of failure. The second level is active and predictive or proactive, utilizing advanced technologies. However, complex advanced technology systems have the drawback of higher probabilities of failure. Therefore while the second level can reduce the level of injury in serious crashes, there is a non trivial proability of failure of this secondary system Therefore it is necessary to build a primary system that is good inough in most cases to reduce injury levels in severe crashes. The paper in the Appendix includes simulation results for an embodiment of the primary system alone with a failure of the secondary system.

The following descriptions are for embodiments of the present invention. Deviations from this description in an embodiment is possible without deviating from the present invention.

PREFERRED EMBODIMENT

The following is a detailed description of some of the components of this embodiment. The seating arrangement of a passenger vehicle is shown in Figure 1. The cross section of the central member of the indo-skeletal structure (101) is fixed to the safety beam (102') and the lower primary slide (102). The Protector Shields (106) is firmly attached to the Upper Primary slide (107), which slides on the lower Primary slide (102) . (The terms upper and lower being used for the slides to distinguish them and not representing a relative elevation of the slides). The construction of such protector shields would follow that of any impact resisting body panel member of a vehicle, with the usual weight strength tradeoffs. Such construction is well disclosed in the background art. The sliding arrangement may use single element or multiple element direct contact low friction surfaces sliding on one another, roller bearings, ball bearing structures – all of which are well disclosed in the background art. The Protector Shield(106) are designed to cover the required "safety zone" as noted on Figure 11. The Upper Primary Slide (107)

locks into the Central member of the indo-skeletal structure (101) in the operating position with locking devices (112). Such locking devices do not take any additional loads on impact, and may as a result follow the extensive background art for locking devices for example similar mechanisms to those used in automobile door locks. These locks may be activated by the ignition key switch for additional safety while the vehicle is operational. The Protector Shield (106) has attached on the outside a shock absorber (103), which may include external airbags (104). The construction of such shock absorbers follow the background art. Such external airbag (104) are protected from sharp objects on impact by a Perforation Shield (105). These perforation shields protect the external airbag (and the passenger) from sharp objects. The construction of such perforation resisting shields are well disclosed in the background art. Such Perforation shields may be attached by conventional means to the outer surface of the airbag and retained in the normal operating position using techniques used for airbags both internal and external disclosed in the background art. The Air Bag (104) is deployed with distance and velocity sensors (113) mounted on the Perforation shields (105). Distance and velocity sensors are used in other applications and their construction is well disclosed in the background art. The Upper Primary Slide (107), supports the secondary slide/Impact decouplers (111). In this embodiment this is firmly attached to the Upper Primary Slide until the impact when it is decoupled to slide away from the impact. The Secondary slide arrangement may use a friction based approach, or other approach , all of which are well disclosed in the background art. This embodiment has contoured surround Passenger Seats (109) that are mounted on the Secondary slides (111). These seats have internal Airbags (114) that deploy on impact and may "unfurl" upwards to protect the head or upper body as well. The construction of seat adjustment mechanisms are well disclosed in the background art. This Figure shows the impacting object on the left approaching the vehicle, but too distant to trigger any action.

In Figure 2, the impacting object has moved to a position that can now trigger the distance and velocity sensors (113). These sensors trigger the deployment of the External Airbags (104), and the shock absorbers (103). The internal airbags (114) may be triggered by conventional means disclosed in the prior art, explicitly or implicitly reacting to proactive or reactive impact detection. The internal air bags are designed to move the passengers and the passenger seates to the extent necessary through a Motion Space to a Safe Position on primary mpact detection, and thereafter protect the protected entity – the passenger and the seat. Thereafter as illustrated in Figure 3, the External Airbags (104) and shock absorbers (103) deploy to provide the required deceleration zone for the impact. As a result on impact the energy of impact is partially absorbed by the External Air bag (104) and the Shock Absorber (103) and the remaining energy transferred to the massive components of the vehicle through the Protector Shield (106), the Upper and Lower Primary Slide/ Safety Beam (107, 102, 102') to the Central element of the Indo-skeletal frame (101) and the body of the vehicle. Notably, the Secondary slides (111) decouple and slide the passenger seats (109) with the passengers away outside the path of the impact forces and protected by the internal Airbag (114). The Upper Primary Slide (107) on the side of the vehicle away from the impact is free to slide out with all devices mounted on it to provide a path for the secondary slide (111) and the seats (109). In this situation it may be seen that the Upper Primary slide works as an impact-resisting beam on the side of the impact and a release and support mechanism on the

side away from the impact. Figure 15 A illustrates the side impact with the deployed internal and external airbags, and the displaced passengers away from the impact in the vehicle sustaining the lateral impact. Figure 15 B illustrates the frontal impact support for the passenger on the right hand side. The Left hand passenger is shown in the normal position for comparison.

Figure 14 illustrates a horizontal cross section of the embodiment at the height of the upper primary slides (107). The central member of the indo-skeletal structure (101) is flanked by the upper primary slides (107) abutting the central member, with the protector shields (106) and the shock absorbers that include the external airbags (103,104) at the outer end of the upper primary slides. The perforation shields are shown at the outer extreme of the shock aborbers and airbags. In this embodiment there are two sets of upper primary slides on each side of the vehicle that can support two rows of seats (front and rear) one on each side with its own protection with the protection shields and shock absorbing devices.

An auxiliary slide beam structure (108) (as illustrated in figures 10A, 10B and 10C) may be attached to the central member of the Indo-skeletal beam (101) and locked into the protector shield when the vehicle is ready for operation, or be attached to the protector shield and slide out with the Upper Primary Slide (7), and get locked to the central member of the Indo-skeletal structure (1) in the operating position

Means for access for passengers in this embodiment as illustrated in Figures 5, 6, 10A, 10B and 10C. The seat (109) and secondary slide (111), slide out on the upper Primary Slide (107) to a position that lets the seat (109) protrude from the vehicle such that the passenger may simply stand in front of the seat and sit down on the seat (109). Thereafter the seat (109) is retracted on the Primary slide to the position as depicted in Figure 6, where the Upper Primary slide (107) is locked with the locking devices (112) in position for operation of the vehicle. The slide drive mechanism may be powered using approaches well disclosed in the background art such as servos, and pneumatic or hydraulic systems. The vehicle while in operation should have the Upper Primary Slide (107) retracted and locked. The ignition lock is used in this embodiment to ensure this practice.

While extended, the clearance on the side of the vehicle for the Easy Ejector will usually be in the range of about 20 inches to 30 inches. This could be substantially less than the clearance required for opening a conventional car door. This is particularly useful for parking in areas with limited clearance.

Figures 12A, 12B and 12C illustrates the detail of the seat (109). The seat (109) may be constructed with customizable multi-elements that conform to the desired shape and provide the desired support for the passenger. Such adjustments may be effected using conventional seat control devices. In this figure the Safety Harness (119) is secured to the sides of the contoured seat (109) between the arm rests (122). The safety harness (119) may be designed to protect the passenger in head-on collisions by providing a soft barrier in close proximity to the body but not necessarily touching the body. This arrangement may be preferred to seat belts that do not provide the extended surface area that the harness (119) provides and as result provides greater impact resistance for the same level of

limiting forces that the body can withstand. Moreover, this arrangement may obviate the need for a front collision airbag as the harness (119) may be high enough to support the face and neck under collision conditions. The harness may be constructed of pliable but semi-rigid material (such as high strength nylon) to provide support in a head on collision. A natural benefit of the arrangement of the harness (119) and its supports (120) is that lateral forces on the seat are also braced by the harness support (120) in the operating position. Figures 12 F 2 and 12 G2 illustrate an embodiment of the harness. Moreover the seat (109) may be constructed with reinforcing on the sides to further protect the passenger from crush injuries. The Seating surface (121) is illustrated in the same figure as are the arm rests (122). In conventional vehicle seat designs the door surface provides the only support on the external side surface which are usually limited to arm rests. This seat (109) provides surround support for the passenger particularly desirable on winding roads. The "Custom contoured seats" customized for each passenger may be created with a multi-element adjustable structure (manually with inserts or with computer controlled elements) that provide ergonomic passenger comfort providing where desired, lateral support in addition to the support that conventional seats provide, to cradle the entire lower body in the ejector seat. Similarly child seats (123) as in Figure 12D1, may be designed to protect children. Such seats can be inserted into the seat (109). The Safety harness may also have an attachment for providing greater support for infants and small children.

ADDITIONAL EMBODIMENTS

While the above embodiment uses a power slide drive, this embodiment differs in that a gravity slide drive is employed to move the slides for mounting the vehicle. Figures 7,8 and 9 describe this arrangement. This embodiment differs in the preferred embodiment above in that the Lower Primary slide/safety Beam (102, 102') are pivoted at the Central member of the indo-skeletal structure with pivots (118). As shown in Figure 7, this allows the lower slide to fall to a lower of two positions, that inclines the upper surface of the Lower Primary slide (102) adequately to allow the upper Primary slide (107) to slide outwards to the loading position assisted by the weight of a passenger in the seat and the additional assistance of the Spring arrangement (115). The passenger may dismount from the vehicle when the slide is fully extended as shown in Figure 7. Each side of the vehicle has independent slides and may be operated by passengers independently.

When the passenger dismounts from the seat the Upper Primary slide (107) in its extended position moves to the higher of two positions about the Pivot (118) as illustrated in Figure 8. This move inclines the Upper surface of the Lower Primary slide adequately to allow the weight of a passenger to work against the spring arrangement (115) and move the slide to the operating position. This move up of the Lower Primary Slide (107) may be effected by mechanisms well disclosed in the background art. The Slide as depicted in Figure 8, is now ready for a new Passengers to mount. When the passenger sits on the seat (109), the weight of the passenger works against the spring mechanism (115) to move the slide to the operating position as depicted on the left hand side of the figure 9 and lock the slide in the operating position. The Upper Primary Slide may be unlocked by the passenger by depressing the Inside Door Open Button (116). Activating this button in addition allows the lower primary slide (102) to move and be

locked to the loading inclination - the lower of two positions, and the Upper Primary Slide (107) is free to slide out with the passenger. At this point the arrangement has completed a full cycle and is in the position depicted in Figure 7.

The above cycle represents operation of the Gravity Slide Drive when there is a passenger in the seat (109) when the Slide moves to and from the operating position as on the left of Figure 9. When a passenger dismounts however, and the Slide arrangement needs to be retracted without a passenger in the seat, the weight of the passenger is no longer available for aiding the motion of the slide to the operating position, and the slide must be pushed in against the action of the Spring Arrangement (115) and locked in place at the operating position. When a new Passenger wishes to mount the vehicle, he/she will press the Outside Door Open Button (117) which releases the catch that holds the Upper Primary Slide beam in place but does not affect the movement of the Lower Primary Slide (102) about its pivot (118). The seat as a result slides out on the Upper Primary Slide assisted by the Spring arrangement (115) to the position for mounting the vehicle as depicted in Figure 7. The spring arrangement (115) is designed to be such that it provides a force just adequate to move the Upper Primary Slide out with no passenger in the seat.

Some alternative embodiments may have multiple positions for the inclinations of the safety beams from the center of the vehicle, in the loading position to accommodate the varying road inclinations that may make a single inclination of the safety beam in the loading position inadequate. In such an embodiment the operator will have the facility to switch to the best loading inclination dependant on the inclination of the road. This will overcome some of the disadvantages of regular car doors on steep hills. Moreover, this arrangement can also function as a shock absorbing device for the comfort of the passengers in vehicles under operating conditions. A possible embodiment to achieve this can have a range of angular inclinations for the operating position, the range being set so that the transfer of the compressive load on impact through to the fixed body members of the vehicle or the central beam is achieved. The Safety beams are spring or shock absorber mounted in a vertical plane relative to the central beam and the fixed body members of the vehicle. When a bump in the road is encountered the safety beams pivot on the center and swing higher at the center thereby isolating the passenger from the road.

Some embodiments of the multi-element contoured seats may have a structure that provides anatomically accurate support for the body as illustrated in Figures 19 A,B,C,D and E. This seat architecture may be used in a wide variety of application s outside vehicles as well. Conventional car seats are a set of two or possibly three rigid structures - the seat bottom, the back and the head rest. These have some mobility for comfort. However there are two factors that militate against their comfort and the level of protective support they can provide in collision situations. First, one size must fit all pawssengers and drivers. The mobility provided for the seat bottom, seat back and head rest provide limited flexibility for passengers of different sizes. Second, there is little lateral support for the body that could be vital in a side collision, and third, in a vehicle in motion on a rough surface, the shock absorbtion provided to all parts of the upper body is the same. – the seat back is rigid onece set up by the passenger – this stands in contrast with the internal shock absorbtion of the human body, where the spine provides differential shock absorbtion to different parts of the body, increasing the shock absorbtion towards the head. This last factor implies that

conventional seat backs cannot remove vibrations from both the top and the bottom of the upper body as the body's own shock absorbtion system will move differentially to the seat back along the length of the spine. The embodiments of this invention illustrated in figures 19, improve these characteristics of seats.

Figures 19 A and B show two view of a shadow vertibra of the seat. The design of this vertibra is to provide auxiliary support for the body. The structure shown is one of several possible structures for embodiments of this invention. The body of the vertibra in this embodiment is split into a left body (164) and a right body (165) these elements are permanently bonded or fixed tgether by bolts. The body has two cavities on each of the top and the bottom surface – the air cell sockets. These hold two air cells on the left and the right side. These air cells are supported on the sides by the air cell retainers (159) that slide in and out of the air cell sockets (166, 167, 171, 172). The air cells them selves are made of a pliable and inflatable material, or alternatively a material that can fold within the cell supports. Each pair of air cells are separately inflatable by a multi channel air pump that is installed in the seat embodiment. There is a connecting tube between the left and the right air cells housed in the lateral tilt air cell visco-eleastic damper tube. This tube allows limited air flow between the left and the right chambers to permit lateral tilting of the vertebrae relative to each other. This motion hover is corrected by the lateral tilt return spring (160) that ensures that in the normal position the vertebrae arealigned vertically. This lateral tilt return spring is fixed on one end to a vertibra in the upper fixed slot for lateral tilt return spring (161) and can slide within the next vertibra in the lower sliding slot for lateral tilt return spring (174).Orthogonal support is provided between the vertebrae with the support flange (162) that is fixed at one end in the lower slot for the support flange (173) and is slidably mounted in the adjoining vertibra's upper slot for support flange (163). The flnge is sized to allow limited lateral tilting as the vertibra tilts laterally, but provides firm back support. Notably the upper and lower slots for the support flange may be inclined slightly so as to take the form of the human spine. The body contact is made on the back with the back support adjustable air cushions (170), which in most embodiments are contoured to the shape of the bode and is illustrated as an ellipsoid for clarity. These air cushions are inflatable and the pressure may be adjusted to the comfort of the passenger. There may be a spring loaded cable that is threaded through the vertebrae to tie them together.The spring loading will work against the air cell pressure as the gets elongated with higher air cell pressure. Ideally there can be as many of the shadow vertebrae as vertebrae in the human body although some embodiments may choose some economy in the number of such shadow vertebrae. Figure 19C illustrates two adjoining shadow vertebrae. One of these are for supporting the thorax region and therefore have attached the shadow rib body (175) and the related shadow rib adjustable air cushions (176) (shown as ellipsoids for clarity but in most embodiments will be contoured to take the shape of the body. These air cushions are inflatable for passenger comfort. The air supply being led to the cushions along the rib body and down the shadow spine to the multiple channel control air pump which also supplies air pressure of each of the many air cushions and air cells in the seat embodiment. The shadow ribs are supported by the tilt control connectors(177) that may adjust the angle of the shadow ribs. Figures 19 D and E .illustrate one possible version of this embodiment. Here the shadow vertebrae are stacked up to provide support for the head the neck the shoulders, the thorax and the lumbar region. The head rear support adjustable air cushions (183) provide

forward support for the head while the Head lateral support arms with deploying passive air bag (182) provides lateral support particularly during side collisions with deploying passive micro airbags. Similarly the neckhas rear support from neck rear support adjustable air cushions (184) and lateral support from Neck lateral support with deploying passive micro air bag (181). The shoulders are supported by the shoulder bolster (178) and the shoulder bolster adjustable cushions (179). The shoulder bolster being pivotally attached to a vertibra of the shadow spine and allowed limited pivotal motion vertically to allow the passenger to move his/her upper arms upwards at norma speed. However, the shoulder bolster will resist rapid motion of the upper arms and shoulders as in a collision thereby supporting the passenger. This differential movement characteristics can be achieved by approaches well disclosed in the background including viscous loading of the coupling. Lumbar support is provided by the Lumbar support adjustable air cushions (185). The entire array of the shadow vertebrae may be elongated and contracted by changing the pressure in the air cells thereby provding the optimal sizing for all heights of passengers. The lateral support and back support cushions may be inflated to provide width control and support for passengers of different shapes. Adjustable hip bolsters provide lateral and forward support while the adjustable pelvic support (187) provides vertival support for the passenger. The illustrations exclude the leg and arm supports that are part of the embodiment for sake of clarity. Spring supports can substitute for the air cells in the vertebrae but will not have the advantage of viscous lateral resistance and independent height control. Overall height can however be controlled with the cable threaded through the vertebrae. Motion control of the seat elements can be achieved with devices well disclosed in the background art including servos, and pneumatic and hydraulic systems.

Considering the complexity of the seat systems including the multi channel inflators for each of the air cells and the air cushions along with the mechanical controls for inclining the shadow ribs and the pelvic and hip supports, it would normally be necessary to use a closed loop feedback with computer control. Pressure sensing of each air filled device will provide feedback on the resistant force o the human body and therefore firmness of the support. This information can be used to provide the firmness control desired by the passenger. One computer controlled scheme could be where the passenger inputs gender weight, and height and the computer alters the size of the seat by inflating and deflating aircells and cushions accordingly and the provides several alternative configurations that the customer can select. The customer can then customize firmness and variations on the seat presets.

Finally the shoulder bolsters and shadow ribs may have deploying micro aircusions that hold the passenger in the event of a collision.

Yet another computer control scheme for the seats has a "learn" mode" and a "save" mode for the computer control. When the computer control is set to the learn mode the feedback system observations are used to learn the user's preferred positions. Thereafter when in the save mode the seat is set to this position. As an additional enhancement the seat control can be voice activated to allow the user to "tell" the seat to be either in the learn or save modes.

Another embodiment of the multi element contoured seat that provides anatomically accurate support for the body comprises a shadow spine that is made up in part by an array of interlocking vertibra bodies as in 204 that are each connected to body support members that may be shadow ribs or other support members for the human body as described herein. The size of each vertibra may be scaled to accommodate the force considerations envountered by the vertibra during crash conditions. Therefore many embodiments will have larger vertibra at the lower end of the shadow spine and smaller vertibra at the top of the sipne. Each of the interlocking vertibra bodies have a slider insert 205 that has a hole to accommodate the vertibra attachment pin. The slider moves within the housing on the vertibra body to allow extension and contraction in the effective length of each vertibra. The movement in the position of the hole is accommodated by the slot in the vertibra body. Adjoining vertibra are joined by a pin that is fitten into the vertibra attachment pin socket-1 in the slider insert 213 and the vertibra attachment pin socket-2 212 on the adjoining vertibra. On assembly of the string of such vertibra there will be limited pivotal movement possible laterally as the pin holes 212 rotate relative to the pin holes 213. Such movement may be limited with the shape of the vertibra attachment key 211 and the slot for adjoining vertibra key 210. And further controlled by springs to described below. Each of the vertebrae in the shadow spine may have an angled pin hole 212 along with orthogonal surfaces of the key 211 so that the position of each of the vertebrae reflect the requied curvature of the shadow spine to accommodate the passenger spine curvature. Notably the arrangements for contraction and extension of the chain of vertebrae will allow for different sized passengers. The vertibra at the bottom of the string is connected to the lower part of the seat with a slot arrangement that fits the key on the vertibra or alternatively if the vertibra are oriented to have their keys above their slots, the lower seat will have a key to accommodate the slot on the lowest vertibra. The vertibae may extend to support the head and neck. The number and length of vertebrae will depend on the balance between the larger cost of a large number of vertebrae and the value in accuarate support with a shadow vertibra for each vertibra of the passenger and one for the head of the passenger. The shadow spine also comprises two chords of high tensile strength possibly of stranded steel, that are rigidly connected to the aperture for tension chord 208 of the top vertibra, and are each threaded through the apertures for tension chords 208, one on each side of the vertebrae along the length of the shadow spine. Springs are interspersed between the vertibrea to surround each of the chords one on each side of each vertibra, to separate the vertebrae when there is no tension in the chord and to extend the shadow spine by forcing the slider insert 205 to slide outwards to the extent possible. The two tension chords are threaded through holes in a mounting members of the shadow spine located near the lower seat, and attached to a mechanism that can loosen and tighten each of the two chords concurrently by the same amount, thereby forcing each of the springs to compress and allow a contraction of each of the vertebrae of the shadow spine. This arrangement allows adjustment of the seat back to the size of height of the passenger or operator. The characteristics of each of the pairs of springs on each of the vertebrae can be adjusted to compress by different amounts, the vertebrae at different levels of the shadow spine to reflect the relative variations in size of different vertebrae of tall and short people. In the event of a side collision, one of the tension chords will remain in tension while the other may slacken by compressing

further the springs on its side caused by the lateral force allowing limited lateral movement and bending of the shadow spine, thereby limiting the peak accelerations that are encountered by the upper body head and neck. The entire shadow spine assembly will have some controlled flexibility by design for forward and backward movement for protection of the passenger in a rear or front collision. There will also be attachment points for seat belts or safety shields on one or more of the vertebrae.

A further refinement of this embodiment of the shadow spine in the multi-element contoured seat as in fig 19 H, has additional apertures 214 on each side of each vertibra, to accommodate a spring rod on each side of the shadow spine. The spring rod will be threaded through the aperture 214 in Fig 19H and each attached at only one end either at the top or the bottom. The sizing and surface treatment of the aperture 214 will allow some lateral bending of the spring rod, and allow sliding of the spring rod. On lateral impact the spring rods will resist lateral movement and supplement the force of the springs in compression around the tension chord. Moreover, in rear impact and front impact collisions they will supplement forward and backward bending of the shadow spine and as a result the upper body of the passenger or operator. Notably the cross section of the rods may be adjusted in the lateral direction relative to the forward-backward direction to modify the relative resistive force that it applies in lateral impacts versus forward and back impact.

Yet another variation of this embodiment discharges the air in the adjustable air cushions when passengers leave the seats, and then reinflate these aircushions when the new passenger sits down with air that is preheated or precooled to the preferred temperature of the passenger. Thereafter the air cushions will provide insulation at that temperature for the seating surface.

Yet another embodiment of the multi element seat has a back and head/neck support that is supported by concentric tubes that fit within each other and can slide within each other. The longest and narrowest of these tubes supports the head rest. The tube next in length and wider, supports the neck rest, the tube next in length and still wider supports the thorax (there may also be a tube that supports the shoulders at this postion between the neck and the thorax). The next length of tube supports the lower back and the lumbar region. Each of these tubes may be independently raised or lowered to meet the user's preference and anatomy. Moreover the support for each region whether it be head, neck, shoulders, thorax or lumbar regions, may be widened or narrowed with each of these sections. While the background art provides many possible approaches for raising and lowering the sections and the wideining and narrowing of the sections defined above in this embodiment, a simple embodiment has all the control devices at the bottom of the tubes. The raising and lowering of each tube can use electric servos or pneumatic or gas lift mechanisms attached to the concentric sections that are designed such that the narrower tubes protrude below the wider tubes for access for support and control by the said lift mechanisms. The width of each of the sections may be controlled with air cells that are inflatable to the passenger's preference. This embodiment with concentric tubes may allow some limited flexing and therefore lateral movement of the body under lateral impact conditions thereby

reducing peak accelerations of the head neck and thorax regions of the body. The cross sections of the tubes that support the sections may be circular in some embodiments to allow the user the ability to twist for example to reach a child in the back seat, this embodiment however has a viscous damper or rachet arrangement with a centrifugal governor that prevents rapid twisting motion as under side collision forces. Such viscous dampers or centrifugal rachets may be attached to each of the concentric tubes that allow twisting motion. Such viscous dampers with radial vanes and rachet arrangements with centrifugal governors are well disclosed in the background art. Other embodiments that prevent twisting motion may have rectangular or other irregular cross sections.

Yet another embodiment uses a second rotating mechanism or turn table for the seat about a vertical axis mounted at the point of attachment of the seat to the fiexed elements of the vehicle when in the normal operating position, that allows the user discretion to position and lock the seat at an angle to the direction of motion of the vehicle. This is sometimes desired by drivers. The computer control system for the seats can have a learn position that learns the angular position that is desired by the user and then sets it in the save position. The user commands can be verbal with voice recognition.

Yet another embodiment has a head and neck support in a multi element adjustable seat (where the head and neck support is constructed to be light but strong), in addition to having vertical movements is pivoted along a horizontal lateral axis and is designed with spring controls to move forward and touch the head and neck without pushing the head and neck with uncomfortable forces. Radial or linear viscous dampers are attached about the horizontal axis of the head and neck support that prevents rapid movement of the head and neck in a rear end collision. The viscous dampers are well disclosed in the background art.

Embodiments, particularly those that utilize the indo-skeletal structure may include the following additional embodiments and variations thereof for frontal and rear impact protection and passenger comfort and convenience. The additional structure is illustrated in figures 20 A,B and C. The passenger support platform (198)represents the set of machinery for that purpose. It will take the shape needed to support the variety of structures that are described in this invention.It is supported either in the middle or on the edges by the Central body tubes (188). The first tube that fits into the central body tube is the Body extender tube (189) This optional tube is slidably connected to the central body tube and may be moved in and out by servo motors or pneumatic/hydraulic pistons and cylinders. However the inner tube is axially supported by a compression resistant shock absorber which in turn is mounted rigidly with regard to the outer central body tube in all poitions that the body extender tube can take. The Body extender tube has functions that include extending the wheel base of the vehicle under computer control particularly in drive by wire vehicles, thereby improving the comfort of the vehicle and second increasing the wheel base contingent on vehicle speed such that in the event of a collision there is a longer deceleration space. The shock absorber will become longer and and shorter to accomodate this need and can for example be air shock absorbers. The correlation of speed and length will normally be computer controlled to provide statistically appropriate deceleration

distances for the speed of the vehicle at any time. Notably the steering arrangements and other vehicle systems may also need to be compensated to accommodate the change in wheel base to ensure driver convenience and precise control of the vehicle. The Front end connector tube (190) has a shock absorber in series with a servo or pneumatic/hydraulic controlled actuator for axial movement in and out of the body extender tube (189) as does the back end connector tube ((191). 190 and 191 are connected to the front and back ends respectively which include the front and back wheels.and bumper arrangements. The front module – which may be the engine or hybrid unit is pivoted on brackets at the front end of the front end connector tube, thereby allowing the module to rotate upwards about this pivot. Notably the module will be signifivcantly massive and will require strong supports and pivots. The front module crank is pivotally attached to the body extender tube and also pivotally attached to the front module as shown in figure 20 A. Therefore if there is a movement of the front end towards the body extender tube the front module crank would swing the front module about its pivot in the front towards the vertical direction.

There are at least two functions for this motion. First in the event of a front collision the force will compress the shock absorbers on the end of the front end connector tube and thereby force the crank to pivot up the front module. This angular acceleration of the massive front module will absorb energy of the impact and acting as a "fly wheel", remove acceleration spikes that the passenger would otherwise sustain and in addition due to its vertical acceleration increase the traction on the front wheels thereby increasing the braking friction resistance that can be offered. Finally in the event of a collision the inclining front module will divert the impacting vehicle over the passenger space. This action is illustrated in figure 20 C. Second, particulary for drive by wire vehicles, the front and back end connector tubes may be retracted by servo or pneumatic/hydraulic rrangements, to pivot up the front and back modules thereby reducing the vehicle length substantially and providing better curb visibility to the driver particularly while paaking. This is illustrated in Figure 20 B. Notably the wheels are maintained in the same orientation to the road surface and may be steered as desired with the same mechanisms. For conventional vehicle architectures the pivot of the front module and engine with the front end connector tube should be near the wheel axis to facilitate this additional feature.

The same value is derived in the rear structure as the front structure for rear collisions and in front collisions and in parking. The arguments are similar.

Another embodiment may have a single but broad set of central body tube body extender tube and the back/front end connector tubes with a split front or back module and connection of the front / back connector tube with the front /back ends respectively in the middle. Yet another configuration may have a single central body tube and body extender tube but then have a "T" shaped structure on the back or the front to have seperate left and right front and/or back end connector tubes connected with the front end at either side. In the event the body extender tube in not used the connection of the front/back module cranks will be to the central body tubes.

For embodiments that use an exoskeletal or shell design, an additional embodiment deploys airbags in the space surrounding the engine components to change the characteristics of the crumple zone. Moreover in addition some of these embodiments have the passenger cabin slidably and detachably connected to the rest of the vehicle and mounted behind these deploying airbags such that on impact, the cabin detaches from the vehicle and slides backwards in a controlled fashion to ensure the integrity of the cabin.

Yet another additional embodiment has a rear seat that has a unique bench configuration with sections that maintain their integrity and width in a side collision and other sections that collapse or compress in predefined controlled ways, to absorb the impact accelleration that would otherwise be transmitted to the passengers. The present invention and in particular embodiments of the rear seat are not limited to these figures. There are many embodiments that differ from these figures.

The hip bolster P101 that is compressible to a pre defined width P109 and providing a predefined resistive force to compression, in the event of a lateral force being applied to the hip bolster in a side impact, and designed to compress to a minimum width that still protects the hip of the passengers, is mounted adjacent to and on either side of the contoured seat bottoms P102 which are designed not to compress substantially in the event of lateral compressive forces being applied to it in the event of a side impact. The shapes and widths of the uncompressed hip bolsters may vary depending on whether the hip bolster is at the end of a seat or in between the seat bottoms P102.

The collinear mounting of the hip bolsters and seat bottoms along a lateral axis is in some embodiments achieved with impact decoupler/secondary slides P103 that connect the hip bolsters and the seat bottoms to the fixed elements of the vehicle. These impact decouplers are under normal operating conditions, fixedly attached to each of the seat bottoms and each of the hip bolsters and under a predefined lateral force decouple the seat bottoms and hip bolsters to slide along a lateral axis relative to the fixed elements of the vehicle. The impact decoupler/secondary slides are mounted on the hip bolsters such that under compression to the predefined width, the impact decouplers/secondary slides do not obstruct the compression process.

Some of these embodiments have a further feature to lower and raise the hip bolsters to facilitate egress and ingress. In some such embodiments Slots in the hip bolster accommodate the secondary slides at the time of withdrawal of the hip bolsters to approximately the level of the seat bottoms. In addition there are slots to accommodate the sliding surfaces on the fixed elements of the vehicle, that are attached to the impact decouplers/secondary slides. This arrangement for lowering and raising the hip bolsters may be activated when the doors are opened and closed, raising the hip bolsters to the operating position when the doors are closed and lowering the hip bolsters when the doors are opened thereby facilitating egress and ingress. The lowering and raising arrangement can also be disabled to allow more passengers to use the back seat but without the using the side impact protection system.

-The arrangement for raising and lowering the hip bolsters may also be used to change the width of the seat bottom within limits by changing the height of the bolsters, each having an angled edge on the sides facing the seat bottoms.

The back rest P112 and the shoulder bolster/support P111, support the back and shoulders/arms respectively of the passengers. The seat bottom P102 and the back rest P112 are located in the same lateral position for each of the passengers. Similarly, the hip bolsters and the shoulder bolsters are located in the same lateral position so that the shoulder bolster lies substantially above the hip bolster. The shoulder bolster is controllably crushable like the hip bolster, to be reduced under compressive lateral forces to a predefined narrow width. The back rest and the shoulder bolster support are mounted on impact decoupler/secondary slides in an analogous fashion to the seat bottom and the hip bolster respectively. Moreover, the back rest and the seat bottom are connected so that the movement of the seat bottom and the back rest when decoupled and thereafter laterally slidably attached to the fixed members of the vehicle, follow each other exactly so that the passenger support position is maintained under lateral impact conditions. Some embodiments have retracting arrangements of the shoulder bolster analogous to the hip bolster.

In some embodiments the sliding surfaces on the fixed elements of the vehicle, that the impact decoupler/secondary slides are restrained to following during impact, may be segmented into sections across the vehicle so that sections of the seat back may be folded down along with these surfaces to provide enhanced storage space in the trunk of the vehicle or for other utility purposes. Moreover the members of the fixed elements of the vehicle that provide these sliding surfaces may be constructed in telescoping elements so that on lateral impact they decouple and telescope together rather than buckle under lateral forces thereby maintaining the integrity of the lateral sliding surfaces. These telescoping sections may also form a part of the impact decoupling arrangement of the secondary slides.

The head rest P113 is connected to the back rest and is vertically adjustable but is laterally fixed to the back rest, and therefore will move laterally with the back rest in the event of a side impact of sufficient magnitude, thereby ensuring that the head and the back of the passenger are supported at the same lateral position ensuring that there is little differential movement of the head relative to the body of the passenger during impact.

Under lateral impact conditions, forces on the protector shields which may consist of the vehicle body sides and/or the back door and/or the rear wheels and sections of the wheel wells of the vehicle, all of which have surfaces that abut the sides of the passengers, the hip bolsters and the shoulder bolsters on the impact side of the vehicle, provide impact resistance. As a controlled crush commences in a lateral direction, internal airbags are deployed adjoining the hip bolsters and shoulder bolsters on the impact side of the vehicle but on the inside of the protector shield elements, thereby transferring impact forces through the airbag to the hip bolster and shoulder bolster on the impact side of the vehicle. The inside airbag in some embodiments may be in several sections with one or more of these sections mounted inside the rear wheel well of the vehicle.

Head and neck airbags P114, Body air bags P115 and side bolster airbags P110 are deployed on impact to hold the passengers in the survival space contained by the seat bottom, the back rest and the head rest.

Thereafter the movement of the passengers laterally will be with minimal differential movement of the body elements as they are held by the airbags that are in turn attached to the head rest the back rest and the seat bottom respectively, which in turn are constrained to move together laterally on impact.

The airbags may be constructed as micro-air cushions that are driven by the internal airbag as the sacrificial chamber. They may also be separately deployed airbags.

Some of the chambers of the inside airbags may be preinflated and therefore completely passive.

The body airbags may be shaped to be inclined downwards on the top surface to gently push the arms of the passengers forward, while maintaining relatively even support for the arms down from the shoulder.

In the compressed position of the hip bolsters and shoulder bolsters, it is likely that the shoulder space will be very limited. Therefore, some embodiments may have the center seat back offset forward relative to the seat backs on either side, thereby moving the passenger in the central seat to be slightly ahead of the passengers on the side in the operating position. Therefore under impact, the shoulders of the center passenger will not abut the shoulders of the passengers on the side but will lie ahead of the shoulders of the passengers on the sides, thereby allowing adequate space for shoulders of all passengers under impact. The body air bags on deployment will push all the arms forward and upward and hold the torsos of passengers on both sides. If the center passenger shoulder is in front of the side passenger shoulders the inner arm of each of the side passengers will push up the arms of the center passenger when the air bag deploys.

The shapes of the body airbags may be such that they hold both passengers on either side, or be designed to hold only one of the two passengers adjoining the hip bolster or shoulder bolster from which it is deployed. In the latter case there will be two bags to support each of the two passengers on either side the hip bolster and the shoulder bolster. The hip bolster and shoulder bolsters on the ends of the rear seat assembly will need only one air bag on each as there is only one adjoining passenger.

Some car architectures have the rear wheel well partially straddling the rear seat. As a result an outward displacement of the rear seat on the further side from the impact can be prevented. Some embodiments of the present invention that are in these architectures, have specially constructed wheel wells and componentry that are placed between the seats and the wheel wells to allow a compression of the wheel wells as the rear seat moves outwards on the side opposite the collision. Some of these arrangements may include a perforation or weakening of the wheel well along the profile of the seat in the outward extended position of the seat under impact of the side further from the impact, to allow the lateral force of the seat on the wheel well to separate and crush the section in the way of the seat to allow the movement of the seat. To assist with this process of separation of the section of the wheel well in the way of the seat, the seat may have mounted to its edge in a position facing the wheel well a cutting edge, so that the wheel well may be cut or separated more easily during collision conditions as described above.

Yet other embodiments in architectures of cars that have wheel wells partially straddling the rear seat, have airbags that deploy in the wheel well on the impact side to control the forces on the rear seat, and would provide the function of the inside airbags in other embodiments.

Yet other embodiments of the present invention have a raised and/or forward shifted section of the middle seat on the rear seat assembly so that in the normal operating position the passenger in the center seat, has his/her shoulders in a position that will not engage the shoulders of the side passengers under impact. As a result the present invention will under side impact conditions, compress the side bolsters and back /shoulder bolsters, while maintaining the survival space of the back and bottom rests of the seats, while the shoulders overlap and thereby permit the compression of the arrangement of the passengers under side impact.

Another additional embodiment provides for the convertion of the vehicle as described in the present invention into an aircraft with the same robust safety arrangements, but also adapted for functioning as a helicopter type vehicle with the necessary changes in the architecture to provide for the power source at the top of the passenger cab, while retaining a reduced wheel base if necessary for balance and manouvering considerations. Notably the present invention can therefore have embodiments that are aircraft with the side, front and back impact protection that is required for use of such vehicles on conventional roads exceeding the stringent minimum safety standards of all road vehicles.

One version of this additional embodiment has the front module 194, along with the crank 196, and the pivoting socket for pivoting about a pin on the front end 190, 192 mounted on a pair of elevator beams 199, each supported pivotally near the center of the vehicle 188 or in its vicinity, and constructed such that they support the front module when in the near horizontal position when the vehicle functions as a ground vehicle. Each of the cranks 196 have one of their pivots mounted on the corresponding elevator beam 199. the other pivot of the ctrank being on the module 194. The module in the near horizontal position during functioning as a surface vehicle will have the notches at the front end resting in the pivot pins on the front end 190 and locked adequately in place.This arrangement, ensures that in the event of a collision at the front end, the pivot pin engages the slot and pushes the front module backwards at the pin position, thereby forcing the crank 196, that is fixed on the stationary elevator beam 199 at the rear end, to move the rear pivot on the front module upwardsand thereby ensure the performance of the present invention with this structure as noted herein. When elevated by mechanical, pneumatic or hydraulic means well disclosed in the background art, the elevator beam inclines the front module to an adjustable angle to the vertical. Threby allowing a folded propeller that may be mounted at the front end of the said front module and the vanes of which may be folded in a storage position on the sides of the front module and its top and bottom in recesses designed for the purpose (the length of the vanes /blades can be greater for those stored on the sides of the front module and shorter for those stored at the top and bottom of the front module. Figures do not show the folded propeller) this propeller can be engaged to the motor and/or engine that is in the front module to provide loft for the vehicle to fly. In addition the front end 192 and back end 193 may be retracted as described in the present invention, to fold the back end upwards and to reduce the wheel base and the maneuverability of the airbourne vehicle. The position of the rear module can be varied with controls on the retraction of the back end to provide the right balace characteristics of the vehicle when air bourne. This additional embodiment is bewst suited for a drive by wire vehicle as the front module is

not directly connected to the wheels and a transmission system to the wheels is not necessary, thereby reducing the weight of the vehicle. Low mass wheel motors are another useful addition to propel the vehicle as a ground vehicle. Such wheel motors may be used to drive small propellers to provide lateral thrust needed for the vehicle when in flight. (in some embodiments after being disengaged from the wheels)Forward thrust can be provided from the main propeller with an inclined elevator beam.

Moreover, in this additional flying embodiment and in an embodiment for a standard ground vehicle, the shock absorbtion systems in 189, 190 may have shock absorbers that may be decoupled to provide even greater retraction movement under servo control.

Yet other flying embodiments of the present invention have dual elevating beams that engage both the front and the back modules thereby permitting both modules to to be elevated and drive the propellers or rotors. These embodiments will have the modules in the elevated position to be at a small angle to each other so that the rotors do not collide while rotating.. Moreover they have contra rotating rotors or propellers. The inclination of the rotors or propellers may be changed to facilitate forward sideward or backward movement of the vehicle.

Yet other flying embodiments have dual elevator beams on each side for each module so that they may elevate the moduled to a position substantially above the passenger cabin without rotating the modules substantially.

Yet other flying embodiments of the present invention maintain the modules in the normal operating position as in a surface vehicle as noted herein, but with rotor or propeller shafts that may be angled upwards to a substantially vertical orientation. These embodiments may have rotor or prpeller shafts that are long so that the center of lift or the point at which the upward thrust of the rotors applies will be well above the center of gravity of the vehicle thereby providing greater stability.

Yet another flying embodiment of the present invention, has each of the seats on one or more mounts (these mounts can be the secondary & primary slide arrangements noted herein), such that under substantial vertical load as encountered in a vertical crash situation the mounts tilt so that the seat support for the back or spine of the passenger or operator inclines backwards so that the axial load on the spine due to the vertical deceleration is reduced by supporting the upper body in a substantially horizontal or inclined position. These tilting mounts may be attached to the fixed body members of the vehicle and maintained in the operating position using friction or impact shear load induced decoupling arrangements. One such embodiment has a pair of primary and secondary slides as in a conventional non-flying embodiment as in figures 10 D1 – 10D4 but in addition has the central mount of the primary slide rearward on the vehicle attached to the central body member with a key and slot arrangement with a key on the lower primary slide mount and the slot on the central body member 201 in Fig 10D5, such that under vertical impact the key decouples and slide into the slot vertically thereby rotating the seat about the primary slide on the forward side of the seat resulting in a "cradle" position for the seat that protects the passenger from a axial load on the spine. Yet another embodiment may use the two center mounts of the lower primary slide in Fig 10 D1-10D4, linked rigidly together by a member that is shaped in the arc of a circle in the vertical plane of the central body member with center

above the central body member, said rigid member housed in a slot in the fixed central member, such that under normal operation and under lateral impact the linking member is not detached from the fixed central body member of the vehicle and transfers the lateral load to the fixed body members, but under vertical loading of the seat (and the primary slide) the linking member detaches and slides in the housing slot to describean arc of the same circles that defines the profiles of the slot and the linking member, the center of said circles being so arranged that with this circular movement of the linking member in the slot the center of gravity of the passenger or operator and the seat are lowered, and the seat rotates in a direction to a cradle position where the passenger or operator is in a reclining position or the upper body of said passenger is in a near horizontal position.

Yet another additional embodiment of the present invention has the passenger support mechanism (the seat in many embodiments) supported by a pivot substantially in the center of the seat and nea r the lower support element of the support mechanism and the occupant contact surface thereof, with an axis along the direction of motion of the vehicle, and motion about this pivot being spring controlled to return the seat to the operating position under no external forces. The pivotal movement is also heavily damped to absorb energy as the seat is moved in either lateral direction from the operating vertical position. The pivot is attached on its other end to the impact decoupler/secondary slides that have been previously disclosed. In the event of the side impact, the internal airbags or equivalents that may be damped springs, will initially move the passenger support mechanism pivotally prior to the impact decouplers of the secondary slide being decoupled. Therefore following impact, the head and thorax start moving first towards the impacted surface of the vehicle (or accelerate more slowly than the impacted surface of the vehicle) and then the body rotates with the passenger support mechanism away from the impact, and finally if the impact is severe enough, the entire body with the passenger support mechanism moves when the impact decouplers are decoupled. This additional embodiment gives the head and thorax a greater motion space than the pelvic region as the body accelerates, and is particularly useful if the movement of the lower seat is constrained by fixed elements of the vehicle such as a center tunnel that is not designed to collapse. The longer time (and distance) allowed for the head and thorax to accerate give them a potentially lower peak acceleration of the acceleration is designed to be as near constant as possible be design of the springs and dampers controlling the pivotal movement and the resistance to motion caused by the secondary slides when decoupled. Notably in this additional embodiment the head and neck are well supported by elements of the passenger support mechanism.

Yet another additional embodiment extends the embodiment shown in figures 10D1-10D4 where the safety beam upper element is concentric to the safety beam lower element. Here the safety beam lower and upper elements have an interlocking worm drive that is driven at one of the ends of these elements to move the safety beam upper element into the access position and back from the operating position. Thre can be multiple concentric telescoping tubes that constitute the safety beam upper element provide an accordian type extension the drive in this embodiment may be between the safety beam lower element and the section of the safety beam upper element sections

that supports the passenger support mechanism directly or indirectly through the impact decouplers/secondary slides. Furthermore in this embodiment the inside airbag equivalents may be damped spring assemblies that engage the cylindrical safety beam lower and upper elements when in the operating position. This will be particularly useful for hinged protector shields that move separately to the passenger support mechanism such as in gull wing dorrs. Such hinged protector shields may have pins to engage the safety beam lower and upper element in the operating position.

ALTERNATIVE EMBODIMENTS

In an alternative embodiment to the preferred embodiment, the present invention may use hinged Protector Shields (106) that lock into the Primary Slide (107) when closed. This will allow the arrangement to work for mounting and dismounting the vehicle with either the Primary Slides deactivated or non-operational as well as when they are functional. The seats may also be mounted on rotating mechanisms or extension arms rather than a primary slide, to assist passengers in mounting and dismounting.

Another alternative embodiment utilizes co-axial sliding mechanisms that constitute said rotating mechanisms rather than the primary slides such that the fixed and rotating members of said rotating mechanisms have an adequate area of contact and reaction to support lateral collision forces.

Another alternative embodiment is illustrated in Figures 5A and 6A. The "door" that contains the perforation shield (105) with distance/velocity sensors (113), the external airbags (104), the shock absorbers (103) and the protector shields (106), hinges down on the pivot (112A) to provide support for the upper primary slide. The inner surface of the Protector shield is designed to perform the function of the lower Primary slide (102). This embodiment will be particularly useful for larger vehicles with a plurality of seats on each side of the vehicle. These multiple seats may be mounted on separate sections of upper primary and secondary slides.

Yet another embodiment has the at least one shock absorbing device and the at least one force distributing protector shield comprising a deformable protective shell mounted to the fixed elements of the vehicle on the outside of the passengers so that in the event of a side impact, the shell distributes the impact force to the fixed body members of the vehicle while by deforming, absorbs some of the energy of impact.

Another alternative embodiment is illustrated in figures 1D to 4D where the Shock Absorbers (103) excluding the External Air bags (104) are mounted on the inner surface of the protector shields (106). As may be seen from the drawings, in this particular embodiment, the shock absorber excluding the external air bags are locked directly to the lower primary slide (102, 102') in the operating position, although in another configuration the locks my be between the protector shield and the lower primary slide in the operating position. Such embodiments may be designed to allow limited intrusion of the protector shield with resistance provided by the shock absorber (103) thereby reducing the peak acceleration sustained by the vehicle body under impact. Notably, as the passenger environment is protected and moves away from the impact, crush injury to the passenger is avoided. This is a unique feature of this invention where both the crush injury of the passenger and the peak acceleration of the vehicle (and the passenger as a

result) may be minimized at the same time. Conventional designs try to minimize intrusion by bracing the side of the vehicle with beams and thereby increasing the peak acceleration of the vehicle, or increasing intrusion to reduce the peak acceleration but allowing greater crush injury.

Another alternative embodiment may have a contoured safety harness with a different shape to that of the preferred embodiment. Figures 12 A 1 to 12 C1 illustrate an embodiment of a safety harness using a slightly different geometry but performing the same function in the same way as in the preferred embodiment.

Some embodiments of the multi-element contoured seat may have sides that fold downand away from the passenger. This feature is useful particularly for the inner side of the passengers near the side of the vehicle and for both sides of the passengers in the middle of the vehicle, if the center seats are fixed and not ejectable. Notably however, the sides lock in the operating position and brace the seat from lateral compression, thereby protecting the passenger.

Some embodiments have seat bottoms comprising two symmetrical elements each with a support surface for supporting the pelvis of the passenger, where the said support surface may be laterally displaced to space out the symmetric elements and/or angled about an axis horizontal and in the direction of motion of the vehicle. Such an arrangement for the seat bottom allows adjustment of the supprt provided by the seat to be lateral as well as vertical to the preference of the user. Moreover, if the said symmetrical elements are designed to be curved to accommodate the pelvis of the user, there can be substantial lateral support for the pelvis of the user, in many of the preferred angular orientations of the seat elements, in the event of a lateral impact.

Some embodiments of the seats may have sides that could include arm rests, side bolsters and other elements as disclosed in this invention, that that drop down or back on the door or access side at the time of egress and ingress, particularly in embodiments that use conventional doors for access. Activation for these movements can be with the switching on and off of the ignition switch for the vehicle.

Yet another embodiment raises he seat bottom at the time of egress and ingress with servos or pneumatic/hydraulic systems, so that the seat members on the sides of the sat are relatively lower to the seat bottom thereby facilitating egress and ingeress of the passenger. . Moreover, arrangements to raise the seat bottom may in addition in some embodiments help negotiate a high "door" sill by the sliding or rotating seats at egress and ingress.

Yet another embodiment using conventional doors, has the arm rests on the door side integrated in to the doors but protected and decoupled from the door members on its outside by inside air bags. This design would have these arm rests locking into the seat when the door is closedthereby providing the decoupling for the entire seat with the inside airbag during lateral impact.

Another alternaive embodiment uses shock absorbing devices mounted at each end on each of the two surfaces of the impact decoupler/secondary slide substituting or supplementing the inside airbags.

Another alternative embodiment may have an auxiliary slide behind the seat and of any convenient height. This embodiment is shown in figures 1C -4 C. The figures illustrate the working of the current

invention with a high section of the central member of the indo skeletal structure behind the seats, but abutting the auxiliary beams in the operating position. As the High section of the central member (101) is behind the seats and the secondary slides (111), the seats and the secondary slides are free to move across the vehicle under impact as shown in figure 4 C.

Yet another alternative embodiment has an external seat profile as illustrated in figure 12 E 1. The higher rectangular external profile provides greater protection to the passenger.

Yet another alternative embodiment has a vertical extension/ "safety cage" (125) as shown in figure 10 A1, 10B1 and 10C1. Here the vertical extension/safety cage engages a beam across the top of the vehicle that may be supported by the shell structure of the vehicle (the figure shows only half the width of the vehicle). Such a safety cage/vertical extension can provide protection in a roll over situation and also provide additional compressive strength for the vehicle, and may function as a fixed or retractable roll bar. In some embodiments such a vertical extension "safety cage" will perform the function of the "B" pillar of the vehicle under lateral impact. Notably no "B" pillar is needed to support rear door hinges in the present invention. Moreover, in some embodiments the beam arrangement across the top of the vehicle or other support structures on the roof section of the shell may be designed to be rigid on compression but telescope out with the secondary slides under impact using appropriate logic to drive the locking mechanisms, thereby providing a protective cage even when the seat is in the ejected state.

Yet another embodiment, deters a roll over following side impact, by implementing an "outrigger" arrangement having reinforced upper primary slides and/or secondary slides and bracing brackets anchored to the fixed members of the vehicle that hold these slides in their extended substantially horizontal position after extension under impact, without permitting them to buckle under a vertical forces encountered under the initial stage of a roll over situation.

The preferred embodiment has the external airbags or shock absorbers triggered on detection of an expected impact as noted. This implies that on the far side (non-impact side) if there is possible secondary impact from a second object, the same mechanisms will deploy the external airbags on the second side, thereby protecting the far side occupant in the event of a second object hitting the vehicle soon after the first. An alternative embodiment can have distance/velocity sensors mounted in positions on the front and back edge of the perforation shields or protector shields to facilitate better detection of objects approaching the vehicle at wide angles to the perpendicular direction. Yet another alternative embodiment to this will have both impact side and far side external airbags deploy on detection of the first impact.

Another alternative embodiment has a safety harness/shield as illustrated in Figure 12H2. This embodiment of the safety harness is mounted on spring loaded hinged supports at the head support section of the multi element adjustable seat (137) - similar to conventional supports for the headrest, and to lockable supports between the arm rests (138) or on the side bolsters of the multi element adjustable seat. The spring loading will support the weight of the harness and thereby retract the harness when unlocked. The harness includes a hinged and spring mounted shield (130) that may pivot on the lower safety harness support (138), The passenger side of the shield, has on its

surface an implementation of a Passive Air Cushion System that uses the pressure in one or more sacrificial chambers which under pressure transfer air to one or more micro-air cushionsthat protect high priority anatomical regions. In this embodiment, the passive anatomical micro air cushion (131), derives it inflation source from the sacrificial chamber (139) at the lower end of the shield of the safety harness, that is compressed by a much greater body mass under impact. In a frontal collision the force of the more massive parts of the body on the sacrificial chamber will deploy the passive anatomical micro-air cushions to protect the face and the neck. The narrower sections of the aircushions and flow control mechanisms if installed, will cause some visco-elastic behavior and in addition cause air speed amplification to create faster deployment. While this mechanism activates the shield (130) may pivot down to take some of the impact energy. The shield is shaped to the contour of the human body head and neck when it is forced forward as in a frontal collision. This embodiment may in addition have multiple or variable postion harness support anchor points on the arm rests or the side bolsters that are part of the multi-element seat, to accommodate people of different proportions. Moreover this embodiment may have in addition an additional bracket that moves the anchor point of the lower safety harness locking supports substantially forward, and provides a supplementary passive anatomical micro-air-cushion that can be mounted on the permanent micro-air-cushion on the shield, to accommodate pregnant women, and the special critical force distribution they can withstand.

In this embodiment, the two pivoted arms swing forward under collision forces the moment created by the shield with the body pressure against it, and extends the upper extending arms (133) to absorb some of the shock and to provide a space for the forward movement of the upper body. The elbows (132) facilitate the relative angular movement of the upper arms and lower arms of the safety harness (133,134). They are spring loaded to ensure that they support the lower parts of the harness when unlocked to allow the entire harness to move up and away from the body when unlocked without any force being applied. Under side impact the passiveanatomical head and neck micro-air-cushions deploy to protect the head and neck under relative lateral acceleration. Notably the passive anatomical head and neck micro-air-cushions can be actively deployed or as in this embodiment passively deployed by a discharge of air from sacrificial chambers between the seats or on the outer surface of the seats and mounted on each of the seats, so that lateral pressure will inflate the anatomical head and neck micro-air-cushions. The sacrificial chambers offer secondary impact protection by cushioning the seat. Notably this embodiment does not use any active airbags in the vicinity of the human body, reducing the risks associated with the high energy external deployment devices. The adjustable head rest (136) follows conventional design but is here mounted on the safety harness hinged mounts.

Figure 12 I 2 shows the passive anatomical micro-air-cushions deployed (the sacrificial chamber has been compressed and the top region is full and ready to protect the face and neck in a frontal impact. Figure 12 J 2 shows the anatomical head and neck passive micro airbags deployed under side impact, ready to support the head and neck in a side collision. Notably this embodiment uses a new concept where the impact energy is redeployed for protecting vital parts of the impacted object which are often embedded inside the object, using fluid transfer – in this case air transfer. Force and velocity amplification or deamplification can be acheieved with the geometry of the

interconnections, the sacrificial chambers and the micro-air-cushions. The sacrificial chambers can be used for secondary impact protection as well by carefully controlling the flow parameters. This is illustrated in Figure 17. The approach obviates the need for active airbag technologies in the vicinity of sensitive equipment, living organisms and indeed people.

This embodiment of the harness allows movement within the vehicle for passengers when it is unlocked and allowed to swing up within the vehicle as shown in Figure 16D. However, visibility is somewhat obstructed preventing the driver from driving without locking the harness in place.

In this embodiment of the safety harness entering and leaving the vehicle are facilitated by the entire device swinging away from the body as shown in Figures 16 A,B and C. The passenger simply needs to stand up to leave. To enter the passenger simply sit down and place his/her feet on the foot rest (141) and retract the slider mechanism. This embodiment also has radar or infrared detectors as on elevator doors to detect limbs in the way of the retracting sliding mechanism for the protection of the passengers.

Figure 15C shows the parts of this embodiment and the adjustable arm rests.

Another embodiment of the shield on the safety harness has a folding section at the top that can be straightened and locked in place for adults and folded down for children.

Another embodiment uses flexible netting on part of the shield surface to protect passengers under impact. In this embodiment, the shield.has a frame on which the netting is deployed. The upper end of the frame is adequately bent forward and then downwards to ensure that the passenger head and neck do not strike the frame under frontal collision. In yet another embodiment of this arrangement, the shield of flexible netting is designed for the head and neck and is normally retracted forward, and deployed on impact by initial forces by the lower torso of the passenger against the lower part of the safety harness/shield.

Yet another variation of this safety harness with netting on a frame, has telescoping frame members on the sides so that the height of the frame is adjustable by retraction of the telescoping members to accommodate children and small adults.

Yet another embodiment of the harness has an upper section of the safety harness consisting of spring mounted support arms mounted in the vicinity of the head rest and designed --when pulled down by the passenger --to swing down and over the passenger head and in front of the passenger. The support arms each having telescoping sections that connect to the shield, such telescoping sections having arrangements for an inertial racheting that prevent extension of these telescoping arms in the event of a sudden tension as in an impact. The lower section of the harness consists of short adjustable belts or arms that can be locked on the sides of the seat or on the inside of the arm rests as in a four point seat belt. This embodiment provides all the benefits of a four point seat belt but in addition has the benefit of head and neck support in the event of a collision. This arrangement allows protection with the telescoping sections and the adjustments on the lower end of the harness for different sized passengers.

Yet another embodiment utilizes the passive anatomical micro air cushion (131) at the top of the shield/harness that derives its inflation source from the sacrificial chamber (139) at the lower end of the safety shield/ harness. However, in this embodiment the anatomical micro air cushion is limited to only the top edge of the shield to support the head, neck and the upper thorax when deployed under collision conditions. This anatomical micro air cushion (131) is supported by pairs of telescoping tubes the lower member of each such tubes being fixed to the harness/shield support in the vicinity of the sacrificial chamber, and the upper member of each pair of telescoping tubes are attached to the passive anatomical micro air cushion (131). The outer tubes have contoured semi-rigid materials to conform broadly to the body shape. The lower and upper membersof each pair telescope into one another co-axially, and are lockable in different longtitudinal positions relative to the other member of the pair, thereby providing for a variable height anatomical micro air cushion. Airflow under deployment conditions is conducted either directly through said telescoping tubes or seperate tubes that have an "accordian" collapsible structure that can extend as the telescoping tubes do, and may be placed inside said telescoping tubes. The length of the telescoping tubes may be manually set with the locks or in other embodiments set by automated or computer controls that sense the size of the passenge from selected elements of the multi-element contoured seat.

Yet another embodiment has a harness as in figure 12H2 except that there is a safety harness support arm only on the outer side of the passenger towards the side of the vehicle. (i.e in sonme of these embodiments there is one Safety Harness elbow (132), one Safety Harness extending upper arm (133) and one Safety Harness Pivoting lower arm (134). Moreover the safety harness/shield support arm is designed such that upon release from across the lap of the passenger, the shield flips to a vertical plane in the vicinity of the vertical plane of said support arm. Thereby permitting the safety harness to swing over the head of the passenger even when the seat is only partially displaced for entry or exit from the vehicle. Often this may be useful when there is limted access space next to the vehicle.

Yet another embodiment , principally for vehicles with drive by wire technologies, has the vehicle controls mounted on the shield . If a steering wheel is used this may be mounted on the front surface of the shield (on the surface opposite the passenger). Thesteering wheel or other controls may have distance adjustments for ergonomic positioning.

Yet another embodiment principally for drive by wire technologies , has the driver controls mounted on the contoured arm rests of the car. Adjustments for the arm rests will include further controls for the ergonomic positioning of these controls on the arm rests.

Vehicles, principally those that utilize drive by wire technologies with either of the above configurations, will have the entire area below the windshied free of controls. This embodiment utilizes this area for a GPS driven positioning display that mimics the view ahead of the driver. The display system may use vector imaging techniques or non-linear image mapping techniques that are well disclosed in the background art that provide the same perspective to the driver on the display as what he sees on the road ahead, thereby minimizing mental processing of

information in establishing a correspondence between the image and the actual physical position and orientation of the vehicle thereby reducing reaction time for action by the driver. Furthermore, the positioning of the display just below the screen ensures that there is minimal spacial disorientation of the driver in turning his/her head to look at the screen thereby reducing further the mental information processing needs and improving further the reaction time of the driver. In some embodiments when there are controls such as a steering wheel in front of the driver, a fixed or a "pop up" screen just below the windshield or a projection onto the lower windshield may be utilized. The image may include the destination and path to that destination and may be at a different scale to the perspective of the driver ahead of the vehicle. This embodiment and variations provide a unique system that conventional GPS navigation systems do not provide in speeding up driver reaction times.

Another embodiment has air conditioning micro-ducts on the seating surfaces and the safety harness/shields, for the comfort of passengers, particularly in open vehicles.

Another alternative embodiment has the "Open" switch for the slide on the inside of the vehicle designed the "press bar" so that the intuitive reaction of the passenger to "open the door" is harnessed. However, this can be deactivated when the vehicle is in motion.

Another alternative embodiment has a center console that is designed to crush under impact as shown in Figures 1F – 4F, thereby minimizing the ejection of the far side passenger on impact.

Yet another embodiment has a detachable center console that includes part of the center tunnel that houses the transmission shaft for rear wheel drive vehicles with front mounted engines and several cable and hydraulic systems. One such embodiment has perforated or weakened line of detachment or an interlocking arrangement on the center tunnel that delineates the section of the center tunnel that will be detached from the remaining part of the center tunnel in the event that the seat carriage with secondary slides apply sufficient shear force on this line of intended detachment. In embodiments that require the separation of the two sections of the center tunnel by cutting through the weakened tunnel material along the predefined line, a cutting edge mounted on the moving surface of the secondary slide may be used to cut through the tunnel material in the event of an impact. Notably, in the event of a side impact, the lateral torsional force system will tend to raise the impact side of the vehicle. Therefore the transmission shaft in this situation will be at the lowest level of the center tunnel within the design parameters, and therefore will not be in the way of the seared section of the center tunnel which will be at the top of the tunnel. Moreover, the pipes and cables that are mounted within the tunnel may be mounted such that they have adequate slack in the event of such a displacement of the sheared section. They may also be mounted low enough on the center tunnel to be below the line of shear on the center tunnel, which will avoid the need for special considerations for the cables and pipes in the event of the shear of the upper tunnel. In the event that the design of the vehicle requires a high center tunnel where the transmission shaft will not be low enough to allow the traverse of the sheared tunnel over it, the transmission shaft may be designed to fracture or decouple in the region of the sheared section of the center tunnel, in

the event of lateral forces as in this situation but still transfer the required torsional forces to drive the vehicle. This may be achieved with suitable couplings on the transmission shaft. Another important consideration for this embodiment is that the peak acceleration of the vehicle following impact and the resulting peak forces precede the time at which the shear of the tunnel will occur and therefore the integrity of the tunnel is maintained at the time when the strength of the tunnel and the remaining structure is most needed. The length of the detaching section of the center tunnel and indeed the other parts of the center console mounted thereon may be increased in some embodiments to accommodate the legs of the passenger as the seat moves towards the center of the vehicle.

Another alternative embodiment has the internal airbag partially filled at all times, so that in the event of no deployment of the external airbags either because of technology failure or non installation or other reason, the passenger and seat arrangement are cushioned even prior to further inflation of the internal airbag on deployment on impact. Shock absorbers may supplement the operation of the internal airbags in this embodiment with partially inflated internal airbags under normal operating conditions.

Another alternative embodiment can have the internal airbags deployed on impact as noted with such deployment effected by inflation by some of the compressed air of the external airbags on impact, thereby providing "acceleration de-amplification" for the movement of the passengers on impact.

Yet another embodiment has proactive sensors deploying the internal airbags directly, without the installation of external airbags.

Yet another embodiment of the invention has a retaracting canopy stored in the roof of the vehicle, and attachable to the protector shield or attached components such as the side window, when desired. When attached, the canopy will deploy over the seats when in the extended or loading positions, thereby protecting the seat and the passenger from rain or other snow while entering or leaving the vehicle.

Yet another embodiment has external airbags constructed using the Passive Air-Cushion System with micro chambers that are connected to each other by restricted paths that provide visco elastic energy absorbtion in the event of some sections of the airbag being impacted while others are not, thereby forcing air from the compressed micro chambers to the other micro chambers, each of the micro chambers functioning as either a sacrificial chamber or a Micro Air Cushion on impact. This embodiment may of course have external airbags proactively deployed in the manner described herein, prior to impact and their performance as Micro Air Cushion systems. Yet another variation may include one-way valves between the chamber directly connected to the inflation source and each of the micro-chambers (implementable for example with flaps against an aperture) so that inflation may be achieved rapidly, and then the Passive Air-cushion benefits realized on impact.

Yet another embodiment uses the Passive Air-cushion system to protect passengers from "Whip Lash" injury, by providing Micro Air-cushions in the vicinity of the head and neck, and providing sacrificial chambers that are compressed in the event of a rear end collision. In some embodiments the sacrificial chamber can be mounted

below the seat with one face mounted to the vehicle structure and the other face mounted to the seat of the passenger, the seat being mounted to the support structure to allow controlled limited rearward movement relative to its mountings to allow compression of the sacrificial chamber by the inertial mass of the passenger and seat on impact.

Yet another embodiment utilizes multiple adjoining but seperate Passive Air–cushion systems where on esuch system connects the external airbags (sacrificial chambers) with internal airbags (micro Air-cushions), and another such system connects different and distinct internal airbags (sacrificial chambers) to micro Air-cushions in the vicinity of the passenger's body, thereby creating a cascading system of Passive Air - cushion systems. These embodiments may of course have external airbags proactively deployed in the manner described herein, prior to impact and their performance as Micro Air Cushion systems..

Yet another embodiment utilizes the independence of the venting of micro aircushions and the venting of the sacrificial chamber, to maintain the inflation of the air cushions well after the time frame for impact absorbtion by the sacrificial chamber such that the passenger is held in a safe position for a predetermined time. Some such embodiments may hold the passenger for a period of upto say 3 seconds to protect the passenger in the event of a roll over of the vehicle. Among these embodiments, some may have rollover detection devices that sense the orientation of the vehicle that slows the venting of the micro air cushions in the event of the commencement of a rollover of the vehicle.

Yet another embodiment comprises actively inflated airbags of minimal volume each connected to a plurality of anatomical micro aircushions, mounted on the multi element adjustable seat, that deploy on either side of the head and neck, either side and ahead of the torso and thorax below the arms and either side of and above the upper legs, said airbags inflatable in the event of a detection of a side impact thereby holding the passenger in the multi element adjustable seat for translation with the motion of the multi element adjustable seat propelled by the internal airbag or the internal shock absorbing devices.

Yet another embodiment utilizes an auxiliary brake attached to the secondary slides in addition to the friction limited sliding arrangements of the secondary slide, to provide a further control on the rate of movement of the secondary slide under side or lateral impact.

Yet another embodiment utilizes a foot safety switch attached to the foot rest, that activates the sliding mechanism to move the sliding seats into and out of the vehicle. The foot rest in some such embodiments may be bar that is depressed to move the slide into and out of the vehicle. These foot rests being designed to avoid ankle injuries in the event of rear collisions sustained by the vehicle.

Yet another embodiment uses supplementary porous filling materials within prefilled internal airbags designed with suitable vents to change the compression characteristics of the inside airbags under impact.

Yet another embodiment utilizes pressure memory capable materials on the surface of the seats or passenger supports so that surround seats contour to the exact shape of the body for further comfort of passengers and also better support under collision conditions.

Yet another embodiment for proactive impact detection uses one or more of radar detection and motion detection as in machine vision using visible or infrared or ultraviolet spectral components. The use of both these approaches for detection may use algorithms that estimate the speed of approach of the impacting object and the distance, and thereby have independent measures of the required inflation of external or internal airbags. In conjunction with each other in some embodiments, the failure probability of the system is reduced by using the worst case scenario of impact –with regard to velocity and time of impact -- detected by these two systems. The two measurements may also be used in stochastic estimators to provide a better quality estimate of the distance and velocity parameters of the impacting object, when the two independent measurements are sufficiently similar to exclude the possibility of failure of either system to within a predefined error threshold. Moreover, those embodiments that use more than one camera in the machine vision system for motion detection can make 3-dimensional estimates of the impacting body and thereby from a database of known object shapes and sizes, predict the type of object and thereby its mass for better estimation of the best response with the deployment pattern and inflation levels of the external and internal air bags. Still other embodiments with a single camera in the machine vision system may utilize the divergence of the profile of the impacting vehicle as it approaches to predict relationships between the impact velocity and distance by assuming a constant velocity of the approaching object and using the non linearity of the projection of the object on the projection plane of the machine vision system. Moreover, some embodiments can use the shape of the impacting object from object recognition algorithms in the machine vision system with predefined data of known object types, to predict the type and mass density of the object and accordingly deploy the airbags appropriately. Some of these embodiments can work with distance and speed measurement in a radar based system and thereby together predict the size and mass and shape of the impacting body. Airbag deployment characteristics can thereby be optimally designed for impact with for example pedestrians, trucks or cardboard boxes at varying speeds appropriately.

Furthermore, in embodiments with one machine vision camera and one radar detector in the system, in the event of failure of the radar detector, the machine vision system alone can determine the type of impacting object (and its worst case size) and the velocity of approach for a given size of the object from the divergence of the profile of the object, and assuming a worst case size scenario, deploy the airbags appropriately, and in the event of the failure of the machine vision system the radar detector can detect velocity and distance and deploy the airbags assuming the worst type of object.

Yet another embodiment will use secondary slides whose sliding surfaces are slightly inclined upwards towards the center of the vehicle, to allow the secondary slides to negotiate a center tunnel with reduced need for any arrangements to shear a section of the tunnel. The connection surfaces of the secondary slides to the fixed

elements of the vehicle at the time of impact and the vehicle seat may be arranged to support the seat in the required substantially upright position.

Yet another embodiment, has wheel chairs as passenger support mechanisms for the disabled, with collapsible wheels such that the chairs may be backed into clamps that attach on the lower side of the chair supports. In some such embodiments (as illustrated in figures 18A to 18 J) these clamps along with the lower cushion of the car seat 148 – (which is specially made to accommodate the chair support cross members), are extended forward on tertiary slides or extension arms with hydraulic automation, such that the movement forward and if necessary down, supports the wheel chair by locking the chair clamps 149 to the chair cross supports 150, and then providing adequate support for the passenger and the wheel chair. The Teritiary Slides or extension arm are supported by the impact decoupler/ Secondary Slides which are in turn attached to the Upper Primary Slides in the extended or loading position. Figure 18B illustrates the position of the seat bottom and clams just below the wheel chair prior to attachment to the wheel chair. Once the hydraulic mechanism raises the wheel chair off the ground, the Primary Pivot of the rear wheels 151 may be unlocked and the wheel swung up backwards and locked as noted in Figure 18C. Notably the Rear wheels support much of the passenger weight when the wheel chair is used and therefore in addition to the pivoting Principal Rear Wheel Support 152 the rear wheel in addition has a Rear Wheel Support Strut 153 that supports the compressive load when the wheel chair is operational. Threafter the front wheels may be unlocked and swung back on the Primary Pivots for the Front Wheel 157. This is illustrated in Fingure 18 D.

Thereafter the space below the wheel chair is clear and the tertiary slide or arm mechanism can move the wheel chair back and lock it with and against the Seatback 156 which is specially shaped to accommodate the cross support members of the wheel chair. This is illustrated in Figure 18 E. Some such embodiments may have the option to release the rigid back support mouting of the wheel chair 158, and thereby benefit from the reclining options of the vehicle seat back. In the process of moving back to the seat back 156, the spring loaded locking sleeves 155, that support the Secondary pivot for rear wheel retraction 144 are pushed forward relative to the wheel chair body thereby releasing the Secondary Pivot for rear wheel retraction 154 to allow the wheels to swing in and lock behind the seat back 156. This is illustrated in Figure 18F. The wheel chair is then in a position on the extended impact decoupler/secondary slide to be transported into the vehicle. Notably in this wheel chair conversion embodiment, supplementary side and back air cushions may be inflated to fill in the areas where wheel chair support members are in the vicinity of the passenger and also to hold the wheel chair structure securely, thereby providing further protection in the event of a collision of the vehicle. This wheel chair conversion embodiment has all the side impact protection as the regular seat and has all the optionality for front impact protection of the safety shield/harness or more conventional options. Figure 18 G shows a plan view of the wheel chair prior to the insertion of Seat lower cushion and support structure. Figure 18 H illustrates an elevation view of the wheel chair and the seat lower cushion and support structure. Still other of these embodiments may use turn tables or other rotating mechanisms rather than the tertiary sliding

arrangements or extending arms so that the wheel chair may be directly loaded on a turn table mounted on the impact decoupler/secondary slides, and then rotated into a driving or passenger position when retracted into the vehicle.

Yet another embodiment has anatomical micro-aircushions on the left and right edges of the support surface of the safety shield connected to selected sacrificial chambers along the bottom edge of said support surface. This will provide additional support for the passenger in a side impact, by assisting in preventing body movement outside the countoured seat under collision conditions.

Yet another embodiment has anatomical micro-aircushions on the outer edges of each of the countoured seats, particularly to cover a part of the front of the shoulders the legs and torso in the event of a side collision. These anatomical air-cushions use sacrificial chambers on the sides of the seats.

Yet another embodiment minimizes ejection hazards by controlling further the lateral movement of the seats under side impact. In these embodiments, the Upper primary slide is connected to the locking mechanisms that hold it to the vehicle under operating conditions through shock absorbers or spring mechanisms that allow controlled movement of the upper primary slides out of the vehicle when the vehicle sustains a side impact from the far side. In such embodiments the locks do not disengage when there is a side impact, as the shock absorbing devices provide the required controlled lateral movement of the far side upper primary slide under impact.

Yet another embodiment has a flexible stretchable (or folded) material that is bound to the protector shield and the "doors" of the vehicle on one of its edges where it makes contact normally with the vehicle body, the other edge of the flexible and stretchable material is bound to a frame that locks to the vehicle body under operating conditions. Under normal egress and ingress the frame along with the "doors" with the flexible, stretchable material operates as one unit the frame being held together with the "door" with door impact decouplers that fracture or disengage under impact, thereby allowing the "door" and the upper primary slide on the far side to extend out of the vehicle while the frame remains locked to the vehicle, and stretching the flexible, stretchable material so that passenger body extremities are not ejected from the vehicle but are retained by the flexible stretchable material within the vehicle.

Yet another embodiment has preinflated inside airbags that are deflated when seats move outwards (on the far side) under impact, threby creating more space within the vehicle, minimizing the need for ejection on the far side under impact.

Yet another set of embodiments has a child or infant support mechanism (CISM) as the passenger support mechanism. For frontal collision protection these embodiments may have the following arrangements. One such embodiment has the CISM 224 comprising two support pins 225 that are located above the center of mass of the occupant and the support mechanism structure and engages a rotary damped spring with shock absorbing device (not shown) when inserted into the supports 215. and locked therein. The damped spring mechanism prevents rotary motion of the pins in the supports except under front collision conditions when the torque generated by the inertial mass of the occupant and the support mechanism structure with a center of mass lower than the pivot,

swing the CISM down and forward thereby bringing the occupant closer to a foetal position with the reactive force for deceleration applied to the occupant significantly from the lower support structure of the CISM. The final position of course is designed not to bring the occupant to a postion that would cause excessive spinal compression. The head and neck on the other hand, will engage and be protected by a safety harness as disclosed in this invention (not shown and the body will face substantially away from the impact. Furhtermore in a front impact, the relevant embodiment has the extendable spring damper 216 which contains a damped spring may extend to increase shock absorbtion, while other embodiments. have a pivotally mounted arrangement that extends under front impact. The Arms that constitute 216 Extendable Spring Damper loaded attachment for CISM support in these latter embodiments are air damper (internal airbag equivalents) loaded for rotary movement. For some embodiments the mounting of the CISM can be rigid in the operating position i.e. the support of the CISM support pivots 225 on the support 215 may be rigidly fixed in the operating position, and support may even be on multiple points on the arm of 216 directly supporting the CISM, as the pivotal movement may be restricted to the elbow of 216 arms and its attachment to the support members (the Outer rotator 218 in some embodiments or Support Bracket 232 in others). In both the linear and rotational embodiments of 216 noted above, we have movement restricted to a position that orients the occupant to maximize support from the seat bottom and for head and neck support from the safety harness.

This set of embodiments of CISM supports and indeed any embodiments of Passenger support mechanism may have for side impact protection, one or more of a nested set of the slidng arrangements disclosed in this invention. i.e. The embodiments can have safety beam lower and upper elements –1 attached to the impact decoupler/secondary slide –1 as disclosed herein (sliding arrangement 1), and a safetybeam lower and upper elements –2 attached to the impact decoupler secondary slide –1 with its own impact decoupler secondary slide –2 (sliding arrangement 2) which is attached to the passenger support mechanism that may be an CISM or other passenger support mechanism. Some embodiments use a first rectangular section linear slidng arrangement, and a second rectangular section curvilinear sliding arrangement (inner and outer rotators) both with shock absorbtion with internal airbag equivalents (which may be air shock absorbers or similar devices). Other embodiments use Cylindrical linear sliding arrangements (sliding arrangement 1) and a rectangular curvilinear sliding arrangement (sliding arrangement 2). Still other Embodiments, use cylindrical linear slides for sliding arrangement 1 and create a virtual curvilinear sliding arrangement by pivoting the CISM support Bracket 232 in the center and control its movement by an internal airbag equivalent for combined rotational and linear motion shock absorbtion. This particular arrangement therefore reduces the structure to a single sliding arrangement and a single pivotal arrangement rather than two sliding arrangements. These embodiments are of course general to any passenger support mechanism including seats. For example the some embodiments may be accomplished with curvilinear ssecondary slide on the second set of sliding arrnagments below the seat. Other embodiments may be accomplished with a pivotal arrangement to complement the single secondary sliding arrangment thereby creating a virtual curvilinear second sliding arrangement.

Greater detail of the lateral impact protection arrangements of this set of embodiments for the CISM are described below:

The first embodiments in Figs 10A 1- 5 have the exendable air damper loaded attachment 216 attached to the Inner rotator for the CISM 217 that mates with the Outer rotator and is slidably mouted thereto with internal airbag equivalents attached between these two elements (not shown) to keep the inner rotator in the operating position as shown in Fing 10E1, but to rotate as shown in Fig 10E3 under lateral impact, thereby orienting to the exent possible the occupant to face away from the impact and to increase the resistive force accelerating the occupant to be applied by the body of the CISM 224. The Outer rotator 218 has the secondary slide 111 attached to it. The secondary slide impact decoupler in turn is detachably attached to the safety beam upper element 107. Which is slidably mounted to the safety beam lower element 102 which is rigidly attached to the fixed body members of the vehicle which includes the rigidly attached seat.. Under a predetermined shear force the secondary slide 111 of 218 is designed to detach from the safety beam upper element 107 and thereafter be slidably attached thereon. Under operating conditions the Locking pin is in place. A lateral slide assembly assembly may be used for the linear or curvilinear sliding arrangement described herein. When the locking pin 226 engages the slot 227 in the secondary slide and the holes 230 in the safety beam lower and upper elements, the CISM is locked from lateral movement in the operating position. The Internal Airbag equivalents 228 are uncompressed and either one of them is ready for compression in the event of a side impact on the relevant side. When a side impact is encountered, the inertial mass of the CISM and the occupant may provide a lateral force larger than the critical shear force to decouple the impact decoupler between the secondary slide 111 and the safety beam upper element 107, and thereafter the CISM and attached elements to the Secondary slide 111 move against the compression of the air shock absorber or other device in the Internal Airbag equivalent 228. This provides shock absorbtion in lateral impact to the occupant in the CISM. Simpler versions of this arrangement that could be used in other embodiments may integrate the secondary slide 111 and the Safety beam upper element 107, with a matching slot in the safety beam upper element as present in the secondary slide 111. When the pin is in place, in this simpler arrangement the safey beam lower element is engaged to the ends of the two internal airbags this alone keeps the arrangement in the operating position. There is no impact decoupling in this simpler arrangement. Fig 10E2 Shows a loading or access position. This is a convenient position to load or unload the CISM with the occupant. It is achieved by removing the locking pin and sliding the Safety Beam Upper element 107 on the safety beam lower element 102.

Yet another embodiment, use cylindrical slides for lateral impact protection. Here Safety Beam Lower Elements 102 slidably support cylindrical safety beam Upper elements 107, which in this embodiment is a part of the secondary slide 111 (the safety beam upper element 107 may in other embodiments be detachably coupled to the impact decoupler secondary slides as disclosed in this invention). In this embodiment, the pin that locks the secondary slide (and safety beam upper element) to the internal airbag equivalents 228 (not shown), which are in turn housed in the cylindrical slot 229, within the secondary slide and the safety beam lower element, is located in a pin hole drilled through 231- the support key for the outer rotator from the secondary slide. The pin when locked engages a hole between two sections of the internal airbag equivalents that straddle the hole. The pin if engaged will therefore compress one or the other of the inside airbag equivalents in the event of the secondary slide moving under impact conditions relative to the

safety beam lower elements 102 and the fixed elements of the vehicle, providing shock absorbtion. However if the pin is withdrawn, the secondary slide will not engage the internal airbag equivalents 228 and will therefore slide easily to a loadiong or access position nearer the door, for placing the CISM in its supports or removing the CISM from its supports. A similar pin may be mounted on the outer rotator and engage between a pair of internal airbag equivalents 228 that are mounted inside slots between the inner and outer rotator and engaging on their outer end, the inside rotator. When the pin is engaged, it provides a surface resisting the movement of one of the internal airbag equivalents an thereby provides shock absorbtion under impact. However, when the pin is retracted back into the outer rotator, it allows free slding between the inner and outer rotators, thereby allowing the CISM mounts to be positioned to easily attach the CISM in a loading position. Moreover, in this embodiment a further refinement would be a cable activated lever that operated all the pins – in the linear and curvilinear sliding arrangements (similar to a bicycle brake cable) for ease of operation of loading and unloading the occupants.

Yet another embodiment uses cylindrical linear slides for lateral impact protection along with a virtual curvilinear slide implemetation using a pivoting arrangement between the CISM support bracket 232 and the support member 236 (support for secondary slides, CISM support bracket and internal airbag equivalents) and a dual internal airbag equivalent devicethat allows compression and expansion 239 mounted between the edge of the CISM support bracket 232 and the Fixed Support for safety beam lower elements and internal airbag equivalents 235. The 232 may have lateral support flanges for the CISM such that the CISM nests withing the 232 when in the operating position without obstructing forward deployment of the CISM in a front impact.. This embodiment has two safety beam lower elements that each slidably support on their outer surface one of the two secondary slides 111 (this embodiment uses the reduced form where the secondary slides are integrated with the safety beam upper element without impact decoupling as disclosed herein) The secondary slides are connected together and pivotally support the CISM support bracket with the support for secondary slides, CISM support bracket and internal airbag equivalents 236. The internal airbag equivalents in this embodiment is a dual element that can be compressed in both directions 238. Its center which is the active end that may be moved relative to its extreme ends under impact forces, is mouted to a support flange 237. This mount may be disconnected using a pin or other locking device to disengage the internal airbag equivalents to aid loading and unloading the occupant in the CISM. (An alternative embodiment uses single Internal airbag equivalents 228 that only compress but don't expant between their ends. Two of these may be substituted for 238, each rigidly mounted at the outer end to the fixed support flange 235 with their pistons pointing inwards and engaged into the circular slots. The Pin hole 240 for engaging the secondary slide and its attachments is also shown. This arrangement allows a single Internal Airbag Equivalent to compress while not affecting the other as the pinstons simply engage the slots and are not fixed within the slots.

In the event of a lateral impact the inertial mass of the CISM with occupant will exert a force through its center of mass that is within the substantially semicircular CISM support bracket, and will therefore compress the Internal airbag equivalents 238 attached to the Secondary slide. However, as the second internal airbag equivalent 239 is attached to the edge of the CISM support bracket this too will undergo extension or contraction depending on the side on which the impact was received. The reactive forece from the latter internal airbag equivalent will however rotate the CISM to face away from the impact.

Notably there are several possible embodiments of this CISM support mechanism in this invention. Elements of these may be used in different combinations and not all elements may be present in any one embodiment. For example any of the front impact arrangements as noted above may be used with any of the lateral impact arrangement noted above. Yet another example of a reduced content embodiment does not hav the lateral rotator for side impact to rotate the occupant but simply slides the CISM and the occupant laterally as disclosed above. Moreover, There are a number of variations of the CISM support in this invention. For example the safety beam lower element may be mounted on the bottom seat support flange 221, back seat support flange or on both. There may be multiple safety beam lower elements each with their own safety beam upper elements and other disclosed elements attached thereon, working in parallel to provide greater support. Notably an embodiment with the safety beam lower element attached to the bottom seat support flange 221 and comprising inner and outer rotators for lateral impact, will under side impact rotate the occupant to face away from the impact (the center of mass of the CISM and the occupant needs to be arranged to be below the pivot) but in so doing will incline the occupant to the vertical.

Each of these variations in the embodiment have advantages and disadvantes that performance, geometry and cost will influence. Some of these embodiments may be removable from the vehicle and attached to the seat with 3 point seat belts for example with the shoulder strap attachment points 223 on the Back seat support flange 222. Others may be designed into the vehicle as in for example a part of the center arm rest in the rear seat of a vehicle. The attachment of these embodiments of he invention may also be with methods available in the background art such as "Isofix" fasteners or other lathc arrangements such as with the top lock flanges 241, the side lock flanges 242 and front lock flanges 243.

The side impact performance will in particular will be aided with the side lock flanges 242 being locked into support points attached to the fixed members of the vehicle between the seat cushions on the back or front seats of the vehicle.

The The side support flanges 244, will aid in bracing the structure and helping transfer the load from the shock absorbing members to the structure and the lock flanges or 3 point seat belt as available in the vehicle. In some embodiments the safety beam lower element attached (by bolts not shown through the Side Support flange to the support member for the internal airbag equvalent that controls the rotational motion. However, other embodiments may have the side flanges, and the entire module attached to the side support flanges and the other structural members either in the front or rear facing arrangements for the CISM.

Some embodiments of the invention may have the safety beam upper and lower elemtns along with the secondary slides, internal airbag equivalents and attached hardware, removable and attachable at the front end of the support structure thereby allowing the installation of a rearward facing child seat. Such a seat may not require a front impact protection mechanism and therefore many such embodiments may have the CISM support

bracket directly connected to the CISM. However, further refinements of the invention may have the CISM in two sections – the first to support the head, neck, thorax, lumbar regions and the pelvis of the child and the second to support the lower limbs of the child. The CISM support bracket may be connected to the first of these and the second which supports a smaller load may be pivotally moutned to the upper section of the CISM , thereby allowing a recling position for the child. For older children – upto about 40 lbs, leg room in the rearward facing position becomes important. Embodiments that have a removable car seat cushion with the mountings and locks as discussed below this level will facilitate this.

As much of the complexity of the invention is external to the CISM, the CISM may be constructed to be very light and made inexpensively, thereby allowing a change in CISM and its support members that attach to the CISM support bracket, to suit the child as it grows older.

Finally the CISM support embodiments disclosed here include alternative support structures outside the automobile that can receive the same support pivots or lock points. Thereby making the loading and unloading of children easier. These external support structures include all types of strollers and bicycle trailers that have the suppot members that lock to the pivots or lock points. Some such laternative structures may replicate the impact protection of the CISM support in the vehicle for use in bicycle trailers and strollers.

Many aspects of the embodiments of the invention for the Child support Mechanism as the passenger support mechanism may be used for adult passengers as well. The cylindrical safety beam lower elements as in the Child support embodiment may be modified to attach either directly or pivotally to the vehicle central body member (pivotal mounting can contribute to shock absorbtion of the seat) or mounted on a member that can raise/lower and tilt the seats by suitable slidable and pivotal attachemtn to the fixed central member using well known approaches in the background art.. The remaining aspects of the embodiment for the child support case may be replicated after suitable scaling. In addition, with gull wing doors or other doors that provide clearance of the Passenger support mechanisms as well as doors attached to the secondary slides as disclosed herein, the Passenger support mechanisms can slide right out of the vehicle as disclosed elsewhere in this invention. The Front collision protection arrangement for the Child support case will be most relevant for the adult passenger support mechanism case when the steering wheel and other hardware are not in the way of a movement forward of the Passenger Support Mechanism. This may be the case in drive –by-wire vehicles where the sterring and other controls are mounted on a safety shield as disclosed herein.

Fig 10E 18, 10E19 illustrate another embodiment of the CISM and its supports. This embodiment uses multiple cylindrical slides that permet the lateral displacement of the CISM under impact. Pivoting of the CISM is under the diagonal and under the seat. Figs 10E20 and 10E21 show yet another embodinment of the CISM and its supports with a simpler arrangement where the side pivoting supports each have a preferably shock absorbing central member that can extend or contract under large axial forces or when unlocked for egress and ingress, and two pivots at each end of connection to the CISM and the CISM frame with these axes parallel to each other on both supports, said pivots being normally fixed but allowed to rotate for egress and ingress and when under large

torsional stress as in impact. These provide the reqired displacement of the center of mass of the CISM without the use of a slide. (i.e, the CISM "rocks" on these pivots to rotate away from the impact and displace the Center of gravity concurrently) under side impact and also provide shock absorbing motion in the axial direction of the vehicle in a front impact. Notably the rotation of the axis of the pivoting supports are in the same sense (ie both clockwise or both anticlockwise) in the lateral impact case and in opposite direction s in the front impact case.

CONCLUSIONS, RAMIFICATIONS & SCOPE

Thus it will become apparent that the present invention presented, provides a new paradigm for implementing key safety features and providing utility in accessing passenger vehicles and comfort in travelling in such vehicles. While the above description provides many specificities, these should not be construed as limitations on the scope of the present invention, but rather as an exemplification of the preferred, an additional and an alternative embodiment thereof. Many other variations are possible.

The present invention provides an arrangement that diverts the impact energy in impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers but decelerating the impacting object with the remaining mass of the vehicle. Moreover the arrangement synergistically provides a means for utilitarian easy access to the vehicle for passengers and drivers alike and allows the installation of multi-element surround contoured seats for the comfort and protection of passengers. Furthermore, the arrangement allows the installation of a new and unique safety harness that may obviate the need for safety belts and front impact airbags for protection in head-on collisions. This arrangement differs sharply from the Background art in that it does not simply offer to the impacting body a reinforced rigid shell where the passenger is treated as part of this integral unit, but rather provides selective and differential treatment of the mass of the passengers and driver of the vehicle vis-à-vis the remaining mass of the vehicle. Furthermore the present invention differs sharply from the Background art in that the resulting structure synergistically permits the installation of contoured multi-element surround seats that would not be implementable without the slide arrangements on either side of the vehicle in the present invention.

The present invention provides a gravity slide drive for my arrangement for which there is no counterpart in the Background art. This allows further Utility and weight and energy saving in implementing the above elements of the present invention.

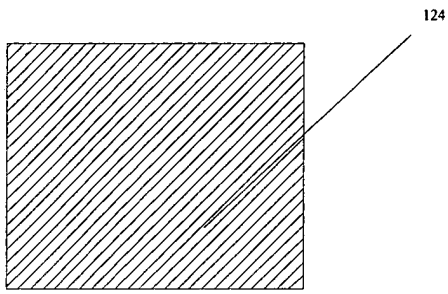
The present invention includes External side Airbags that differ sharply from the Background art in that for the first time they proactively create a "Just in Time" deceleration zone for the lateral or side impact with internal and/or external side airbags while not remaining in an extended position under normal operating conditions of the vehicle.

The present invention describes an indo-skeletal structure of the vehicle body that permits the energy transfer from the lateral or side impact through compressive members to the body of the vehicle. Unlike the Background art this indo-skeletal structure is designed to transfer energy to the body of the vehicle without transferring it to the passengers and driver of the vehicle. The passengers are targeted for protection with "Safety zones".

ABSTRACT OF DISCLOSURE:

An arrangement in passenger vehicles, that diverts the impact energy in impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers, and in the same arrangement provides utilitarian access to the vehicle, such utilitarian access making it possible to both install multi-element contoured surround seats for passengers and the driver, and also safety devices and arrangements for head-on collision protection that protect the passenger. An indo-skeletal structural arrangement proposed for the vehicle, provides further benefits by targeting the strength of the vehicle to protect passengers while minimizing other massive elements in the vehicle.

FIGURE 1



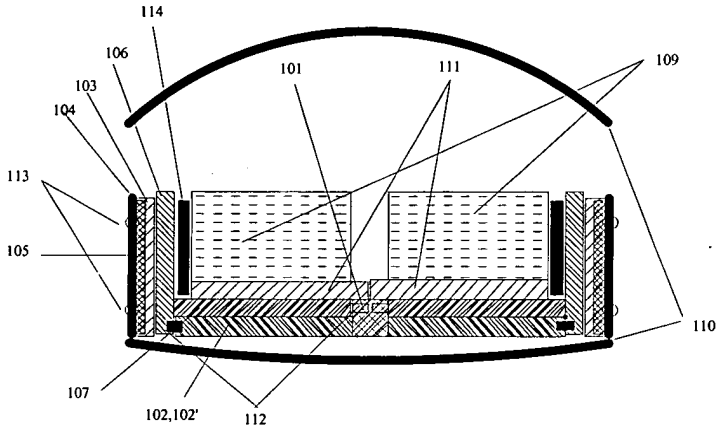


FIGURE 2

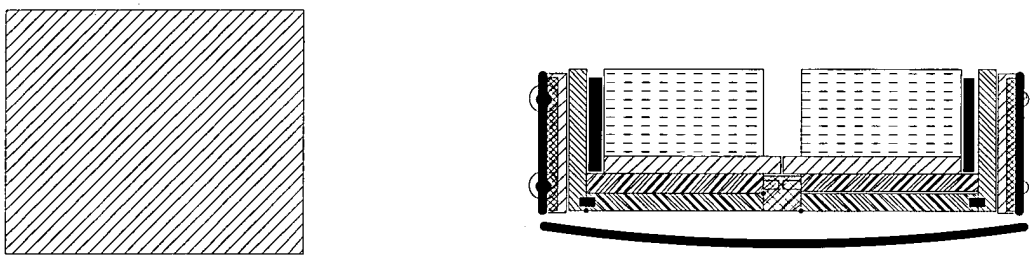


FIGURE 3

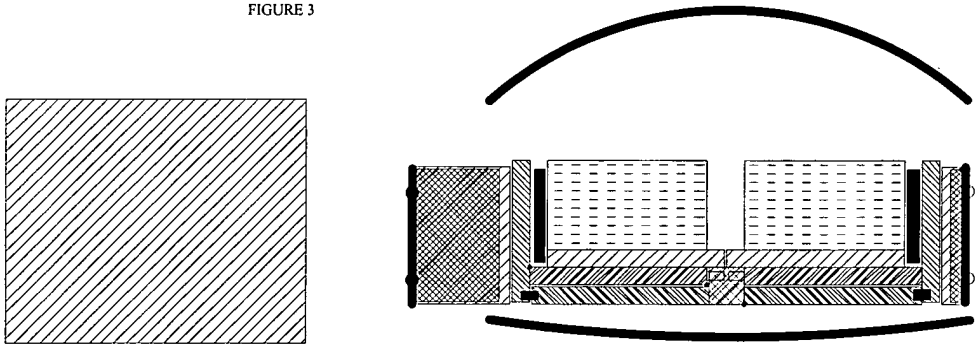


FIGURE 4

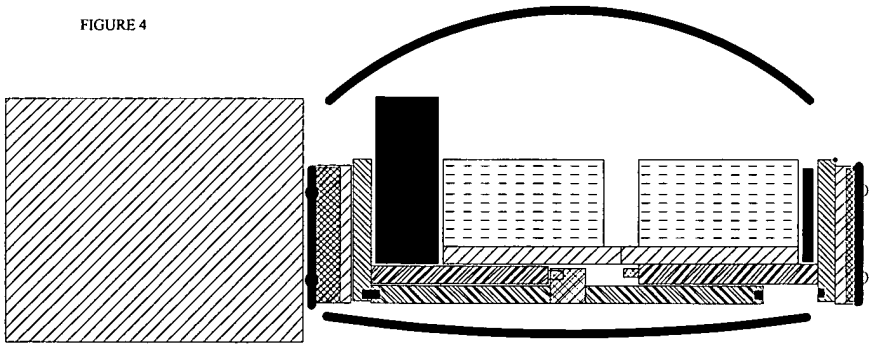


FIGURE 1B

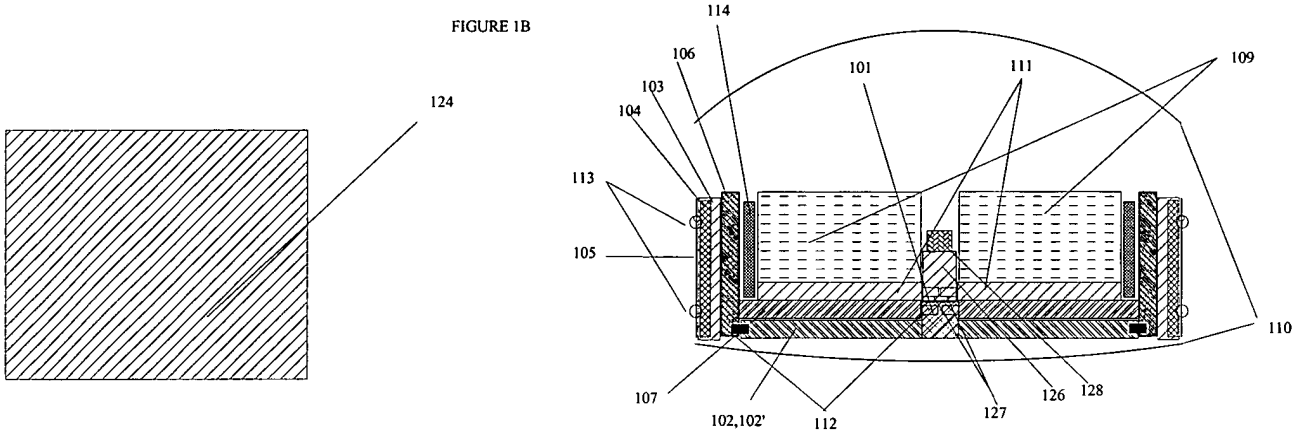


FIGURE 2B

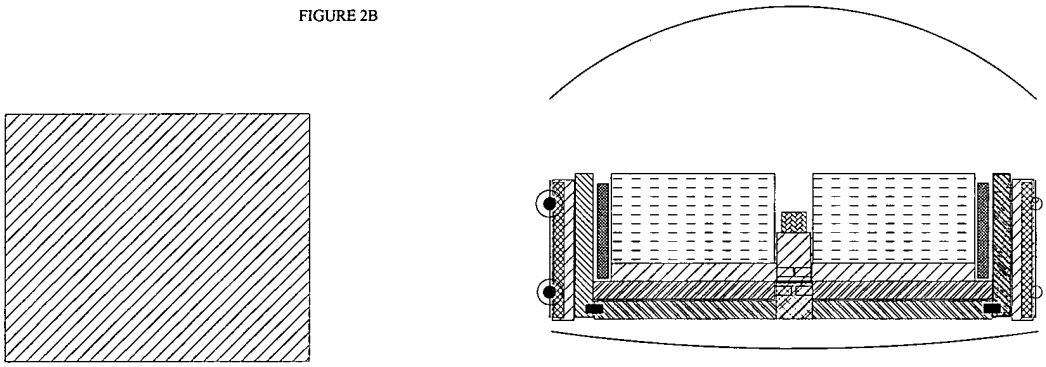


FIGURE 3B

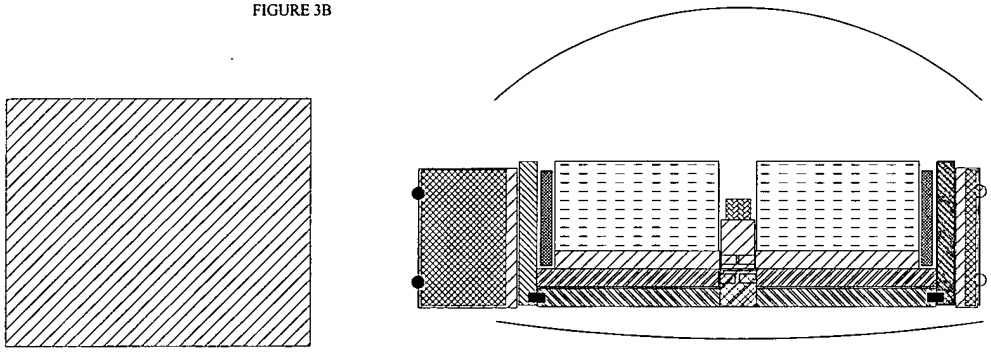


FIGURE 4B

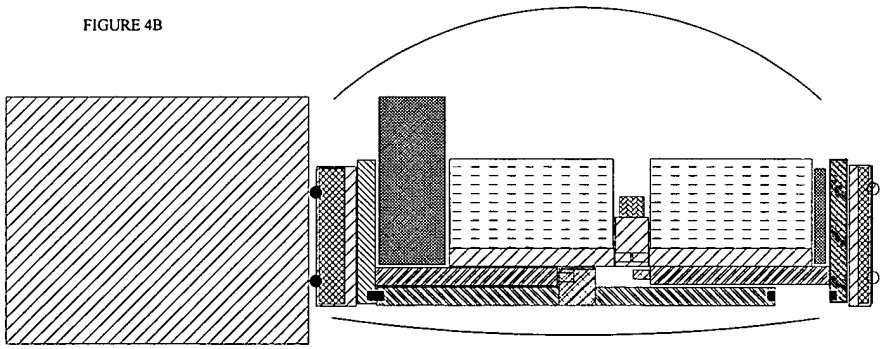


FIGURE 1D

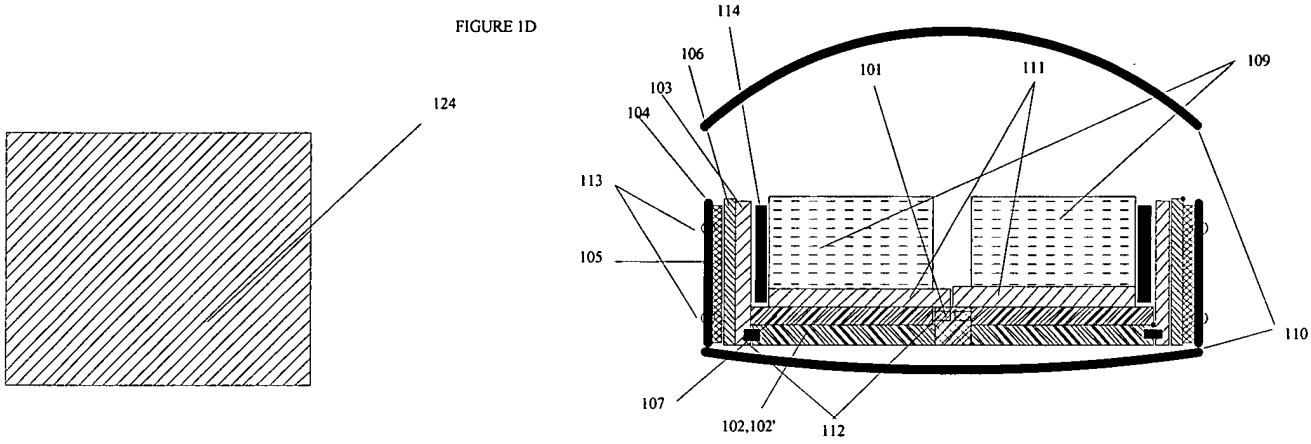


FIGURE 2D

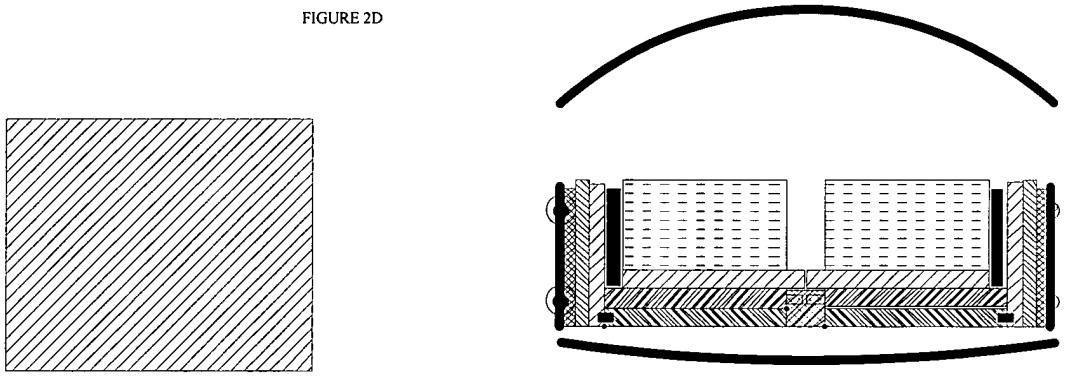


FIGURE 3D

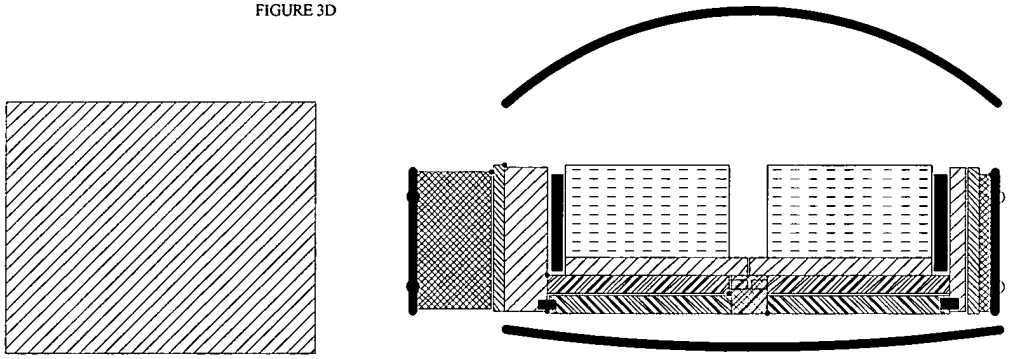


FIGURE 4D

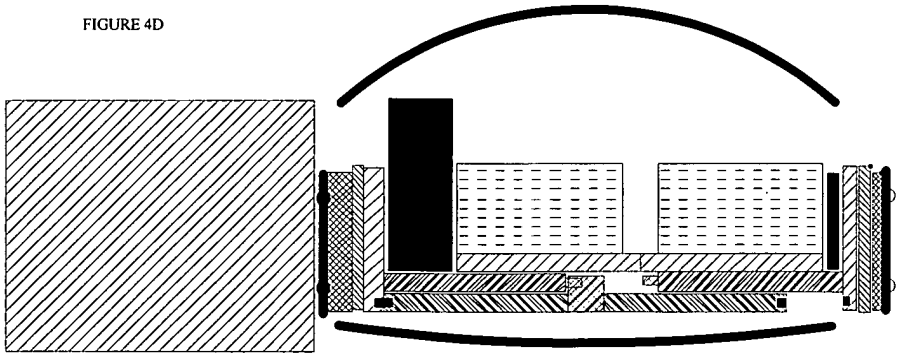
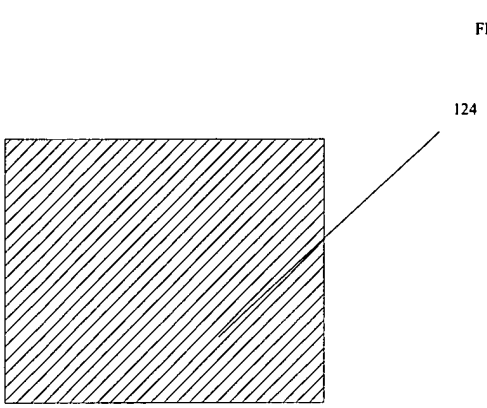


FIGURE 1C



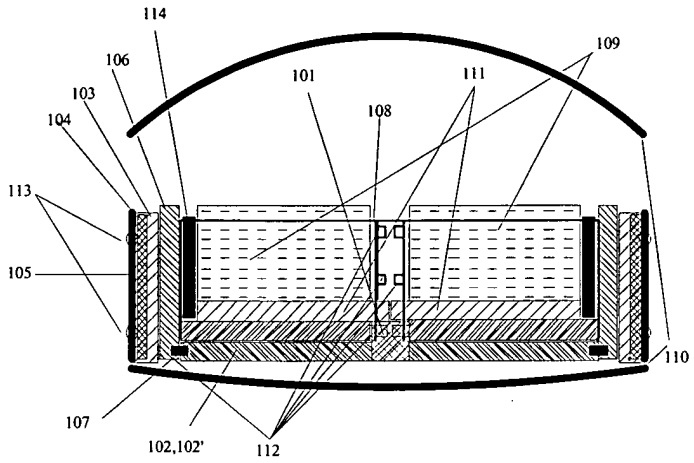


FIGURE 2C

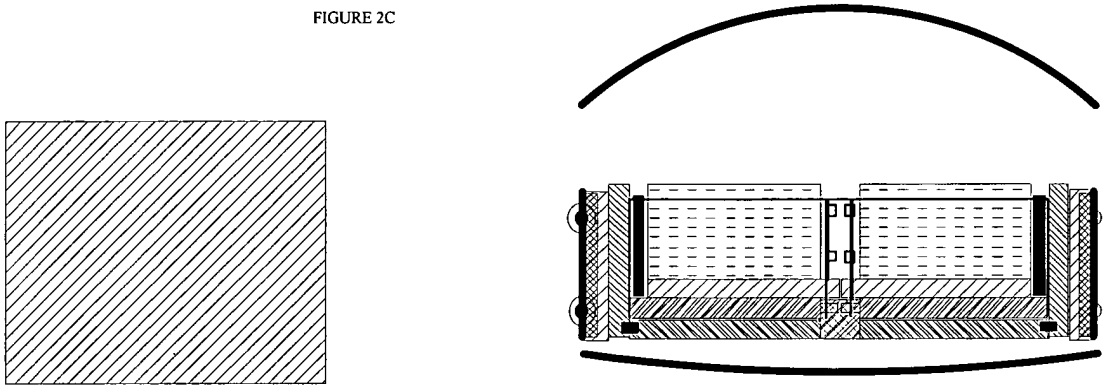


FIGURE 3C

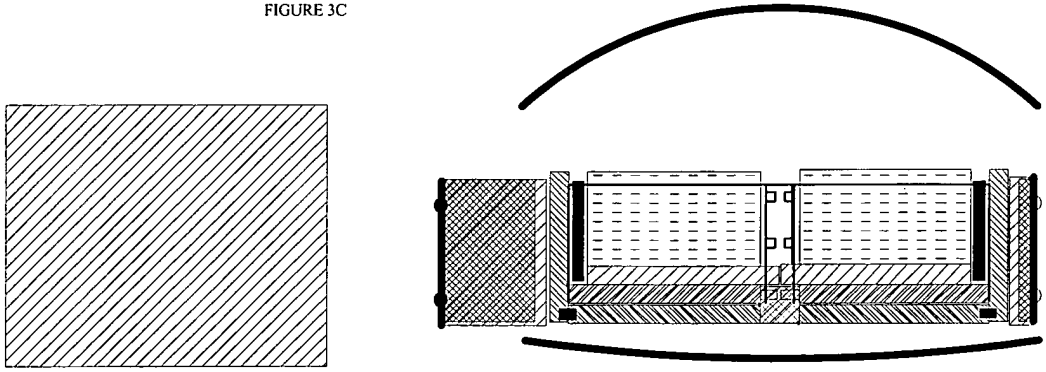


FIGURE 4C

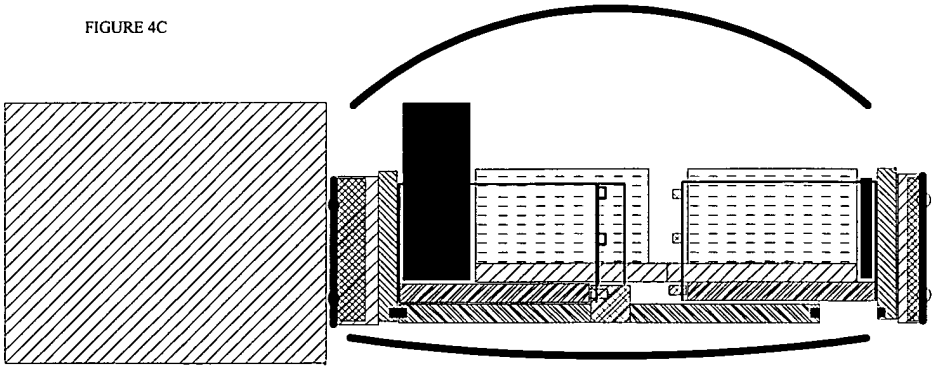


FIGURE 1F

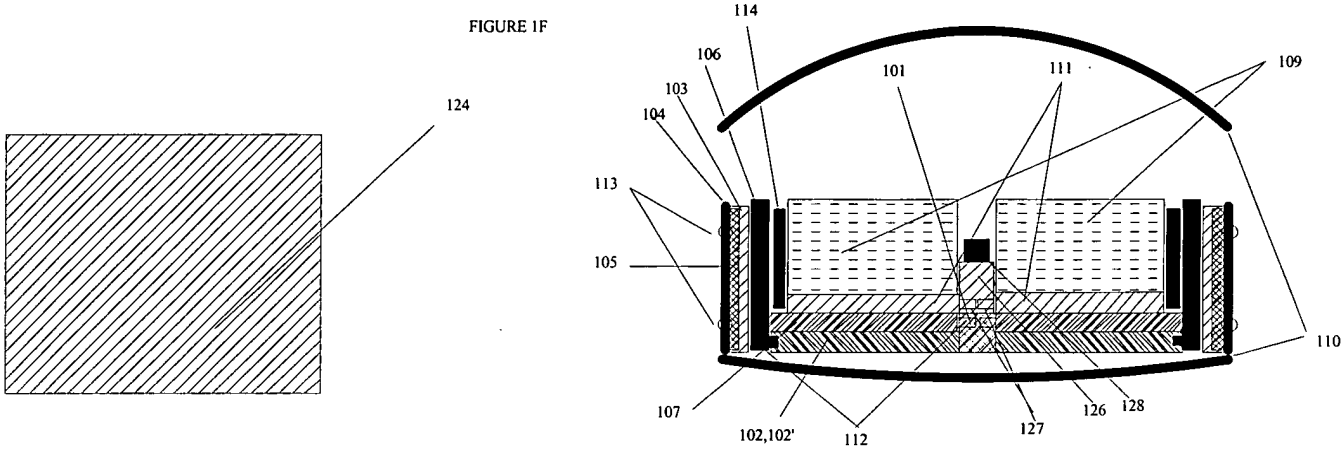


FIGURE 2F

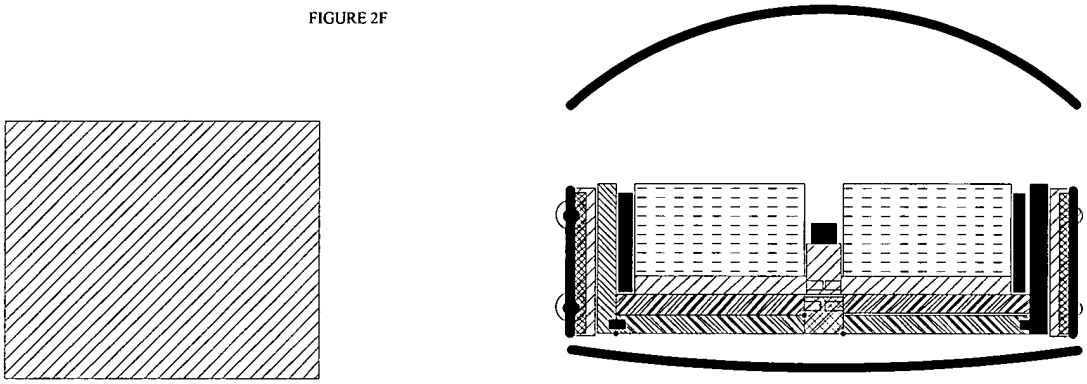


FIGURE 3F

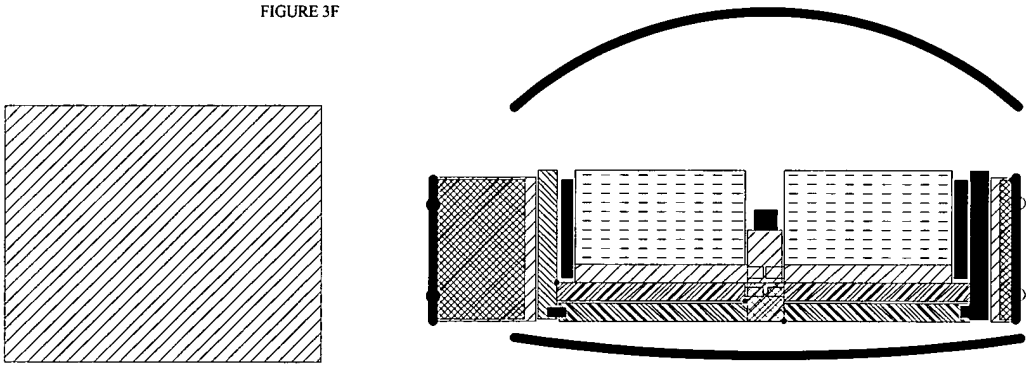


FIGURE 4F

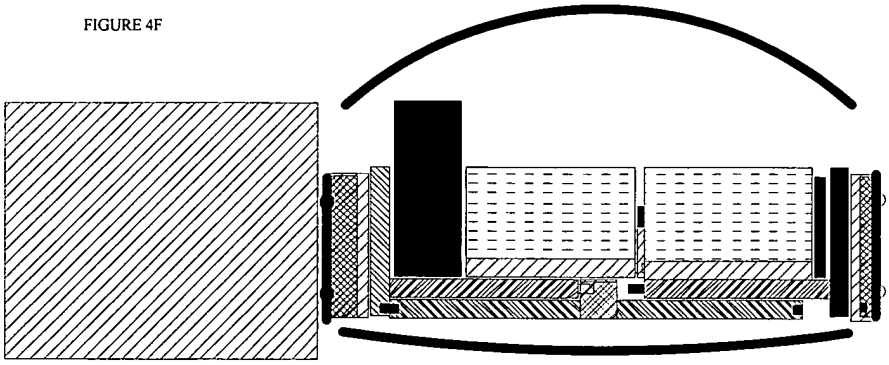


FIGURE 1G

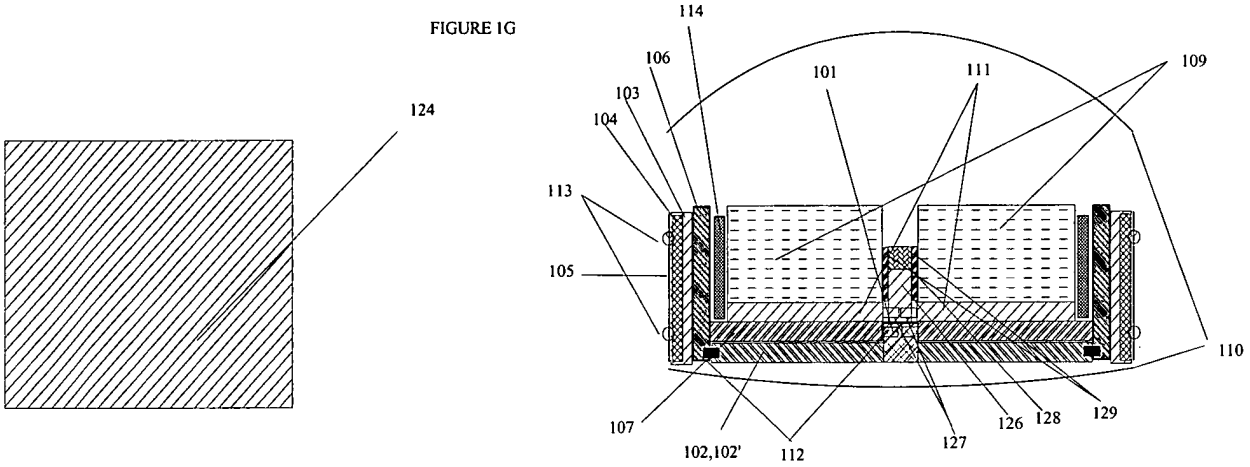


FIGURE 2G

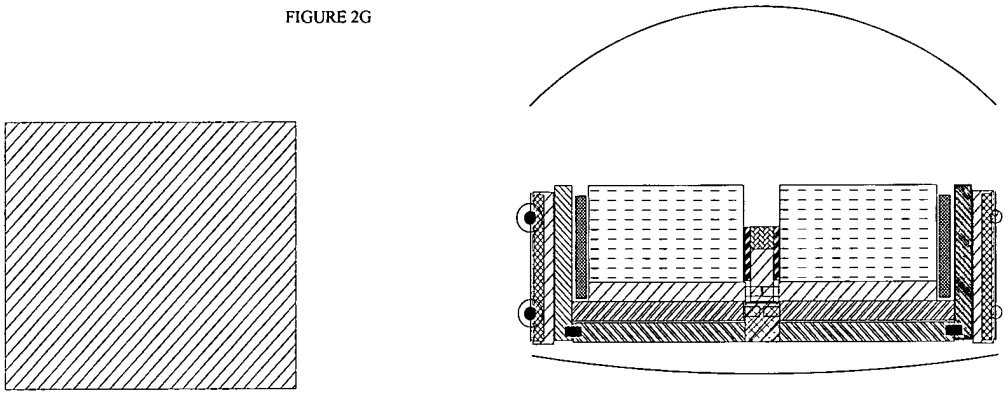


FIGURE 3G

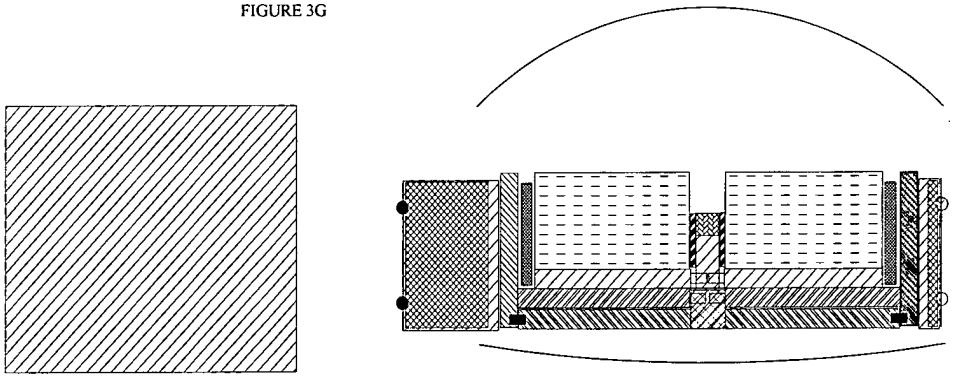


FIGURE 4G

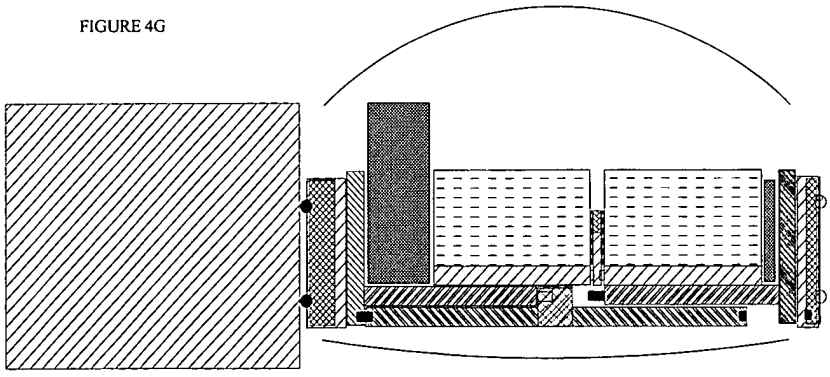


FIGURE 5

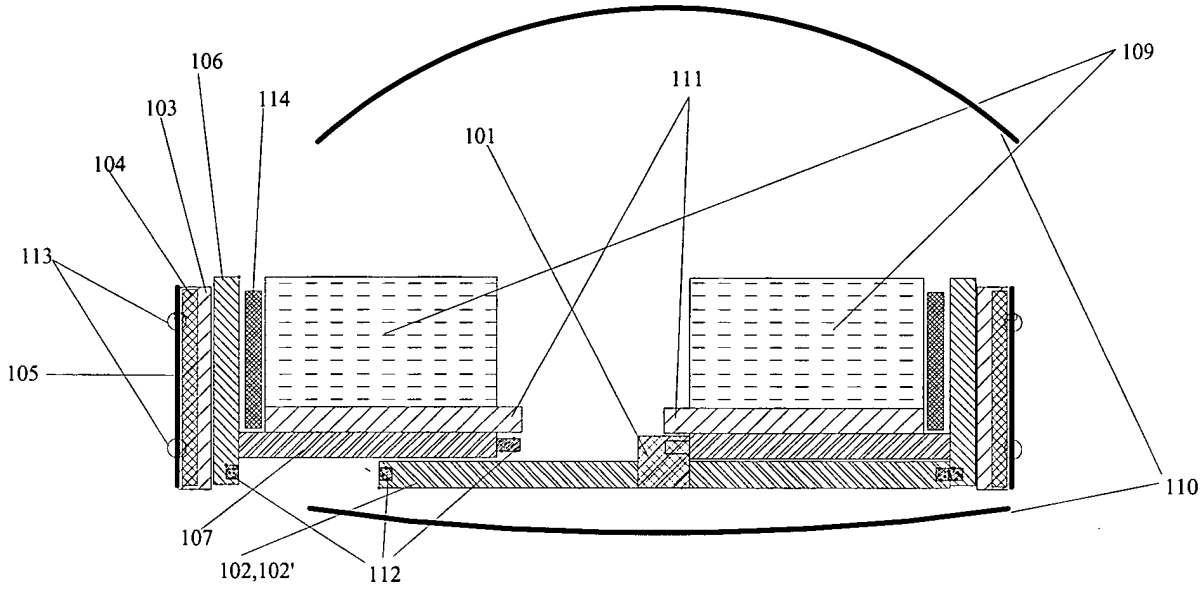


FIGURE 6

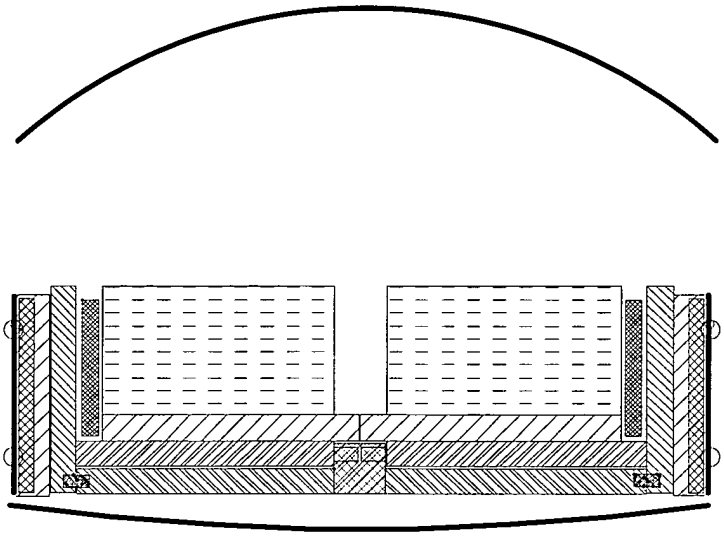


FIGURE 5A

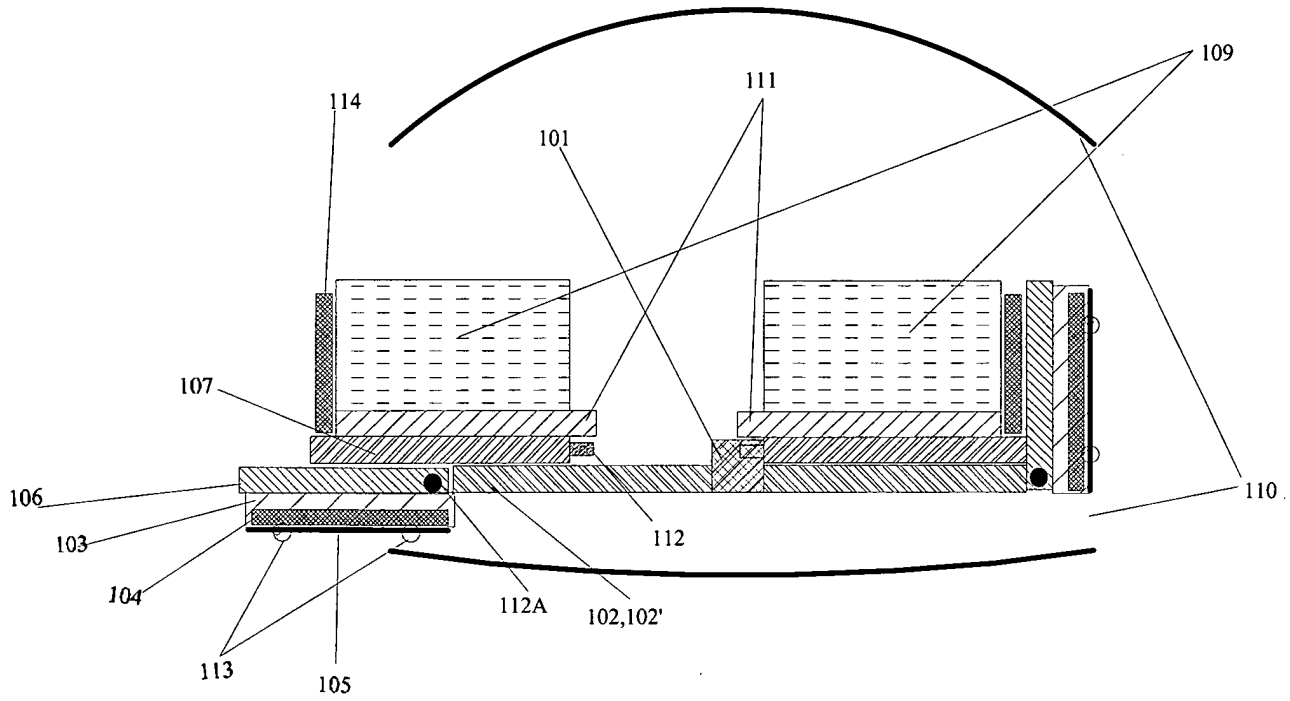


FIGURE 6A

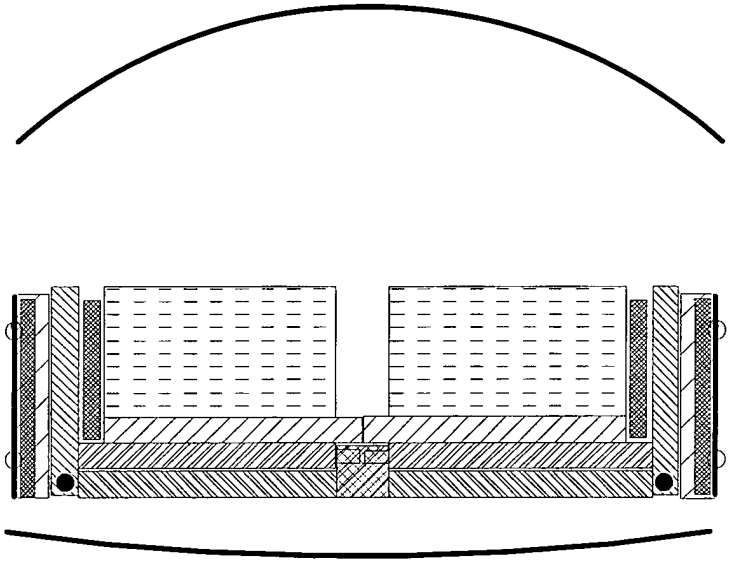


FIGURE 7

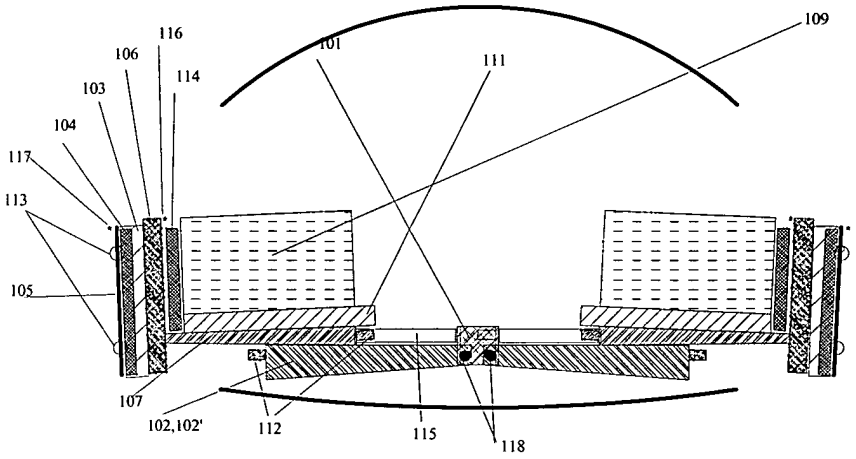


FIGURE 8

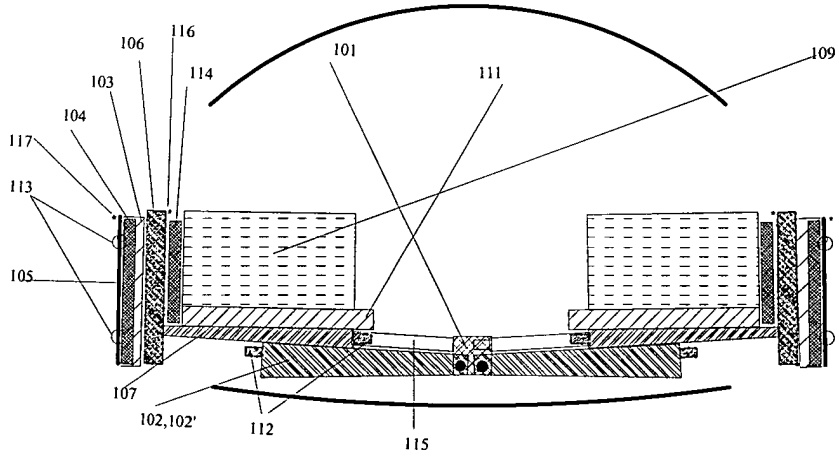


FIGURE 9

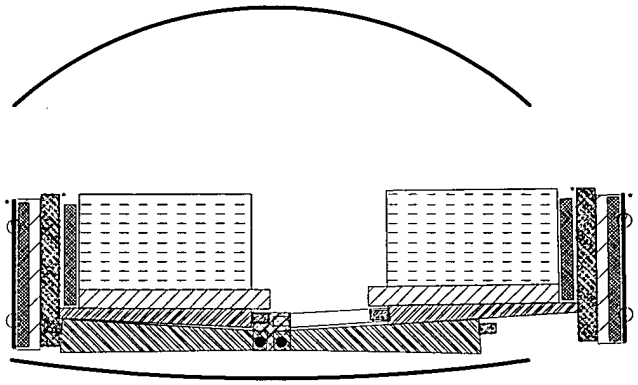


FIGURE 10A

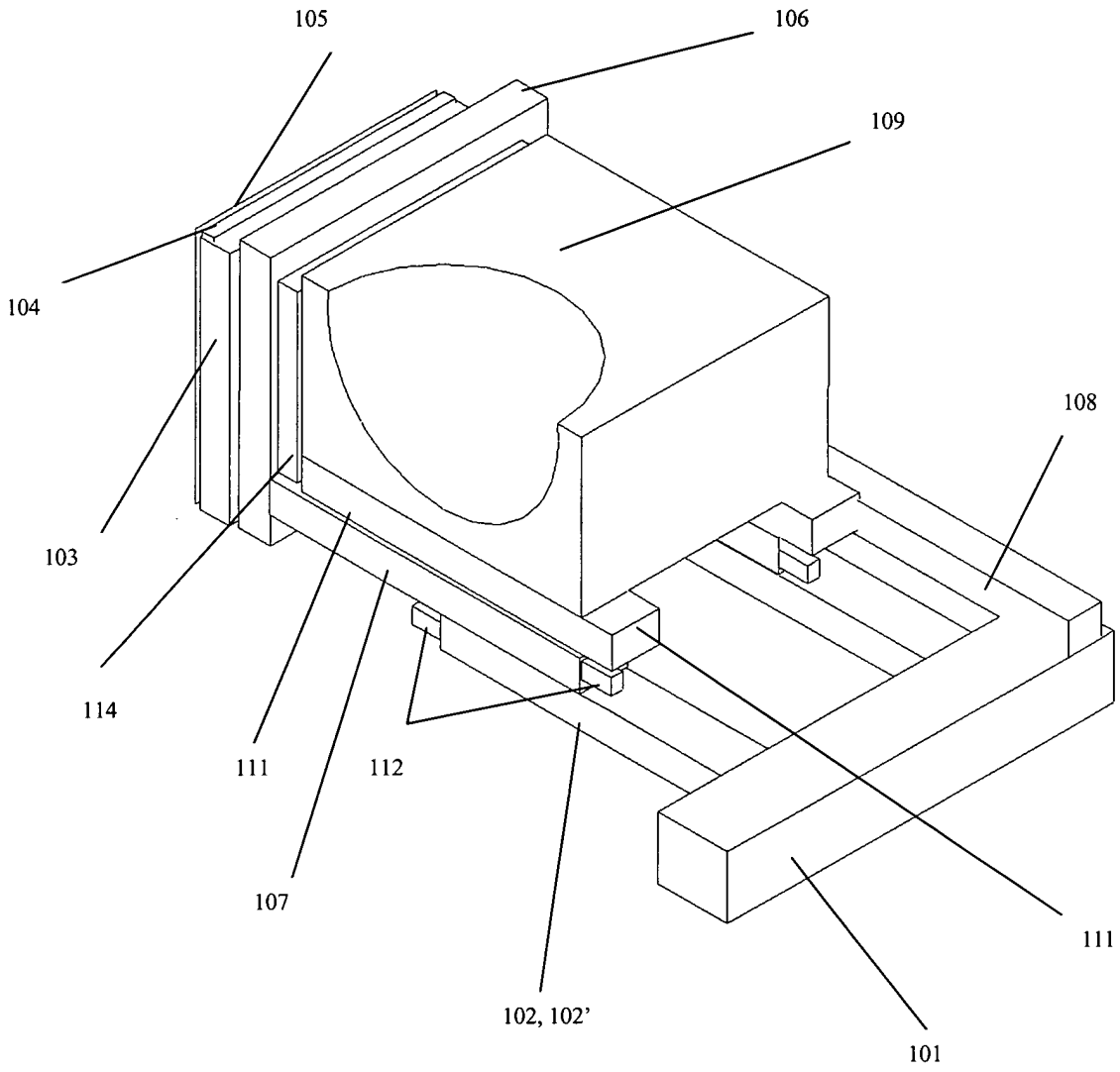


FIGURE 10 B

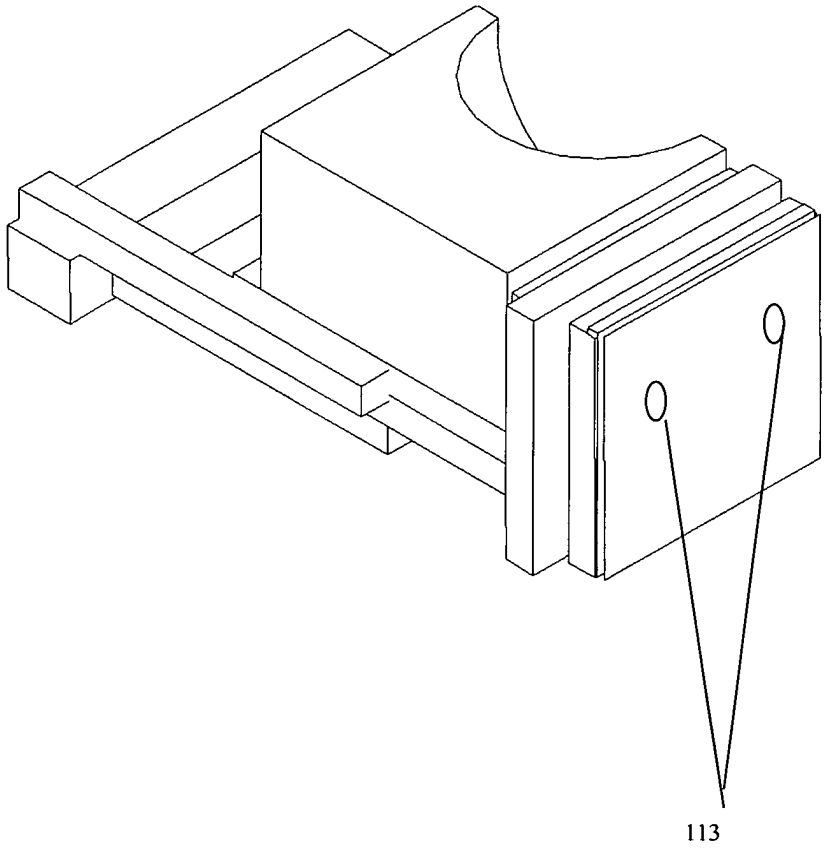


FIGURE 10 C

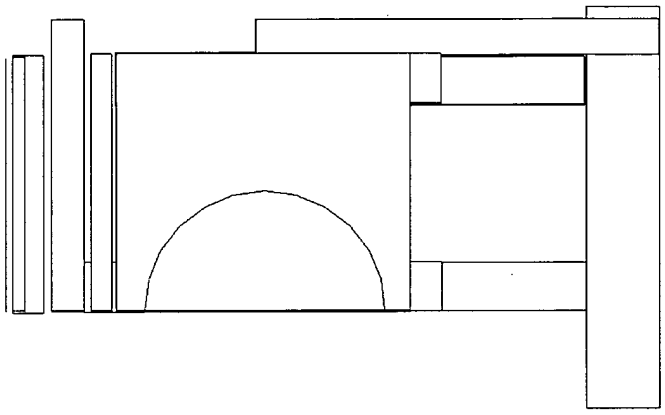


FIGURE 10 A1

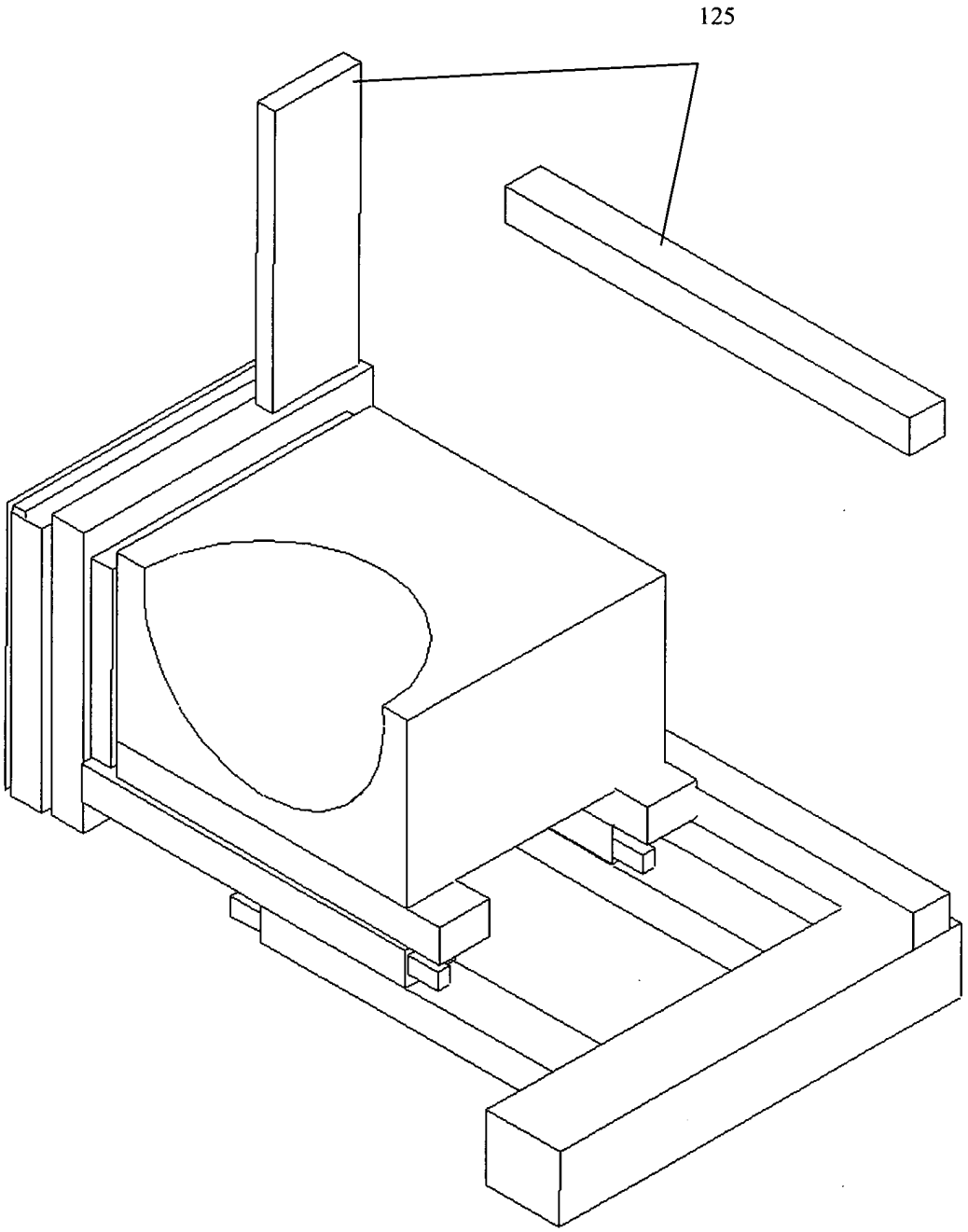


FIGURE 10 B1

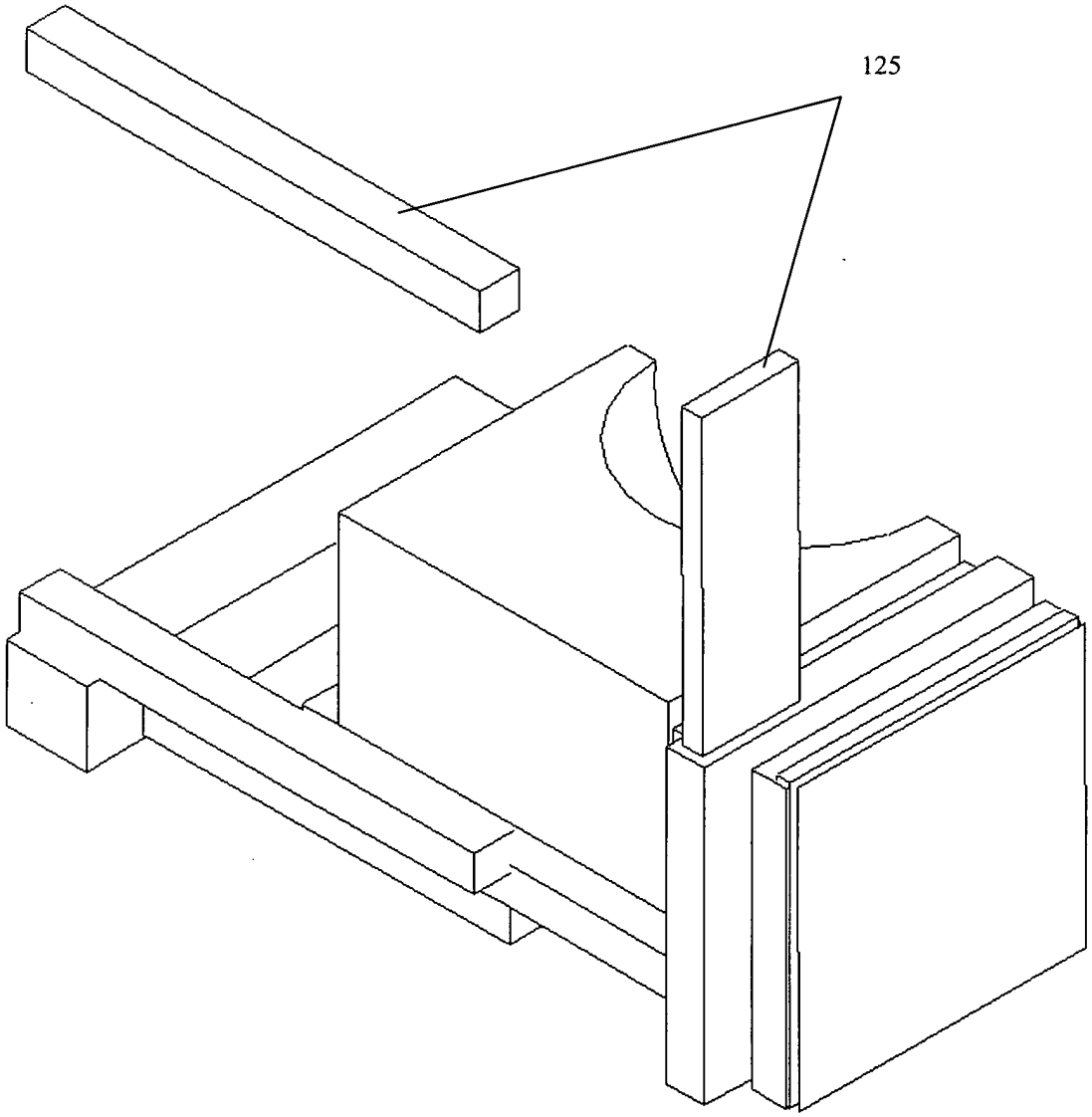


FIGURE 10 C 1

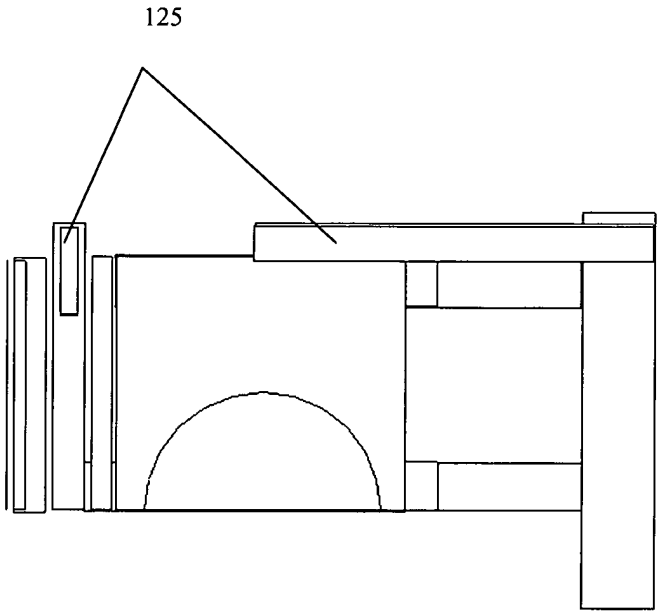


Fig 10 D1

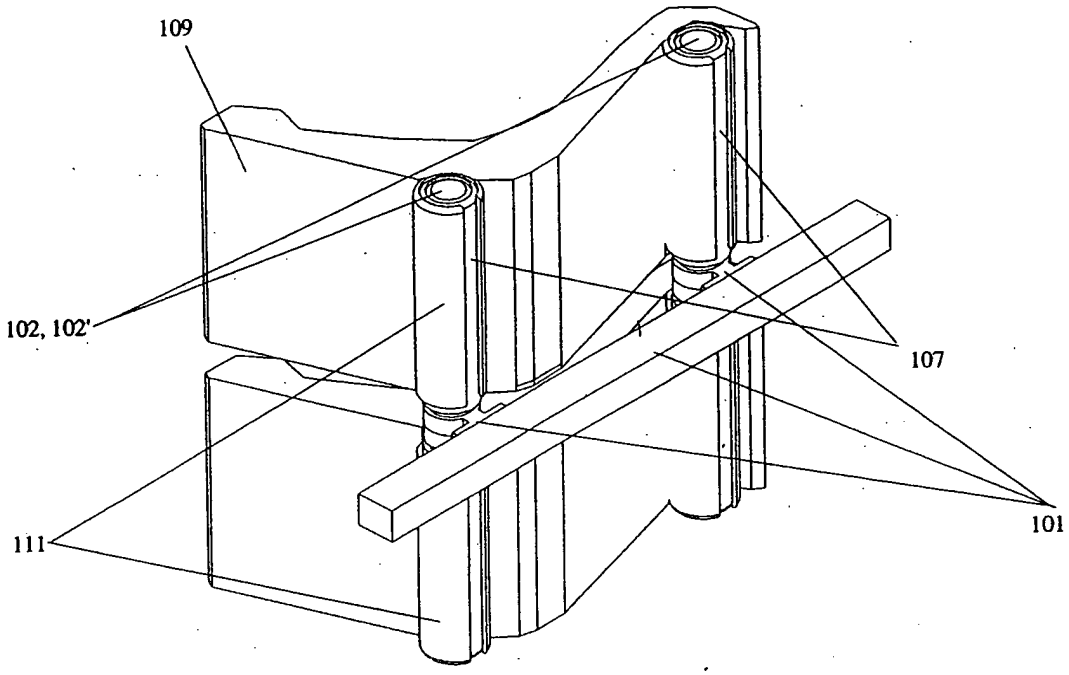


Fig 10D2

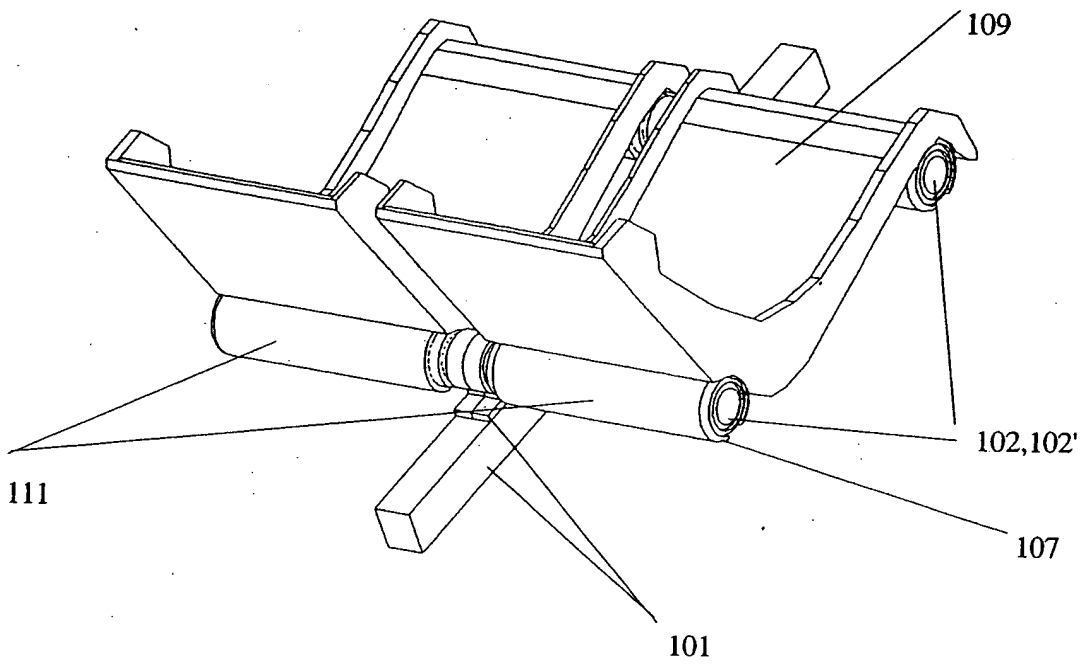


Fig 10D3

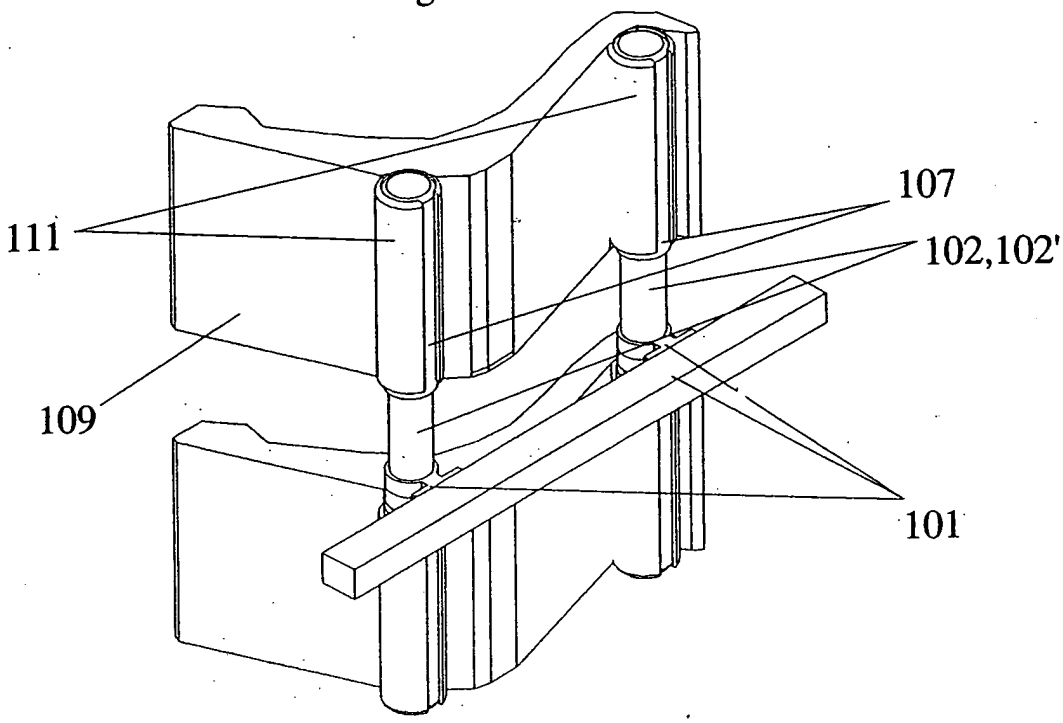


Fig 10D4

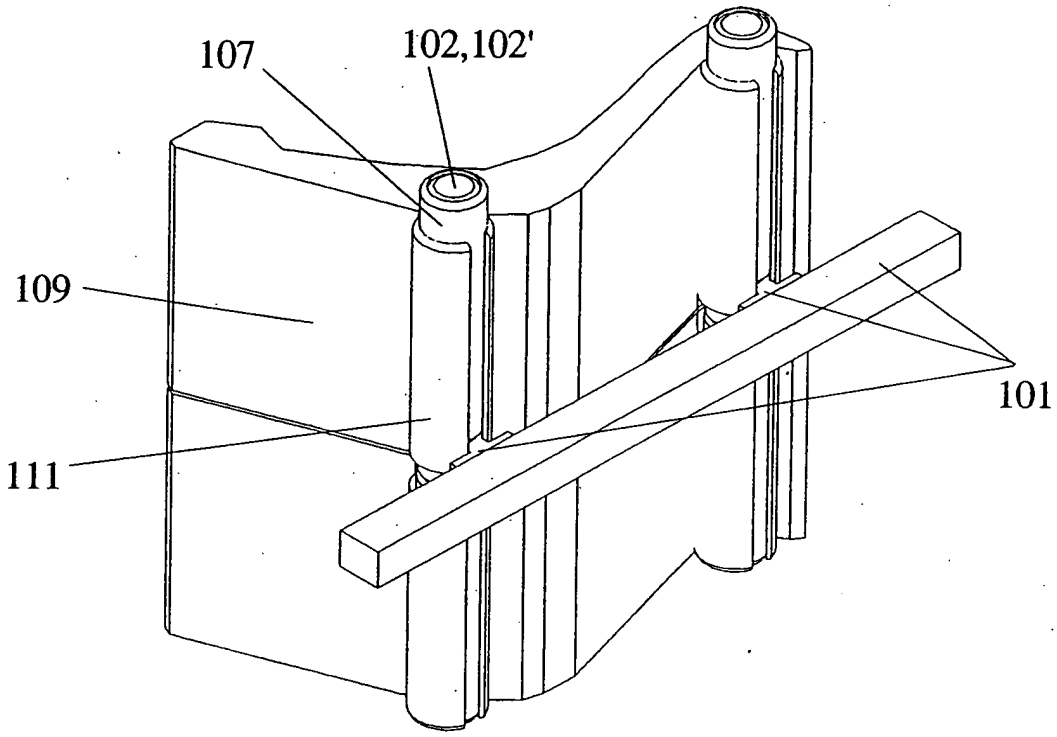


Fig 10 D5

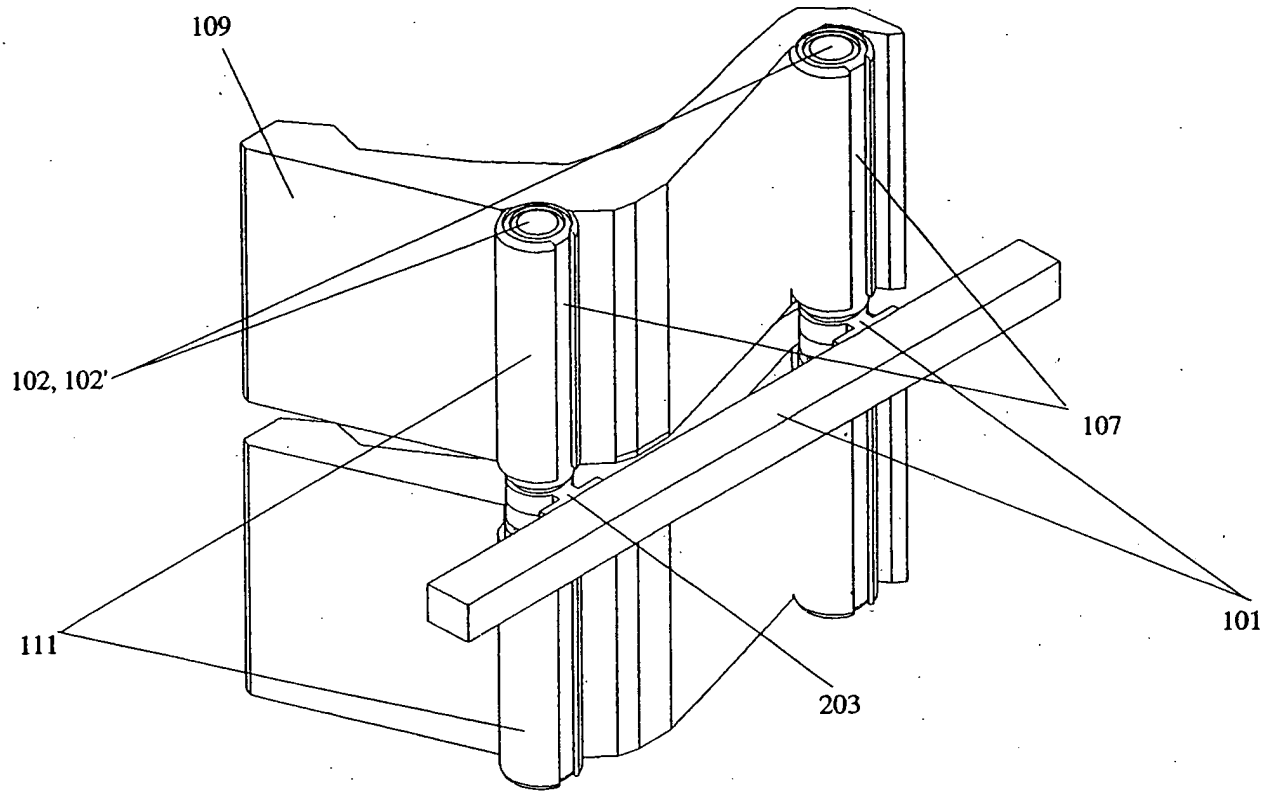


FIGURE 11 Safety Zones

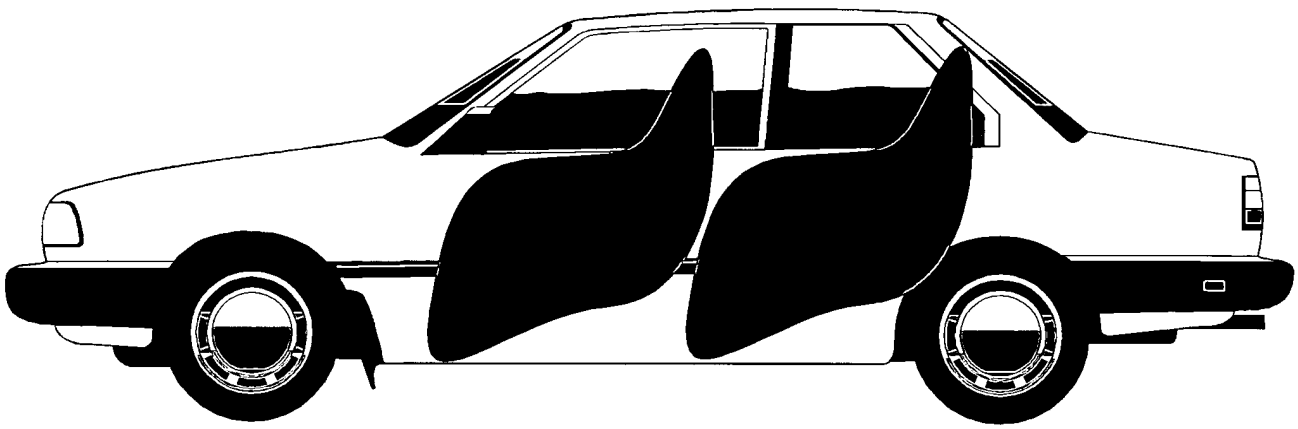


FIGURE 12 H2

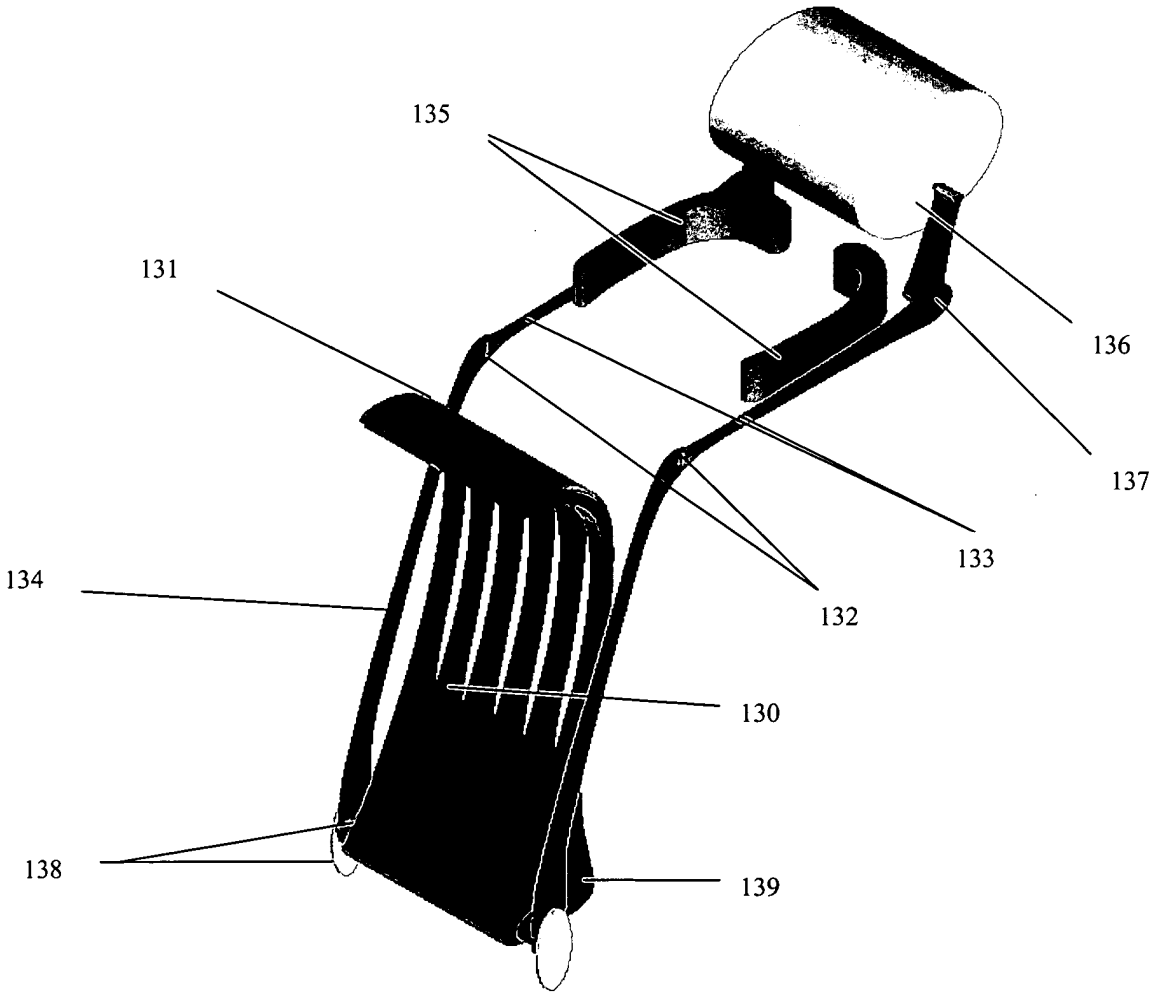


FIGURE 12 I 2

FIGURE 12 J 2

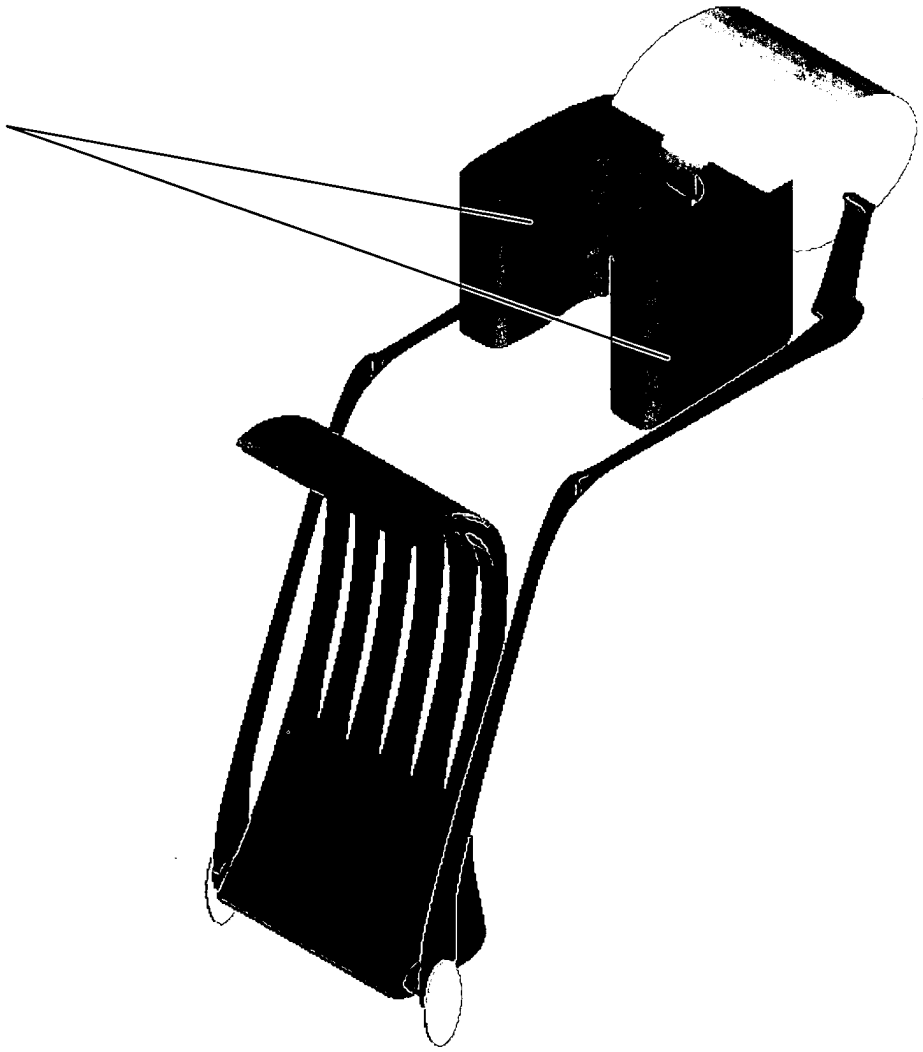


FIGURE 13

AN ISOMETRIC VIEW

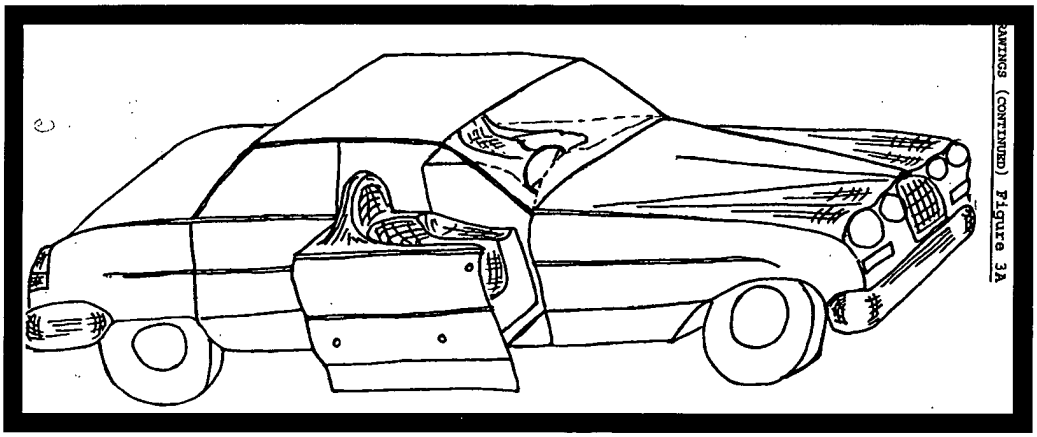


FIGURE 14

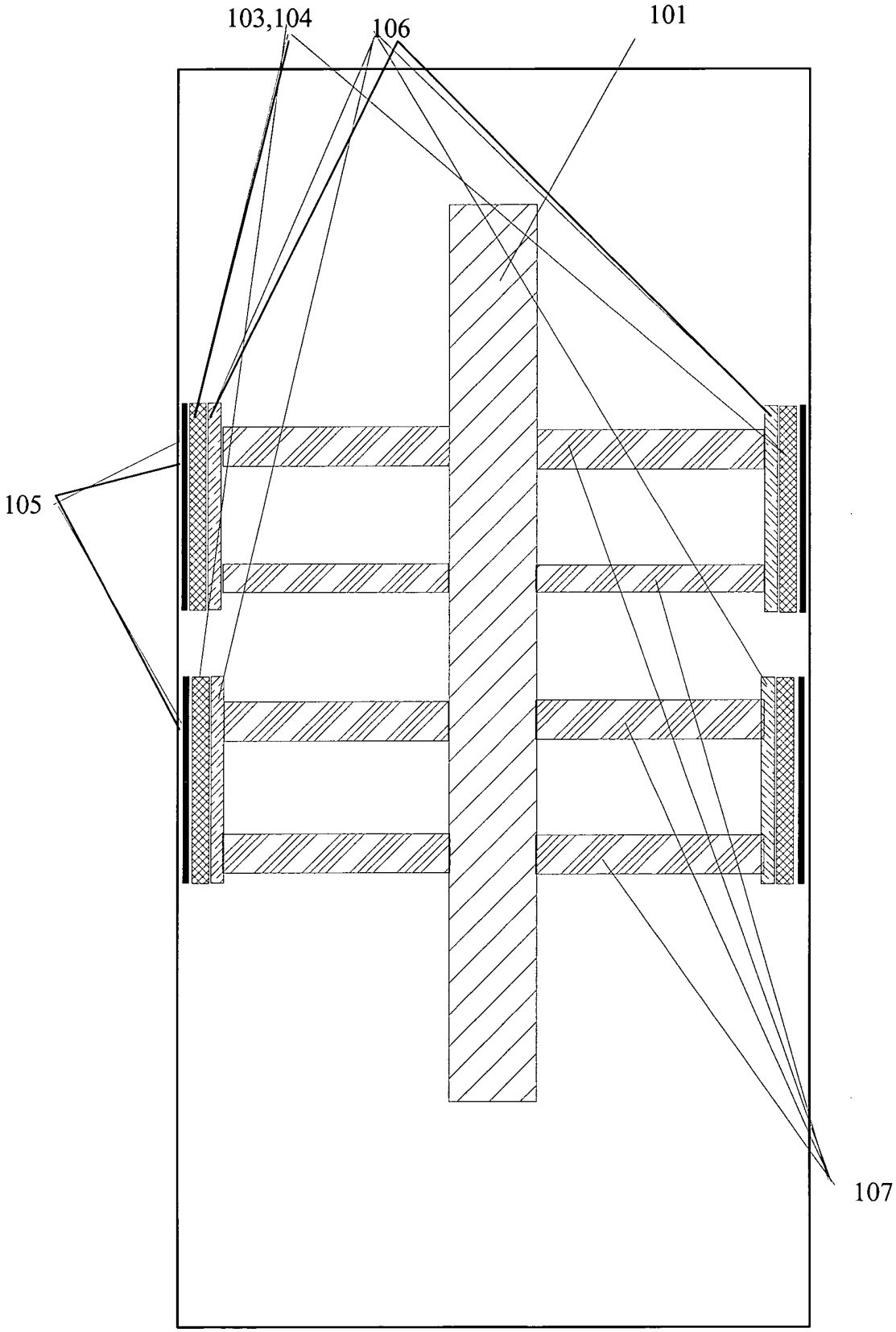


FIGURE 17 A and B

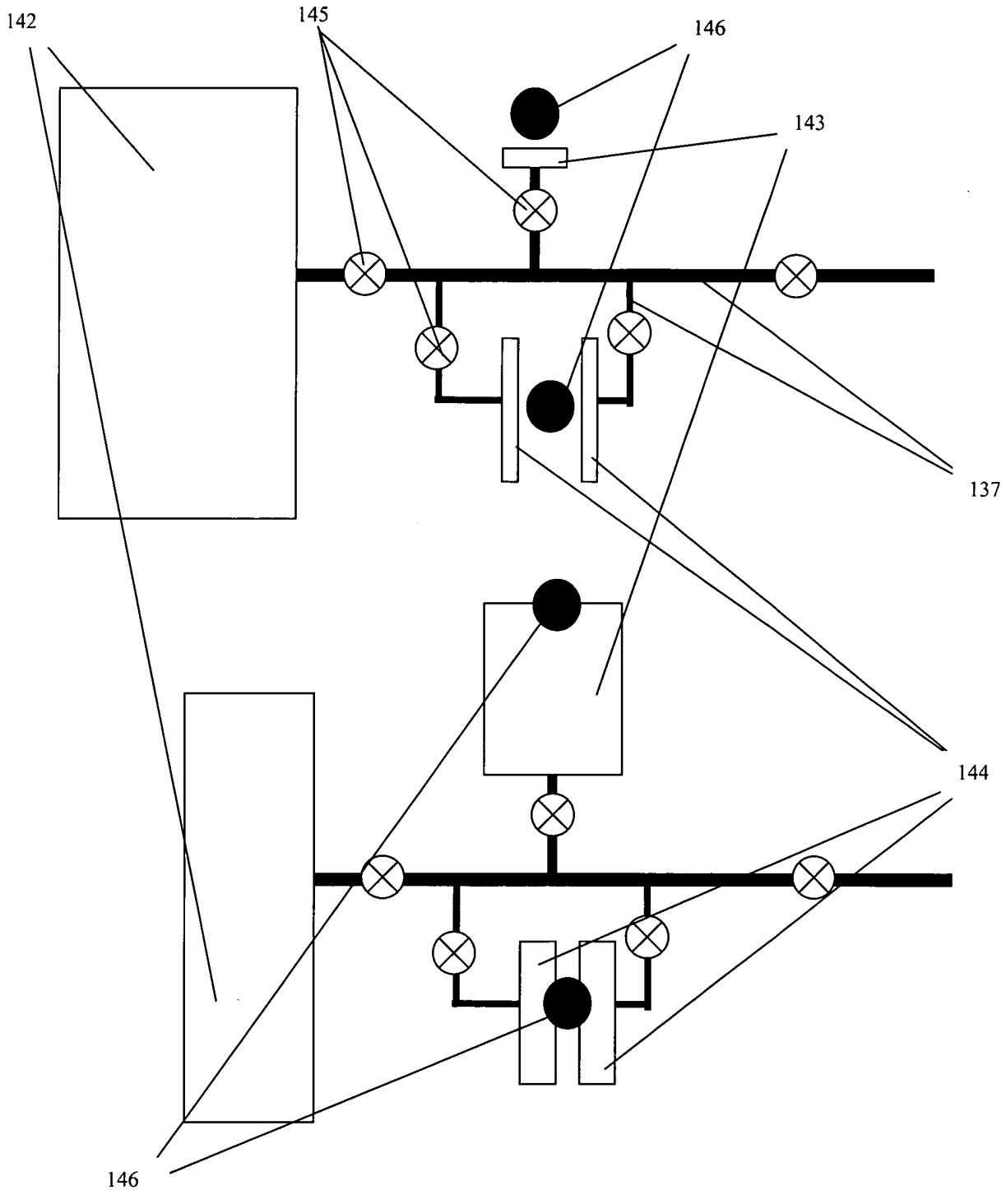


FIGURE 19 A

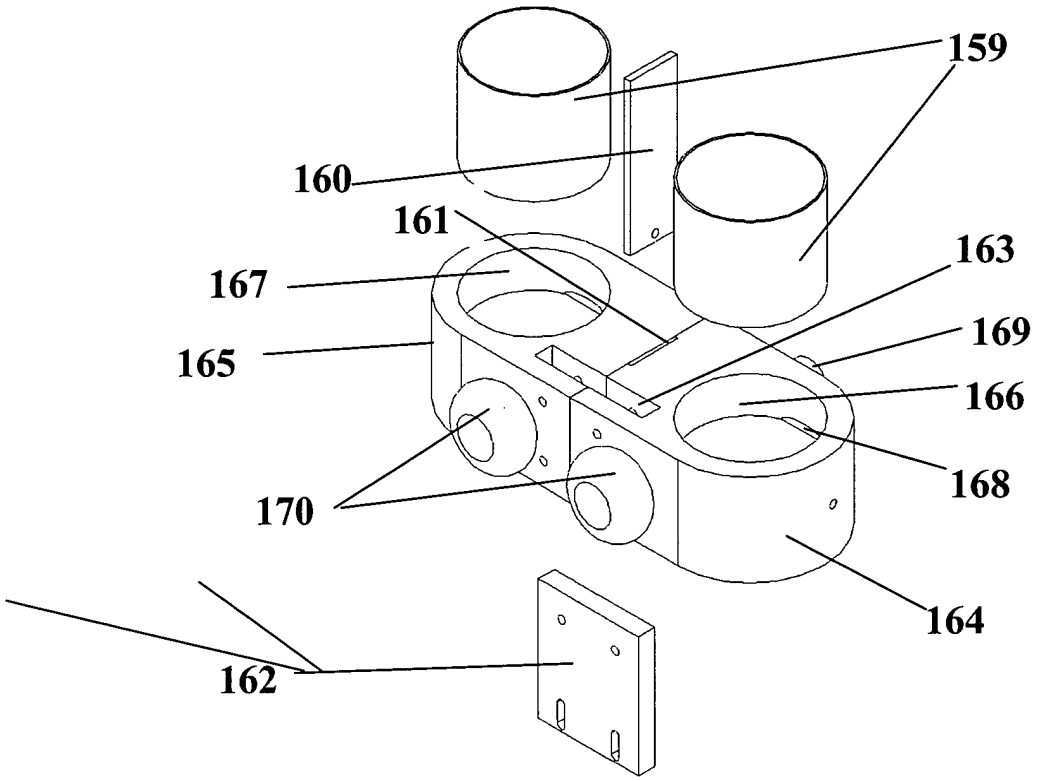


FIGURE 19 B

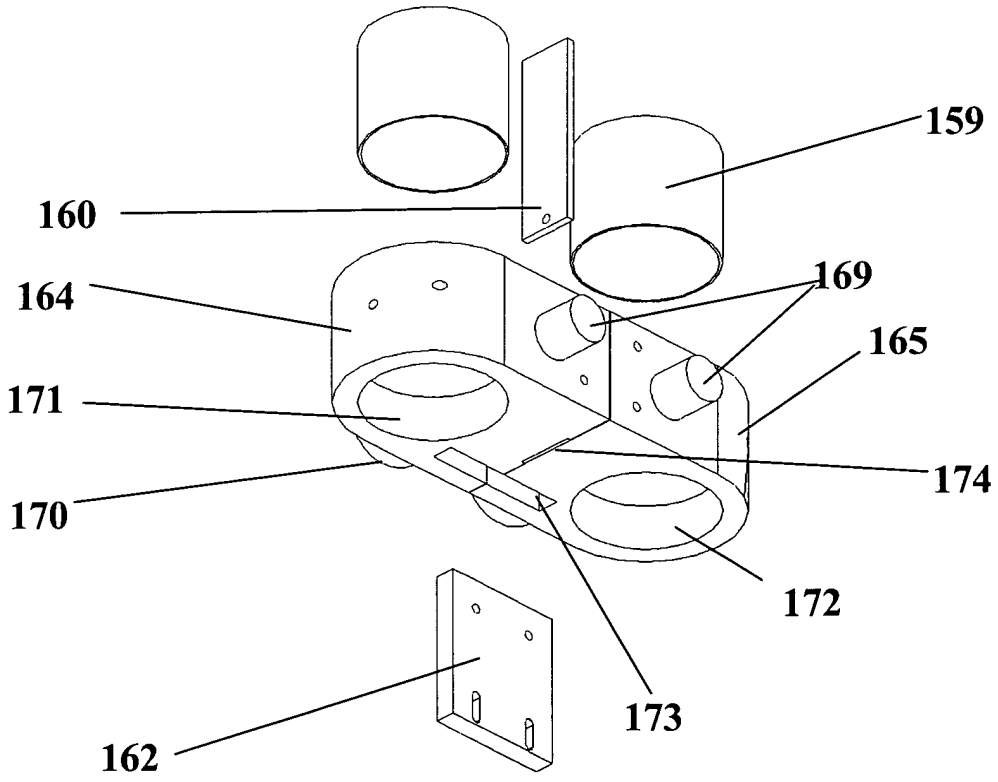


FIGURE 19 C

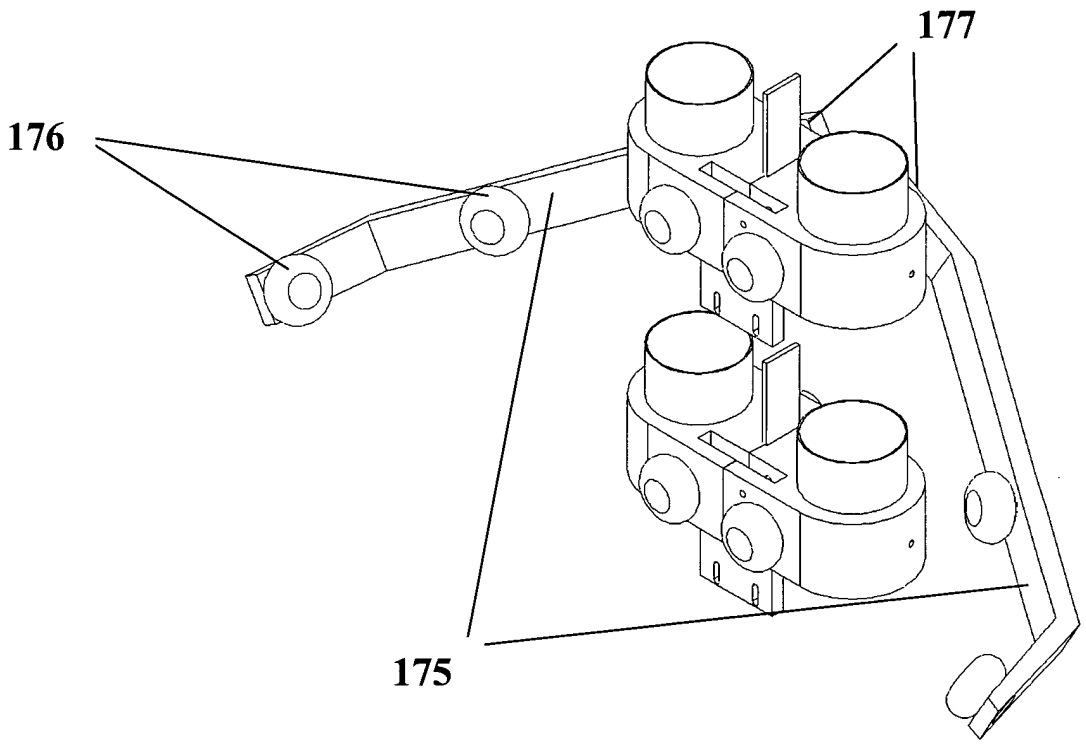


FIGURE 19 D

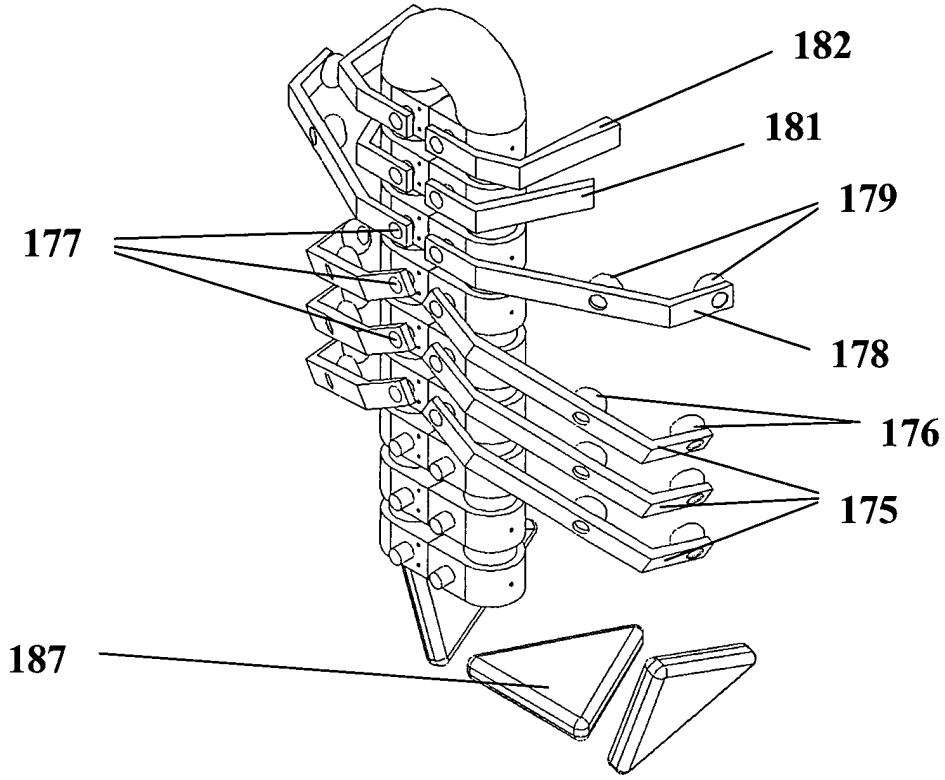


FIGURE 19 E

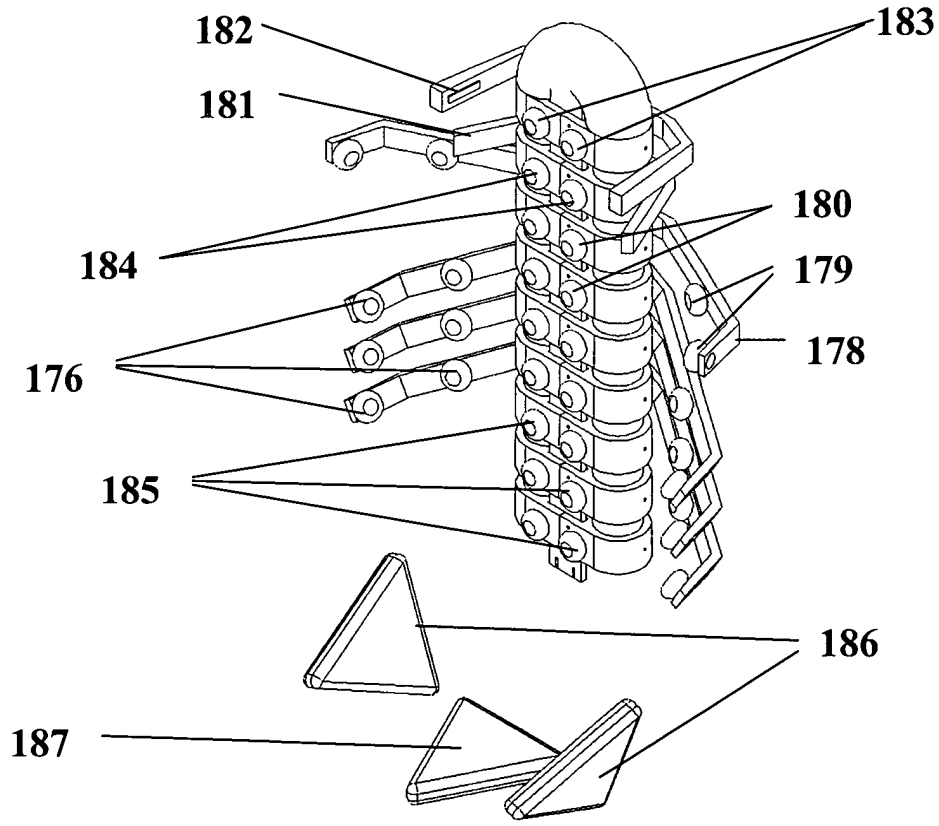


FIGURE 20 A

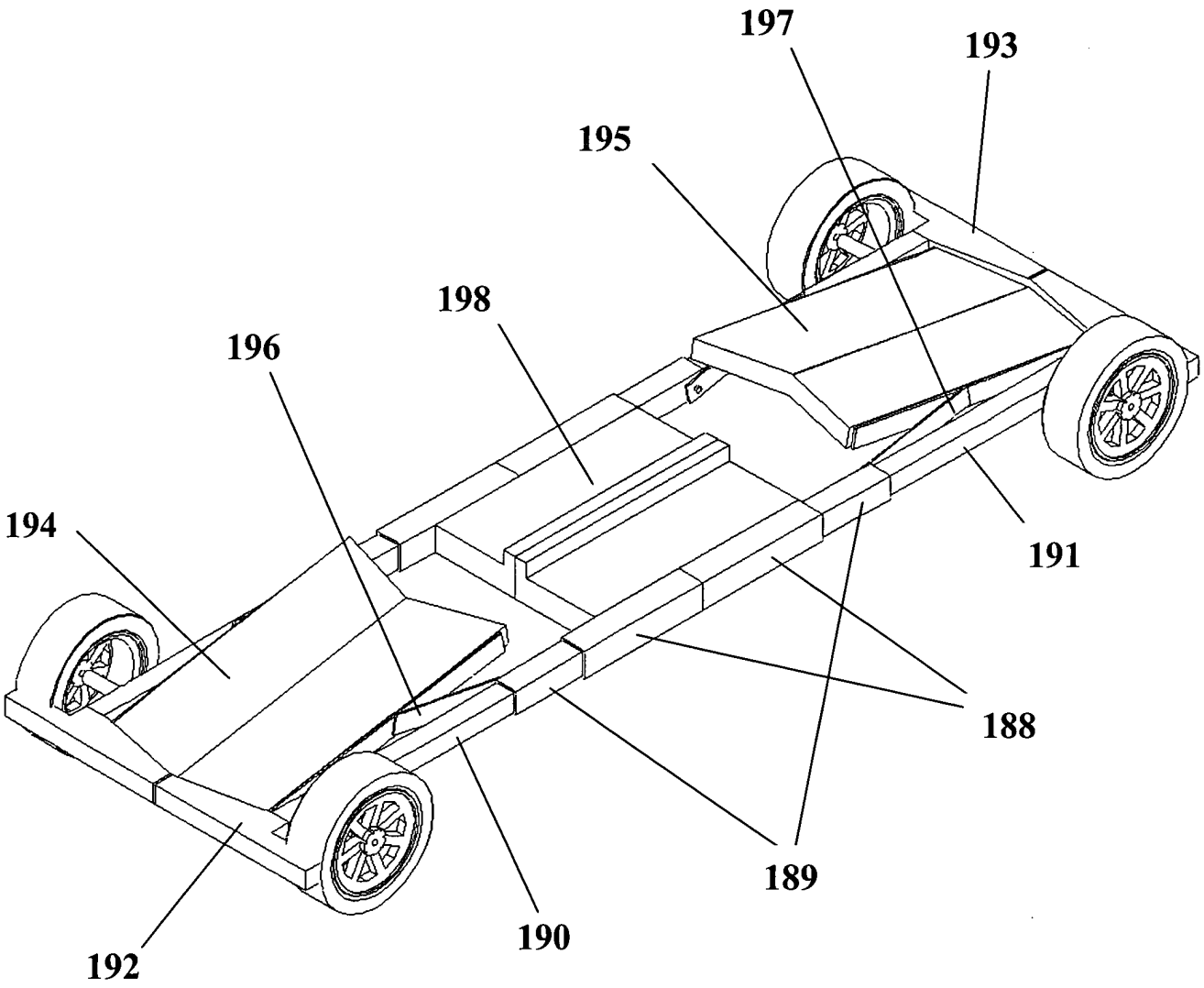


FIGURE 20C

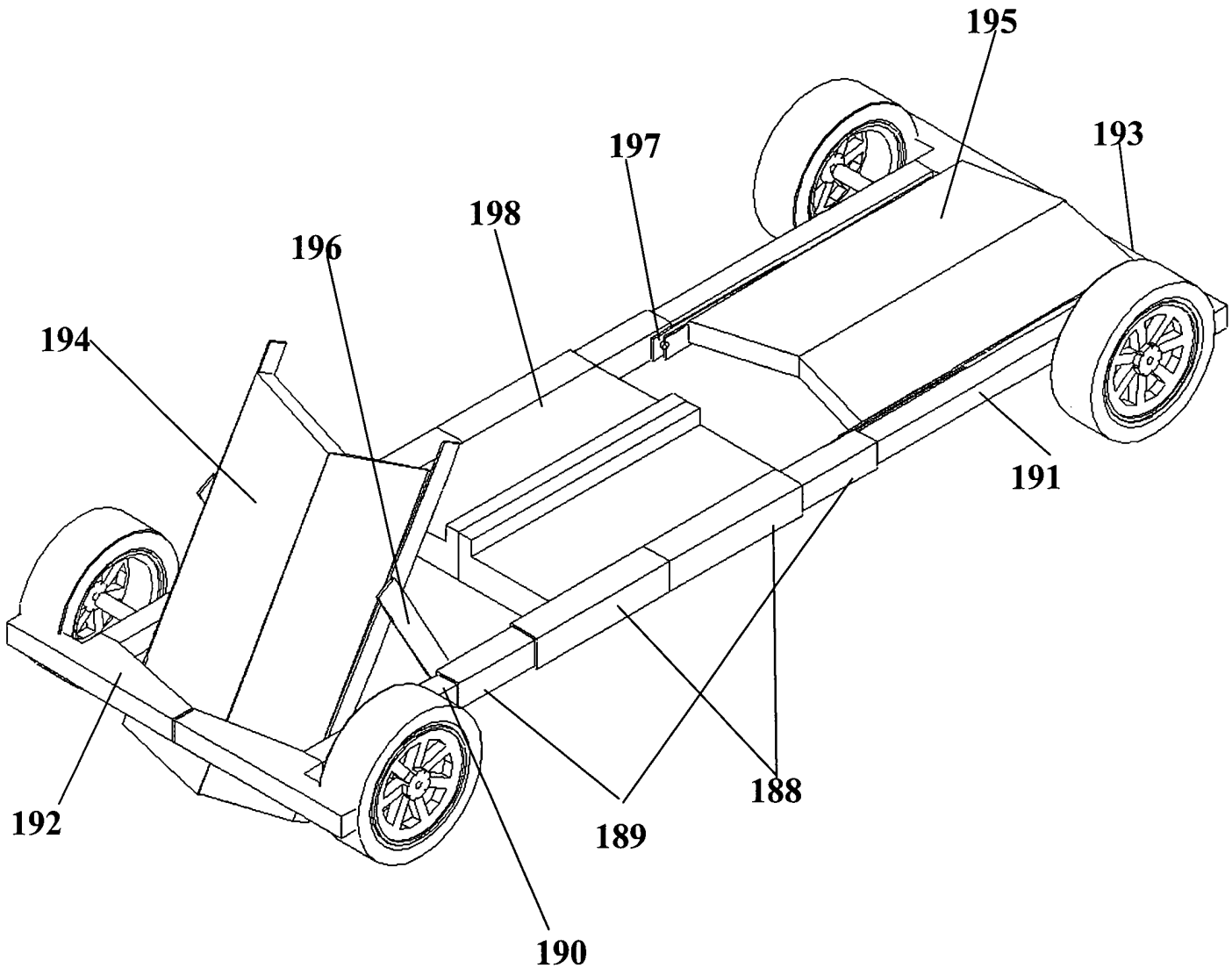


FIGURE 20 B

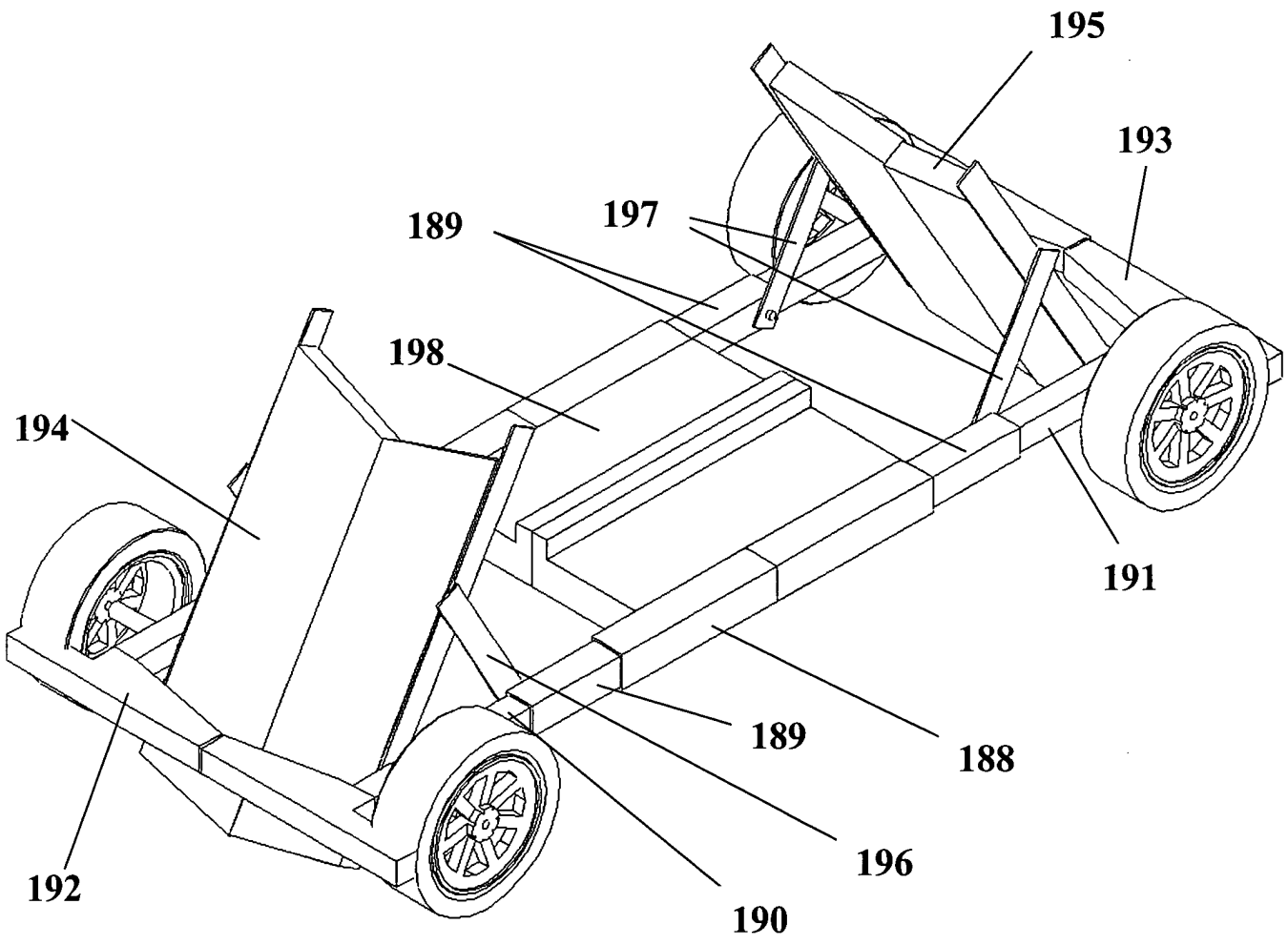


Fig 20 D

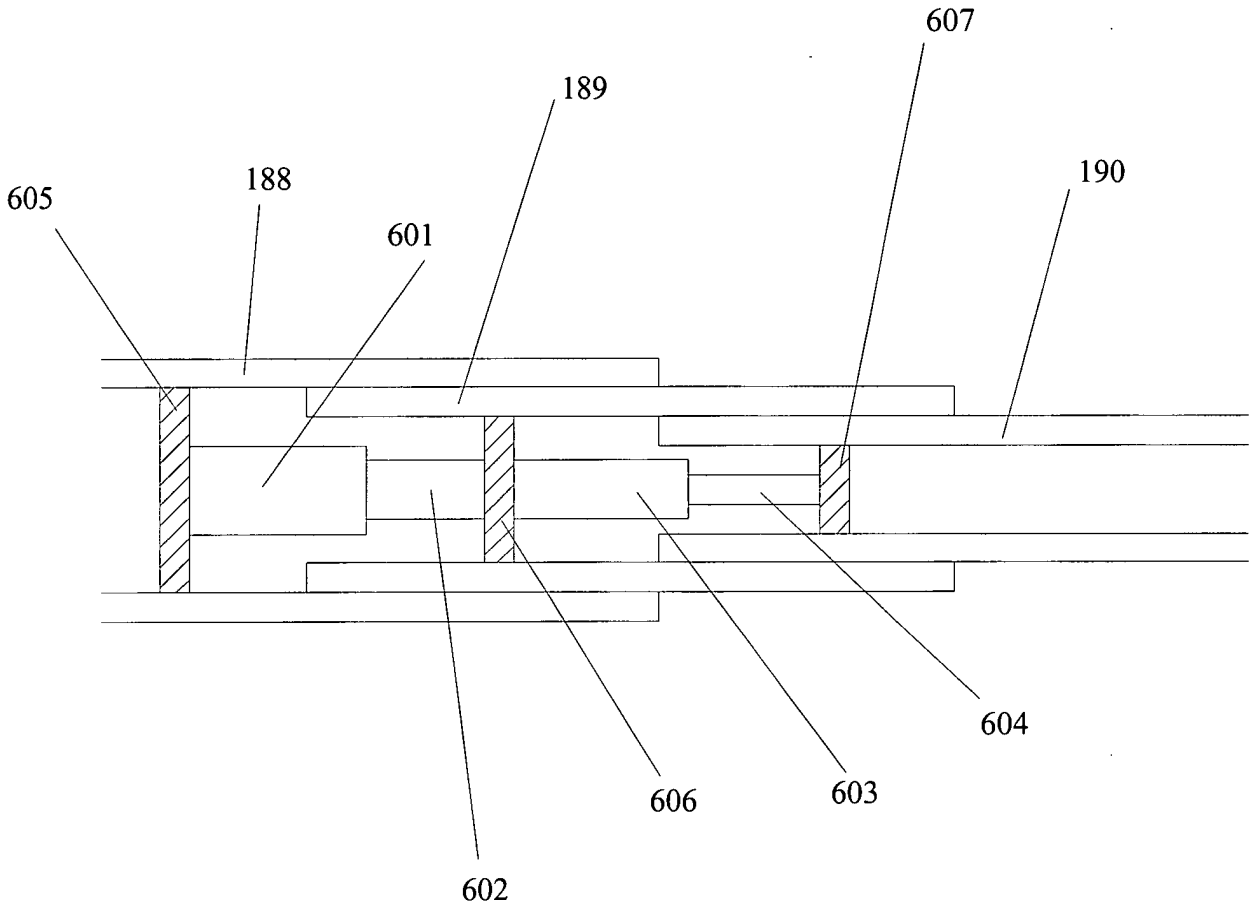


Fig 21 A

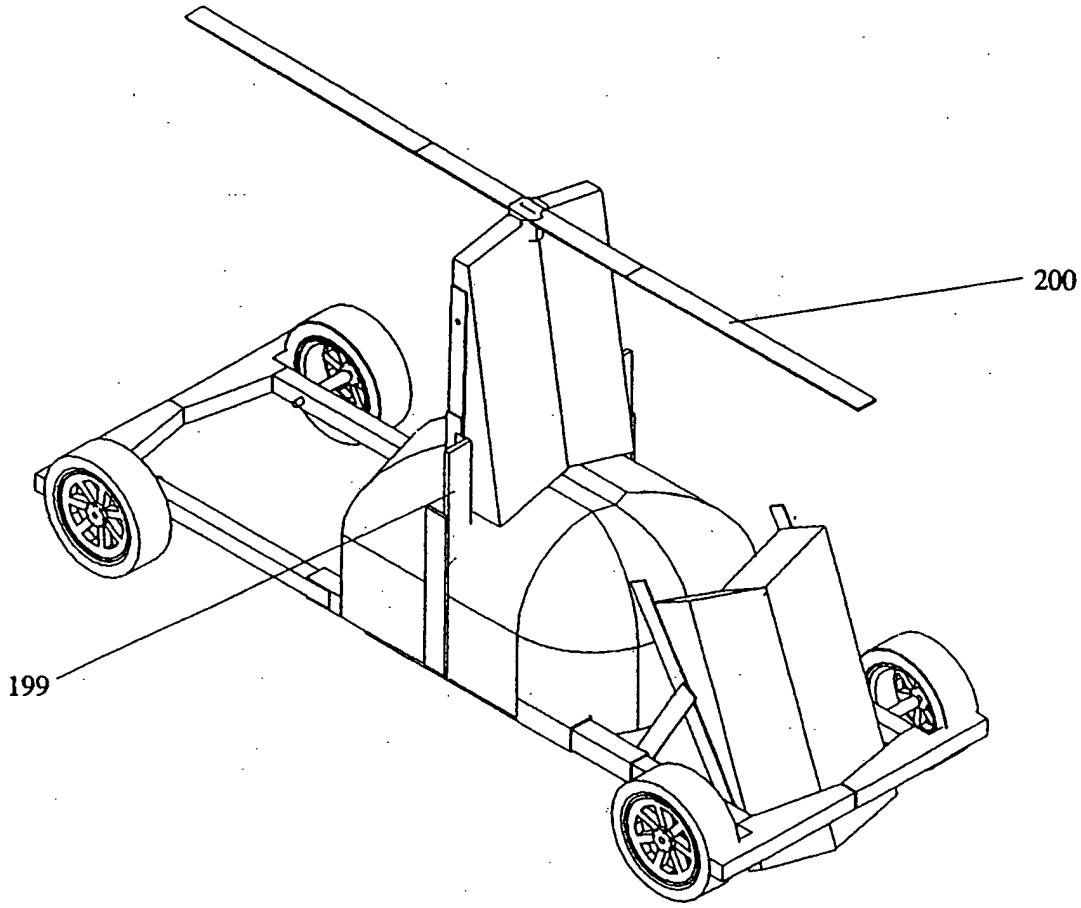


Fig 21 B

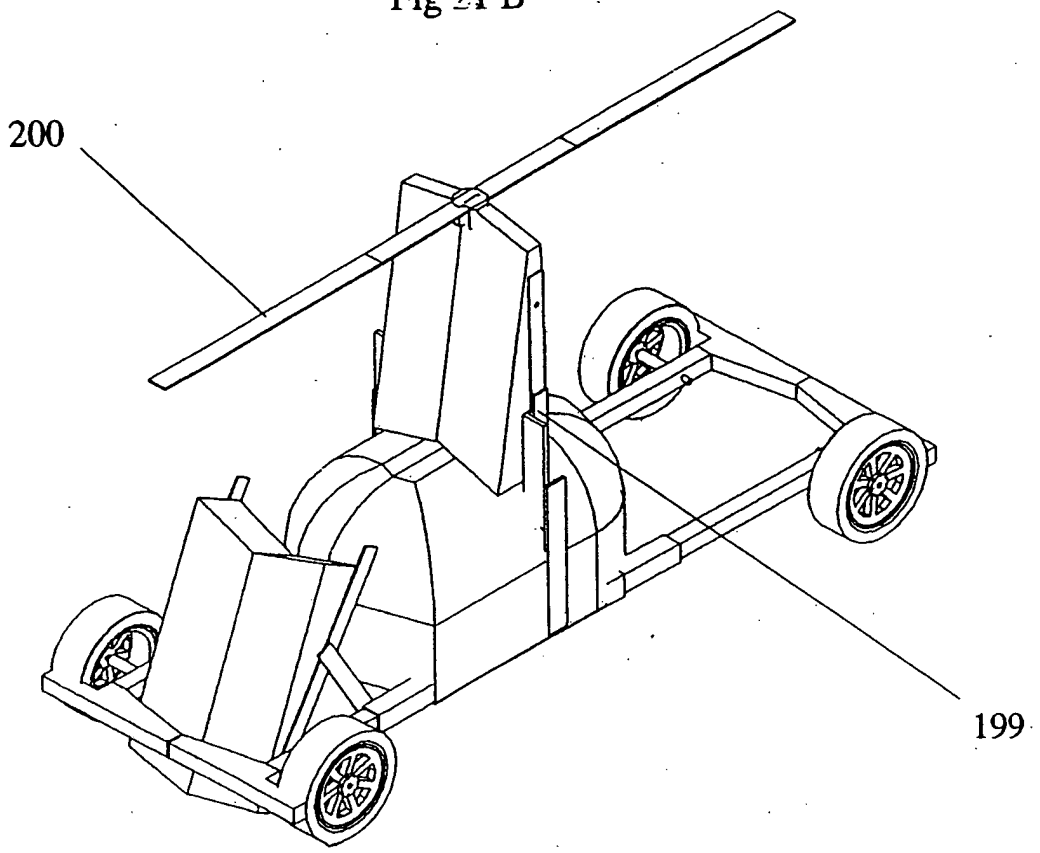


Fig 21 C

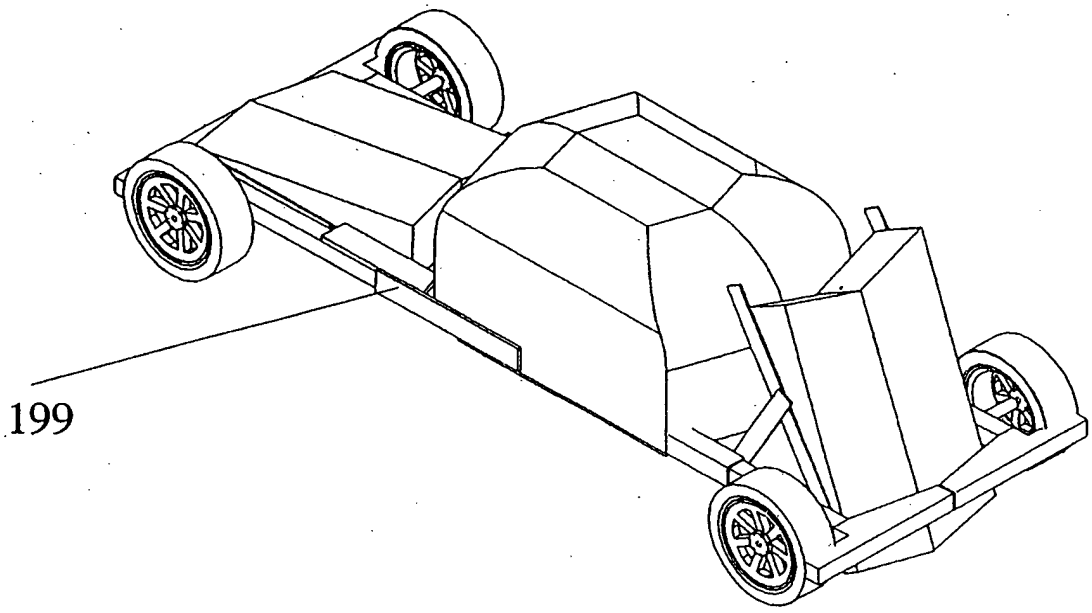


Fig 21 D

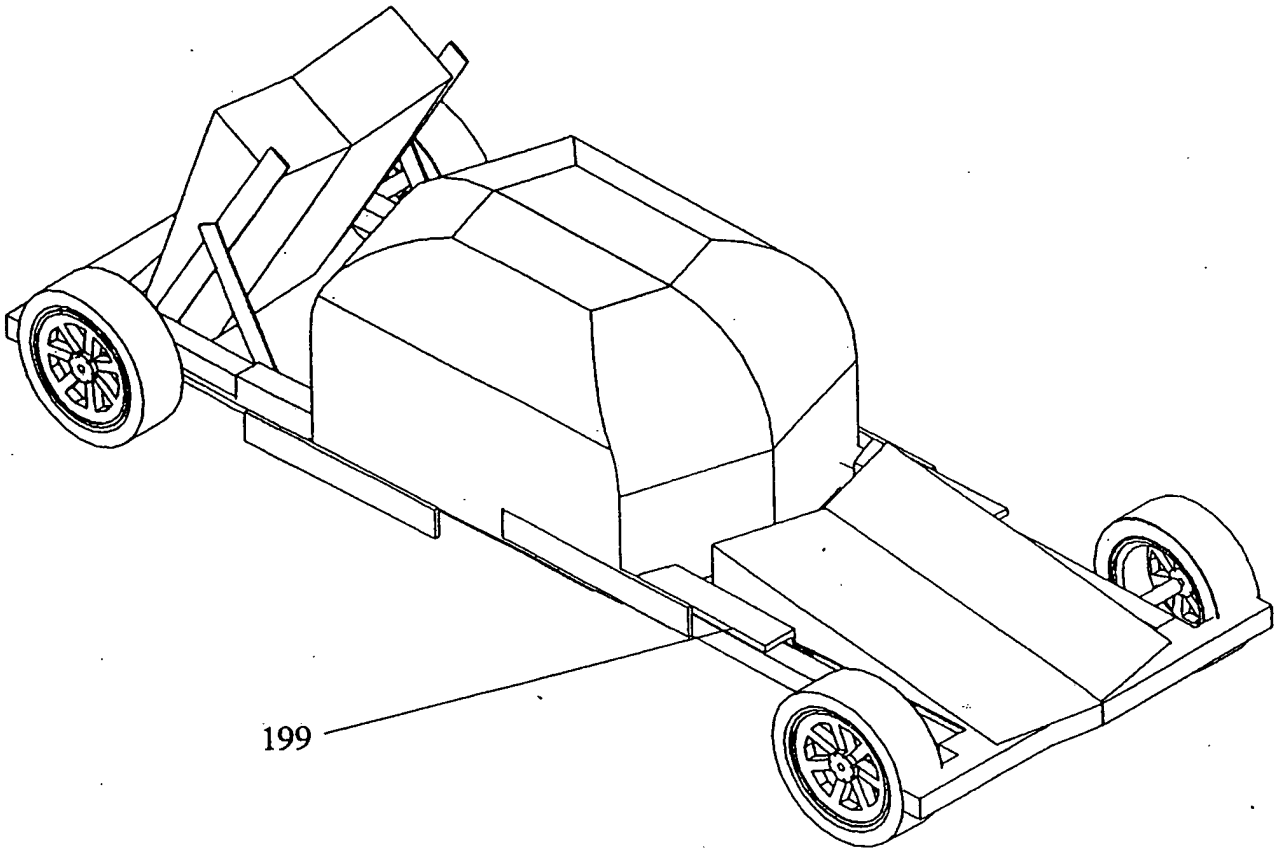
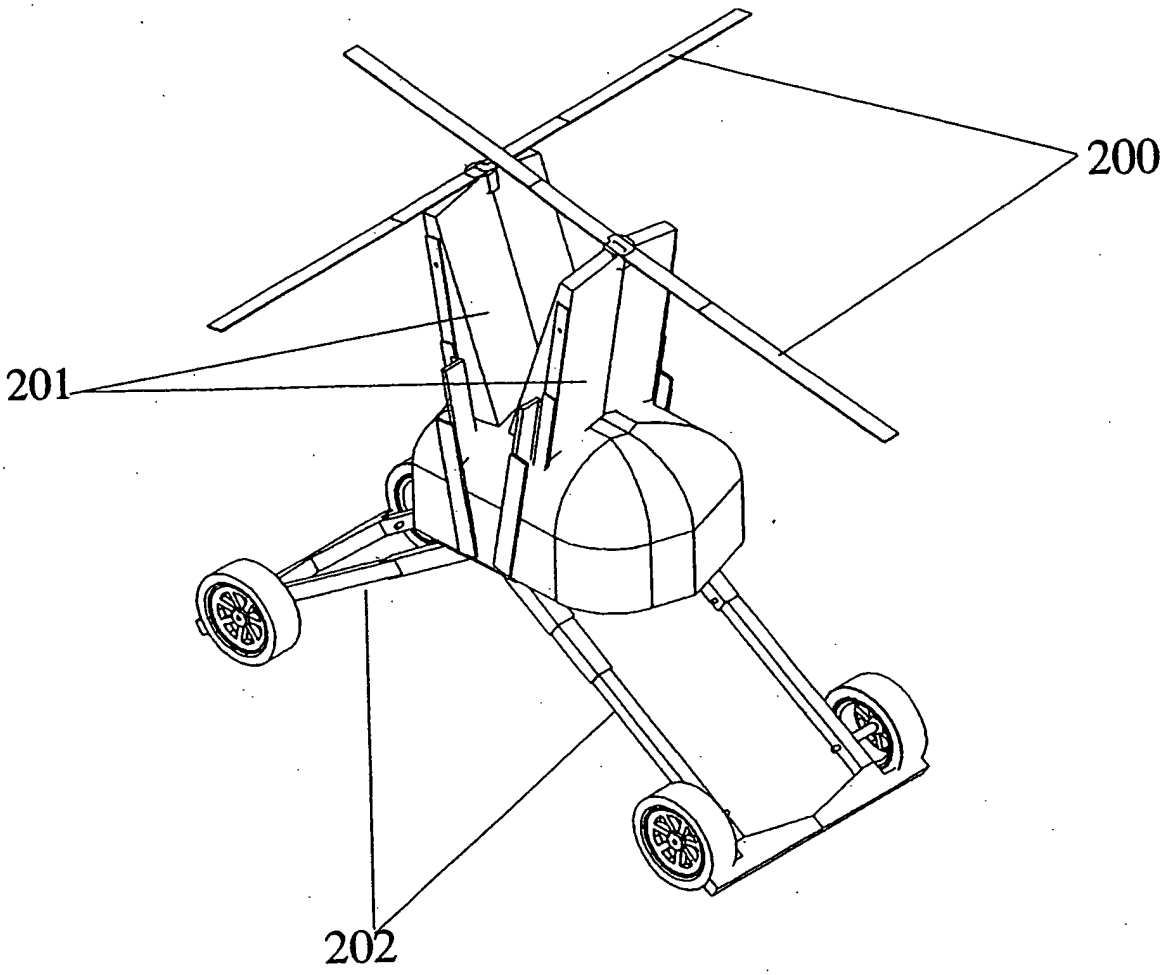


Fig 21 E



DocCode - SCORE

SCORE Placeholder Sheet for IFW Content

Application Number: **12924354** Document Date: **10/20/2010**

The presence of this form in the IFW record indicates that the following document type was received in paper and is scanned and stored in the SCORE database.

- Drawings

Images of the original documents are scanned in gray scale or color and stored in SCORE. Bi-tonal images are also stored in IFW. Defects visible in both IFW and SCORE are indicative of defects in the original paper documents.

To access the documents in the SCORE database, refer to instructions developed by SIRA.

At the time of document entry (noted above):

- Examiners may access SCORE content via the eDAN interface.
- Other USPTO employees can bookmark the current SCORE URL (http://es/ScoreAccessWeb/).
- External customers may access SCORE content via the Public and Private PAIR interfaces.

Form Revision Date: December 8, 2006

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/924,354	09/24/2010	3616	0.00		7	2

CONFIRMATION NO. 8323

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

FILING RECEIPT

OC000000043960650

Date Mailed: 10/14/2010

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Arjuna Indraeswaran Rajasingham, Bethesda, MD;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a DIV of 11/185,784 07/21/2005 ABN

Foreign Applications

If Required, Foreign Filing License Granted: 10/12/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/924,354**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No
** **SMALL ENTITY** **

Title

Easy ejector seat with skeletal crash safety beam

Preliminary Class

180

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/924,354	09/24/2010	Arjuna Indraeswaran Rajasingham	

CONFIRMATION NO. 8323

ARJUNA INDRAESWARAN RAJASINGHAM
6024 BRADLEY BOULEVARD
BETHESDA, MD 20817

FORMALITIES LETTER

OC000000043960651

Date Mailed: 10/14/2010

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
  *Applicant must submit $**165** to complete the basic filing fee for a small entity.*

The application is informal since it does not comply with the regulations for the reason(s) indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- A substitute specification in compliance with 37 CFR 1.52, 1.121(b)(3), and 1.125, is required. The substitute specification must be submitted with markings and be accompanied by a clean version (without markings) as set forth in 37 CFR 1.125(c) and a statement that the substitute specification contains no new matter (see 37 CFR 1.125(b)). The specification, claims, and/or abstract page(s) submitted is not acceptable and cannot be scanned or properly stored because:
  - The specification, claims, and/or abstract page(s) 9 are not typewritten or mechanically printed in permanent dark ink on one side (see 37 CFR 1.52(a) and (b)).
- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
  - The drawings must be reasonably free from erasures and must be free from alterations, overwriting, interlineations, folds, and copy marks. See Figure(s) all.

The following item(s) appear to have been **omitted** from the application:

- Figure(s) **21F** described in the specification.

Applicant must reply to this notice within the time period set forth in this notice to avoid abandonment of this application. Applicant must select one of the three following options and the reply must comply with the requirements set forth in the selected option and any other requirements set forth in this notice. The reply should also indicate which option applicant has selected.

I. Petition for date of deposit: Should applicant contend that the above-noted omitted item(s) was in fact deposited in the U.S. Patent and Trademark Office (USPTO) with the nonprovisional application papers, a copy of this Notice and a petition (and $400.00 petition fee *(37 CFR 1.17(f))*) with evidence of such deposit **must** be filed within **TWO MONTHS** of the date of this Notice. The petition fee will be refunded if it is determined that the item(s) was received by the USPTO. **THIS TWO MONTH PERIOD IS EXTENDABLE UNDER 37 CFR 1.136(a) or (b).**

II. Petition for later filing date: Should applicant desire to supply the omitted item(s) and accept the date that such omitted item(s) was filed in the USPTO as the filing date of the above-identified application, a copy of this Notice, the omitted item(s) (with a supplemental oath or declaration in compliance with 37 CFR 1.63 and 1.64 referring to such items), and a petition under 37 CFR 1.182 (with the $400.00 petition fee *(37 CFR 1.17(f))* requesting the later filing date **must** be filed within **TWO MONTHS** of the date of this Notice. **THIS TWO MONTH PERIOD IS EXTENDABLE UNDER 37 CFR 1.136(a) or (b).**
Applicant is advised that generally the filing fee required for an application is the filing fee in effect on the filing date accorded the application and that payment of the requisite basic filing fee on a date later than the filing date of the application requires payment of a surcharge (37 CFR 1.16(f)). To avoid processing delays and payment of a surcharge, applicant should submit any balance due for the requisite filing fee based on the later filing date being requested when submitting the omitted item(s) and the petition (and petition fee) requesting the later filing date.

III. Acceptance of application as deposited: Applicant may accept the application as deposited in the USPTO by filing an appropriate amendment as set forth in either (A) or (B) below within **TWO MONTHS** of the date of this Notice. **THIS TWO MONTH PERIOD IS EXTENDABLE UNDER 37 CFR 1.136(a) or (b)** . The application will maintain a filing date as of the date of deposit of the application papers in the USPTO, and original application papers (i.e., the original disclosure of the invention) will include only those application papers present in the USPTO on the date of deposit. A petition is not required for this option.
(A) If applicant wants to accept the application as deposited without adding the subject matter that was in the omitted item (e.g., a missing page or figure), applicant is required to submit one or more of the following items without adding any new matter (see 35 U.S.C. 132(a)):

1. For a missing page of the specification,
   a) a substitute specification including claims that amends the specification to renumber the pages consecutively and cancels any incomplete sentences, and
   b) a statement that the substitute specification includes no new matter, in compliance with 37 CFR 1.121(b)(3) and 1.125;
2. For a missing figure of the drawings,
   a) replacement drawing sheets in compliance with 37 CFR 1.121(d) to renumber the drawing figures consecutively (if necessary),
   b) a substitute specification excluding claims that amends the specification to cancel any references to any omitted drawing(s) and corrects the references in the specification to the drawing figures to correspond with any relabeled drawing figures, and
   c) a statement that the substitute specification includes no new matter, in compliance with 37 CFR 1.121(b)(3) and 1.125;
3. For a missing page of the claim listing only, a replacement claim listing with the claims renumbered consecutively or, if amendment to the claims is also necessary, then a complete claim listing in compliance with 37 CFR 1.121(c);
4. For a missing or unreadable compact disc,
   a) a substitute specification (excluding the claims) deleting the reference to the compact disc and the files contained on the compact disc, and
   b) a statement that the substitute specification includes no new matter, in compliance with 37 CFR 1.121(b)(3) and 1.125; and
5. For a missing or unreadable file submitted on a compact disc,

a) a substitute specification (excluding the claims) deleting the reference to the missing or unreadable file, and a statement that the substitute specification includes no new matter, in compliance with 37 CFR 1.121(b)(3) and 1.125; and
b) a replacement transmittal letter listing all of the files except the missing or unreadable file in compliance with 37 CFR 1.52(e)(3)(ii).

(B) Alternatively, if applicant wants to accept the application as deposited but wishes to add the subject matter in the omitted item (e.g., a missing page or figure) by relying on an incorporation by reference under 37 CFR 1.57 or other portions of the original disclosure, applicant is required to submit one or more of the following items without adding any new matter (see 35 U.S.C. 132(a)):

1. To add the subject matter in a missing page of specification,
   a) a substitute specification excluding claims and
   b) a statement that the substitute specification includes no new matter, in compliance with 37 CFR 1.121(b)(3) and 1.125;
2. To add a missing figure of the drawings, new and replacement drawing sheets in compliance with 37 CFR 1.121(d);
3. To add the subject matter in a missing page of the claim listing, a complete claim listing in compliance with 37 CFR 1.121(c) (e.g., a claim in the missing page should be submitted as a new claim);
4. To add the subject matter in a missing or unreadable compact disc,
   a) a replacement compact disc and a duplicate copy of the compact disc, in compliance with 37 CFR 1.52(e); and
   b) a statement that the replacement compact disc contains no new matter in compliance with 37 CFR 1.52(e)(4); and,
5. To add the subject matter in a missing or unreadable file submitted on a compact disc,
   a) a replacement compact disc that contains all of the files listed in the specification including the missing or unreadable file and a duplicate copy of the compact disc, in compliance with 37 CFR 1.52(e); and
   b) a statement that the replacement compact disc contains no new matter in compliance with 37 CFR 1.52(e)(4).

If applicant is relying on an incorporation by reference under 37 CFR 1.57 to add the omitted subject matter, then applicant must also comply with the requirements of 37 CFR 1.57.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of $**65** for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this notice.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is $**610** for a small entity

- $**165** Statutory basic filing fee.
- $**65** Surcharge.
- The application search fee has not been paid. Applicant must submit $**270** to complete the search fee.
- The application examination fee has not been paid. Applicant must submit $**110** to complete the examination fee for a small entity in compliance with 37 CFR 1.27.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/wtsige/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

U.S. PTO
12/924354
09/24/2010

PTO/SB/05 (08-08)
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17444 U.S. PTO 092410

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	
First Inventor	ARJUNA I. RAJASINGHAM
Title	EASY EJECTOR WITH SKELETAL CRASH
Express Mail Label No.	EG 500804236 US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Commissioner for Patents**
P.O. Box 1450
Alexandria VA 22313-1450

1. ☑ **Fee Transmittal Form** (e.g., PTO/SB/17)
2. ☑ **Applicant claims small entity status.** See 37 CFR 1.27.
3. ☑ **Specification** [Total Pages 92]
   Both the claims and abstract must start on a new page
   (For information on the preferred arrangement, see MPEP 608.01(a))
4. ☑ **Drawing(s)** (35 U.S.C. 113) [Total Sheets 39]
5. **Oath or Declaration** [Total Sheets ______]
   a. ☑ Newly executed (original or copy)
   b. ☐ A copy from a prior application (37 CFR 1.63(d)) (for continuation/divisional with Box 18 completed)
      i. ☐ DELETION OF INVENTOR(S)
      Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☐ **Application Data Sheet.** See 37 CFR 1.76
7. ☐ **CD-ROM or CD-R** in duplicate, large table or Computer Program *(Appendix)*
   ☐ Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission** *(if applicable, items a. – c. are required)*
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. ☐ **Assignment Papers** (cover sheet & document(s))
   Name of Assignee ______________________
10. ☐ **37 CFR 3.73(b) Statement** *(when there is an assignee)* ☐ **Power of Attorney**
11. ☐ **English Translation Document** *(if applicable)*
12. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
13. ☐ **Preliminary Amendment**
14. ☐ **Return Receipt Postcard** (MPEP 503) *(Should be specifically itemized)*
15. ☐ **Certified Copy of Priority Document(s)** *(if foreign priority is claimed)*
16. ☐ **Nonpublication Request** under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
17. ☐ Other: ______________________

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:*

☐ Continuation ☑ Divisional ☐ Continuation-in-part (CIP) of prior application No.: 11/185,784

Prior application information: *Examiner* FAYE FLEMMING *Art Unit:* 3616

The PTO did not receive the following listed item(s) Fee Transmittal

19. CORRESPONDENCE ADDRESS

☐ The address associated with Customer Number: ________ OR ☑ Correspondence address below

Name	ARJUNA INDRAESWARAN RAJASINGHAM				
Address	6024 BRADLEY BOULEVARD				
City	BETHESDA	State	MARYLAND	Zip Code	20817
Country	UBNITED STATES	Telephone	3014377349	Email	air@mmmmg.com

Signature	[signature]	Date	24 Sept 2010
Name (Print/Type)	A. I. RAJASINGHAM	Registration No. (Attorney/Agent)	

U.S. PTO
12/924354
09/24/2010

092410 17441 U.S. PTO

PTO/SB/05 (08-08)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	
First Inventor	ARJUNA I. RAJASINGHAM
Title	EASY EJECTOR WITH SKELETAL CRASH
Express Mail Label No.	EG 500804236 US

APPLICATION ELEMENTS
See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Commissioner for Patents**
P.O. Box 1450
Alexandria VA 22313-1450

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2. ☑ **Applicant claims small entity status.** See 37 CFR 1.27.
3. ☑ **Specification** [*Total Pages* 92]
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   (For information on the preferred arrangement, see MPEP 608.01(a))
4. ☑ **Drawing(s)** (*35 U.S.C. 113*) [*Total Sheets* 39]
5. **Oath or Declaration** [*Total Sheets* ____]
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   (for continuation/divisional with Box 18 completed)
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   (if applicable, items a. – c. are required)
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
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   ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. ☐ **Assignment Papers** (cover sheet & document(s))
   Name of Assignee ____________________
10. ☐ **37 CFR 3.73(b) Statement** *(when there is an assignee)* ☐ **Power of Attorney**
11. ☐ **English Translation Document** *(if applicable)*
12. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
13. ☐ **Preliminary Amendment**
14. ☐ **Return Receipt Postcard** (MPEP 503) *(Should be specifically itemized)*
15. ☐ **Certified Copy of Priority Document(s)** *(if foreign priority is claimed)*
16. ☐ **Nonpublication Request** under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
17. ☐ Other: ____________________

The PTO did not receive the following listed item(s) Fee Transmittal

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:*

☐ Continuation ☑ Divisional ☐ Continuation-in-part (CIP) of prior application No.: 11/185,784

Prior application information: *Examiner* FAYE FLEMMING *Art Unit:* 3616

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PTO/SB/01 (04-09)
Approved for use through 09/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☑ Declaration Submitted With Initial Filing OR ☐ Declaration Submitted After Initial Filing (surcharge (37 CFR 1.16(f)) required)

Attorney Docket Number	
First Named Inventor	ARJUNA I RAJASINGHAM
COMPLETE IF KNOWN	
Application Number	
Filing Date	SEPT 24 2010
Art Unit	
Examiner Name	

I hereby declare that: (1) Each inventor's residence, mailing address, and citizenship are as stated below next to their name; and (2) I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention titled:

EASY EJECTOR WITH SKELETAL CRASH SAFETY BEAM

(Title of the Invention)

the application of which

☑ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) _____ as United States Application Number or PCT International Application Number _____ and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

Authorization To Permit Access To Application by Participating Offices

☐ If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the above-identified patent application is filed access to the above-identified patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the above-identified patent application is filed to have access to the above-identified patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the above-identified patent application with respect to: 1) the above-identified patent application-as-filed; 2) any foreign application to which the above-identified patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the above-identified patent application; and 3) any U.S. application-as-filed from which benefit is sought in the above-identified patent application.

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DECLARATION — Utility or Design Patent Application

Claim of Foreign Priority Benefits

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application number(s) are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

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DECLARATION — Utility or Design Patent Application

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	Family Name or Surname
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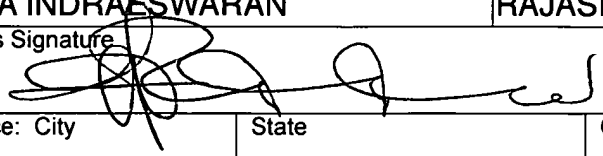
Inventor's Signature  Date: SEPTEMBER 24 2010

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☐ Additional inventors or a legal representative are being named on the NIL supplemental sheet(s) PTO/SB/02A or 02LR attached hereto

PATENT APPLICANT

A.I.Rajasingham. 6024 Bradley Boulevard, Bethesda, MD 20817

TITLE OF INVENTION: Easy Ejector Seat with Skeletal Crash Safety Beam

THE FOLLOWING APPLICATIONS ARE HEREBY INCORPORTATED HEREIN BY REFERENCE.

FURTHER, THIS APPLICATION CLAIMS PRIORITY FROM THE FOLLOWING APPLICATIONS: This application claims priororty from applications entitled " Easy Ejector with skeletal crash safety beam" US S/N: 08/936,626 filed 9/24/97, US S/N 09/404,475, US S/N 09/435,830 , US S/N 60/195298, US S/N 60,226,570, EPO S/N 98948260.9-2306, EPO S/N 00203896.6. and US 09/779,591, US 09/779,592, US 09/779,593, US 09/779,594; US 60/280470;US 60/282105; US 60/286629; US 60/332419; US 60/338466; US 60/367644; US 60/461,434; US 10/279,171; 60/362450; 10/109,674. and 10/681,304.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT: Not Applicable

REFERENCE TO A MICRO FICHE APPENDIX: Not Applicable

BACKGROUND OF INVENTION

FIELD OF INVENTION

The present invention defines a means to incorporate in passenger motor vehicles, unique safety arrangements particularly for lateral or side impacts that provide energy absorption by the mass of the vehicle but decouple the passenger from the impact acceleration and deceleration that is provided by the mass of the vehicle, thereby protecting the passengers during such collisions. Moreover, the same arrangement synergistically provides utility in access, comfort and further safety in the operating position for passengers and the driver.

DESCRIPTION OF THE RELATED ART:

In the past safety of passengers was not always the priority in passenger vehicle design. In the evolution of motor vehicle design the structure moved from a chassis that held together the mechanical components of the vehicle – a structure that was then attached to a passenger compartment or to passenger seats. The design of the structure was to hold together the working components of the vehicle – a critical aspect at the time. Thereafter in more recent times right up to the present, Exo-skeletal designs have been the dominant paradigm. Here rigid shells were constructed to hold both the mechanical components and the passengers in fixed positions. However such fixed shell structures have had limited success in protecting passengers and drivers when there are lateral collisions as passengers undergo the same impact related accelerations and decelerations as the remaining parts of the vehicle, as space limitations don't allow for "crumple zones" as in the case of impact protection for head on collisions. Passengers are particularly vulnerable to side impacts as they cannot take preemptive measures as with head-on collisions where there is speed control and directional control that is available. As vehicle speeds have increased substantially in the last several decades, these safety considerations for passengers have become critical and urgent. Vehicle designers — particularly automobile designers – have risen admirably to the task by incorporating myriads of devices and additions within the rigid shell paradigm to minimize risk in the event of collisions. Such devices include restraints such as seat belts and certain types of protective air bags. However, there are limits within the rigid shell paradigm for two reasons: First, the energy of impact cannot be easily diverted away from passengers into the remaining mass of the vehicle on impact. Second, the rigid shell needs to support high shear stresses on lateral impact and related compressive loads to the passenger compartment of the vehicle a factor that can only be addressed with greater mass of the vehicle that will impact its performance.

Another area of interest in passenger vehicles is to provide, in synergy with the above contributions, utility and comfort of passengers and drivers and further synergistic head-on collision protection.

There are four areas of Background art that are related to the present invention. These are: vehicles with sliding seats, safety arrangements addressing lateral impacts on passenger vehicles, air bags and other shock absorbing devices, and miscellaneous safety devices for frontal impacts. None of the inventions in these areas individually or collectively state or imply any aspects of the present invention. Moreover, none of this Background art even addresses the issue of energy transfer away from the passengers to the mass of the vehicle on impact and concurrently provide a mechanism for easy access to the vehicle with ejector seats. This is despite the urgent need in the car industry for such safety and utility. Moreover the novelty of the present invention is underscored as it provides solutions hitherto unidentified in a very large and competitive industry that is acutely aware of these needs and is constantly in search of new solutions to them.

Sloan 3,071,407 (1963) describes a single rear bench seat (lines 4-45) – full length (C1-L55), that can slide out of either side of the vehicle. It describes a door structure that may be attached to the seat and slide across and through the passenger compartment of the vehicle as the seat slides out. This invention does not state or

imply any safety considerations in its structure, moreover such a bench seat on slides, in the event of a lateral collision on the doors will focus the impact energy on the passengers and these passengers will be the principal casualties as the mass of the vehicle slides away little harmed. This will be the case even in the embodiment described where the doors are fixed to the seat and slides through the passenger compartment with the seat. Moreover, it cannot be used in a front seat even for its limited functionality with doors fixed to the seat as driving instrumentation (steering wheel etc) will not allow a door to slide through the compartment. Finally it does not provide any comfort features for passengers over and above a bench seat. Mach 2,753,947 (1956) describes a sliding bench seat for the access of the engine of the vehicle it does not address the issue of safety of passengers or access utility. It is expected to perform similarly to Sloan in an impact on the doors or around the side profile of the passengers in the vehicle. Solomon 2,758,872 (1953) provides a sliding bench seat that goes through the doorway and for the same reasons as Sloan does not provide protection in side impacts or provide any comfort features over and above a bench seat. . Cyphert 3,944,277 (1976) describes a seat mounted on a sliding platform that has a door at the end and protective walls around it. The arrangement being designed for the utility of the operator to reach points away from the body of the vehicle without dismounting the vehicle. This invention like Sloan does not state or imply any safety considerations in its use. Moreover there is no expressed or implied reference to the utility of mounting and dismounting the vehicle or for the comfort of the operator or the passengers except for the ability for the platform to move out to give the operator greater reach away from the vehicle body. Rees 5,213,300 (1993) describes internal design structure for slide arrangements that allow forward and backward movement of the passenger seats in vehicles. This like many other inventions prior to it relate to the structure of the slides to adjust the position of the seats for passenger comfort in the direction of motion of the vehicle.

All the above items of background art relate to sliding seats. None of the above background art related to sliding seats have stated or implied safety considerations. Moreover, none of them provide utility for mounting and dismounting a vehicle except for a bench seat that slides out on either side of the vehicle, or provide comfort features except for seating arrangement on a bench seat and in one of the above – the lateral movement for convenience of the operator.

Maier US 2,148,950 (1939) provides a laterally braced passenger compartment that braces a rigid shell body of a vehicle. Barenyi 2,710,222 (1955) provides a stiffening for the bottom plate of a vehicle body. Catlin 5,660,428 (1997) provides a design for a rigid shell structure . Guertler 5,464,266 (1995) uses stiffening arrangements for the floor of the vehicle as a component of a rigid shell vehicle body. Masuda 5,671,968 (1968) describes a strengthened rigid shell for the passenger compartment Oliver 4,533,172 (1985) describes a three part rigid shell structure for motor vehicles with the central section for passengers Sinnhuber 5,000,509 (1991) describes an arrangement that transfers impact energy from lateral impacts to the rigid body of the vehicle but does so through rigid members that include elements in the seats. The seats have limited lateral movement and are not free to move independent of the vehicle body in the event of a collision, thereby placing the passengers on the direct path of the

energy transfer Maeda 4,512,604 (1985) describes a lateral brace for the seat arrangement of the vehicle within a rigid vehicle body structure thereby distributing the impact energy to other parts of the rigid body structure. Sacco 5,435618 (1995) describes a lateral stiffening element that braces the rigid vehicle body in the region of the seats. Bhalsod 5,716,094 (1998) describes a pusher block that engages the seat in the event of a lateral impact thereby providing a rigid member between the rigid body structure and the seats that can transfer impact energy to the seats.

All of the above items of background art related to bracing a rigid body structure and provide stiffening mechanisms within the rigid shell structure to distribute energy of lateral impact. None of these items of background art provide mechanisms to transfer energy away from passengers in lateral impacts. or provide other safety arrangements or provide utility for mounting and dismounting the vehicle or provide comfort features for passengers in the operating position.

Baber 5,725,265 (1998) presents airbags for front and rear vehicle bumpers that deploy on impact. Such devices cannot be implemented on the side of the vehicle as a deceleration zone is not available under operating conditions as may be made available in the front and back of the vehicle. Moreover, as this airbag deploys on impact it creates a deceleration zone by pushing its own vehicle away that may actually increase the impulse forces acting on the passengers. Mercier 3,822,076 (1974) describers similar external front and back airbags and uses probes that protrude from the vehicle at the front and back to deploy the airbags. Such apparatus cannot be installed on the sides of the vehicle, as clearances are small. Stirling 5,131,703 (1992) describes a fluid filled chamber around the vehicle that will provide a deceleration zone on impact – frontal rear or lateral. However this arrangement requires the deceleration zone to be present during normal operating conditions that will reduce the maneuverability of vehicles if deployed on the sides of the vehicle. Park 4,995,659 (1991) describes a gas filled chamber deployed around the vehicle. Such a chamber is normally inflated under normal conditions and reduces maneuverability of the vehicle. Campbell 4,815,777 (1989) describes a bumper that can be deployed selectively by filling with gas. This bumper is effective when extended only. It is not designed to be deployed when the vehicle is in motion , as it will reduce maneuverability. Hartmann 5,810, 427 (1998) describes a mechanism that transfers fluid from one airbag to another on impact. The airbag that is deployed is normally in an extended position to absorb the impact energy and provide the deceleration zone. However, such an extended airbag will reduce the maneuverability of the vehicle. There is a literature ("Extended Bumper and Glass-Plastic glazing methods to reduce intrusion and ejection in severe motor vehicle crashes". C.C.Clark 1993. 26th Symposium on Automotive Technology and Automation. Aachen Germany., "Airbag bumpers inflated just before the crash" C.C.Clark., William A. Young. 1994. SAE Technical Paper 941051., "The crash anticipating extended airbag bumper system". C.C.Clark.1994. Fourteenth International Technical Conference on the enhanced safety of vehicles. Munich Germany., "Airbags as a means to reduce crash loads and intrusion, and increase intervehicular compatibility." C.C.Clark. 1995. International Conference on Pelvic and Lower extremity injuries-Proceedings Washington DC., Human Transportation Fatalities and Protection against Rear and Side Crash Loads by the Airstop Restraint" Carl Clark and Carl Blechschmidt. 1965. The Ninth Stapp Car

Conference.) IDS, and background art on the construction of external airbags including deployment proactively with radar or other devices. This entire literature is limited to the use of proactive external airbags mounted on vehicles with rigid structures that include the passenger. There is no reference in this literature to the proactive detection of impact explicitly or implicitly creating a deceleration zone for passenger protection internally, relative to the vehicle as in the present invention. Moreover, this literature is focussed on external airbags for front impact protection with for example rigid penetration buffers to negotiate posts and trees, unlike the present invention which does not prescribe external airbags for front impacts. Furthermore, as this literature describes external airbags without perforation shields their implementability is questionable as, unlike internal airbags that are in relatively protected environments, impact with external airbags often occurs with objects with sharp points and edges that are likely to perforate the external airbags. The Present invention requires perforation shields for external airbags.

All the above items of background art relate to air bag devices for safety in vehicles. However, none of these references take the integrated approach of the present invention, as more fully explained below, which comprises proactive deployment of both internal and external air bags, together with sliding seat members and other devices. Moreover while the present invention can function even without the deployment of external airbags, either proactive or reactive, taken together these items provide protection for passengers which is more than the sum of the parts. Furthermore, none of the protection airbags disclosed, related to external air bags having protective perforation shields that further enhance their efficacy. Moreover none of these devices provide energy transferring mechanisms away from the passenger in a lateral impact or provide other safety features. Moreover they do not provide any utility features for passengers in mounting and dismounting the vehicle or provide comfort features to the passengers.

Perras 2,873,122 (1959) which describes an invention where upon a head-on collision the seat projects a curved protector around the passenger designed to protect the passenger. This curved protector retracts into the seat under normal operating conditions. It is not clear how effective such a mechanism will be as the acceleration of the passenger forward relative to the vehicle may precede that of curved protector's release from the seat. Satzinger 3,961,805 (1976) describes seat belts for frontal collisions that provide safety for vehicles. Such seat belts are in common use. However, they suffer from the drawback that they restrain the body of the passenger in the narrow regions covered by such belts which may cause injury as other parts of the body are not restrained. Moreover such belts are not popular, while in common use as the belts are in constant contact with the body- a factor that is not often relished. Pulling 3,981,520 (1976) describes an arrangement where that provides passenger movement and protection in frontal impacts. On impact the passenger moves in the vertical plane of motion to a more protected position while side firing airbags provide frontal protection. This system of deployment of airbags for frontal collision protection is similar to other frontal airbag systems. They are necessary as restraining systems during the collision but need to be retracted in conventional passenger compartments to give passengers access to their seats while mounting and dismounting the vehicle. Erickson 2,777,531 (1957) describes an invention that rotates the seat of the passenger thereby restraining and protecting the passenger on impact taking advantage of the inertia prior to impact to endow the

passenger with rotational energy that changes the position of the seat. Such rotation can injure the passenger with impacts at present day passenger vehicle speeds.

All the above items of background art relate to frontal impact protection. None of these items provide a device that is normally deployed during operation, and provides a broad area of restraint across the body for the entire upper body, head and neck, without a need for changing the orientation of the passenger. Moreover none of these items provide any protection for side impacts or provide utility for mounting and dismounting the vehicle or for the comfort of the passengers in the operating position.

SUMMARY

In view of these prior references what would be useful is an arrangement that diverts the impact energy in lateral or side impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers, and in the same arrangement provides utilitarian access to the vehicle, such utilitarian access making it possible to both install multi-element contoured surround seats for passengers and the driver, and also a safety device for head-on collision protection that obviates the need for conventional seat belts and front impact airbags. Moreover, it would be useful to have a synergistic structural arrangement for the vehicle that targets strength of the vehicle to protect passengers while minimizing other massive elements in the vehicle.

The present invention includes these objects and advantages.

OBJECTS & ADVANTAGES

Some of the objects and advantages of the present invention are, to provide an arrangement that diverts the impact energy in lateral or side impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers but decelerating the impacting object with the remaining mass of the vehicle. Moreover the arrangement synergistically provides a means for utilitarian easy access to the vehicle for passengers and drivers alike and allows the installation of multi-element surround contoured seats for the comfort and protection of passengers. This arrangement differs sharply from the Background art in that it does not simply offer to the impacting body a reinforced rigid shell where the passenger is treated as part of this integral unit, but rather provides selective and differential treatment of the mass of the passengers and driver of the vehicle vis-à-vis the remaining mass of the vehicle. Furthermore the present invention differs sharply from the Background art in that the resulting structure synergistically permits the installation of contoured multi-element surround seats and a unique safety harness that protects passengers in head-on collisions, both of which may not be implementable without the slide or other moving arrangements for seats on either side of the vehicle in the present invention.

Another object and Advantage of the present invention is the gravity slide drive and a related shock absorbing arrangement relative to the fixed body members of the vehicle ad the terrain traversed by the vehicle, for my arrangement for which there is no counterpart in the Background art. This

allows further Utility and weight and energy saving in implementing the above elements of the present invention.

Another Object and Advantage of the present invention includes External side Airbags that differ sharply from the Background art in that for the first time they proactively create a "Just in Time" deceleration zone both for the passenger relative to the vehicle and also for the vehicle relative to the impacting body, for the lateral or side impact while not remaining in an extended position under normal operating conditions of the vehicle.

Another Object and advantage of this invention is a perforation resistant shield for external airbag protection that would reduce the probability of deployment failure. The background art does not provide for this function in externally deploying airbags.

Another object and advantage of the present invention is a indo-skeletal structure of the vehicle body that permits the energy transfer from the lateral or side impact through compressive members to the body of the vehicle. Unlike the Background art this indo-skeletal structure is designed to transfer energy to the body of the vehicle without transferring it to the passengers and driver of the vehicle. The passengers are targeted for protection with "Safety zones".

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is an illustration of a front elevation of a seating arrangements in a passenger vehicle. This figure is an illustration of the invention in the normal vehicle operating condition. The impacting body is represented on the left as still distant but advancing towards the above passenger vehicle.

Figure 2 is an illustration of the same vehicle arrangement as in Figure 1, except that the impacting object has advanced towards the passenger vehicle adequately to trigger the distance and velocity sensors.

Figure 3 is an illustration of the same vehicle as in Figures 1 and 2, except that the distance and velocity sensors have deployed the external Airbags. They may also provide delayed deployment of the internal Airbags.

Figure 4 is an illustration of the same vehicle as in Figures 1,2 and 3 except that the impacting object has made impact with deceleration and energy absorption provided by the External airbags and the shock absorbers and resisted by the mass of the vehicle through compression members as noted below. The Passengers and seats are free to move away from the impact on the secondary slides as the internal Airbag deploys, pushing out the Primary slide on the side away from the impact.

Figures 1D, 2D, 3D and 4D illustrate an alternative embodiment with the shock absorbers mounted internal to the protector shield.

Figures 1C, 2C, 3C and 4C illustrate an alternative embodiment that has an auxiliary beam mounted behind the seat with a high section of the central member of the skeletal structure behind the seat to abut the auxiliary beam.

Figures 1B, 2B, 3B and 4B illustrate an alternative embodiment with a center console.

Figures 1F, 2F, 3F and 4F illustrate an alternative embodiment with a center console that is crushable and as a result decreases the need for the ejection of the passenger on the further side of the vehicle at impact.

Figures 1G, 2G, 3G and 4G illustrate an alternative embodiment with center airbags that are a part of a passive airbag system to protect passengers during lateral impact by absorbing some of the impact energy but more importantly providing a means to inflate head and neck protection airbags and other anatomical micro airbags mounted in the vicinity of the human body. This particular embodiment has a crushable center console as well.

Figure 5 and 6 is an illustration of the seating arrangement as used for loading and unloading passengers and driver. Figure 5 represents the open position and Figure 6 represents the closed position.

Figures 5A and 6A illustrate an embodiment of the current invention with the protector shield/shock absorbers/external airbag hinging down to support the primary slide. A useful feature for larger vehicles with more than a single seat on each side.

Figures 7-9 is an illustration of the Gravity slide drive that may be embodied in the invention. Figure 7 is an illustration of the Gravity Slide drive at the end of the unload cycle for passengers. Figure 8 is an illustration of the Gravity slide drive at the beginning of the Load cycle for passengers. Figure 9 is an illustration of the left side loaded and ready for operation of the vehicle and the right side at the start of the loading operation, emphasizing the independence of the two sides of the Gravity slide drive mechanism.

Figure 10 A and B are an illustration of Isometric views of the present invention on one side of the vehicle for clarity. Figure 10 C is an illustration of a Plan view of the present invention for one side of the vehicle.

Figures 10 A1, 10B1 are isometric views of an alternative embodiment with a vertical extension/"safety cage" to protect passengers further. Figure 10 C1 is a plan view of the same arrangement.

Figures 10D1 to 10 D5 represent embodiments with cylindrical slides. Fig 10D3 shows the extended position for one side of the vehicleand 10D 4 shows the impacted position for one side of the vehicle.

Figure 11. is an illustration of the position of the "Safety Zones" that are targeted for protection with the Protector shields.

Figs 12 H2, 12 I 2, 12 J 2 illustrate an isometric view of another embodiment of the safety harness, in the normal state, with front impact anatomical passive micro air bag deployed, and the head and neck anatomical micro airbags deployed respectively.

Figure 13. is an illustration of a drawing of isometric view of the present invention.

Figure 14 illustrates a horizontal cross section of an embodiment of the present invention at the level of the upper primary slides.

Figures 17 A,B show a schematic diagramof the passive air cushionsystem disclosed in this invention.

Figures 19 A-E show an embodiment of the customizable contoured multi – element seat. Figure 19 F, G show another embodiment of a customizable multi element seat.

Figures 20 A-C show an embodiment of the indo skeletal structure that includes special arrangements for front impact protection and other features for passenger convenience and comfort and Fig 20D shows an embodiment of the connections between the elements in Figures 20 A-C.

Figures 21 A-F show other alternative embodiments for impact protection.

LIST OF REFERENCE NUMBERS

101 - Central Member of Indo-skeletal structure

102 – Safety Beam Lower Element

103 - Side impact shock absorbers

104 – External Air Bags

105 – Perforation Shields

106 – Protector Shields

107 – Safety Beam Upper Element

108 – Auxiliary Beam.(fixed or sliding)

109 – Multi-element contoured passenger seat

110 – Vehicle Shell/Body

111 – Secondary Slides/Impact decouplers

112 – Locking devices

112A-Pivot for Protector shield

113 – Proactive Velocity/Distance Detectors

114 – Internal side impact airbag

115 – Spring device for manual slide

116 – Inside door open button

117 – outside door open button

118 – Beam pivot for Gravity slide drive ejector

119 - Safety Harness

120 – Support for Safety Harness

121 – Bottom of seating surface of the contoured seat

122 – Contoured arm rests

123 – Child seat attachment

124 – Impacting body

125 - Vertical extensions/ Safety Cage (fixed or sliding)

126 – Center console

127 – Secondary slide/Center console locks

128 – Instrumentation

129 – Center airbags-energy absorption/ passive head and neck anatomical airbag system

130 – Safety Harness Shield

131 – Safety Harness -Anatomical passive micro air bag and visco-elastic buffer

132 – Safety Harness elbow

133 – Safety Harness extending upper arm

134 – Safety Harness Pivoting lower arm

135 – Safety Harness Head and neck anatomical micro airbags (active or passive)

136 – Safety Harness Adjustable Head restraint

137 – Safety Harness Hinged support

138 – Safety Harness Locking Support

139 – Safety Harness passive micro airbag air reservoir

140 - Adjustable Hinge support on seat

141 – Foot rest

142 – Sacrificial chamber

143 – Micro air-cushion – displacement function

144 – Micro air cushion – support function

145 – Valves – air flow/fluid flow

146 – protected entity

147 – Fluid paths

148 – Wheel Chair Conversion - Seat lower cushion and support structure

149 – Wheel Chair Conversion – Chair Clamps

150 – Wheel Chair Conversion – Chair Cross support

151 – Wheel Chair Conversion – Primary Pivot with locks for Rear Wheel retraction

152 – Wheel Chair Conversion – Principal Rear Wheel Support

153 – Wheel Chair Conversion – Rear Wheel Support strut

154 – Wheel Chair Conversion – Secondary Pivot for Rear Wheel retraction

155 – Wheel Chair Conversion – Spring loaded locking support Sleeve

156 – Wheel Chair Conversion – Seat back

157 – Wheel Chair Conversion – Primary Pivot with locks for front wheel

158 – Wheel Chair Conversion – Wheel chair back pivot release

159 – shadow vertibra – air cell retainer

160 - shadow vertibra – lateral tilt return spring

161 - shadow vertibra –upper fixed slot fo lateral tilt return spring

162 - shadow vertibra –support flange

163 - shadow vertibra –upper slot for support flange

164 - shadow vertibra – left body

165 - shadow vertibra – right body

166 - shadow vertibra – left upper air cell socket

167 - shadow vertibra – right upper air cell socket

168 - shadow vertibra – lateral tilt air cell visco elastic damper tube

169 - shadow vertibra – lateral support arm connector

170 - shadow vertibra – - back support adjustable air cushions

171 - shadow vertibra – left lower air cell socket

172 - shadow vertibra – right lower air cell socket

173 shadow vertibra – lower slot of r support flange

174 – lower sliding slot for lateral tilt return spring

175 - shadow rib – body

176 - shadow rib – adjustable air cushions

177 - shadow rib – tilt control connectors

178 – shoulder bolster

179 – Shoulder bolster adjustable air cushions

180 - back support adjustable air cushions

181 – Neck lateral support with deploying passive micro air bag

182 – Head lateral support arms with deploying passive micro air bag

183 – Head rear support adjustable air cushions

184 – Neck rear support adjustable air cushions

185 - Lumbar support adjustable air cushions

186 – Adjustable Hip bolster

187 – Adjustable Pelvic support

188 – Axial contraction system – Central body tube

189 – Axial contraction system - Body extender tube

190 - Axial contraction system – front end connector tube

191 - Axial contraction system – back end connector tube

192 - Axial contraction system – front end

193 - Axial contraction system – back end

194 - Axial contraction system - front module

195 - Axial contraction system – rear module

196 - Axial contraction system – front module crank

197 - Axial contraction system – rear module crank

198 – passenger support plaform

199 – Elevator beam

200 – Propeller

201 – dual Elevating modules

202 – aligning wheel shockabsorber arrangement.

203 – Lower Primary slide support with decoupling key that slots into central member

204 – shadow vertibra 2 – body

205 – shadow vertibra 2 – slider insert

206 – Shadow vertibra 2 – body: first support surface for length adjustment spring

207 – Shadow vertibra 2 – body: second support surface for length adjustment spring

208 – shadow vertibra 2 – body: aperture for tension cord

209 – Shadow vertibra 2 - body: aperture for slider insert

210 - Shadow vertibra 2 - body: slot for adjoining vertibra key

211 - Shadow vertibra 2 - body: vertibra attachment key

212 - Shadow vertibra 2 - body: vertibra attachment pin socket 1

213 - Shadow vertibra 2 - body: vertibra attachment pin socket 2

214 - Shadow vertibra 2 - body: holes to accommodate spring rods

215 – Child or Infant Support Mechanism support (CISM support)

216 – Extendable spring/damper loaded attachment for CISM support

217 – Inner rotator for CISM support

218 - Outer rotator (including attached impact decoupler/secondary slide 111)

219 –reserved

220 –reserved

221 –Bottom seat support flange

222 - Back seat support flange

223 – Shoulder strap attachement for 3 point belt.

224 – Child or Infant support mechanism (CISM)

225 - CISM support pivots

226 – Lock pin – Internal Airbag equivalents (IAE) with Safety beam lower element

227 – Pin slot for lateral impact movement

228 - Internal Airbag equivalent shock absorber

229 - Slot for housing Internal Airbag Equivalent shock absorbers

230 - Pin Hole for registering Lock Pin

231 - Support Key -secondary slide to outer rotator

232 – CISM Support Bracket

233 - Pivotal support for CISM Support Bracket

234 – Pivot for Internal Airbag equivalent attached to CISM support bracket

235 – Fixed Support for safety beam lower elements and internal airbag equivalents

236 – support for secondary slides, CISM support bracket and internal airbag equivalents

237 – Support flange between Secondary slide and internal airbag equivalent active ends

238 - Internal airbag equivalents – dual movable active end at center

239 -Internal Airbag Equivalents–dual movable extremes-expansion/compression.

240 – Lock pin hole on dual internal airbag equivalent center support

241 – Top lock flanges

242 – Side lock flanges

243 - Front lock flanges

244 - Side support flange

245 – Lateral Brace

P101 – Compressible Laterally Slidable (when detached) Hip Bolster

P102 – Seat Bottom Contoured

P103 – Impact Decoupler Secondary Slide Elements

P104 – Retraction Slots for secondary slide support rails (rails not shown)

P105 – Retraction slots for Secondary slides, retracted at Egress and Ingress

P106 – Front sid of rear seat

P107 – Back of seat bottom

P108 – Side bolsters in retracted position for egress and ingress

P109 – Crushed side bolstersduring impact (does not intrude into hip space)

P110 – Side Bolster Air Bags

P111 – Shoulder bolster /support – operating position and width

P112 – Back rest

P113 – Head Rest

P114 – Head and Neck air bags (head rest is fixed to backrest so that it moves with back rest on lateral impact)

P115 – Body Air Bags to hold and move the body on lateral impact. The airbags are shaped to push the arms out of the way at deployment time.

P116 – Crushed shoulder bolster/support (controlled crush)

P117 – Back Rest

DETAILED DESCRIPTION OF INVENTION

The present invention provides a passenger vehicle a structure that synergistically incorporates two functions. First, during lateral or side impacts, a means to decouple from impact, and protect passengers while projecting the remaining mass of the vehicle to decelerate the impacting body, and second, utility to passengers and drivers, in mounting and dismounting the vehicle with the comfort of contoured surround seats. The arrangement may in some embodiments use an indo-skeletal beam that allows such embodiments to rely on compressive force transmission to transfer impact energy to the mass of the vehicle rather than shear loads that are required in the shell paradigm of construction in most current passenger vehicles.

The present invention may use Primary and Secondary slides on each side of the vehicle, to meet these objectives. The Primary slide has among other attached devices, a protector shield that bears the impact force in lateral or side impacts. Such protector shields may be hinged out for access if the sliding arrangement is not used. The Primary Slide may engage a central indo-skeletal beam in some embodiments. The Secondary slide is attached among other devices to possibly contoured surround seats. This slide may be activated under impact to guide passengers in their seats away from the impact zone.

The present invention may utilize a Safety Beam in the vicinity of the seats. However, there is an important advance over the Background art in that the Beam does not lock the passengers on the path of the energy transfer, but rather, conducts the energy of impact away from the passenger to the indo-skeletal frame or to the body members of the shell (collectively elements of the fixed body members) and thereby to the mass of the vehicle allowing independent motion of the passengers away from the impact.

The present invention may use proactively fired external airbags which for the first time provide a means to create a "Just in Time" deceleration zone on the side of a vehicle prior to impact but not deployed under normal operating conditions of the vehicle. Notably, Background art for external airbags that are either extended under normal operating conditions of the vehicle or require reactive deployment cannot function effectively, as the former will impede the maneuverability of the vehicle and the latter will not be able to create a deceleration zone in time for the impact.

Overall this invention provides a "bottom up" paradigm for the design of vehicles starting with the human environment and building outwards to the vehicle – in stark contrast to the conventional approach of design that starts with the vehicle and inserts within these constraints, the passenger environment. Moreover, this invention embodies a two level safety system. The first or the primary level is passive and has a negligible probability of failure. The second level is active and predictive or proactive, utilizing advanced technologies. However, complex advanced technology systems have the drawback of higher probabilities of failure. Therefore while the second level can reduce the level of injury in serious crashes, there is a non trivial proability of failure of this secondary system Therefore it is necessary to build a primary system that is good inough in most cases to reduce injury levels in severe crashes. The paper in the Appendix includes simulation results for an embodiment of the primary system alone with a failure of the secondary system.

The following descriptions are for embodiments of the present invention. Deviations from this description in an embodiment is possible without deviating from the present invention.

PREFERRED EMBODIMENT

The following is a detailed description of some of the components of this embodiment. The seating arrangement of a passenger vehicle is shown in Figure 1. The cross section of the central member of the indo-skeletal structure (101) is fixed to the safety beam (102') and the lower primary slide (102). The Protector Shields (106) is firmly attached to the Upper Primary slide (107), which slides on the lower Primary slide (102) . (The terms upper and lower being used for the slides to distinguish them and not representing a relative elevation of the slides). The construction of such protector shields would follow that of any impact resisting body panel member of a vehicle, with the usual weight strength tradeoffs. Such construction is well disclosed in the background art. The sliding arrangement may use single element or multiple element direct contact low friction surfaces sliding on one another, roller bearings, ball bearing structures – all of which are well disclosed in the background art. The Protector Shield(106) are designed to cover the required "safety zone" as noted on Figure 11. The Upper Primary Slide (107)

locks into the Central member of the indo-skeletal structure (101) in the operating position with locking devices (112). Such locking devices do not take any additional loads on impact, and may as a result follow the extensive background art for locking devices for example similar mechanisms to those used in automobile door locks. These locks may be activated by the ignition key switch for additional safety while the vehicle is operational. The Protector Shield (106) has attached on the outside a shock absorber (103), which may include external airbags (104). The construction of such shock absorbers follow the background art. Such external airbag (104) are protected from sharp objects on impact by a Perforation Shield (105). These perforation shields protect the external airbag (and the passenger) from sharp objects. The construction of such perforation resisting shields are well disclosed in the background art. Such Perforation shields may be attached by conventional means to the outer surface of the airbag and retained in the normal operating position using techniques used for airbags both internal and external disclosed in the background art. The Air Bag (104) is deployed with distance and velocity sensors (113) mounted on the Perforation shields (105). Distance and velocity sensors are used in other applications and their construction is well disclosed in the background art. The Upper Primary Slide (107), supports the secondary slide/Impact decouplers (111). In this embodiment this is firmly attached to the Upper Primary Slide until the impact when it is decoupled to slide away from the impact. The Secondary slide arrangement may use a friction based approach, or other approach , all of which are well disclosed in the background art. This embodiment has contoured surround Passenger Seats (109) that are mounted on the Secondary slides (111). These seats have internal Airbags (114) that deploy on impact and may "unfurl" upwards to protect the head or upper body as well. The construction of seat adjustment mechanisms are well disclosed in the background art. This Figure shows the impacting object on the left approaching the vehicle, but too distant to trigger any action.

In Figure 2, the impacting object has moved to a position that can now trigger the distance and velocity sensors (113). These sensors trigger the deployment of the External Airbags (104), and the shock absorbers (103). The internal airbags (114) may be triggered by conventional means disclosed in the prior art, explicitly or implicitly reacting to proactive or reactive impact detection. The internal air bags are designed to move the passengers and the passenger seates to the extent necessary through a Motion Space to a Safe Position on primary mpact detection, and thereafter protect the protected entity – the passenger and the seat. Thereafter as illustrated in Figure 3, the External Airbags (104) and shock absorbers (103) deploy to provide the required deceleration zone for the impact. As a result on impact the energy of impact is partially absorbed by the External Air bag (104) and the Shock Absorber (103) and the remaining energy transferred to the massive components of the vehicle through the Protector Shield (106), the Upper and Lower Primary Slide/ Safety Beam (107, 102, 102') to the Central element of the Indo-skeletal frame (101) and the body of the vehicle. Notably, the Secondary slides (111) decouple and slide the passenger seats (109) with the passengers away outside the path of the impact forces and protected by the internal Airbag (114). The Upper Primary Slide (107) on the side of the vehicle away from the impact is free to slide out with all devices mounted on it to provide a path for the secondary slide (111) and the seats (109). In this situation it may be seen that the Upper Primary slide works as an impact-resisting beam on the side of the impact and a release and support mechanism on the

side away from the impact. Figure 15 A illustrates the side impact with the deployed internal and external airbags, and the displaced passengers away from the impact in the vehicle sustaining the lateral impact. Figure 15 B illustrates the frontal impact support for the passenger on the right hand side. The Left hand passenger is shown in the normal position for comparison.

Figure 14 illustrates a horizontal cross section of the embodiment at the height of the upper primary slides (107). The central member of the indo-skeletal structure (101) is flanked by the upper primary slides (107) abutting the central member, with the protector shields (106) and the shock absorbers that include the external airbags (103,104) at the outer end of the upper primary slides. The perforation shields are shown at the outer extreme of the shock aborbers and airbags. In this embodiment there are two sets of upper primary slides on each side of the vehicle that can support two rows of seats (front and rear) one on each side with its own protection with the protection shields and shock absorbing devices.

An auxiliary slide beam structure (108) (as illustrated in figures 10A, 10B and 10C) may be attached to the central member of the Indo-skeletal beam (101) and locked into the protector shield when the vehicle is ready for operation, or be attached to the protector shield and slide out with the Upper Primary Slide (7), and get locked to the central member of the Indo-skeletal structure (1) in the operating position

Means for access for passengers in this embodiment as illustrated in Figures 5, 6, 10A, 10B and 10C. The seat (109) and secondary slide (111), slide out on the upper Primary Slide (107) to a position that lets the seat (109) protrude from the vehicle such that the passenger may simply stand in front of the seat and sit down on the seat (109). Thereafter the seat (109) is retracted on the Primary slide to the position as depicted in Figure 6, where the Upper Primary slide (107) is locked with the locking devices (112) in position for operation of the vehicle. The slide drive mechanism may be powered using approaches well disclosed in the background art such as servos, and pneumatic or hydraulic systems. The vehicle while in operation should have the Upper Primary Slide (107) retracted and locked. The ignition lock is used in this embodiment to ensure this practice.

While extended, the clearance on the side of the vehicle for the Easy Ejector will usually be in the range of about 20 inches to 30 inches. This could be substantially less than the clearance required for opening a conventional car door. This is particularly useful for parking in areas with limited clearance.

Figures 12A, 12B and 12C illustrates the detail of the seat (109). The seat (109) may be constructed with customizable multi-elements that conform to the desired shape and provide the desired support for the passenger. Such adjustments may be effected using conventional seat control devices. In this figure the Safety Harness (119) is secured to the sides of the contoured seat (109) between the arm rests (122). The safety harness (119) may be designed to protect the passenger in head-on collisions by providing a soft barrier in close proximity to the body but not necessarily touching the body. This arrangement may be preferred to seat belts that do not provide the extended surface area that the harness (119) provides and as result provides greater impact resistance for the same level of

limiting forces that the body can withstand. Moreover, this arrangement may obviate the need for a front collision airbag as the harness (119) may be high enough to support the face and neck under collision conditions. The harness may be constructed of pliable but semi-rigid material (such as high strength nylon) to provide support in a head on collision. A natural benefit of the arrangement of the harness (119) and its supports (120) is that lateral forces on the seat are also braced by the harness support (120) in the operating position. Figures 12 F 2 and 12 G2 illustrate an embodiment of the harness. Moreover the seat (109) may be constructed with reinforcing on the sides to further protect the passenger from crush injuries. The Seating surface (121) is illustrated in the same figure as are the arm rests (122). In conventional vehicle seat designs the door surface provides the only support on the external side surface which are usually limited to arm rests. This seat (109) provides surround support for the passenger particularly desirable on winding roads. The "Custom contoured seats" customized for each passenger may be created with a multi-element adjustable structure (manually with inserts or with computer controlled elements) that provide ergonomic passenger comfort providing where desired, lateral support in addition to the support that conventional seats provide, to cradle the entire lower body in the ejector seat. Similarly child seats (123) as in Figure 12D1, may be designed to protect children. Such seats can be inserted into the seat (109). The Safety harness may also have an attachment for providing greater support for infants and small children.

ADDITIONAL EMBODIMENTS

While the above embodiment uses a power slide drive, this embodiment differs in that a gravity slide drive is employed to move the slides for mounting the vehicle. Figures 7,8 and 9 describe this arrangement. This embodiment differs in the preferred embodiment above in that the Lower Primary slide/safety Beam (102, 102') are pivoted at the Central member of the indo-skeletal structure with pivots (118). As shown in Figure 7, this allows the lower slide to fall to a lower of two positions, that inclines the upper surface of the Lower Primary slide (102) adequately to allow the upper Primary slide (107) to slide outwards to the loading position assisted by the weight of a passenger in the seat and the additional assistance of the Spring arrangement (115). The passenger may dismount from the vehicle when the slide is fully extended as shown in Figure 7. Each side of the vehicle has independent slides and may be operated by passengers independently.

When the passenger dismounts from the seat the Upper Primary slide (107) in its extended position moves to the higher of two positions about the Pivot (118) as illustrated in Figure 8. This move inclines the Upper surface of the Lower Primary slide adequately to allow the weight of a passenger to work against the spring arrangement (115) and move the slide to the operating position. This move up of the Lower Primary Slide (107) may be effected by mechanisms well disclosed in the background art. The Slide as depicted in Figure 8, is now ready for a new Passengers to mount. When the passenger sits on the seat (109), the weight of the passenger works against the spring mechanism (115) to move the slide to the operating position as depicted on the left hand side of the figure 9 and lock the slide in the operating position. The Upper Primary Slide may be unlocked by the passenger by depressing the Inside Door Open Button (116). Activating this button in addition allows the lower primary slide (102) to move and be

locked to the loading inclination - the lower of two positions, and the Upper Primary Slide (107) is free to slide out with the passenger. At this point the arrangement has completed a full cycle and is in the position depicted in Figure 7.

The above cycle represents operation of the Gravity Slide Drive when there is a passenger in the seat (109) when the Slide moves to and from the operating position as on the left of Figure 9. When a passenger dismounts however, and the Slide arrangement needs to be retracted without a passenger in the seat, the weight of the passenger is no longer available for aiding the motion of the slide to the operating position, and the slide must be pushed in against the action of the Spring Arrangement (115) and locked in place at the operating position. When a new Passenger wishes to mount the vehicle, he/she will press the Outside Door Open Button (117) which releases the catch that holds the Upper Primary Slide beam in place but does not affect the movement of the Lower Primary Slide (102) about its pivot (118). The seat as a result slides out on the Upper Primary Slide assisted by the Spring arrangement (115) to the position for mounting the vehicle as depicted in Figure 7. The spring arrangement (115) is designed to be such that it provides a force just adequate to move the Upper Primary Slide out with no passenger in the seat.

Some alternative embodiments may have multiple positions for the inclinations of the safety beams from the center of the vehicle, in the loading position to accommodate the varying road inclinations that may make a single inclination of the safety beam in the loading position inadequate. In such an embodiment the operator will have the facility to switch to the best loading inclination dependant on the inclination of the road. This will overcome some of the disadvantages of regular car doors on steep hills. Moreover, this arrangement can also function as a shock absorbing device for the comfort of the passengers in vehicles under operating conditions. A possible embodiment to achieve this can have a range of angular inclinations for the operating position, the range being set so that the transfer of the compressive load on impact through to the fixed body members of the vehicle or the central beam is achieved. The Safety beams are spring or shock absorber mounted in a vertical plane relative to the central beam and the fixed body members of the vehicle. When a bump in the road is encountered the safety beams pivot on the center and swing higher at the center thereby isolating the passenger from the road.

Some embodiments of the multi-element contoured seats may have a structure that provides anatomically accurate support for the body as illustrated in Figures 19 A,B,C,D and E. This seat architecture may be used in a wide variety of application s outside vehicles as well. Conventional car seats are a set of two or possibly three rigid structures - the seat bottom, the back and the head rest. These have some mobility for comfort. However there are two factors that militate against their comfort and the level of protective support they can provide in collision situations. First, one size must fit all pawssengers and drivers. The mobility provided for the seat bottom, seat back and head rest provide limited flexibility for passengers of different sizes. Second, there is little lateral support for the body that could be vital in a side collision, and third, in a vehicle in motion on a rough surface, the shock absorbtion provided to all parts of the upper body is the same. – the seat back is rigid onece set up by the passenger – this stands in contrast with the internal shock absorbtion of the human body, where the spine provides differential shock absorbtion to different parts of the body, increasing the shock absorbtion towards the head. This last factor implies that

conventional seat backs cannot remove vibrations from both the top and the bottom of the upper body as the body's own shock absorbtion system will move differentially to the seat back along the length of the spine. The embodiments of this invention illustrated in figures 19, improve these characteristics of seats.

Figures 19 A and B show two view of a shadow vertibra of the seat. The design of this vertibra is to provide auxiliary support for the body. The structure shown is one of several possible structures for embodiments of this invention. The body of the vertibra in this embodiment is split into a left body (164) and a right body (165) these elements are permanently bonded or fixed tgether by bolts. The body has two cavities on each of the top and the bottom surface – the air cell sockets. These hold two air cells on the left and the right side. These air cells are supported on the sides by the air cell retainers (159) that slide in and out of the air cell sockets (166, 167, 171, 172). The air cells them selves are made of a pliable and inflatable material, or alternatively a material that can fold within the cell supports. Each pair of air cells are separately inflatable by a multi channel air pump that is installed in the seat embodiment. There is a connecting tube between the left and the right air cells housed in the lateral tilt air cell visco-eleastic damper tube. This tube allows limited air flow between the left and the right chambers to permit lateral tilting of the vertebrae relative to each other. This motion hover is corrected by the lateral tilt return spring (160) that ensures that in the normal position the vertebrae arealigned vertically. This lateral tilt return spring is fixed on one end to a vertibra in the upper fixed slot for lateral tilt return spring (161) and can slide within the next vertibra in the lower sliding slot for lateral tilt return spring (174).Orthogonal support is provided between the vertebrae with the support flange (162) that is fixed at one end in the lower slot for the support flange (173) and is slidably mounted in the adjoining vertibra's upper slot for support flange (163). The flnge is sized to allow limited lateral tilting as the vertibra tilts laterally, but provides firm back support. Notably the upper and lower slots for the support flange may be inclined slightly so as to take the form of the human spine. The body contact is made on the back with the back support adjustable air cushions (170), which in most embodiments are contoured to the shape of the bode and is illustrated as an ellipsoid for clarity. These air cushions are inflatable and the pressure may be adjusted to the comfort of the passenger. There may be a spring loaded cable that is threaded through the vertebrae to tie them together.The spring loading will work against the air cell pressure as the gets elongated with higher air cell pressure. Ideally there can be as many of the shadow vertebrae as vertebrae in the human body although some embodiments may choose some economy in the number of such shadow vertebrae. Figure 19C illustrates two adjoining shadow vertebrae. One of these are for supporting the thorax region and therefore have attached the shadow rib body (175) and the related shadow rib adjustable air cushions (176) (shown as ellipsoids for clarity but in most embodiments will be contoured to take the shape of the body. These air cushions are inflatable for passenger comfort. The air supply being led to the cushions along the rib body and down the shadow spine to the multiple channel control air pump which also supplies air pressure of each of the many air cushions and air cells in the seat embodiment. The shadow ribs are supported by the tilt control connectors(177) that may adjust the angle of the shadow ribs. Figures 19 D and E .illustrate one possible version of this embodiment. Here the shadow vertebrae are stacked up to provide support for the head the neck the shoulders, the thorax and the lumbar region. The head rear support adjustable air cushions (183) provide

forward support for the head while the Head lateral support arms with deploying passive air bag (182) provides lateral support particularly during side collisions with deploying passive micro airbags. Similarly the neckhas rear support from neck rear support adjustable air cushions (184) and lateral support from Neck lateral support with deploying passive micro air bag (181). The shoulders are supported by the shoulder bolster (178) and the shoulder bolster adjustable cushions (179). The shoulder bolster being pivotally attached to a vertibra of the shadow spine and allowed limited pivotal motion vertically to allow the passenger to move his/her upper arms upwards at norma speed. However, the shoulder bolster will resist rapid motion of the upper arms and shoulders as in a collision thereby supporting the passenger. This differential movement characteristics can be achieved by approaches well disclosed in the background including viscous loading of the coupling. Lumbar support is provided by the Lumbar support adjustable air cushions (185). The entire array of the shadow vertebrae may be elongated and contracted by changing the pressure in the air cells thereby provding the optimal sizing for all heights of passengers. The lateral support and back support cushions may be inflated to provide width control and support for passengers of different shapes. Adjustable hip bolsters provide lateral and forward support while the adjustable pelvic support (187) provides vertival support for the passenger. The illustrations exclude the leg and arm supports that are part of the embodiment for sake of clarity. Spring supports can substitute for the air cells in the vertebrae but will not have the advantage of viscous lateral resistance and independent height control. Overall height can however be controlled with the cable threaded through the vertebrae. Motion control of the seat elements can be achieved with devices well disclosed in the background art including servos, and pneumatic and hydraulic systems.

Considering the complexity of the seat systems including the multi channel inflators for each of the air cells and the air cushions along with the mechanical controls for inclining the shadow ribs and the pelvic and hip supports, it would normally be necessary to use a closed loop feedback with computer control. Pressure sensing of each air filled device will provide feedback on the resistant force o the human body and therefore firmness of the support. This information can be used to provide the firmness control desired by the passenger. One computer controlled scheme could be where the passenger inputs gender weight, and height and the computer alters the size of the seat by inflating and deflating aircells and cushions accordingly and the provides several alternative configurations that the customer can select. The customer can then customize firmness and variations on the seat presets.

Finally the shoulder bolsters and shadow ribs may have deploying micro aircusions that hold the passenger in the event of a collision.

Yet another computer control scheme for the seats has a "learn" mode" and a "save" mode for the computer control. When the computer control is set to the learn mode the feedback system observations are used to learn the user's preferred positions. Thereafter when in the save mode the seat is set to this position. As an additional enhancement the seat control can be voice activated to allow the user to "tell" the seat to be either in the learn or save modes.

Another embodiment of the multi element contoured seat that provides anatomically accurate support for the body comprises a shadow spine that is made up in part by an array of interlocking vertibra bodies as in 204 that are each connected to body support members that may be shadow ribs or other support members for the human body as described herein. The size of each vertibra may be scaled to accommodate the force considerations envountered by the vertibra during crash conditions. Therefore many embodiments will have larger vertibra at the lower end of the shadow spine and smaller vertibra at the top of the sipne. Each of the interlocking vertibra bodies have a slider insert 205 that has a hole to accommodate the vertibra attachment pin. The slider moves within the housing on the vertibra body to allow extension and contraction in the effective length of each vertibra. The movement in the position of the hole is accommodated by the slot in the vertibra body. Adjoining vertibra are joined by a pin that is fitten into the vertibra attachment pin socket-1 in the slider insert 213 and the vertibra attachment pin socket-2 212 on the adjoining vertibra. On assembly of the string of such vertibra there will be limited pivotal movement possible laterally as the pin holes 212 rotate relative to the pin holes 213. Such movement may be limited with the shape of the vertibra attachment key 211 and the slot for adjoining vertibra key 210. And further controlled by springs to described below. Each of the vertebrae in the shadow spine may have an angled pin hole 212 along with orthogonal surfaces of the key 211 so that the position of each of the vertebrae reflect the requied curvature of the shadow spine to accommodate the passenger spine curvature. Notably the arrangements for contraction and extension of the chain of vertebrae will allow for different sized passengers. The vertibra at the bottom of the string is connected to the lower part of the seat with a slot arrangement that fits the key on the vertibra or alternatively if the vertibra are oriented to have their keys above their slots, the lower seat will have a key to accommodate the slot on the lowest vertibra. The vertibae may extend to support the head and neck. The number and length of vertebrae will depend on the balance between the larger cost of a large number of vertebrae and the value in accuarate support with a shadow vertibra for each vertibra of the passenger and one for the head of the passenger. The shadow spine also comprises two chords of high tensile strength possibly of stranded steel, that are rigidly connected to the aperture for tension chord 208 of the top vertibra, and are each threaded through the apertures for tension chords 208, one on each side of the vertebrae along the length of the shadow spine. Springs are interspersed between the vertibrea to surround each of the chords one on each side of each vertibra, to separate the vertebrae when there is no tension in the chord and to extend the shadow spine by forcing the slider insert 205 to slide outwards to the extent possible. The two tension chords are threaded through holes in a mounting members of the shadow spine located near the lower seat, and attached to a mechanism that can loosen and tighten each of the two chords concurrently by the same amount, thereby forcing each of the springs to compress and allow a contraction of each of the vertebrae of the shadow spine. This arrangement allows adjustment of the seat back to the size of height of the passenger or operator. The characteristics of each of the pairs of springs on each of the vertebrae can be adjusted to compress by different amounts, the vertebrae at different levels of the shadow spine to reflect the relative variations in size of different vertebrae of tall and short people. In the event of a side collision, one of the tension chords will remain in tension while the other may slacken by cmpressing

further the springs on its side caused by the lateral force allowing limited lateral movement and bending of the shadow spine, thereby limiting the peak accelerations that are encountered by the upper body head and neck. The entire shadow spine assembly will have some controlled flexibility by design for forward and backward movement for protection of the passenger in a rear or front collision. There will also be attachment points for seat belts or safety shields on one or more of the vertebrae.

A further refinement of this embodiment of the shadow spine in the multi-element contoured seat as in fig 19 H, has additional apertures 214 on each side of each vertibra, to accommodate a spring rod on each side of the shadow spine. The spring rod will be threaded through the aperture 214 in Fig 19H and each attached at only one end either at the top or the bottom. The sizing and surface treatment of the aperture 214 will allow some lateral bending of the spring rod, and allow sliding of the spring rod. On lateral impact the spring rods will resist lateral movement and supplement the force of the springs in compression around the tension chord. Moreover, in rear impact and front impact collisions they will supplement forward and backward bending of the shadow spine and as a result the upper body of the passenger or operator. Notably the cross section of the rods may be adjusted in the lateral direction relative to the forward-backward direction to modify the relative resistive force that it applies in lateral impacts versus forward and back impact.

Yet another variation of this embodiment discharges the air in the adjustable air cushions when passengers leave the seats, and then reinflate these aircushions when the new passenger sits down with air that is preheated or precooled to the preferred temperature of the passenger. Thereafter the air cushions will provide insulation at that temperature for the seating surface.

Yet another embodiment of the multi element seat has a back and head/neck support that is supported by concentric tubes that fit within each other and can slide within each other. The longest and narrowest of these tubes supports the head rest. The tube next in length and wider, supports the neck rest, the tube next in length and still wider supports the thorax (there may also be a tube that supports the shoulders at this postion between the neck and the thorax). The next length of tube supports the lower back and the lumbar region. Each of these tubes may be independently raised or lowered to meet the user's preference and anatomy. Moreover the support for each region whether it be head, neck, shoulders, thorax or lumbar regions, may be widened or narrowed with each of these sections. While the background art provides many possible approaches for raising and lowering the sections and the wideining and narrowing of the sections defined above in this embodiment, a simple embodiment has all the control devices at the bottom of the tubes. The raising and lowering of each tube can use electric servos or pneumatic or gas lift mechanisms attached to the concentric sections that are designed such that the narrower tubes protrude below the wider tubes for access for support and control by the said lift mechanisms. The width of each of the sections may be controlled with air cells that are inflatable to the passenger's preference. This embodiment with concentric tubes may allow some limited flexing and therefore lateral movement of the body under lateral impact conditions thereby

reducing peak accelerations of the head neck and thorax regions of the body. The cross sections of the tubes that support the sections may be circular in some embodiments to allow the user the ability to twist for example to reach a child in the back seat, this embodiment however has a viscous damper or rachet arrangement with a centrifugal governor that prevents rapid twisting motion as under side collision forces. Such viscous dampers or centrifugal rachets may be attached to each of the concentric tubes that allow twisting motion. Such viscous dampers with radial vanes and rachet arrangements with centrifugal governors are well disclosed in the background art. Other embodiments that prevent twisting motion may have rectangular or other irregular cross sections.

Yet another embodiment uses a second rotating mechanism or turn table for the seat about a vertical axis mounted at the point of attachment of the seat to the fiexed elements of the vehicle when in the normal operating position, that allows the user discretion to position and lock the seat at an angle to the direction of motion of the vehicle. This is sometimes desired by drivers. The computer control system for the seats can have a learn position that learns the angular position that is desired by the user and then sets it in the save position. The user commands can be verbal with voice recognition.

Yet another embodiment has a head and neck support in a multi element adjustable seat (where the head and neck support is constructed to be light but strong), in addition to having vertical movements is pivoted along a horizontal lateral axis and is designed with spring controls to move forward and touch the head and neck without pushing the head and neck with uncomfortable forces. Radial or linear viscous dampers are attached about the horizontal axis of the head and neck support that prevents rapid movement of the head and neck in a rear end collision. The viscous dampers are well disclosed in the background art.

Embodiments, particularly those that utilize the indo-skeletal structure may include the following additional embodiments and variations thereof for frontal and rear impact protection and passenger comfort and convenience. The additional structure is illustrated in figures 20 A,B and C. The passenger support platform (198)represents the set of machinery for that purpose. It will take the shape needed to support the variety of structures that are described in this invention.It is supported either in the middle or on the edges by the Central body tubes (188). The first tube that fits into the central body tube is the Body extender tube (189) This optional tube is slidably connected to the central body tube and may be moved in and out by servo motors or pneumatic/hydraulic pistons and cylinders. However the inner tube is axially supported by a compression resistant shock absorber which in turn is mounted rigidly with regard to the outer central body tube in all poitions that the body extender tube can take. The Body extender tube has functions that include extending the wheel base of the vehicle under computer control particularly in drive by wire vehicles, thereby improving the comfort of the vehicle and second increasing the wheel base contingent on vehicle speed such that in the event of a collision there is a longer deceleration space. The shock absorber will become longer and and shorter to accomodate this need and can for example be air shock absorbers. The correlation of speed and length will normally be computer controlled to provide statistically appropriate deceleration

distances for the speed of the vehicle at any time. Notably the steering arrangements and other vehicle systems may also need to be compensated to accommodate the change in wheel base to ensure driver convenience and precise control of the vehicle. The Front end connector tube (190) has a shock absorber in series with a servo or pneumatic/hydraulic controlled actuator for axial movement in and out of the body extender tube (189) as does the back end connector tube ((191). 190 and 191 are connected to the front and back ends respectively which include the front and back wheels.and bumper arrangements. The front module – which may be the engine or hybrid unit is pivoted on brackets at the front end of the front end connector tube, thereby allowing the module to rotate upwards about this pivot. Notably the module will be signifivcantly massive and will require strong supports and pivots. The front module crank is pivotally attached to the body extender tube and also pivotally attached to the front module as shown in figure 20 A. Therefore if there is a movement of the front end towards the body extender tube the front module crank would swing the front module about its pivot in the front towards the vertical direction.

There are at least two functions for this motion. First in the event of a front collision the force will compress the shock absorbers on the end of the front end connector tube and thereby force the crank to pivot up the front module. This angular acceleration of the massive front module will absorb energy of the impact and acting as a "fly wheel", remove acceleration spikes that the passenger would otherwise sustain and in addition due to its vertical acceleration increase the traction on the front wheels thereby increasing the braking friction resistance that can be offered. Finally in the event of a collision the inclining front module will divert the impacting vehicle over the passenger space. This action is illustrated in figure 20 C. Second, particulary for drive by wire vehicles, the front and back end connector tubes may be retracted by servo or pneumatic/hydraulic rrangements, to pivot up the front and back modules thereby reducing the vehicle length substantially and providing better curb visibility to the driver particularly while paaking. This is illustrated in Figure 20 B. Notably the wheels are maintained in the same orientation to the road surface and may be steered as desired with the same mechanisms. For conventional vehicle architectures the pivot of the front module and engine with the front end connector tube should be near the wheel axis to facilitate this additional feature.

The same value is derived in the rear structure as the front structure for rear collisions and in front collisions and in parking. The arguments are similar.

Another embodiment may have a single but broad set of central body tube body extender tube and the back/front end connector tubes with a split front or back module and connection of the front / back connector tube with the front /back ends respectively in the middle. Yet another configuration may have a single central body tube and body extender tube but then have a "T" shaped structure on the back or the front to have seperate left and right front and/or back end connector tubes connected with the front end at either side. In the event the body extender tube in not used the connection of the front/back module cranks will be to the central body tubes.

For embodiments that use an exoskeletal or shell design, an additional embodiment deploys airbags in the space surrounding the engine components to change the characteristics of the crumple zone. Moreover in addition some of these embodiments have the passenger cabin slidably and detachably connected to the rest of the vehicle and mounted behind these deploying airbags such that on impact, the cabin detaches from the vehicle and slides backwards in a controlled fashion to ensure the integrity of the cabin.

Yet another additional embodiment has a rear seat that has a unique bench configuration with sections that maintain their integrity and width in a side collision and other sections that collapse or compress in predefined controlled ways, to absorb the impact accelleration that would otherwise be transmitted to the passengers. The present invention and in particular embodiments of the rear seat are not limited to these figures. There are many embodiments that differ from these figures.

The hip bolster P101 that is compressible to a pre defined width P109 and providing a predefined resistive force to compression, in the event of a lateral force being applied to the hip bolster in a side impact, and designed to compress to a minimum width that still protects the hip of the passengers, is mounted adjacent to and on either side of the contoured seat bottoms P102 which are designed not to compress substantially in the event of lateral compressive forces being applied to it in the event of a side impact. The shapes and widths of the uncompressed hip bolsters may vary depending on whether the hip bolster is at the end of a seat or in between the seat bottoms P102.

The collinear mounting of the hip bolsters and seat bottoms along a lateral axis is in some embodiments achieved with impact decoupler/secondary slides P103 that connect the hip bolsters and the seat bottoms to the fixed elements of the vehicle. These impact decouplers are under normal operating conditions, fixedly attached to each of the seat bottoms and each of the hip bolsters and under a predefined lateral force decouple the seat bottoms and hip bolsters to slide along a lateral axis relative to the fixed elements of the vehicle. The impact decoupler/secondary slides are mounted on the hip bolsters such that under compression to the predefined width, the impact decouplers/secondary slides do not obstruct the compression process.

Some of these embodiments have a further feature to lower and raise the hip bolsters to facilitate egress and ingress. In some such embodiments Slots in the hip bolster accommodate the secondary slides at the time of withdrawal of the hip bolsters to approximately the level of the seat bottoms. In addition there are slots to accommodate the sliding surfaces on the fixed elements of the vehicle, that are attached to the impact decouplers/secondary slides. This arrangement for lowering and raising the hip bolsters may be activated when the doors are opened and closed, raising the hip bolsters to the operating position when the doors are closed and lowering the hip bolsters when the doors are opened thereby facilitating egress and ingress. The lowering and raising arrangement can also be disabled to allow more passengers to use the back seat but without the using the side impact protection system.

-The arrangement for raising and lowering the hip bolsters may also be used to change the width of the seat bottom within limits by changing the height of the bolsters, each having an angled edge on the sides facing the seat bottoms.

The back rest P112 and the shoulder bolster/support P111, support the back and shoulders/arms respectively of the passengers. The seat bottom P102 and the back rest P112 are located in the same lateral position for each of the passengers. Similarly, the hip bolsters and the shoulder bolsters are located in the same lateral position so that the shoulder bolster lies substantially above the hip bolster. The shoulder bolster is controllably crushable like the hip bolster, to be reduced under compressive lateral forces to a predefined narrow width. The back rest and the shoulder bolster support are mounted on impact decoupler/secondary slides in an analogous fashion to the seat bottom and the hip bolster respectively. Moreover, the back rest and the seat bottom are connected so that the movement of the seat bottom and the back rest when decoupled and thereafter laterally slidably attached to the fixed members of the vehicle, follow each other exactly so that the passenger support position is maintained under lateral impact conditions. Some embodiments have retracting arrangements of the shoulder bolster analogous to the hip bolster.

In some embodiments the sliding surfaces on the fixed elements of the vehicle, that the impact decoupler/secondary slides are restrained to following during impact, may be segmented into sections across the vehicle so that sections of the seat back may be folded down along with these surfaces to provide enhanced storage space in the trunk of the vehicle or for other utility purposes. Moreover the members of the fixed elements of the vehicle that provide these sliding surfaces may be constructed in telescoping elements so that on lateral impact they decouple and telescope together rather than buckle under lateral forces thereby maintaining the integrity of the lateral sliding surfaces. These telescoping sections may also form a part of the impact decoupling arrangement of the secondary slides.

The head rest P113 is connected to the back rest and is vertically adjustable but is laterally fixed to the back rest, and therefore will move laterally with the back rest in the event of a side impact of sufficient magnitude, thereby ensuring that the head and the back of the passenger are supported at the same lateral position ensuring that there is little differential movement of the head relative to the body of the passenger during impact.

Under lateral impact conditions, forces on the protector shields which may consist of the vehicle body sides and/or the back door and/or the rear wheels and sections of the wheel wells of the vehicle, all of which have surfaces that abut the sides of the passengers, the hip bolsters and the shoulder bolsters on the impact side of the vehicle, provide impact resistance. As a controlled crush commences in a lateral direction, internal airbags are deployed adjoining the hip bolsters and shoulder bolsters on the impact side of the vehicle but on the inside of the protector shield elements, thereby transferring impact forces through the airbag to the hip bolster and shoulder bolster on the impact side of the vehicle. The inside airbag in some embodiments may be in several sections with one or more of these sections mounted inside the rear wheel well of the vehicle.

Head and neck airbags P114, Body air bags P115 and side bolster airbags P110 are deployed on impact to hold the passengers in the survival space contained by the seat bottom, the back rest and the head rest.

Thereafter the movement of the passengers laterally will be with minimal differential movement of the body elements as they are held by the airbags that are in turn attached to the head rest the back rest and the seat bottom respectively, which in turn are constrained to move together laterally on impact.

The airbags may be constructed as micro-air cushions that are driven by the internal airbag as the sacrificial chamber. They may also be separately deployed airbags.

Some of the chambers of the inside airbags may be preinflated and therefore completely passive.

The body airbags may be shaped to be inclined downwards on the top surface to gently push the arms of the passengers forward, while maintaining relatively even support for the arms down from the shoulder.

In the compressed position of the hip bolsters and shoulder bolsters, it is likely that the shoulder space will be very limited. Therefore, some embodiments may have the center seat back offset forward relative to the seat backs on either side, thereby moving the passenger in the central seat to be slightly ahead of the passengers on the side in the operating position. Therefore under impact, the shoulders of the center passenger will not abut the shoulders of the passengers on the side but will lie ahead of the shoulders of the passengers on the sides, thereby allowing adequate space for shoulders of all passengers under impact. The body air bags on deployment will push all the arms forward and upward and hold the torsos of passengers on both sides. If the center passenger shoulder is in front of the side passenger shoulders the inner arm of each of the side passengers will push up the arms of the center passenger when the air bag deploys.

The shapes of the body airbags may be such that they hold both passengers on either side, or be designed to hold only one of the two passengers adjoining the hip bolster or shoulder bolster from which it is deployed. In the latter case there will be two bags to support each of the two passengers on either side the hip bolster and the shoulder bolster. The hip bolster and shoulder bolsters on the ends of the rear seat assembly will need only one air bag on each as there is only one adjoining passenger.

Some car architectures have the rear wheel well partially straddling the rear seat. As a result an outward displacement of the rear seat on the further side from the impact can be prevented. Some embodiments of the present invention that are in these architectures, have specially constructed wheel wells and componentry that are placed between the seats and the wheel wells to allow a compression of the wheel wells as the rear seat moves outwards on the side opposite the collision. Some of these arrangements may include a perforation or weakening of the wheel well along the profile of the seat in the outward extended position of the seat under impact of the side further from the impact, to allow the lateral force of the seat on the wheel well to separate and crush the section in the way of the seat to allow the movement of the seat. To assist with this process of separation of the section of the wheel well in the way of the seat, the seat may have mounted to its edge in a position facing the wheel well a cutting edge, so that the wheel well may be cut or separated more easily during collision conditions as described above.

Yet other embodiments in architectures of cars that have wheel wells partially straddling the rear seat, have airbags that deploy in the wheel well on the impact side to control the forces on the rear seat, and would provide the function of the inside airbags in other embodiments.

Yet other embodiments of the present invention have a raised and/or forward shifted section of the middle seat on the rear seat assembly so that in the normal operating position the passenger in the center seat, has his/her shoulders in a position that will not engage the shoulders of the side passengers under impact. As a result the present invention will under side impact conditions, compress the side bolsters and back /shoulder bolsters, while maintaining the survival space of the back and bottom rests of the seats, while the shoulders overlap and thereby permit the compression of the arrangement of the passengers under side impact.

Another additional embodiment provides for the convertion of the vehicle as described in the present invention into an aircraft with the same robust safety arrangements, but also adapted for functioning as a helicopter type vehicle with the necessary changes in the architecture to provide for the power source at the top of the passenger cab, while retaining a reduced wheel base if necessary for balance and manouvering considerations. Notably the present invention can therefore have embodiments that are aircraft with the side, front and back impact protection that is required for use of such vehicles on conventional roads exceeding the stringent minimum safety standards of all road vehicles.

One version of this additional embodiment has the front module 194, along with the crank 196, and the pivoting socket for pivoting about a pin on the front end 190, 192 mounted on a pair of elevator beams 199, each supported pivotally near the center of the vehicle 188 or in its vicinity, and constructed such that they support the front module when in the near horizontal position when the vehicle functions as a ground vehicle. Each of the cranks 196 have one of their pivots mounted on the corresponding elevator beam 199. the other pivot of the ctrank being on the module 194. The module in the near horizontal position during functioning as a surface vehicle will have the notches at the front end resting in the pivot pins on the front end 190 and locked adequately in place.This arrangement, ensures that in the event of a collision at the front end, the pivot pin engages the slot and pushes the front module backwards at the pin position, thereby forcing the crank 196, that is fixed on the stationary elevator beam 199 at the rear end, to move the rear pivot on the front module upwardsand thereby ensure the performance of the present invention with this structure as noted herein. When elevated by mechanical, pneumatic or hydraulic means well disclosed in the background art, the elevator beam inclines the front module to an adjustable angle to the vertical. Threby allowing a folded propeller that may be mounted at the front end of the said front module and the vanes of which may be folded in a storage position on the sides of the front module and its top and bottom in recesses designed for the purpose (the length of the vanes /blades can be greater for those stored on the sides of the front module and shorter for those stored at the top and bottom of the front module. Figures do not show the folded propeller) this propeller can be engaged to the motor and/or engine that is in the front module to provide loft for the vehicle to fly. In addition the front end 192 and back end 193 may be retracted as described in the present invention, to fold the back end upwards and to reduce the wheel base and the maneuverability of the airbourne vehicle. The position of the rear module can be varied with controls on the retraction of the back end to provide the right balace characteristics of the vehicle when air bourne. This additional embodiment is bewst suited for a drive by wire vehicle as the front module is

not directly connected to the wheels and a transmission system to the wheels is not necessary, thereby reducing the weight of the vehicle. Low mass wheel motors are another useful addition to propel the vehicle as a ground vehicle. Such wheel motors may be used to drive small propellers to provide lateral thrust needed for the vehicle when in flight. (in some embodiments after being disengaged from the wheels)Forward thrust can be provided from the main propeller with an inclined elevator beam.

Moreover, in this additional flying embodiment and in an embodiment for a standard ground vehicle, the shock absorbtion systems in 189, 190 may have shock absorbers that may be decoupled to provide even greater retraction movement under servo control.

Yet other flying embodiments of the present invention have dual elevating beams that engage both the front and the back modules thereby permitting both modules to to be elevated and drive the propellers or rotors. These embodiments will have the modules in the elevated position to be at a small angle to each other so that the rotors do not collide while rotating.. Moreover they have contra rotating rotors or propellers. The inclination of the rotors or propellers may be changed to facilitate forward sideward or backward movement of the vehicle.

Yet other flying embodiments have dual elevator beams on each side for each module so that they may elevate the moduled to a position substantially above the passenger cabin without rotating the modules substantially.

Yet other flying embodiments of the present invention maintain the modules in the normal operating position as in a surface vehicle as noted herein, but with rotor or propeller shafts that may be angled upwards to a substantially vertical orientation. These embodiments may have rotor or prpeller shafts that are long so that the center of lift or the point at which the upward thrust of the rotors applies will be well above the center of gravity of the vehicle thereby providing greater stability.

Yet another flying embodiment of the present invention, has each of the seats on one or more mounts (these mounts can be the secondary & primary slide arrangements noted herein), such that under substantial vertical load as encountered in a vertical crash situation the mounts tilt so that the seat support for the back or spine of the passenger or operator inclines backwards so that the axial load on the spine due to the vertical deceleration is reduced by supporting the upper body in a substantially horizontal or inclined position. These tilting mounts may be attached to the fixed body members of the vehicle and maintained in the operating position using friction or impact shear load induced decoupling arrangements. One such embodiment has a pair of primary and secondary slides as in a conventional non-flying embodiment as in figures 10 D1 – 10D4 but in addition has the central mount of the primary slide rearward on the vehicle attached to the central body member with a key and slot arrangement with a key on the lower primary slide mount and the slot on the central body member 201 in Fig 10D5, such that under vertical impact the key decouples and slide into the slot vertically thereby rotating the seat about the primary slide on the forward side of the seat resulting in a "cradle" position for the seat that protects the passenger from a axial load on the spine. Yet another embodiment may use the two center mounts of the lower primary slide in Fig 10 D1-10D4, linked rigidly together by a member that is shaped in the arc of a circle in the vertical plane of the central body member with center

above the central body member, said rigid member housed in a slot in the fixed central member, such that under normal operation and under lateral impact the linking member is not detached from the fixed central body member of the vehicle and transfers the lateral load to the fixed body members, but under vertical loading of the seat (and the primary slide) the linking member detaches and slides in the housing slot to describean arc of the same circles that defines the profiles of the slot and the linking member, the center of said circles being so arranged that with this circular movement of the linking member in the slot the center of gravity of the passenger or operator and the seat are lowered, and the seat rotates in a direction to a cradle position where the passenger or operator is in a reclining position or the upper body of said passenger is in a near horizontal position.

Yet another additional embodiment of the present invention has the passenger support mechanism (the seat in many embodiments) supported by a pivot substantially in the center of the seat and nea r the lower support element of the support mechanism and the occupant contact surface thereof, with an axis along the direction of motion of the vehicle, and motion about this pivot being spring controlled to return the seat to the operating position under no external forces. The pivotal movement is also heavily damped to absorb energy as the seat is moved in either lateral direction from the operating vertical position. The pivot is attached on its other end to the impact decoupler/secondary slides that have been previously disclosed. In the event of the side impact, the internal airbags or equivalents that may be damped springs, will initially move the passenger support mechanism pivotally prior to the impact decouplers of the secondary slide being decoupled. Therefore following impact, the head and thorax start moving first towards the impacted surface of the vehicle (or accelerate more slowly than the impacted surface of the vehicle) and then the body rotates with the passenger support mechanism away from the impact, and finally if the impact is severe enough, the entire body with the passenger support mechanism moves when the impact decouplers are decoupled. This additional embodiment gives the head and thorax a greater motion space than the pelvic region as the body accelerates, and is particularly useful if the movement of the lower seat is constrained by fixed elements of the vehicle such as a center tunnel that is not designed to collapse. The longer time (and distance) allowed for the head and thorax to accerate give them a potentially lower peak acceleration of the acceleration is designed to be as near constant as possible be design of the springs and dampers controlling the pivotal movement and the resistance to motion caused by the secondary slides when decoupled. Notably in this additional embodiment the head and neck are well supported by elements of the passenger support mechanism.

Yet another additional embodiment extends the embodiment shown in figures 10D1-10D4 where the safety beam upper element is concentric to the safety beam lower element. Here the safety beam lower and upper elements have an interlocking worm drive that is driven at one of the ends of these elements to move the safety beam upper element into the access position and back from the operating position. Thre can be multiple concentric telescoping tubes that constitute the safety beam upper element provide an accordian type extension the drive in this embodiment may be between the safety beam lower element and the section of the safety beam upper element sections

that supports the passenger support mechanism directly or indirectly through the impact decouplers/secondary slides. Furthermore in this embodiment the inside airbag equivalents may be damped spring assemblies that engage the cylindrical safety beam lower and upper elements when in the operating position. This will be particularly useful for hinged protector shields that move separately to the passenger support mechanism such as in gull wing dorrs. Such hinged protector shields may have pins to engage the safety beam lower and upper element in the operating position.

ALTERNATIVE EMBODIMENTS

In an alternative embodiment to the preferred embodiment, the present invention may use hinged Protector Shields (106) that lock into the Primary Slide (107) when closed. This will allow the arrangement to work for mounting and dismounting the vehicle with either the Primary Slides deactivated or non-operational as well as when they are functional. The seats may also be mounted on rotating mechanisms or extension arms rather than a primary slide, to assist passengers in mounting and dismounting.

Another alternative embodiment utilizes co-axial sliding mechanisms that constitute said rotating mechanisms rather than the primary slides such that the fixed and rotating members of said rotating mechanisms have an adequate area of contact and reaction to support lateral collision forces.

Another alternative embodiment is illustrated in Figures 5A and 6A. The "door" that contains the perforation shield (105) with distance/velocity sensors (113), the external airbags (104), the shock absorbers (103) and the protector shields (106), hinges down on the pivot (112A) to provide support for the upper primary slide. The inner surface of the Protector shield is designed to perform the function of the lower Primary slide (102). This embodiment will be particularly useful for larger vehicles with a plurality of seats on each side of the vehicle. These multiple seats may be mounted on separate sections of upper primary and secondary slides.

Yet another embodiment has the at least one shock absorbing device and the at least one force distributing protector shield comprising a deformable protective shell mounted to the fixed elements of the vehicle on the outside of the passengers so that in the event of a side impact, the shell distributes the impact force to the fixed body members of the vehicle while by deforming, absorbs some of the energy of impact.

Another alternative embodiment is illustrated in figures 1D to 4D where the Shock Absorbers (103) excluding the External Air bags (104) are mounted on the inner surface of the protector shields (106). As may be seen from the drawings, in this particular embodiment, the shock absorber excluding the external air bags are locked directly to the lower primary slide (102, 102') in the operating position, although in another configuration the locks my be between the protector shield and the lower primary slide in the operating position. Such embodiments may be designed to allow limited intrusion of the protector shield with resistance provided by the shock absorber (103) thereby reducing the peak acceleration sustained by the vehicle body under impact. Notably, as the passenger environment is protected and moves away from the impact, crush injury to the passenger is avoided. This is a unique feature of this invention where both the crush injury of the passenger and the peak acceleration of the vehicle (and the passenger as a

result) may be minimized at the same time. Conventional designs try to minimize intrusion by bracing the side of the vehicle with beams and thereby increasing the peak acceleration of the vehicle, or increasing intrusion to reduce the peak acceleration but allowing greater crush injury.

Another alternative embodiment may have a contoured safety harness with a different shape to that of the preferred embodiment. Figures 12 A 1 to 12 C1 illustrate an embodiment of a safety harness using a slightly different geometry but performing the same function in the same way as in the preferred embodiment.

Some embodiments of the multi-element contoured seat may have sides that fold downand away from the passenger. This feature is useful particularly for the inner side of the passengers near the side of the vehicle and for both sides of the passengers in the middle of the vehicle, if the center seats are fixed and not ejectable. Notably however, the sides lock in the operating position and brace the seat from lateral compression, thereby protecting the passenger.

Some embodiments have seat bottoms comprising two symmetrical elements each with a support surface for supporting the pelvis of the passenger, where the said support surface may be laterally displaced to space out the symmetric elements and/or angled about an axis horizontal and in the direction of motion of the vehicle. Such an arrangement for the seat bottom allows adjustment of the supprt provided by the seat to be lateral as well as vertical to the preference of the user. Moreover, if the said symmetrical elements are designed to be curved to accommodate the pelvis of the user, there can be substantial lateral support for the pelvis of the user, in many of the preferred angular orientations of the seat elements, in the event of a lateral impact.

Some embodiments of the seats may have sides that could include arm rests, side bolsters and other elements as disclosed in this invention, that that drop down or back on the door or access side at the time of egress and ingress, particularly in embodiments that use conventional doors for access. Activation for these movements can be with the switching on and off of the ignition switch for the vehicle.

Yet another embodiment raises he seat bottom at the time of egress and ingress with servos or pneumatic/hydraulic systems, so that the seat members on the sides of the sat are relatively lower to the seat bottom thereby facilitating egress and ingeress of the passenger. . Moreover, arrangements to raise the seat bottom may in addition in some embodiments help negotiate a high "door" sill by the sliding or rotating seats at egress and ingress.

Yet another embodiment using conventional doors, has the arm rests on the door side integrated in to the doors but protected and decoupled from the door members on its outside by inside air bags. This design would have these arm rests locking into the seat when the door is closedthereby providing the decoupling for the entire seat with the inside airbag during lateral impact.

Another alternaive embodiment uses shock absorbing devices mounted at each end on each of the two surfaces of the impact decoupler/secondary slide substituting or supplementing the inside airbags.

Another alternative embodiment may have an auxiliary slide behind the seat and of any convenient height. This embodiment is shown in figures 1C -4 C. The figures illustrate the working of the current

invention with a high section of the central member of the indo skeletal structure behind the seats, but abutting the auxiliary beams in the operating position. As the High section of the central member (101) is behind the seats and the secondary slides (111), the seats and the secondary slides are free to move across the vehicle under impact as shown in figure 4 C.

Yet another alternative embodiment has an external seat profile as illustrated in figure 12 E 1. The higher rectangular external profile provides greater protection to the passenger.

Yet another alternative embodiment has a vertical extension/ "safety cage" (125) as shown in figure 10 A1, 10B1 and 10C1. Here the vertical extension/safety cage engages a beam across the top of the vehicle that may be supported by the shell structure of the vehicle (the figure shows only half the width of the vehicle). Such a safety cage/vertical extension can provide protection in a roll over situation and also provide additional compressive strength for the vehicle, and may function as a fixed or retractable roll bar. In some embodiments such a vertical extension "safety cage" will perform the function of the "B" pillar of the vehicle under lateral impact. Notably no "B" pillar is needed to support rear door hinges in the present invention. Moreover, in some embodiments the beam arrangement across the top of the vehicle or other support structures on the roof section of the shell may be designed to be rigid on compression but telescope out with the secondary slides under impact using appropriate logic to drive the locking mechanisms, thereby providing a protective cage even when the seat is in the ejected state.

Yet another embodiment, deters a roll over following side impact, by implementing an "outrigger" arrangement having reinforced upper primary slides and/or secondary slides and bracing brackets anchored to the fixed members of the vehicle that hold these slides in their extended substantially horizontal position after extension under impact, without permitting them to buckle under a vertical forces encountered under the initial stage of a roll over situation.

The preferred embodiment has the external airbags or shock absorbers triggered on detection of an expected impact as noted. This implies that on the far side (non-impact side) if there is possible secondary impact from a second object, the same mechanisms will deploy the external airbags on the second side, thereby protecting the far side occupant in the event of a second object hitting the vehicle soon after the first. An alternative embodiment can have distance/velocity sensors mounted in positions on the front and back edge of the perforation shields or protector shields to facilitate better detection of objects approaching the vehicle at wide angles to the perpendicular direction. Yet another alternative embodiment to this will have both impact side and far side external airbags deploy on detection of the first impact.

Another alternative embodiment has a safety harness/shield as illustrated in Figure 12H2. This embodiment of the safety harness is mounted on spring loaded hinged supports at the head support section of the multi element adjustable seat (137) - similar to conventional supports for the headrest, and to lockable supports between the arm rests (138) or on the side bolsters of the multi element adjustable seat. The spring loading will support the weight of the harness and thereby retract the harness when unlocked. The harness includes a hinged and spring mounted shield (130) that may pivot on the lower safety harness support (138), The passenger side of the shield, has on its

surface an implementation of a Passive Air Cushion System that uses the pressure in one or more sacrificial chambers which under pressure transfer air to one or more micro-air cushionsthat protect high priority anatomical regions. In this embodiment, the passive anatomical micro air cushion (131), derives it inflation source from the sacrificial chamber (139) at the lower end of the shield of the safety harness, that is compressed by a much greater body mass under impact. In a frontal collision the force of the more massive parts of the body on the sacrificial chamber will deploy the passive anatomical micro-air cushions to protect the face and the neck. The narrower sections of the aircushions and flow control mechanisms if installed, will cause some visco-elastic behavior and in addition cause air speed amplification to create faster deployment. While this mechanism activates the shield (130) may pivot down to take some of the impact energy. The shield is shaped to the contour of the human body head and neck when it is forced forward as in a frontal collision. This embodiment may in addition have multiple or variable postion harness support anchor points on the arm rests or the side bolsters that are part of the multi-element seat, to accommodate people of different proportions. Moreover this embodiment may have in addition an additional bracket that moves the anchor point of the lower safety harness locking supports substantially forward, and provides a supplementary passive anatomical micro-air-cushion that can be mounted on the permanent micro-air-cushion on the shield, to accommodate pregnant women, and the special critical force distribution they can withstand.

In this embodiment, the two pivoted arms swing forward under collision forces the moment created by the shield with the body pressure against it, and extends the upper extending arms (133) to absorb some of the shock and to provide a space for the forward movement of the upper body. The elbows (132) facilitate the relative angular movement of the upper arms and lower arms of the safety harness (133,134). They are spring loaded to ensure that they support the lower parts of the harness when unlocked to allow the entire harness to move up and away from the body when unlocked without any force being applied. Under side impact the passiveanatomical head and neck micro-air-cushions deploy to protect the head and neck under relative lateral acceleration. Notably the passive anatomical head and neck micro-air-cushions can be actively deployed or as in this embodiment passively deployed by a discharge of air from sacrificial chambers between the seats or on the outer surface of the seats and mounted on each of the seats, so that lateral pressure will inflate the anatomical head and neck micro-air-cushions. The sacrificial chambers offer secondary impact protection by cushioning the seat. Notably this embodiment does not use any active airbags in the vicinity of the human body, reducing the risks associated with the high energy external deployment devices. The adjustable head rest (136) follows conventional design but is here mounted on the safety harness hinged mounts.

Figure 12 I 2 shows the passive anatomical micro-air-cushions deployed (the sacrificial chamber has been compressed and the top region is full and ready to protect the face and neck in a frontal impact. Figure 12 J 2 shows the anatomical head and neck passive micro airbags deployed under side impact, ready to support the head and neck in a side collision. Notably this embodiment uses a new concept where the impact energy is redeployed for protecting vital parts of the impacted object which are often embedded inside the object, using fluid transfer – in this case air transfer. Force and velocity amplification or deamplification can be acheieved with the geometry of the

interconnections, the sacrificial chambers and the micro-air-cushions. The sacrificial chambers can be used for secondary impact protection as well by carefully controlling the flow parameters. This is illustrated in Figure 17. The approach obviates the need for active airbag technologies in the vicinity of sensitive equipment, living organisms and indeed people.

This embodiment of the harness allows movement within the vehicle for passengers when it is unlocked and allowed to swing up within the vehicle as shown in Figure 16D. However, visibility is somewhat obstructed preventing the driver from driving without locking the harness in place.

In this embodiment of the safety harness entering and leaving the vehicle are facilitated by the entire device swinging away from the body as shown in Figures 16 A,B and C. The passenger simply needs to stand up to leave. To enter the passenger simply sit down and place his/her feet on the foot rest (141) and retract the slider mechanism. This embodiment also has radar or infrared detectors as on elevator doors to detect limbs in the way of the retracting sliding mechanism for the protection of the passengers.

Figure 15C shows the parts of this embodiment and the adjustable arm rests.

Another embodiment of the shield on the safety harness has a folding section at the top that can be straightened and locked in place for adults and folded down for children.

Another embodiment uses flexible netting on part of the shield surface to protect passengers under impact. In this embodiment, the shield.has a frame on which the netting is deployed. The upper end of the frame is adequately bent forward and then downwards to ensure that the passenger head and neck do not strike the frame under frontal collision. In yet another embodiment of this arrangement, the shield of flexible netting is designed for the head and neck and is normally retracted forward, and deployed on impact by initial forces by the lower torso of the passenger against the lower part of the safety harness/shield.

Yet another variation of this safety harness with netting on a frame, has telescoping frame members on the sides so that the height of the frame is adjustable by retraction of the telescoping members to accommodate children and small adults.

Yet another embodiment of the harness has an upper section of the safety harness consisting of spring mounted support arms mounted in the vicinity of the head rest and designed --when pulled down by the passenger --to swing down and over the passenger head and in front of the passenger. The support arms each having telescoping sections that connect to the shield, such telescoping sections having arrangements for an inertial racheting that prevent extension of these telescoping arms in the event of a sudden tension as in an impact. The lower section of the harness consists of short adjustable belts or arms that can be locked on the sides of the seat or on the inside of the arm rests as in a four point seat belt. This embodiment provides all the benefits of a four point seat belt but in addition has the benefit of head and neck support in the event of a collision. This arrangement allows protection with the telescoping sections and the adjustments on the lower end of the harness for different sized passengers.

Yet another embodiment utilizes the passive anatomical micro air cushion (131) at the top of the shield/harness that derives its inflation source from the sacrificial chamber (139) at the lower end of the safety shield/ harness. However, in this embodiment the anatomical micro air cushion is limited to only the top edge of the shield to support the head, neck and the upper thorax when deployed under collision conditions. This anatomical micro air cushion (131) is supported by pairs of telescoping tubes the lower member of each such tubes being fixed to the harness/shield support in the vicinity of the sacrificial chamber, and the upper member of each pair of telescoping tubes are attached to the passive anatomical micro air cushion (131). The outer tubes have contoured semi-rigid materials to conform broadly to the body shape. The lower and upper membersof each pair telescope into one another co-axially, and are lockable in different longtitudinal positions relative to the other member of the pair, thereby providing for a variable height anatomical micro air cushion. Airflow under deployment conditions is conducted either directly through said telescoping tubes or seperate tubes that have an "accordian" collapsible structure that can extend as the telescoping tubes do, and may be placed inside said telescoping tubes. The length of the telescoping tubes may be manually set with the locks or in other embodiments set by automated or computer controls that sense the size of the passenge from selected elements of the multi-element contoured seat.

Yet another embodiment has a harness as in figure 12H2 except that there is a safety harness support arm only on the outer side of the passenger towards the side of the vehicle. (i.e in sonme of these embodiments there is one Safety Harness elbow (132), one Safety Harness extending upper arm (133) and one Safety Harness Pivoting lower arm (134). Moreover the safety harness/shield support arm is designed such that upon release from across the lap of the passenger, the shield flips to a vertical plane in the vicinity of the vertical plane of said support arm. Thereby permitting the safety harness to swing over the head of the passenger even when the seat is only partially displaced for entry or exit from the vehicle. Often this may be useful when there is limted access space next to the vehicle.

Yet another embodiment , principally for vehicles with drive by wire technologies, has the vehicle controls mounted on the shield . If a steering wheel is used this may be mounted on the front surface of the shield (on the surface opposite the passenger). Thesteering wheel or other controls may have distance adjustments for ergonomic positioning.

Yet another embodiment principally for drive by wire technologies , has the driver controls mounted on the contoured arm rests of the car. Adjustments for the arm rests will include further controls for the ergonomic positioning of these controls on the arm rests.

Vehicles, principally those that utilize drive by wire technologies with either of the above configurations, will have the entire area below the windshied free of controls. This embodiment utilizes this area for a GPS driven positioning display that mimics the view ahead of the driver. The display system may use vector imaging techniques or non-linear image mapping techniques that are well disclosed in the background art that provide the same perspective to the driver on the display as what he sees on the road ahead, thereby minimizing mental processing of

information in establishing a correspondence between the image and the actual physical position and orientation of the vehicle thereby reducing reaction time for action by the driver. Furthermore, the positioning of the display just below the screen ensures that there is minimal spacial disorientation of the driver in turning his/her head to look at the screen thereby reducing further the mental information processing needs and improving further the reaction time of the driver. In some embodiments when there are controls such as a steering wheel in front of the driver, a fixed or a "pop up" screen just below the windshield or a projection onto the lower windshield may be utilized. The image may include the destination and path to that destination and may be at a different scale to the perspective of the driver ahead of the vehicle. This embodiment and variations provide a unique system that conventional GPS navigation systems do not provide in speeding up driver reaction times.

Another embodiment has air conditioning micro-ducts on the seating surfaces and the safety harness/shields, for the comfort of passengers, particularly in open vehicles.

Another alternative embodiment has the "Open" switch for the slide on the inside of the vehicle designed the "press bar" so that the intuitive reaction of the passenger to "open the door" is harnessed. However, this can be deactivated when the vehicle is in motion.

Another alternative embodiment has a center console that is designed to crush under impact as shown in Figures 1F – 4F, thereby minimizing the ejection of the far side passenger on impact.

Yet another embodiment has a detachable center console that includes part of the center tunnel that houses the transmission shaft for rear wheel drive vehicles with front mounted engines and several cable and hydraulic systems. One such embodiment has perforated or weakened line of detachment or an interlocking arrangement on the center tunnel that delineates the section of the center tunnel that will be detached from the remaining part of the center tunnel in the event that the seat carriage with secondary slides apply sufficient shear force on this line of intended detachment. In embodiments that require the separation of the two sections of the center tunnel by cutting through the weakened tunnel material along the predefined line, a cutting edge mounted on the moving surface of the secondary slide may be used to cut through the tunnel material in the event of an impact. Notably, in the event of a side impact, the lateral torsional force system will tend to raise the impact side of the vehicle. Therefore the transmission shaft in this situation will be at the lowest level of the center tunnel within the design parameters, and therefore will not be in the way of the seared section of the center tunnel which will be at the top of the tunnel. Moreover, the pipes and cables that are mounted within the tunnel may be mounted such that they have adequate slack in the event of such a displacement of the sheared section. They may also be mounted low enough on the center tunnel to be below the line of shear on the center tunnel, which will avoid the need for special considerations for the cables and pipes in the event of the shear of the upper tunnel. In the event that the design of the vehicle requires a high center tunnel where the transmission shaft will not be low enough to allow the traverse of the sheared tunnel over it, the transmission shaft may be designed to fracture or decouple in the region of the sheared section of the center tunnel, in

the event of lateral forces as in this situation but still transfer the required torsional forces to drive the vehicle. This may be achieved with suitable couplings on the transmission shaft. Another important consideration for this embodiment is that the peak acceleration of the vehicle following impact and the resulting peak forces precede the time at which the shear of the tunnel will occur and therefore the integrity of the tunnel is maintained at the time when the strength of the tunnel and the remaining structure is most needed. The length of the detaching section of the center tunnel and indeed the other parts of the center console mounted thereon may be increased in some embodiments to accommodate the legs of the passenger as the seat moves towards the center of the vehicle.

Another alternative embodiment has the internal airbag partially filled at all times, so that in the event of no deployment of the external airbags either because of technology failure or non installation or other reason, the passenger and seat arrangement are cushioned even prior to further inflation of the internal airbag on deployment on impact. Shock absorbers may supplement the operation of the internal airbags in this embodiment with partially inflated internal airbags under normal operating conditions.

Another alternative embodiment can have the internal airbags deployed on impact as noted with such deployment effected by inflation by some of the compressed air of the external airbags on impact, thereby providing "acceleration de-amplification" for the movement of the passengers on impact.

Yet another embodiment has proactive sensors deploying the internal airbags directly, without the installation of external airbags.

Yet another embodiment of the invention has a retaracting canopy stored in the roof of the vehicle, and attachable to the protector shield or attached components such as the side window, when desired. When attached, the canopy will deploy over the seats when in the extended or loading positions, thereby protecting the seat and the passenger from rain or other snow while entering or leaving the vehicle.

Yet another embodiment has external airbags constructed using the Passive Air-Cushion System with micro chambers that are connected to each other by restricted paths that provide visco elastic energy absorbtion in the event of some sections of the airbag being impacted while others are not, thereby forcing air from the compressed micro chambers to the other micro chambers, each of the micro chambers functioning as either a sacrificial chamber or a Micro Air Cushion on impact. This embodiment may of course have external airbags proactively deployed in the manner described herein, prior to impact and their performance as Micro Air Cushion systems. Yet another variation may include one-way valves between the chamber directly connected to the inflation source and each of the micro-chambers (implementable for example with flaps against an aperture) so that inflation may be achieved rapidly, and then the Passive Air-cushion benefits realized on impact.

Yet another embodiment uses the Passive Air-cushion system to protect passengers from "Whip Lash" injury, by providing Micro Air-cushions in the vicinity of the head and neck, and providing sacrificial chambers that are compressed in the event of a rear end collision. In some embodiments the sacrificial chamber can be mounted

below the seat with one face mounted to the vehicle structure and the other face mounted to the seat of the passenger, the seat being mounted to the support structure to allow controlled limited rearward movement relative to its mountings to allow compression of the sacrificial chamber by the inertial mass of the passenger and seat on impact.

Yet another embodiment utilizes multiple adjoining but seperate Passive Air–cushion systems where on esuch system connects the external airbags (sacrificial chambers) with internal airbags (micro Air-cushions), and another such system connects different and distinct internal airbags (sacrificial chambers) to micro Air-cushions in the vicinity of the passenger's body, thereby creating a cascading system of Passive Air - cushion systems. These embodiments may of course have external airbags proactively deployed in the manner described herein, prior to impact and their performance as Micro Air Cushion systems..

Yet another embodiment utilizes the independence of the venting of micro aircushions and the venting of the sacrificial chamber, to maintain the inflation of the air cushions well after the time frame for impact absorbtion by the sacrificial chamber such that the passenger is held in a safe position for a predetermined time. Some such embodiments may hold the passenger for a period of upto say 3 seconds to protect the passenger in the event of a roll over of the vehicle. Among these embodiments, some may have rollover detection devices that sense the orientation of the vehicle that slows the venting of the micro air cushions in the event of the commencement of a rollover of the vehicle.

Yet another embodiment comprises actively inflated airbags of minimal volume each connected to a plurality of anatomical micro aircushions, mounted on the multi element adjustable seat, that deploy on either side of the head and neck, either side and ahead of the torso and thorax below the arms and either side of and above the upper legs, said airbags inflatable in the event of a detection of a side impact thereby holding the passenger in the multi element adjustable seat for translation with the motion of the multi element adjustable seat propelled by the internal airbag or the internal shock absorbing devices.

Yet another embodiment utilizes an auxiliary brake attached to the secondary slides in addition to the friction limited sliding arrangements of the secondary slide, to provide a further control on the rate of movement of the secondary slide under side or lateral impact.

Yet another embodiment utilizes a foot safety switch attached to the foot rest, that activates the sliding mechanism to move the sliding seats into and out of the vehicle. The foot rest in some such embodiments may be bar that is depressed to move the slide into and out of the vehicle. These foot rests being designed to avoid ankle injuries in the event of rear collisions sustained by the vehicle.

Yet another embodiment uses supplementary porous filling materials within prefilled internal airbags designed with suitable vents to change the compression characteristics of the inside airbags under impact.

Yet another embodiment utilizes pressure memory capable materials on the surface of the seats or passenger supports so that surround seats contour to the exact shape of the body for further comfort of passengers and also better support under collision conditions.

Yet another embodiment for proactive impact detection uses one or more of radar detection and motion detection as in machine vision using visible or infrared or ultraviolet spectral components. The use of both these approaches for detection may use algorithms that estimate the speed of approach of the impacting object and the distance, and thereby have independent measures of the required inflation of external or internal airbags. In conjunction with each other in some embodiments, the failure probability of the system is reduced by using the worst case scenario of impact –with regard to velocity and time of impact -- detected by these two systems. The two measurements may also be used in stochastic estimators to provide a better quality estimate of the distance and velocity parameters of the impacting object, when the two independent measurements are sufficiently similar to exclude the possibility of failure of either system to within a predefined error threshold. Moreover, those embodiments that use more than one camera in the machine vision system for motion detection can make 3-dimensional estimates of the impacting body and thereby from a database of known object shapes and sizes, predict the type of object and thereby its mass for better estimation of the best response with the deployment pattern and inflation levels of the external and internal air bags. Still other embodiments with a single camera in the machine vision system may utilize the divergence of the profile of the impacting vehicle as it approaches to predict relationships between the impact velocity and distance by assuming a constant velocity of the approaching object and using the non linearity of the projection of the object on the projection plane of the machine vision system. Moreover, some embodiments can use the shape of the impacting object from object recognition algorithms in the machine vision system with predefined data of known object types, to predict the type and mass density of the object and accordingly deploy the airbags appropriately. Some of these embodiments can work with distance and speed measurement in a radar based system and thereby together predict the size and mass and shape of the impacting body. Airbag deployment characteristics can thereby be optimally designed for impact with for example pedestrians, trucks or cardboard boxes at varying speeds appropriately.

Furthermore, in embodiments with one machine vision camera and one radar detector in the system, in the event of failure of the radar detector, the machine vision system alone can determine the type of impacting object (and its worst case size) and the velocity of approach for a given size of the object from the divergence of the profile of the object, and assuming a worst case size scenario, deploy the airbags appropriately, and in the event of the failure of the machine vision system the radar detector can detect velocity and distance and deploy the airbags assuming the worst type of object.

Yet another embodiment will use secondary slides whose sliding surfaces are slightly inclined upwards towards the center of the vehicle, to allow the secondary slides to negotiate a center tunnel with reduced need for any arrangements to shear a section of the tunnel. The connection surfaces of the secondary slides to the fixed

elements of the vehicle at the time of impact and the vehicle seat may be arranged to support the seat in the required substantially upright position.

Yet another embodiment, has wheel chairs as passenger support mechanisms for the disabled, with collapsible wheels such that the chairs may be backed into clamps that attach on the lower side of the chair supports. In some such embodiments (as illustrated in figures 18A to 18 J) these clamps along with the lower cushion of the car seat 148 – (which is specially made to accommodate the chair support cross members), are extended forward on tertiary slides or extension arms with hydraulic automation, such that the movement forward and if necessary down, supports the wheel chair by locking the chair clamps 149 to the chair cross supports 150, and then providing adequate support for the passenger and the wheel chair. The Teritiary Slides or extension arm are supported by the impact decoupler/ Secondary Slides which are in turn attached to the Upper Primary Slides in the extended or loading position. Figure 18B illustrates the position of the seat bottom and clams just below the wheel chair prior to attachment to the wheel chair. Once the hydraulic mechanism raises the wheel chair off the ground, the Primary Pivot of the rear wheels 151 may be unlocked and the wheel swung up backwards and locked as noted in Figure 18C. Notably the Rear wheels support much of the passenger weight when the wheel chair is used and therefore in addition to the pivoting Principal Rear Wheel Support 152 the rear wheel in addition has a Rear Wheel Support Strut 153 that supports the compressive load when the wheel chair is operational. Threafter the front wheels may be unlocked and swung back on the Primary Pivots for the Front Wheel 157. This is illustrated in Fingure 18 D.

Thereafter the space below the wheel chair is clear and the tertiary slide or arm mechanism can move the wheel chair back and lock it with and against the Seatback 156 which is specially shaped to accommodate the cross support members of the wheel chair. This is illustrated in Figure 18 E. Some such embodiments may have the option to release the rigid back support mouting of the wheel chair 158, and thereby benefit from the reclining options of the vehicle seat back. In the process of moving back to the seat back 156, the spring loaded locking sleeves 155, that support the Secondary pivot for rear wheel retraction 144 are pushed forward relative to the wheel chair body thereby releasing the Secondary Pivot for rear wheel retraction 154 to allow the wheels to swing in and lock behind the seat back 156. This is illustrated in Figure 18F. The wheel chair is then in a position on the extended impact decoupler/secondary slide to be transported into the vehicle. Notably in this wheel chair conversion embodiment, supplementary side and back air cushions may be inflated to fill in the areas where wheel chair support members are in the vicinity of the passenger and also to hold the wheel chair structure securely, thereby providing further protection in the event of a collision of the vehicle. This wheel chair conversion embodiment has all the side impact protection as the regular seat and has all the optionality for front impact protection of the safety shield/harness or more conventional options. Figure 18 G shows a plan view of the wheel chair prior to the insertion of Seat lower cushion and support structure. Figure 18 H illustrates an elevation view of the wheel chair and the seat lower cushion and support structure. Still other of these embodiments may use turn tables or other rotating mechanisms rather than the tertiary sliding

arrangements or extending arms so that the wheel chair may be directly loaded on a turn table mounted on the impact decoupler/secondary slides, and then rotated into a driving or passenger position when retracted into the vehicle.

Yet another embodiment has anatomical micro-aircushions on the left and right edges of the support surface of the safety shield connected to selected sacrificial chambers along the bottom edge of said support surface. This will provide additional support for the passenger in a side impact, by assisting in preventing body movement outside the countoured seat under collision conditions.

Yet another embodiment has anatomical micro-aircushions on the outer edges of each of the countoured seats, particularly to cover a part of the front of the shoulders the legs and torso in the event of a side collision. These anatomical air-cushions use sacrificial chambers on the sides of the seats.

Yet another embodiment minimizes ejection hazards by controlling further the lateral movement of the seats under side impact. In these embodiments, the Upper primary slide is connected to the locking mechanisms that hold it to the vehicle under operating conditions through shock absorbers or spring mechanisms that allow controlled movement of the upper primary slides out of the vehicle when the vehicle sustains a side impact from the far side. In such embodiments the locks do not disengage when there is a side impact, as the shock absorbing devices provide the required controlled lateral movement of the far side upper primary slide under impact.

Yet another embodiment has a flexible stretchable (or folded) material that is bound to the protector shield and the "doors" of the vehicle on one of its edges where it makes contact normally with the vehicle body, the other edge of the flexible and stretchable material is bound to a frame that locks to the vehicle body under operating conditions. Under normal egress and ingress the frame along with the "doors" with the flexible, stretchable material operates as one unit the frame being held together with the "door" with door impact decouplers that fracture or disengage under impact, thereby allowing the "door" and the upper primary slide on the far side to extend out of the vehicle while the frame remains locked to the vehicle, and stretching the flexible, stretchable material so that passenger body extremities are not ejected from the vehicle but are retained by the flexible stretchable material within the vehicle.

Yet another embodiment has preinflated inside airbags that are deflated when seats move outwards (on the far side) under impact, threby creating more space within the vehicle, minimizing the need for ejection on the far side under impact.

Yet another set of embodiments has a child or infant support mechanism (CISM) as the passenger support mechanism. For frontal collision protection these embodiments may have the following arrangements. One such embodiment has the CISM 224 comprising two support pins 225 that are located above the center of mass of the occupant and the support mechanism structure and engages a rotary damped spring with shock absorbing device (not shown) when inserted into the supports 215. and locked therein. The damped spring mechanism prevents rotary motion of the pins in the supports except under front collision conditions when the torque generated by the inertial mass of the occupant and the support mechanism structure with a center of mass lower than the pivot,

swing the CISM down and forward thereby bringing the occupant closer to a foetal position with the reactive force for deceleration applied to the occupant significantly from the lower support structure of the CISM. The final position of course is designed not to bring the occupant to a postion that would cause excessive spinal compression. The head and neck on the other hand, will engage and be protected by a safety harness as disclosed in this invention (not shown and the body will face substantially away from the impact. Furhtermore in a front impact, the relevant embodiment has the extendable spring damper 216 which contains a damped spring may extend to increase shock absorbtion, while other embodiments. have a pivotally mounted arrangement that extends under front impact. The Arms that constitute 216 Extendable Spring Damper loaded attachment for CISM support in these latter embodiments are air damper (internal airbag equivalents) loaded for rotary movement. For some embodiments the mounting of the CISM can be rigid in the operating position i.e. the support of the CISM support pivots 225 on the support 215 may be rigidly fixed in the operating position, and support may even be on multiple points on the arm of 216 directly supporting the CISM, as the pivotal movement may be restricted to the elbow of 216 arms and its attachment to the support members (the Outer rotator 218 in some embodiments or Support Bracket 232 in others). In both the linear and rotational embodiments of 216 noted above, we have movement restricted to a position that orients the occupant to maximize support from the seat bottom and for head and neck support from the safety harness.

This set of embodiments of CISM supports and indeed any embodiments of Passenger support mechanism may have for side impact protection, one or more of a nested set of the slidng arrangements disclosed in this invention. i.e. The embodiments can have safety beam lower and upper elements –1 attached to the impact decoupler/secondary slide –1 as disclosed herein (sliding arrangement 1), and a safetybeam lower and upper elements –2 attached to the impact decoupler secondary slide –1 with its own impact decoupler secondary slide –2 (sliding arrangement 2) which is attached to the passenger support mechanism that may be an CISM or other passenger support mechanism. Some embodiments use a first rectangular section linear slidng arrangement, and a second rectangular section curvilinear sliding arrangement (inner and outer rotators) both with shock absorbtion with internal airbag equivalents (which may be air shock absorbers or similar devices). Other embodiments use Cylindrical linear sliding arrangements (sliding arrangement 1) and a rectangular curvilinear sliding arrangement (sliding arrangement 2). Still other Embodiments, use cylindrical linear slides for sliding arrangement 1 and create a virtual curvilinear sliding arrangement by pivoting the CISM support Bracket 232 in the center and control its movement by an internal airbag equivalent for combined rotational and linear motion shock absorbtion. This particular arrangement therefore reduces the structure to a single sliding arrangement and a single pivotal arrangement rather than two sliding arrangements. These embodiments are of course general to any passenger support mechanism including seats. For example the some embodiments may be accomplished with curvilinear ssecondary slide on the second set of sliding arrnagments below the seat. Other embodiments may be accomplished with a pivotal arrangement to complement the single secondary sliding arrangment thereby creating a virtual curvilinear second sliding arrangement.

Greater detail of the lateral impact protection arrangements of this set of embodiments for the CISM are described below:

The first embodiments in Figs 10A 1- 5 have the exendable air damper loaded attachment 216 attached to the Inner rotator for the CISM 217 that mates with the Outer rotator and is slidably mouted thereto with internal airbag equivalents attached between these two elements (not shown) to keep the inner rotator in the operating position as shown in Fing 10E1, but to rotate as shown in Fig 10E3 under lateral impact, thereby orienting to the exent possible the occupant to face away from the impact and to increase the resistive force accelerating the occupant to be applied by the body of the CISM 224. The Outer rotator 218 has the secondary slide 111 attached to it. The secondary slide impact decoupler in turn is detachably attached to the safety beam upper element 107. Which is slidably mounted to the safety beam lower element 102 which is rigidly attached to the fixed body members of the vehicle which includes the rigidly attached seat.. Under a predetermined shear force the secondary slide 111 of 218 is designed to detach from the safety beam upper element 107 and thereafter be slidably attached thereon. Under operating conditions the Locking pin is in place. A lateral slide assembly assembly may be used for the linear or curvilinear sliding arrangement described herein. When the locking pin 226 engages the slot 227 in the secondary slide and the holes 230 in the safety beam lower and upper elements, the CISM is locked from lateral movement in the operating position. The Internal Airbag equivalents 228 are uncompressed and either one of them is ready for compression in the event of a side impact on the relevant side. When a side impact is encountered, the inertial mass of the CISM and the occupant may provide a lateral force larger than the critical shear force to decouple the impact decoupler between the secondary slide 111 and the safety beam upper element 107, and thereafter the CISM and attached elements to the Secondary slide 111 move against the compression of the air shock absorber or other device in the Internal Airbag equivalent 228. This provides shock absorbtion in lateral impact to the occupant in the CISM. Simpler versions of this arrangement that could be used in other embodiments may integrate the secondary slide 111 and the Safety beam upper element 107, with a matching slot in the safety beam upper element as present in the secondary slide 111. When the pin is in place, in this simpler arrangement the safey beam lower element is engaged to the ends of the two internal airbags this alone keeps the arrangement in the operating position. There is no impact decoupling in this simpler arrangement. Fig 10E2 Shows a loading or access position. This is a convenient position to load or unload the CISM with the occupant. It is achieved by removing the locking pin and sliding the Safety Beam Upper element 107 on the safety beam lower element 102.

Yet another embodiment, use cylindrical slides for lateral impact protection. Here Safety Beam Lower Elements 102 slidably support cylindrical safety beam Upper elements 107, which in this embodiment is a part of the secondary slide 111 (the safety beam upper element 107 may in other embodiments be detachably coupled to the impact decoupler secondary slides as disclosed in this invention). In this embodiment, the pin that locks the secondary slide (and safety beam upper element) to the internal airbag equivalents 228 (not shown), which are in turn housed in the cylindrical slot 229, within the secondary slide and the safety beam lower element, is located in a pin hole drilled through 231- the support key for the outer rotator from the secondary slide. The pin when locked engages a hole between two sections of the internal airbag equivalents that straddle the hole. The pin if engaged will therefore compress one or the other of the inside airbag equivalents in the event of the secondary slide moving under impact conditions relative to the

safety beam lower elements 102 and the fixed elements of the vehicle, providing shock absorbtion. However if the pin is withdrawn, the secondary slide will not engage the internal airbag equivalents 228 and will therefore slide easily to a loadiong or access position nearer the door, for placing the CISM in its supports or removing the CISM from its supports. A similar pin may be mounted on the outer rotator and engage between a pair of internal airbag equivalents 228 that are mounted inside slots between the inner and outer rotator and engaging on their outer end, the inside rotator. When the pin is engaged, it provides a surface resisting the movement of one of the internal airbag equivalents an thereby provides shock absorbtion under impact. However, when the pin is retracted back into the outer rotator, it allows free slding between the inner and outer rotators, thereby allowing the CISM mounts to be positioned to easily attach the CISM in a loading position. Moreover, in this embodiment a further refinement would be a cable activated lever that operated all the pins – in the linear and curvilinear sliding arrangements (similar to a bicycle brake cable) for ease of operation of loading and unloading the occupants.

Yet another embodiment uses cylindrical linear slides for lateral impact protection along with a virtual curvilinear slide implemetation using a pivoting arrangement between the CISM support bracket 232 and the support member 236 (support for secondary slides, CISM support bracket and internal airbag equivalents) and a dual internal airbag equivalent devicethat allows compression and expansion 239 mounted between the edge of the CISM support bracket 232 and the Fixed Support for safety beam lower elements and internal airbag equivalents 235. The 232 may have lateral support flanges for the CISM such that the CISM nests withing the 232 when in the operating position without obstructing forward deployment of the CISM in a front impact.. This embodiment has two safety beam lower elements that each slidably support on their outer surface one of the two secondary slides 111 (this embodiment uses the reduced form where the secondary slides are integrated with the safety beam upper element without impact decoupling as disclosed herein) The secondary slides are connected together and pivotally support the CISM support bracket with the support for secondary slides, CISM support bracket and internal airbag equivalents 236. The internal airbag equivalents in this embodiment is a dual element that can be compressed in both directions 238. Its center which is the active end that may be moved relative to its extreme ends under impact forces, is mouted to a support flange 237. This mount may be disconnected using a pin or other locking device to disengage the internal airbag equivalents to aid loading and unloading the occupant in the CISM. (An alternative embodiment uses single Internal airbag equivalents 228 that only compress but don't expant between their ends. Two of these may be substituted for 238, each rigidly mounted at the outer end to the fixed support flange 235 with their pistons pointing inwards and engaged into the circular slots. The Pin hole 240 for engaging the secondary slide and its attachments is also shown. This arrangement allows a single Internal Airbag Equivalent to compress while not affecting the other as the pinstons simply engage the slots and are not fixed within the slots.

In the event of a lateral impact the inertial mass of the CISM with occupant will exert a force through its center of mass that is within the substantially semicircular CISM support bracket, and will therefore compress the Internal airbag equivalents 238 attached to the Secondary slide. However, as the second internal airbag equivalent 239 is attached to the edge of the CISM support bracket this too will undergo extension or contraction depending on the side on which the impact was received. The reactive forece from the latter internal airbag equivalent will however rotate the CISM to face away from the impact.

Notably there are several possible embodiments of this CISM support mechanism in this invention. Elements of these may be used in different combinations and not all elements may be present in any one embodiment. For example any of the front impact arrangements as noted above may be used with any of the lateral impact arrangement noted above. Yet another example of a reduced content embodiment does not hav the lateral rotator for side impact to rotate the occupant but simply slides the CISM and the occupant laterally as disclosed above. Moreover, There are a number of variations of the CISM support in this invention. For example the safety beam lower element may be mounted on the bottom seat support flange 221, back seat support flange or on both. There may be multiple safety beam lower elements each with their own safety beam upper elements and other disclosed elements attached thereon, working in parallel to provide greater support. Notably an embodiment with the safety beam lower element attached to the bottom seat support flange 221 and comprising inner and outer rotators for lateral impact, will under side impact rotate the occupant to face away from the impact (the center of mass of the CISM and the occupant needs to be arranged to be below the pivot) but in so doing will incline the occupant to the vertical.

Each of these variations in the embodiment have advantages and disadvantes that performance, geometry and cost will influence. Some of these embodiments may be removable from the vehicle and attached to the seat with 3 point seat belts for example with the shoulder strap attachment points 223 on the Back seat support flange 222. Others may be designed into the vehicle as in for example a part of the center arm rest in the rear seat of a vehicle. The attachment of these embodiments of he invention may also be with methods available in the background art such as "Isofix" fasteners or other lathc arrangements such as with the top lock flanges 241, the side lock flanges 242 and front lock flanges 243.

The side impact performance will in particular will be aided with the side lock flanges 242 being locked into support points attached to the fixed members of the vehicle between the seat cushions on the back or front seats of the vehicle.

The The side support flanges 244, will aid in bracing the structure and helping transfer the load from the shock absorbing members to the structure and the lock flanges or 3 point seat belt as available in the vehicle. In some embodiments the safety beam lower element attached (by bolts not shown through the Side Support flange to the support member for the internal airbag equvalent that controls the rotational motion. However, other embodiments may have the side flanges, and the entire module attached to the side support flanges and the other structural members either in the front or rear facing arrangements for the CISM.

Some embodiments of the invention may have the safety beam upper and lower elemtns along with the secondary slides, internal airbag equivalents and attached hardware, removable and attachable at the front end of the support structure thereby allowing the installation of a rearward facing child seat ~~(Fig10E17)~~ . Such a seat may not require a front impact protection mechanism and therefore many such embodiments may have the CISM support

bracket directly connected to the CISM. However, further refinements of the invention may have the CISM in two sections – the first to support the head, neck, thorax, lumbar regions and the pelvis of the child and the second to support the lower limbs of the child. The CISM support bracket may be connected to the first of these and the second which supports a smaller load may be pivotally moutned to the upper section of the CISM , thereby allowing a recling position for the child. For older children – upto about 40 lbs, leg room in the rearward facing position becomes important. Embodiments that have a removable car seat cushion with the mountings and locks as discussed below this level will facilitate this.

As much of the complexity of the invention is external to the CISM, the CISM may be constructed to be very light and made inexpensively, thereby allowing a change in CISM and its support members that attach to the CISM support bracket, to suit the child as it grows older.

Finally the CISM support embodiments disclosed here include alternative support structures outside the automobile that can receive the same support pivots or lock points. Thereby making the loading and unloading of children easier. These external support structures include all types of strollers and bicycle trailers that have the suppot members that lock to the pivots or lock points. Some such laternative structures may replicate the impact protection of the CISM support in the vehicle for use in bicycle trailers and strollers.

Many aspects of the embodiments of the invention for the Child support Mechanism as the passenger support mechanism may be used for adult passengers as well. The cylindrical safety beam lower elements as in the Child support embodiment may be modified to attach either directly or pivotally to the vehicle central body member (pivotal mounting can contribute to shock absorbtion of the seat) or mounted on a member that can raise/lower and tilt the seats by suitable slidable and pivotal attachemtn to the fixed central member using well known approaches in the background art.. The remaining aspects of the embodiment for the child support case may be replicated after suitable scaling. In addition, with gull wing doors or other doors that provide clearance of the Passenger support mechanisms as well as doors attached to the secondary slides as disclosed herein, the Passenger support mechanisms can slide right out of the vehicle as disclosed elsewhere in this invention. The Front collision protection arrangement for the Child support case will be most relevant for the adult passenger support mechanism case when the steering wheel and other hardware are not in the way of a movement forward of the Passenger Support Mechanism. This may be the case in drive –by-wire vehicles where the sterring and other controls are mounted on a safety shield as disclosed herein.

Fig 10E 18, 10E19 illustrate another embodiment of the CISM and its supports. This embodiment uses multiple cylindrical slides that permet the lateral displacement of the CISM under impact. Pivoting of the CISM is under the diagonal and under the seat. Figs 10E20 and 10E21 show yet another embodinment of the CISM and its supports with a simpler arrangement where the side pivoting supports each have a preferably shock absorbing central member that can extend or contract under large axial forces or when unlocked for egress and ingress, and two pivots at each end of connection to the CISM and the CISM frame with these axes parallel to each other on both supports, said pivots being normally fixed but allowed to rotate for egress and ingress and when under large

torsional stress as in impact. These provide the reqired displacement of the center of mass of the CISM without the use of a slide. (i.e, the CISM "rocks" on these pivots to rotate away from the impact and displace the Center of gravity concurrently) under side impact and also provide shock absorbing motion in the axial direction of the vehicle in a front impact. Notably the rotation of the axis of the pivoting supports are in the same sense (ie both clockwise or both anticlockwise) in the lateral impact case and in opposite direction s in the front impact case.

CONCLUSIONS, RAMIFICATIONS & SCOPE

Thus it will become apparent that the present invention presented, provides a new paradigm for implementing key safety features and providing utility in accessing passenger vehicles and comfort in travelling in such vehicles. While the above description provides many specificities, these should not be construed as limitations on the scope of the present invention, but rather as an exemplification of the preferred, an additional and an alternative embodiment thereof. Many other variations are possible.

The present invention provides an arrangement that diverts the impact energy in impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers but decelerating the impacting object with the remaining mass of the vehicle. Moreover the arrangement synergistically provides a means for utilitarian easy access to the vehicle for passengers and drivers alike and allows the installation of multi-element surround contoured seats for the comfort and protection of passengers. Furthermore, the arrangement allows the installation of a new and unique safety harness that may obviate the need for safety belts and front impact airbags for protection in head-on collisions. This arrangement differs sharply from the Background art in that it does not simply offer to the impacting body a reinforced rigid shell where the passenger is treated as part of this integral unit, but rather provides selective and differential treatment of the mass of the passengers and driver of the vehicle vis-à-vis the remaining mass of the vehicle. Furthermore the present invention differs sharply from the Background art in that the resulting structure synergistically permits the installation of contoured multi-element surround seats that would not be implementable without the slide arrangements on either side of the vehicle in the present invention.

The present invention provides a gravity slide drive for my arrangement for which there is no counterpart in the Background art. This allows further Utility and weight and energy saving in implementing the above elements of the present invention.

The present invention includes External side Airbags that differ sharply from the Background art in that for the first time they proactively create a "Just in Time" deceleration zone for the lateral or side impact with internal and/or external side airbags while not remaining in an extended position under normal operating conditions of the vehicle.

The present invention describes an indo-skeletal structure of the vehicle body that permits the energy transfer from the lateral or side impact through compressive members to the body of the vehicle. Unlike the Background art this indo-skeletal structure is designed to transfer energy to the body of the vehicle without transferring it to the passengers and driver of the vehicle. The passengers are targeted for protection with "Safety zones".

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Claims:

1. An airbag for the protection of occupants in vehicles, wherein said airbag is prefilled with air and supplementary porous filling materials, and comprising vents for exhaust, thereby enabling adjustment of the compression characteristics of the airbag.

2. An airbag as in claim 1, wherein said airbag acts as a sacrificial chamber to release airflow during compression to aircushions that are enabled to protect an occupant during impact.

3. An airbag as in claim 2, deployed with said airbag deployed such that its compression is enabled by contact with parts of the occupant with high inertial mass such that the subsequent inflation of the aircushions protect high priority anatomical regions of the occupant.

4. An airbag as in claim 3, wherein the torso of the occupant compresses the sacrificial airbag and one or both of the head and neck are protected by the at least one air cushions.

5. A vehicle with side impact protection for occupants provided with cylindrical slides (10D1 to 10D5) wherein the egress and ingress is enabled by the activation a first set of slides and impact protection for motion into the vehicle for the occupant is enabled with a second set of slides that are concentric.

6. A vehicle with side impact protection as in claim 5, wherein the first set of slides are enabled for motion with a motorized threaded shaft concentric to the cylindrical slides.

7. A vehicle with side impact protection as in claim 5, wherein the motion of the second set of slides move above structural elements of the vehicle in the center of the vehicle thereby enabling greater motion of the near side occupant during a side impact to the vehicle.

ABSTRACT OF DISCLOSURE:

An arrangement in passenger vehicles, that diverts the impact energy in impacts away from the passengers to the remaining mass of the vehicle thereby protecting the passengers, and in the same arrangement provides utilitarian access to the vehicle, such utilitarian access making it possible to both install multi-element contoured surround seats for passengers and the driver, and also safety devices and arrangements for head-on collision protection that protect the passenger. An indo-skeletal structural arrangement proposed for the vehicle, provides further benefits by targeting the strength of the vehicle to protect passengers while minimizing other massive elements in the vehicle.

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FIGURE 1

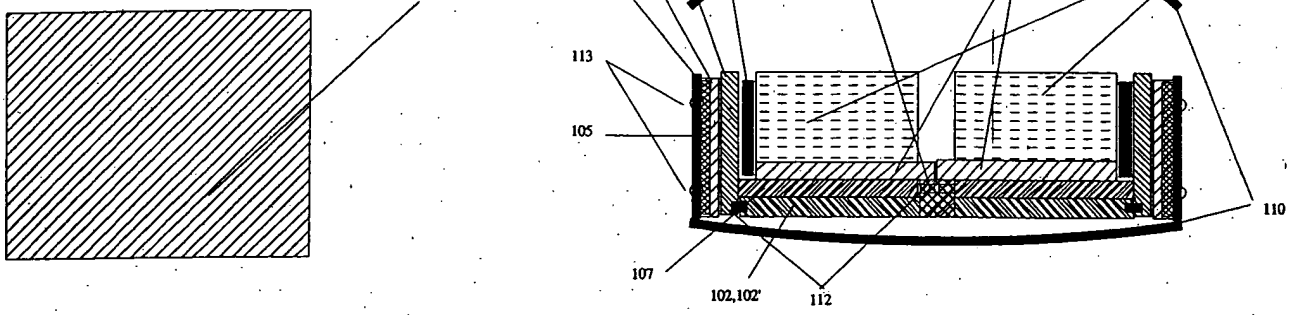


FIGURE 2

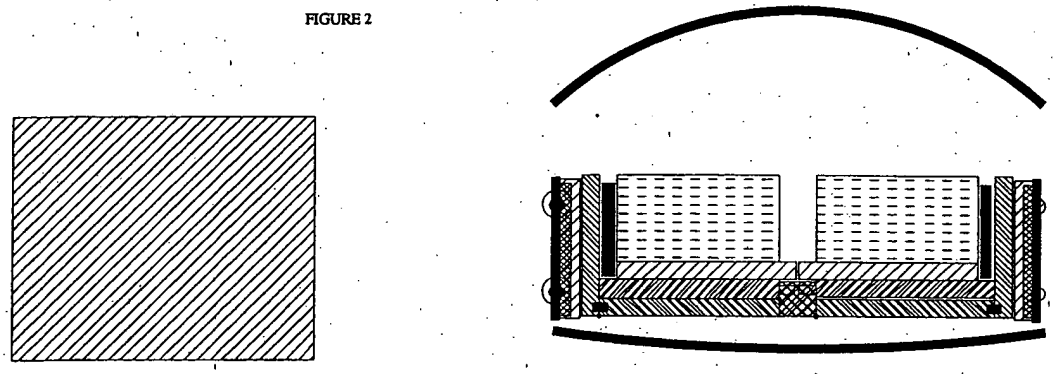


FIGURE 3

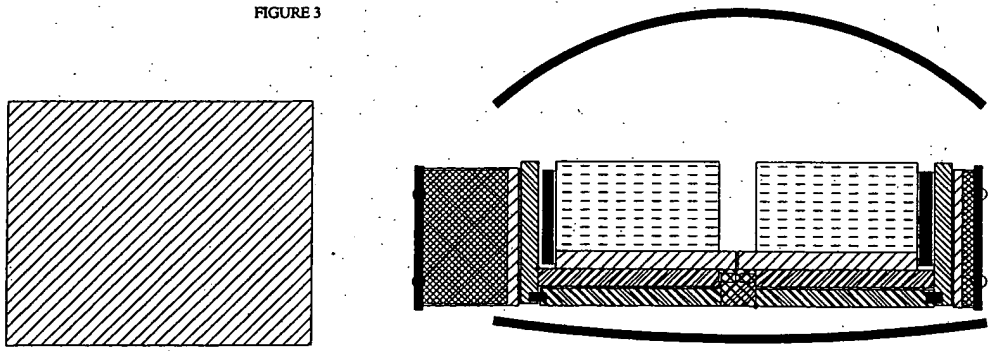


FIGURE 4

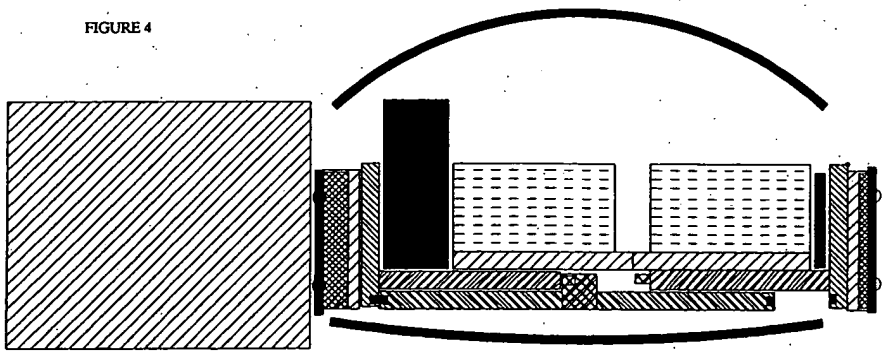


FIGURE 1B

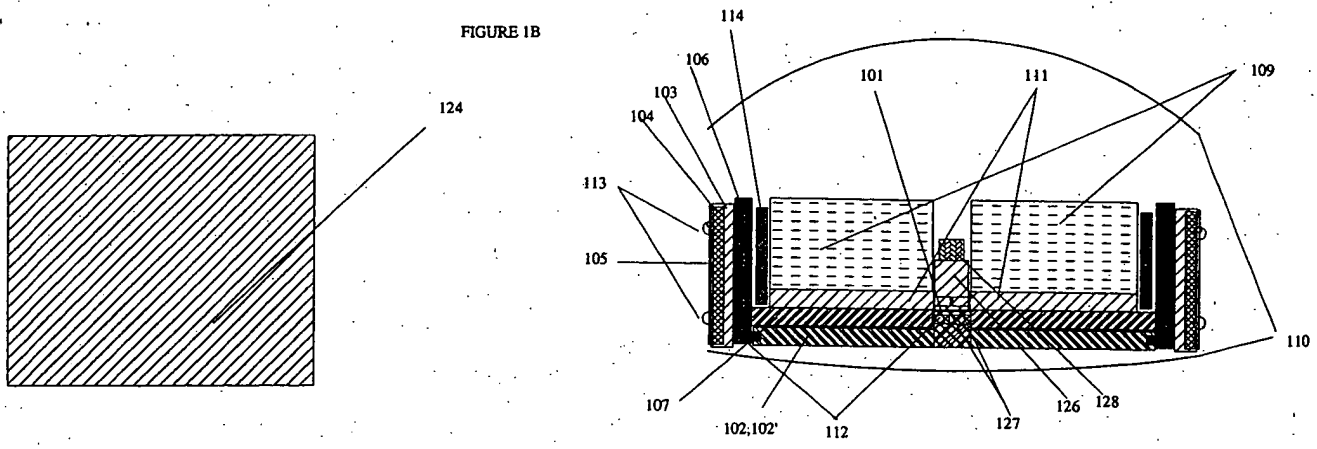


FIGURE 2B

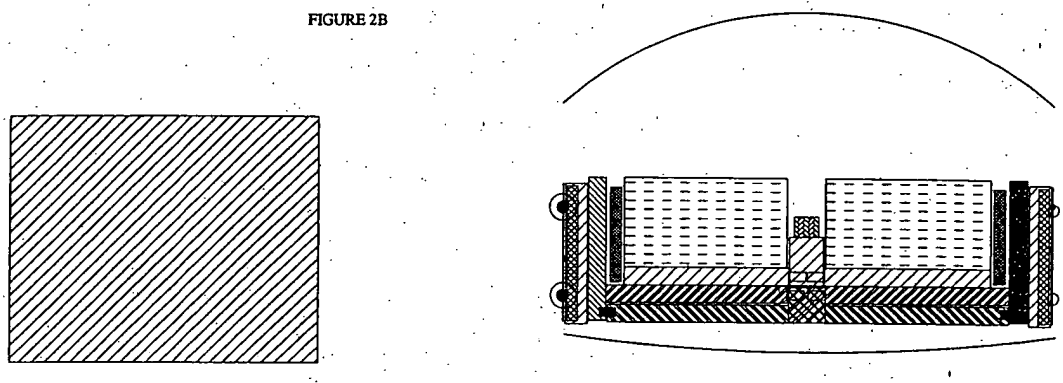


FIGURE 3B

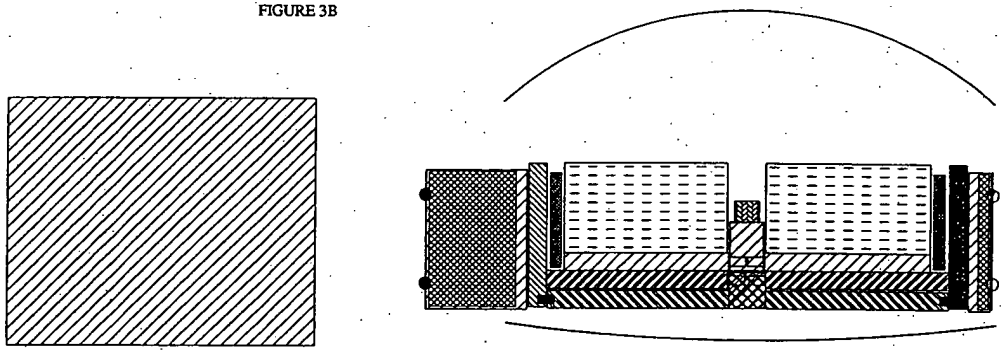


FIGURE 4B

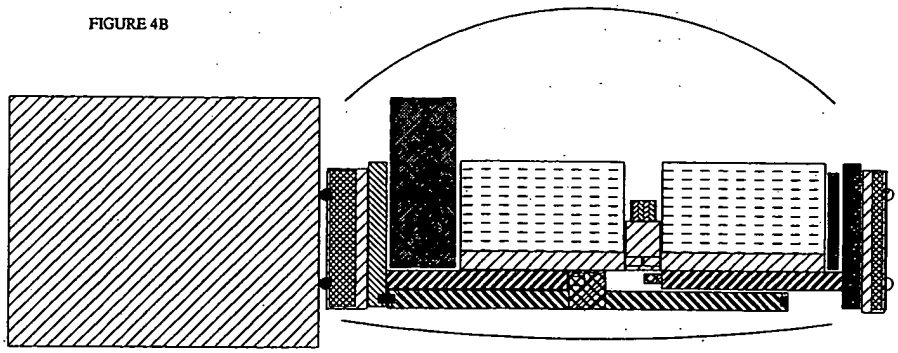


FIGURE 1D

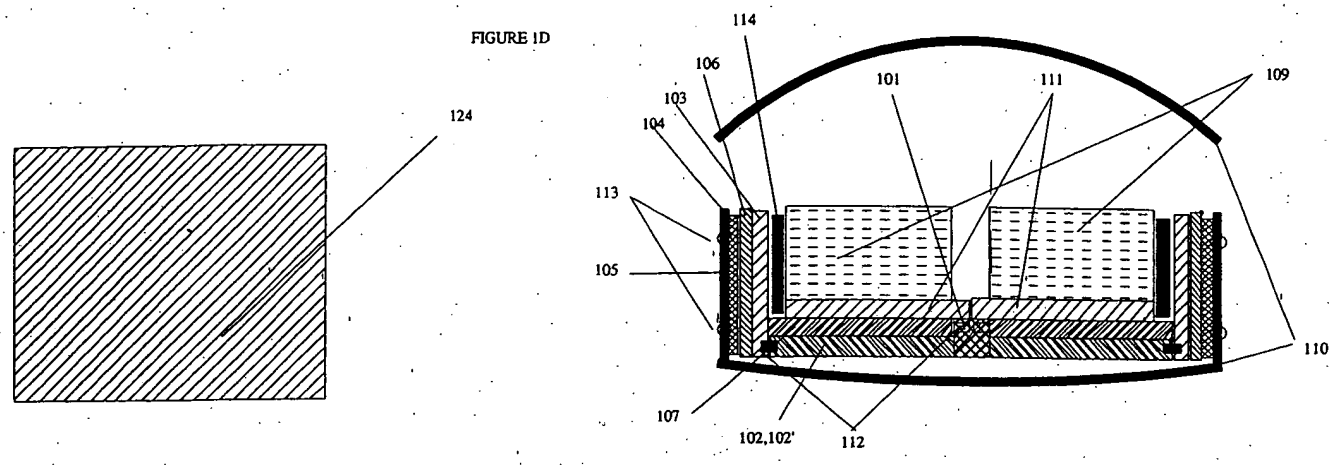


FIGURE 2D

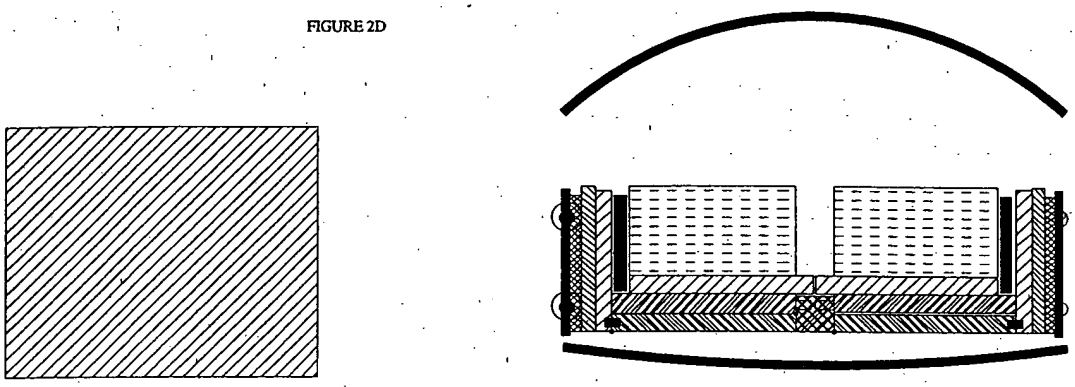


FIGURE 3D

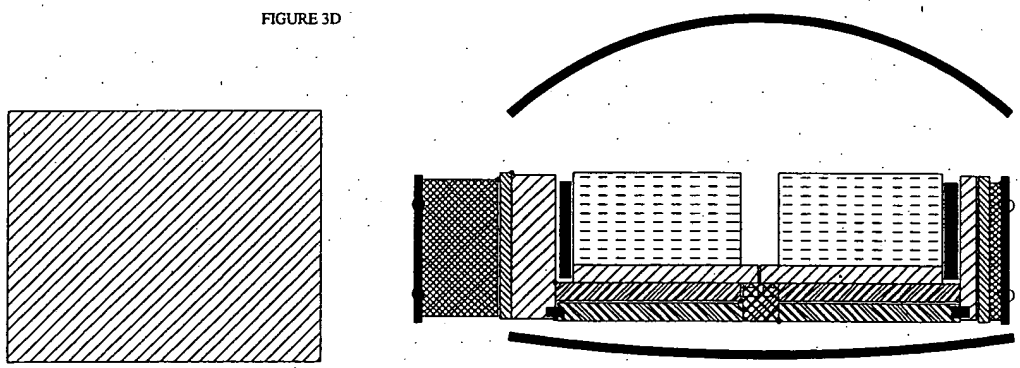


FIGURE 4D

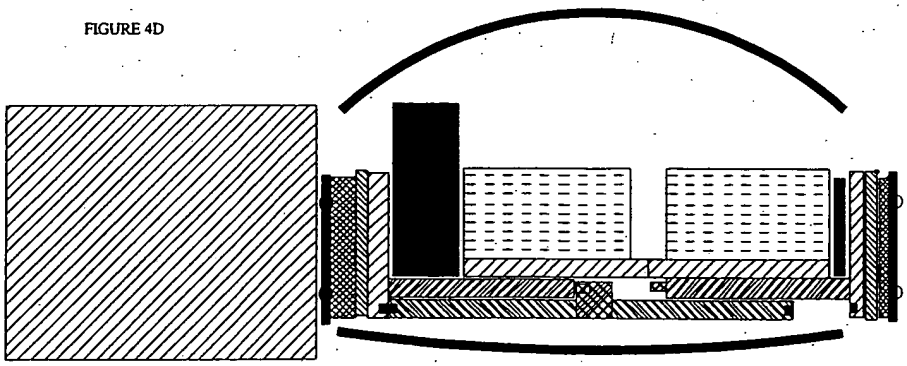
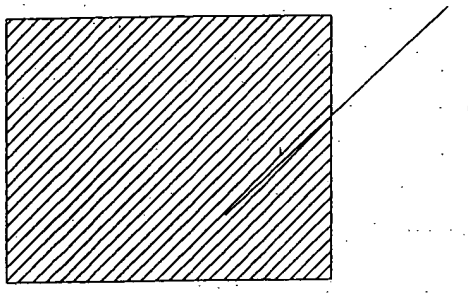


FIGURE 1C



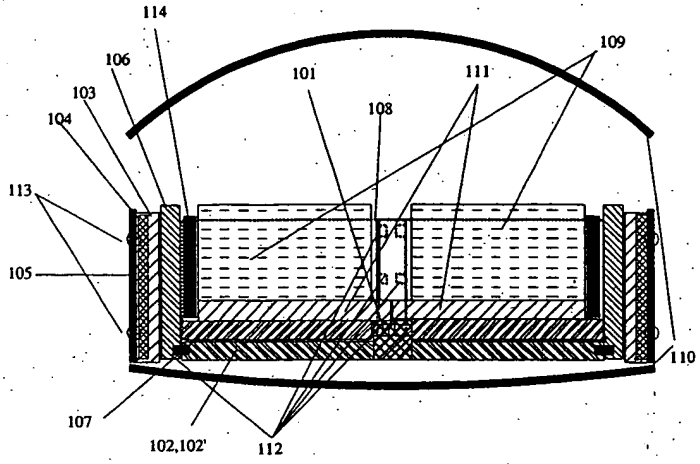
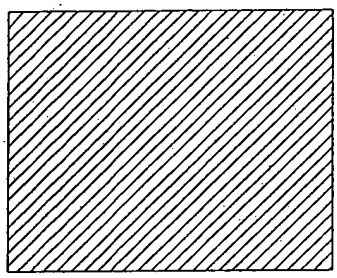


FIGURE 2C



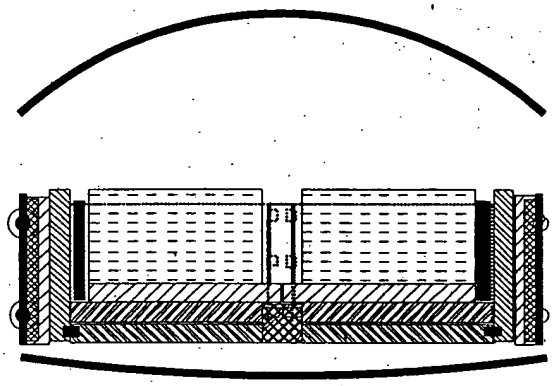
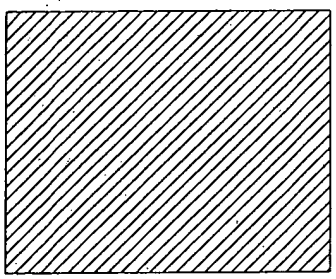


FIGURE 3C



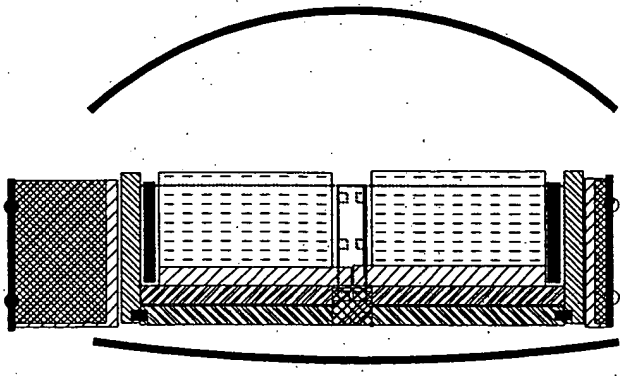
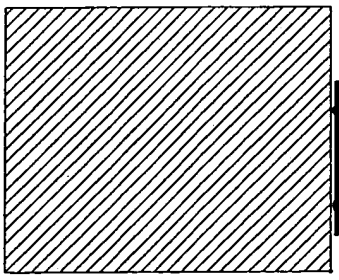


FIGURE 4C



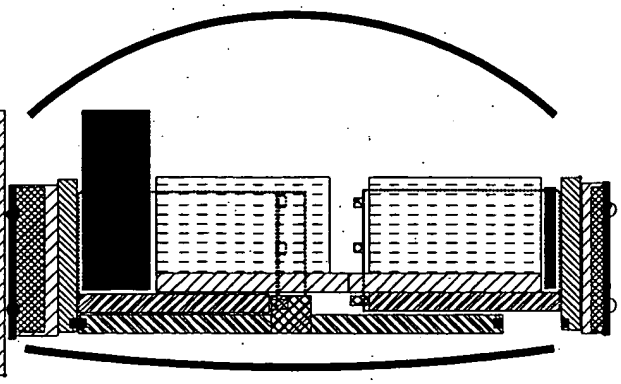


FIGURE 1F

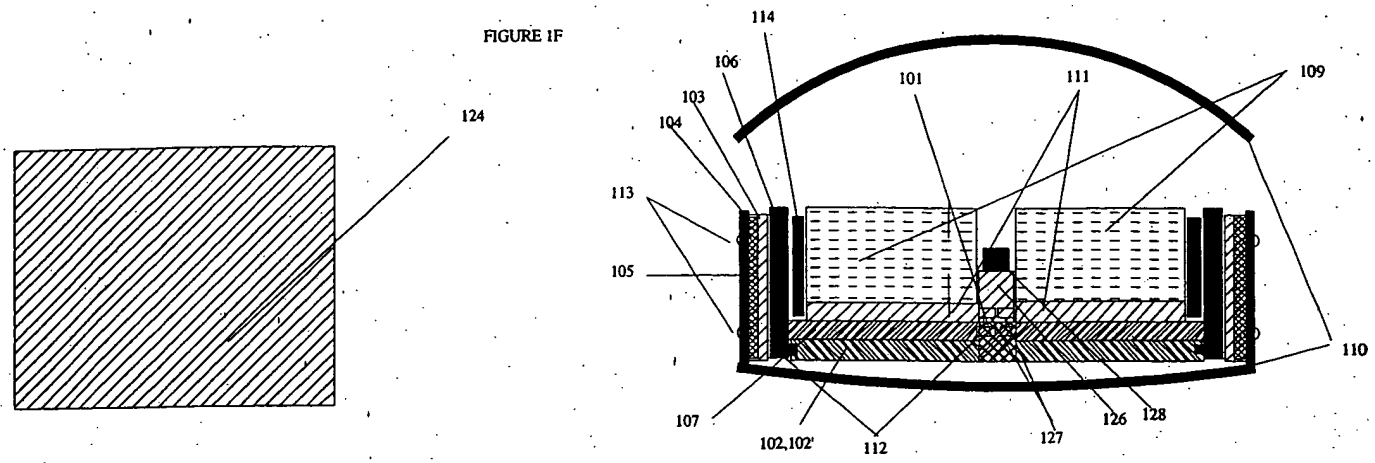


FIGURE 2F

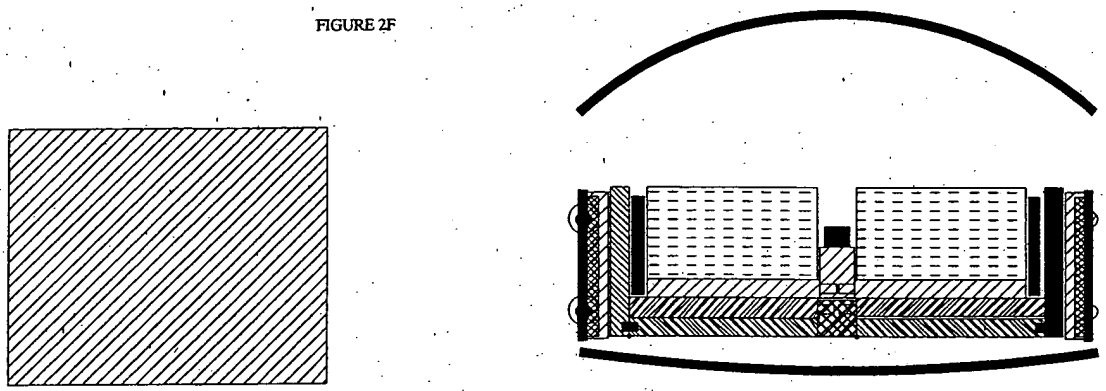


FIGURE 3F

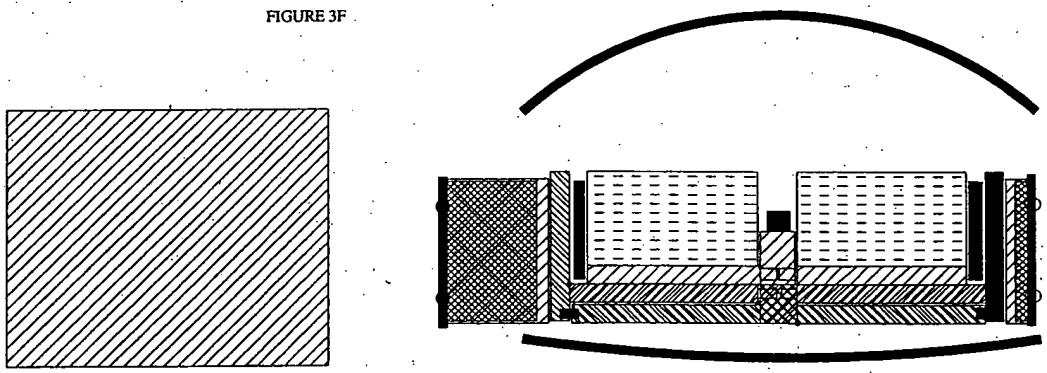


FIGURE 4F

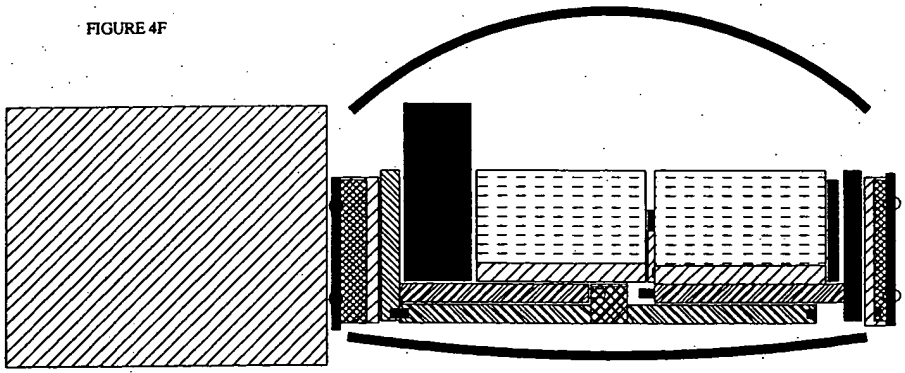


FIGURE 1G

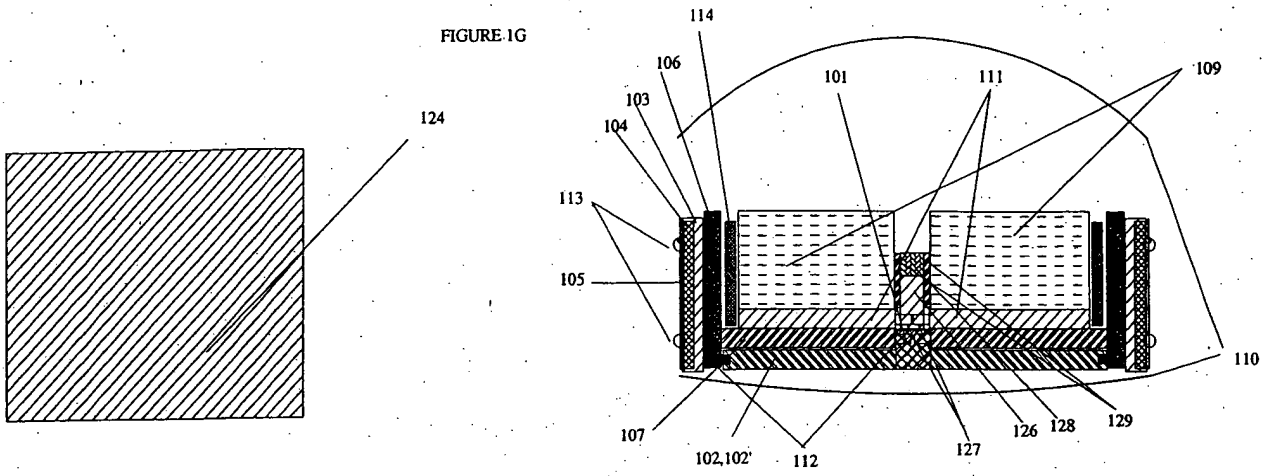


FIGURE 2G

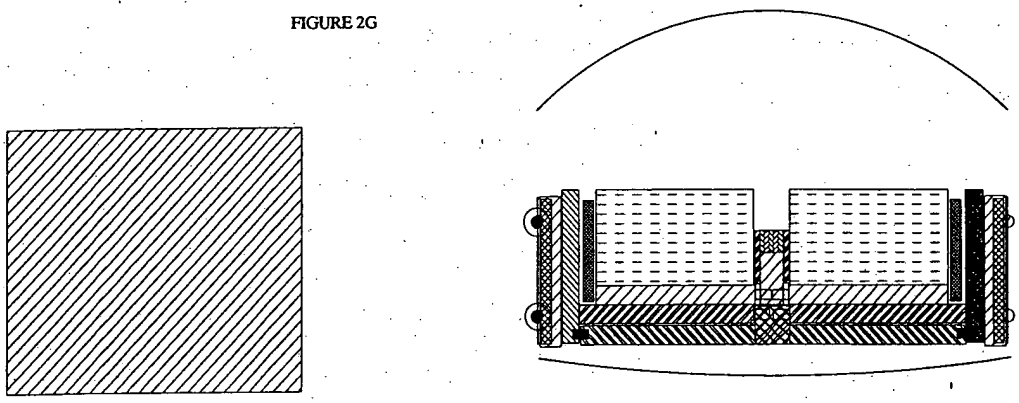


FIGURE 3G

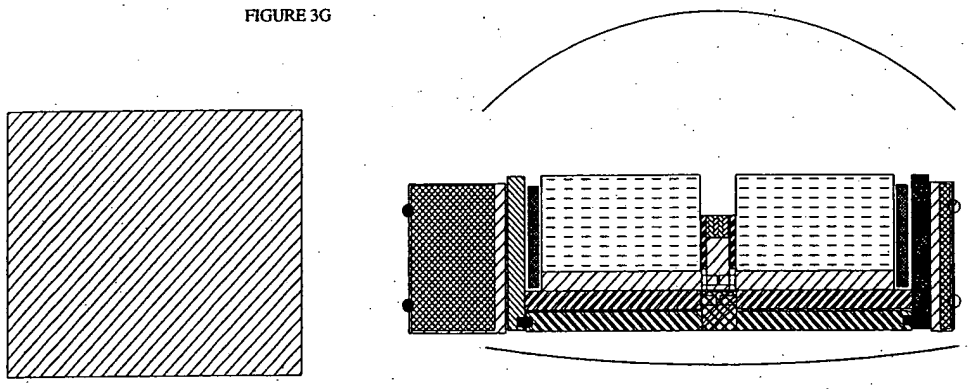


FIGURE 4G

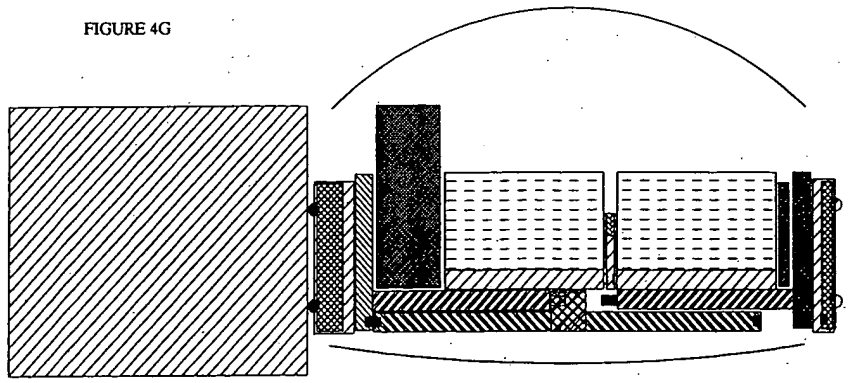


FIGURE 5

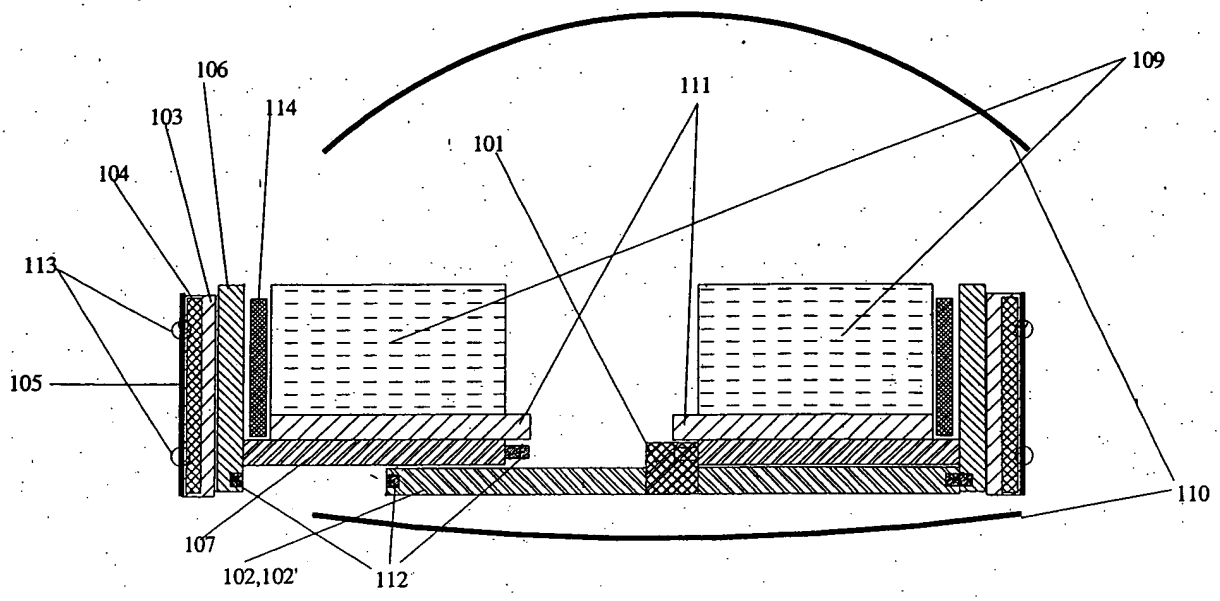


FIGURE 6

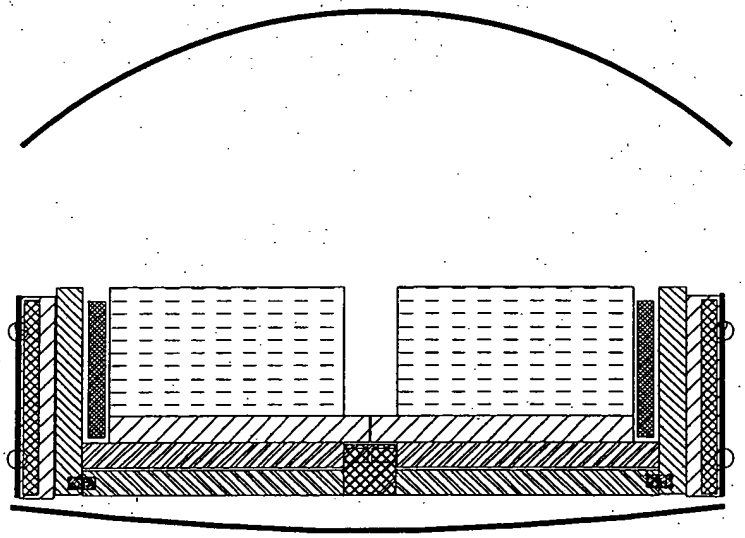


FIGURE 5A

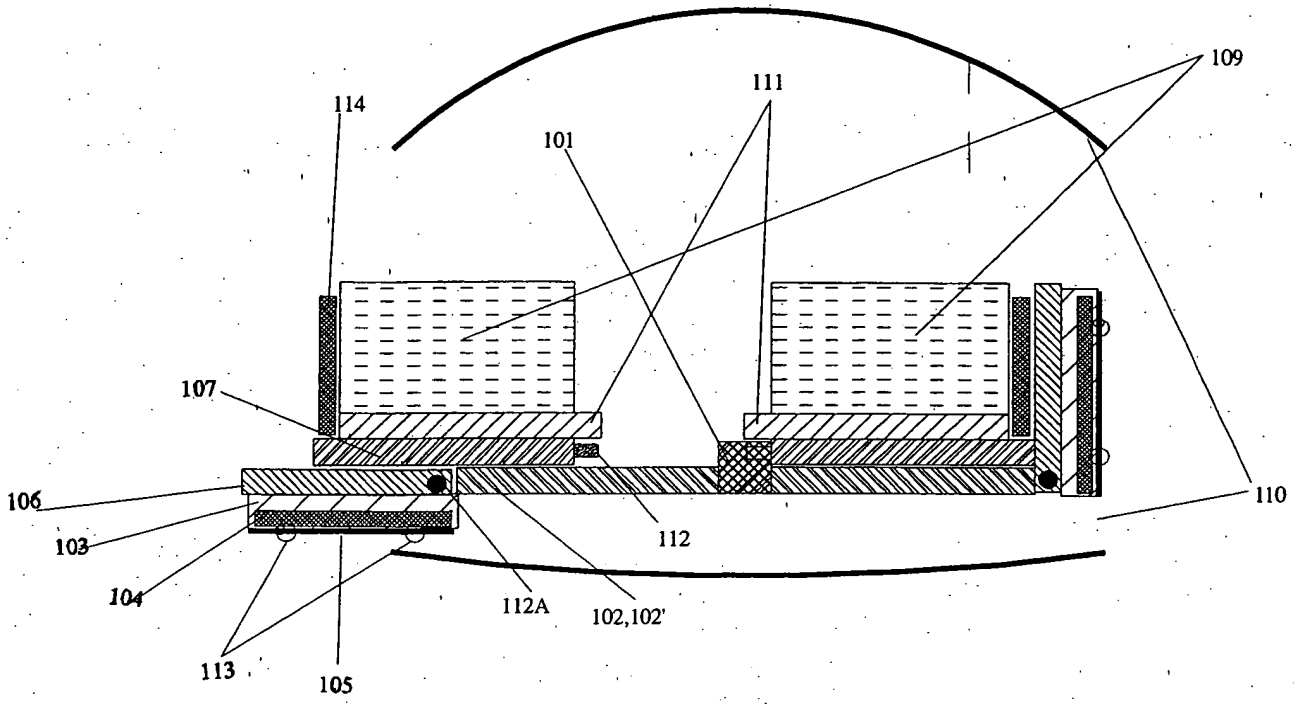


FIGURE 6A

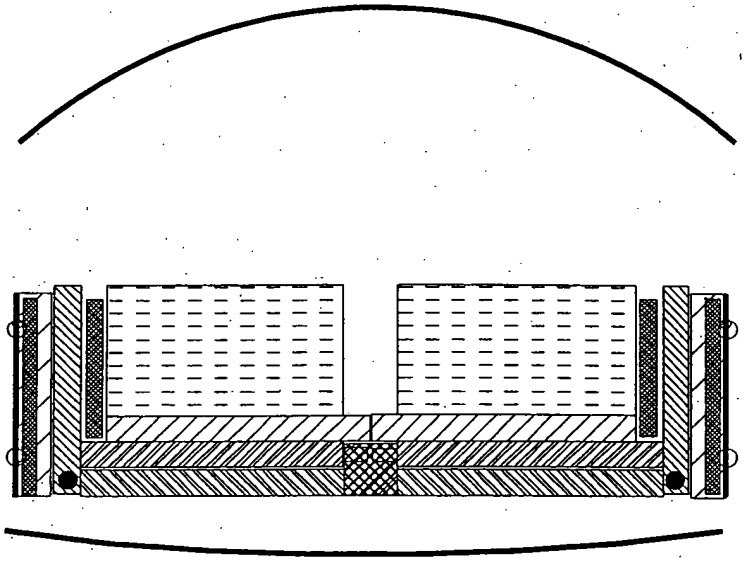


FIGURE 7

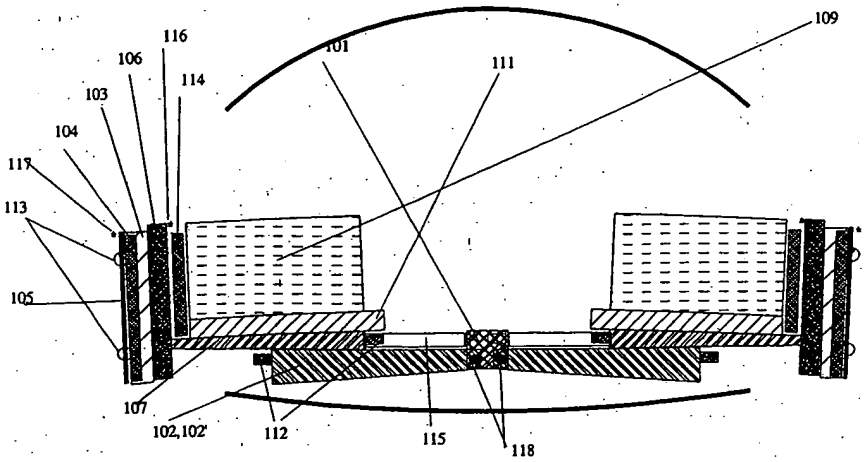


FIGURE 8

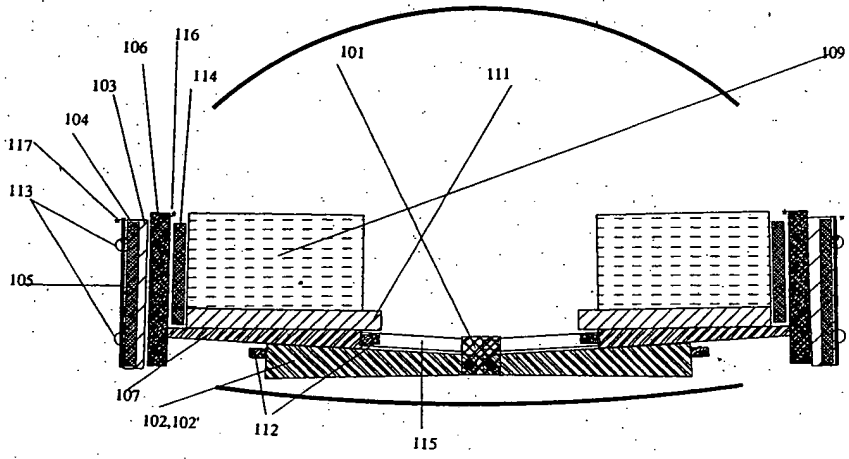


FIGURE 9

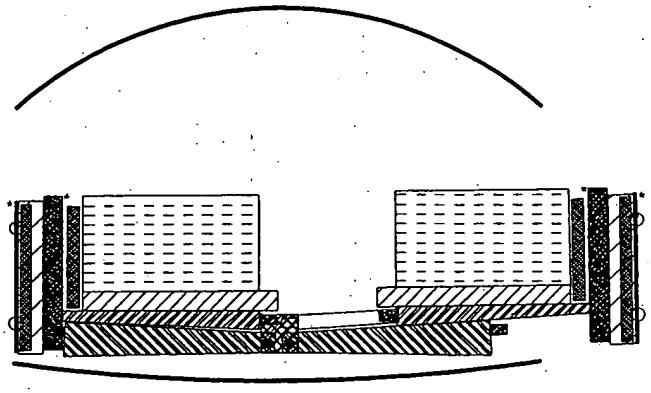


FIGURE 10A

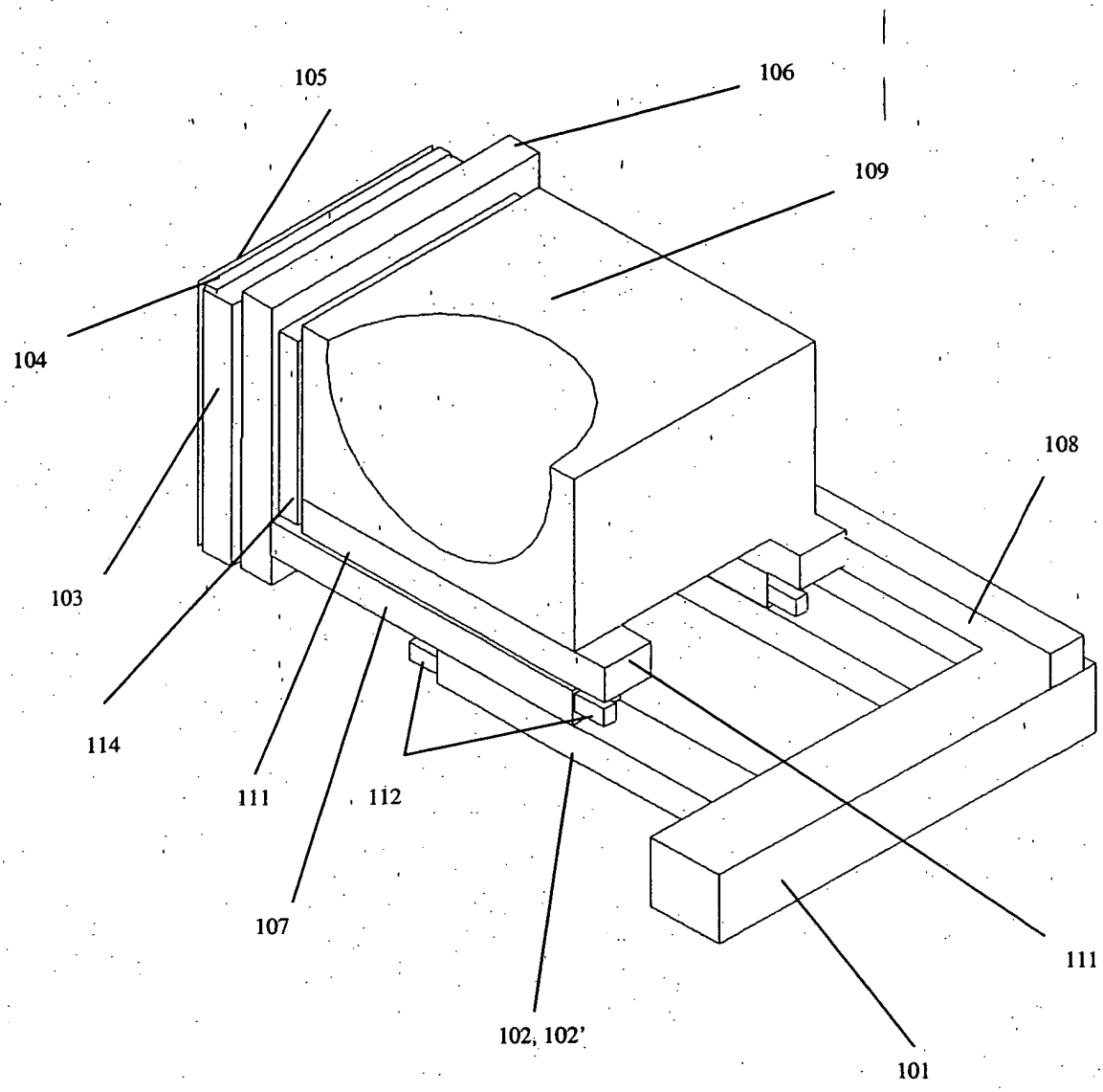


FIGURE 10 B

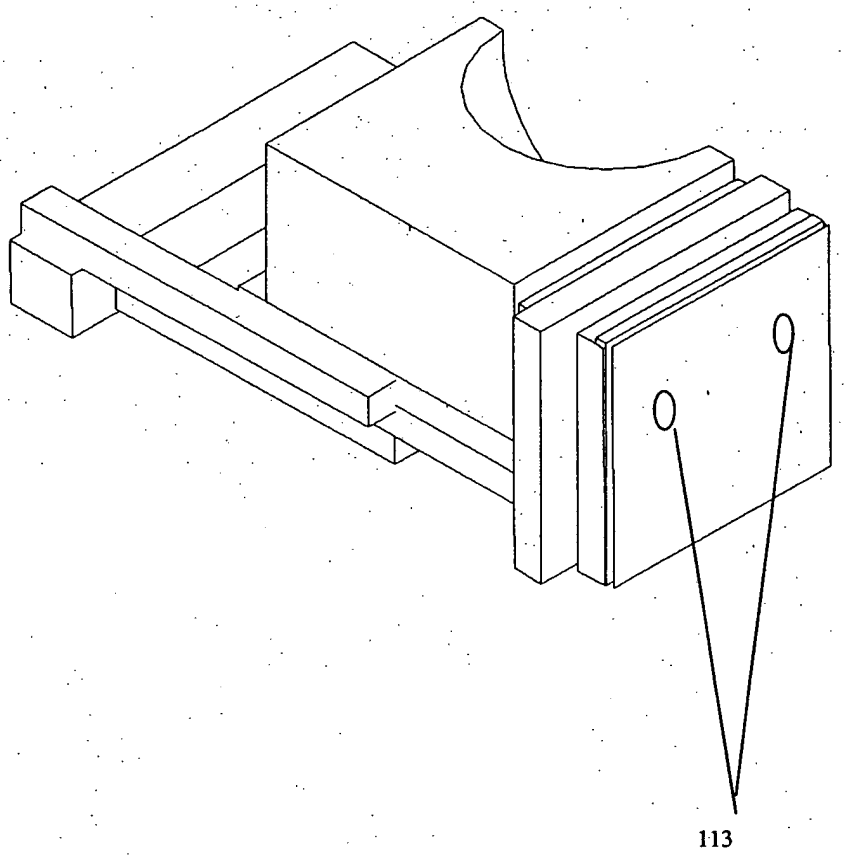


FIGURE 10-C

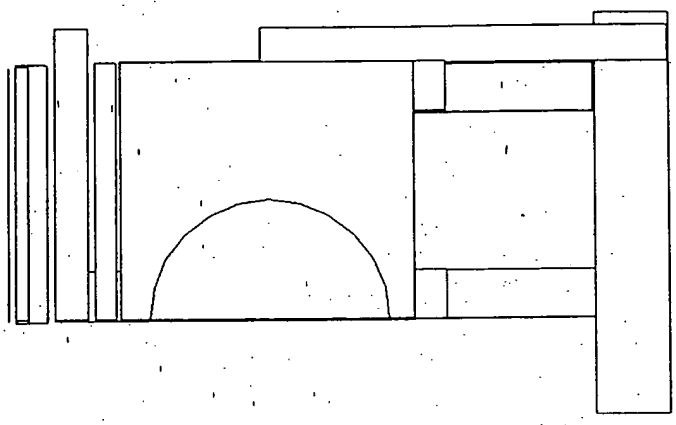


FIGURE 10 A1

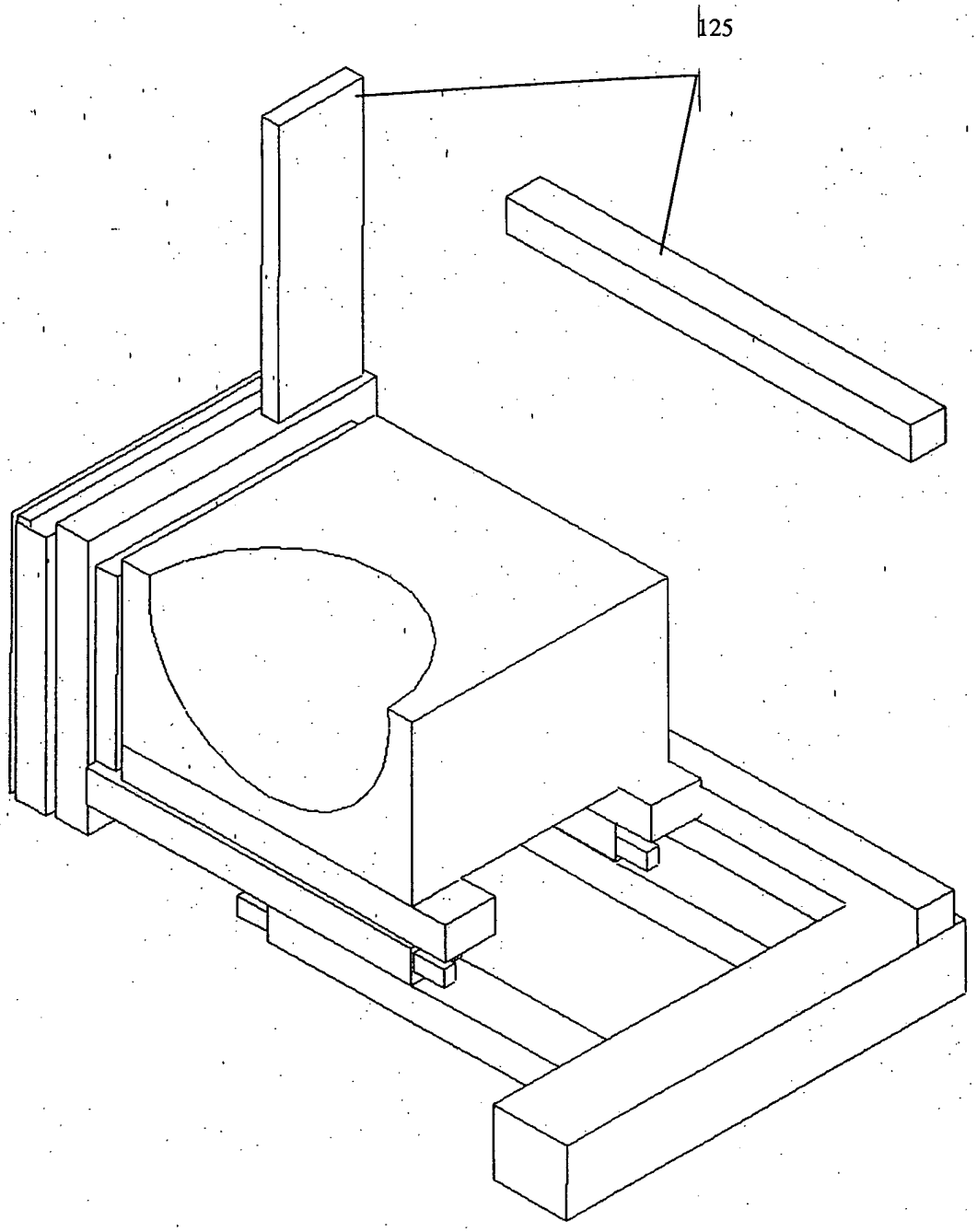


FIGURE 10 B1

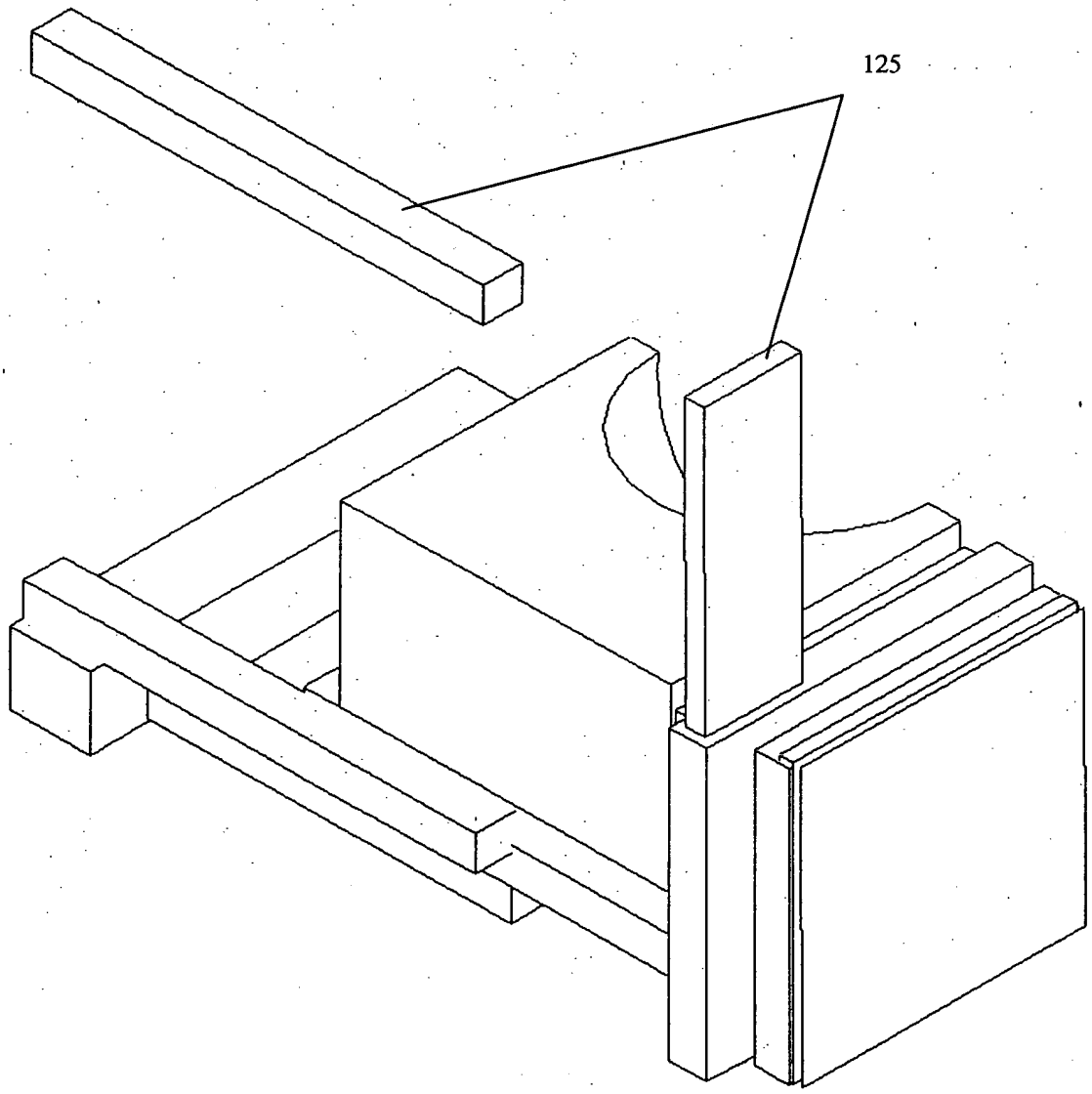


FIGURE 10 C 1

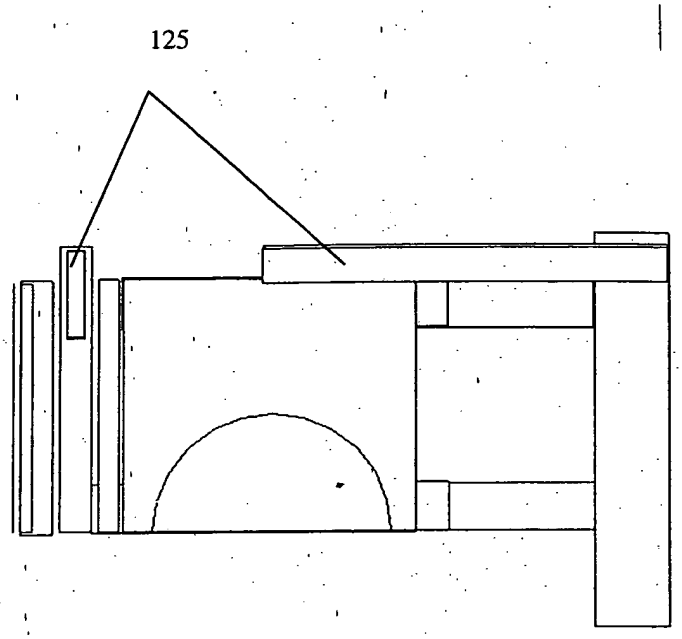


Fig 10 D1

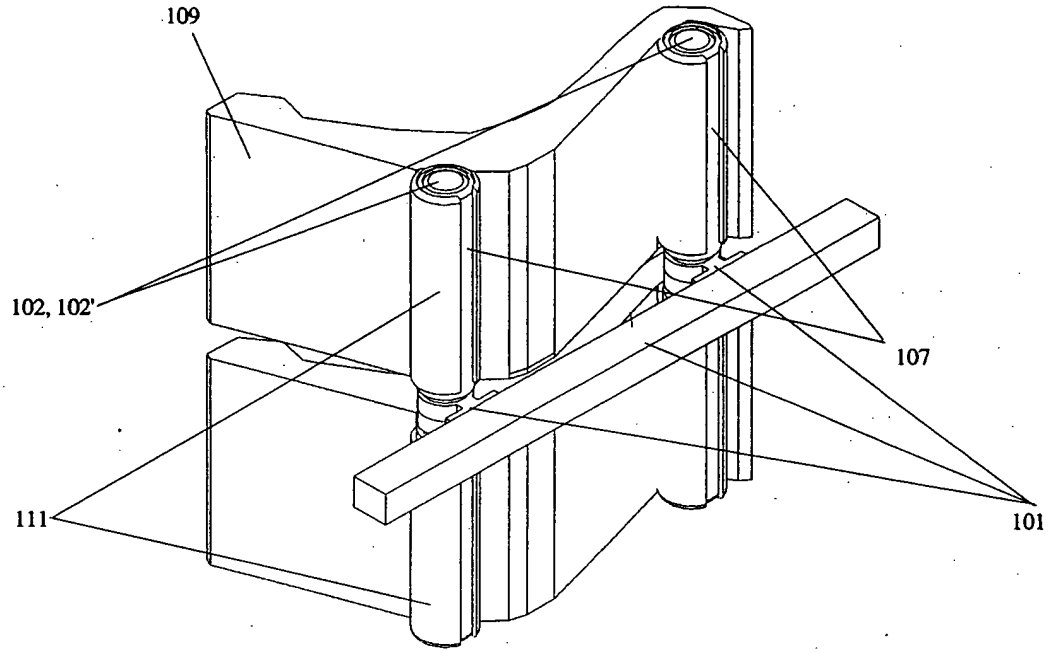


Fig 10D2

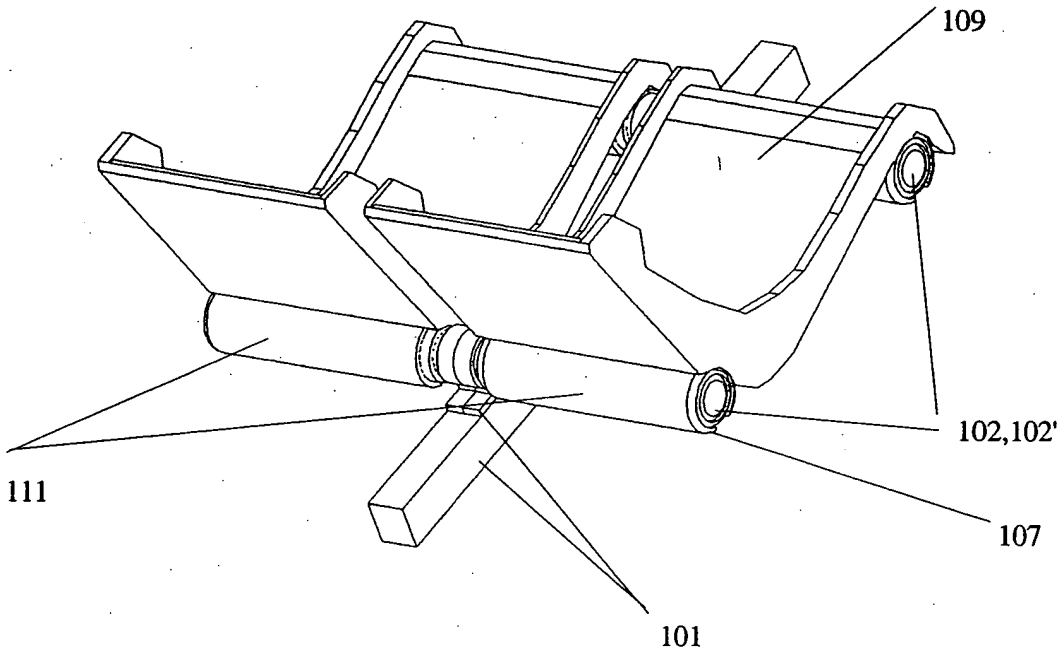


Fig 10D3

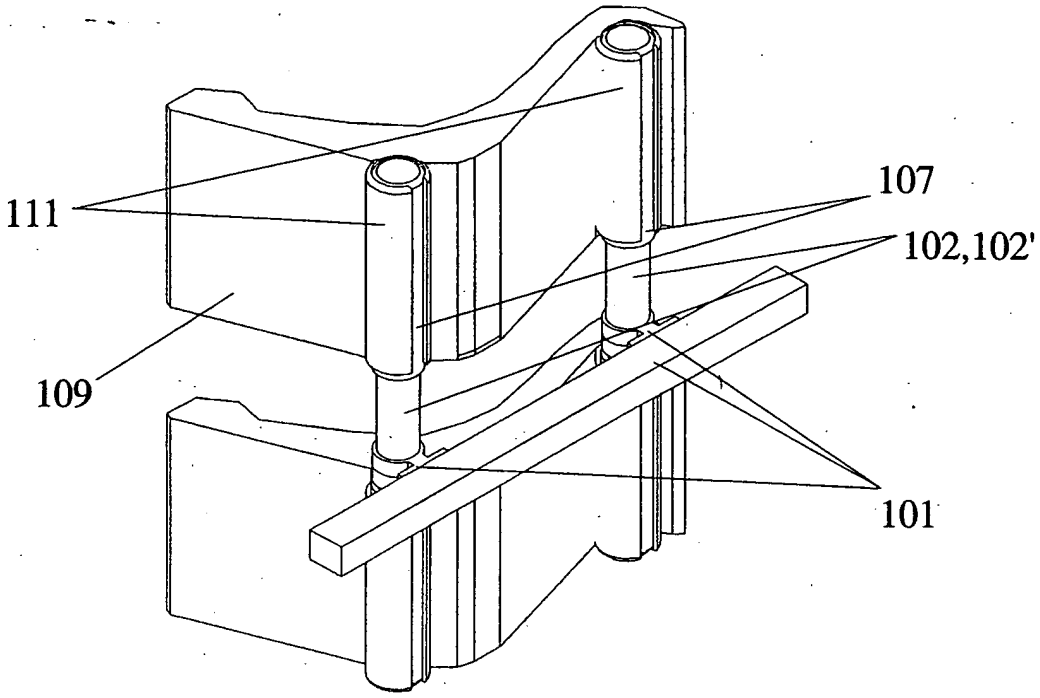


Fig 10D4

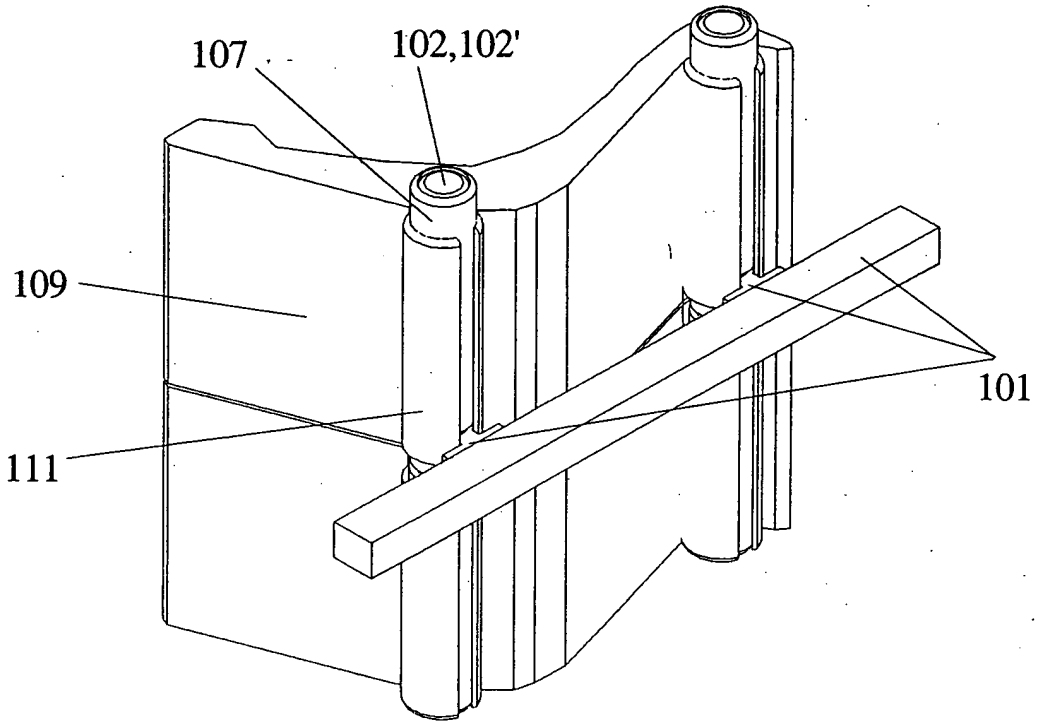


Fig 10 D5

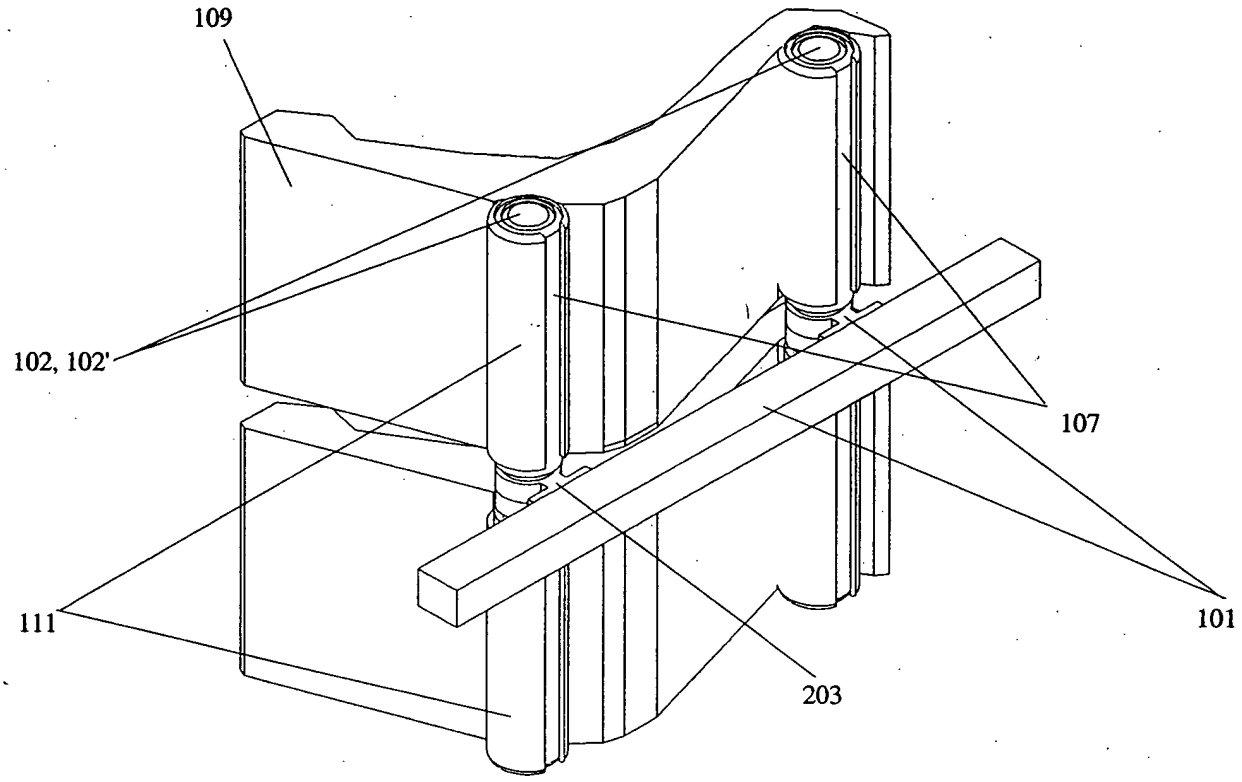


FIGURE 11 Safety Zones

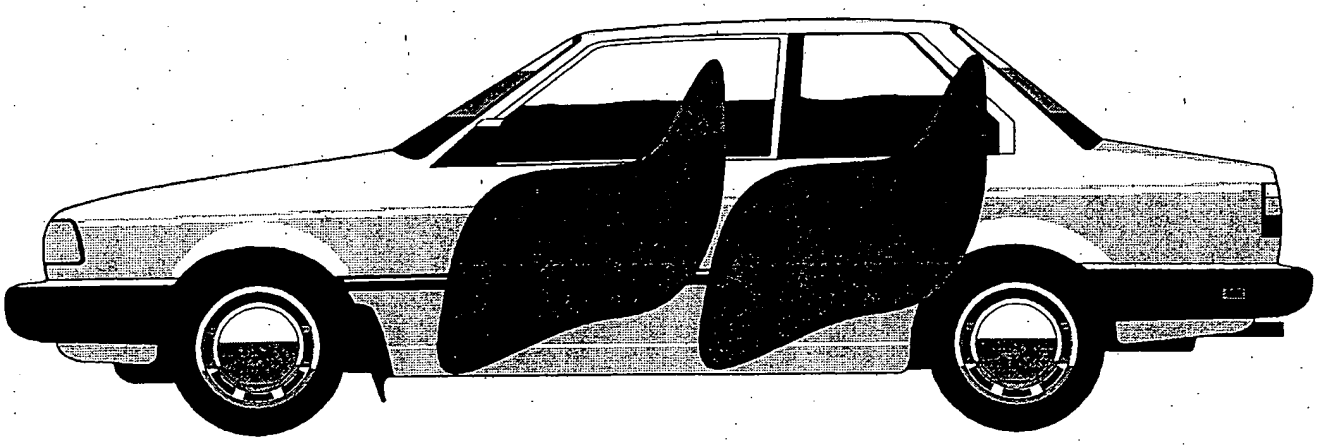


FIGURE 12 H2

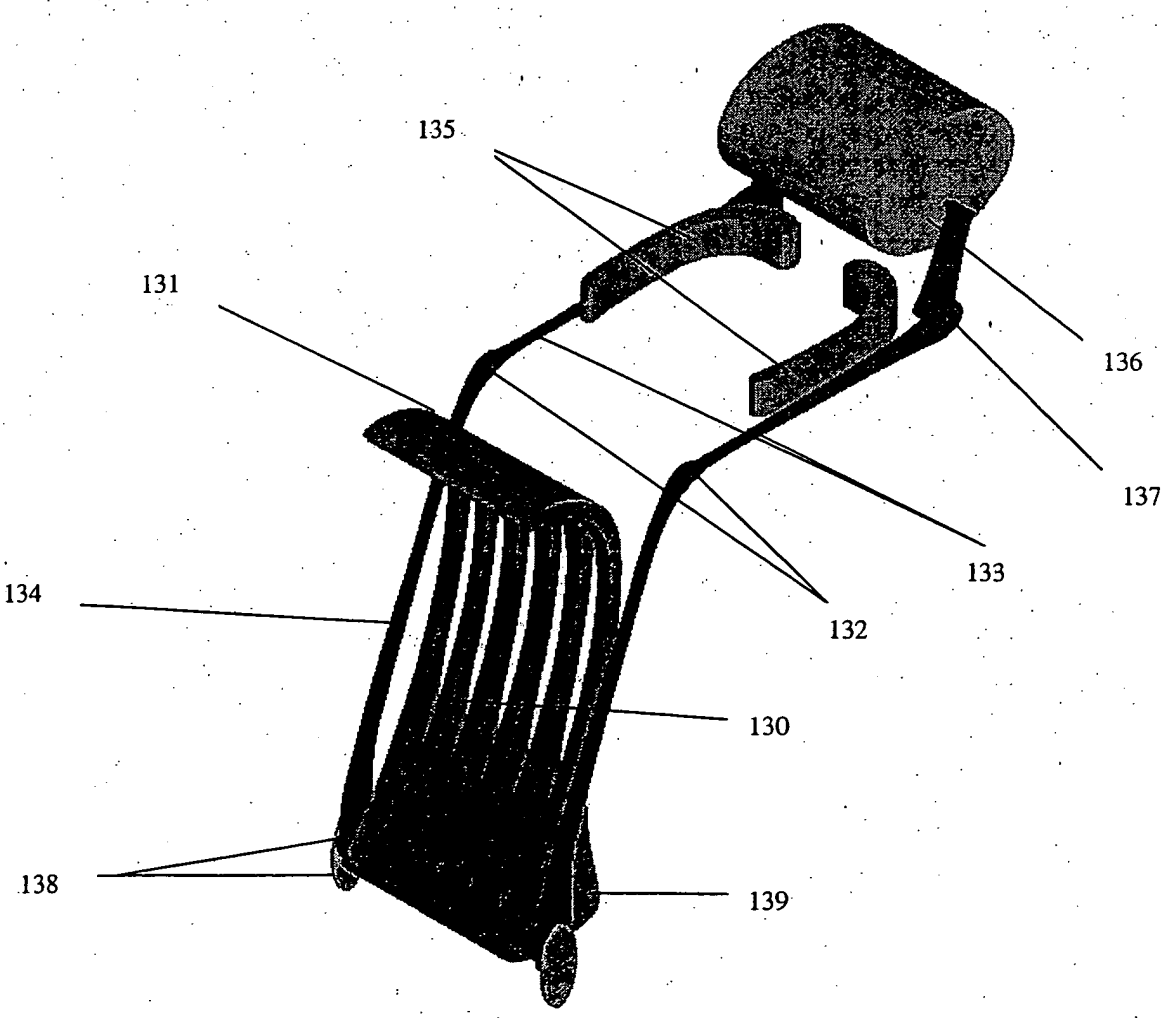


FIGURE 12 I 2

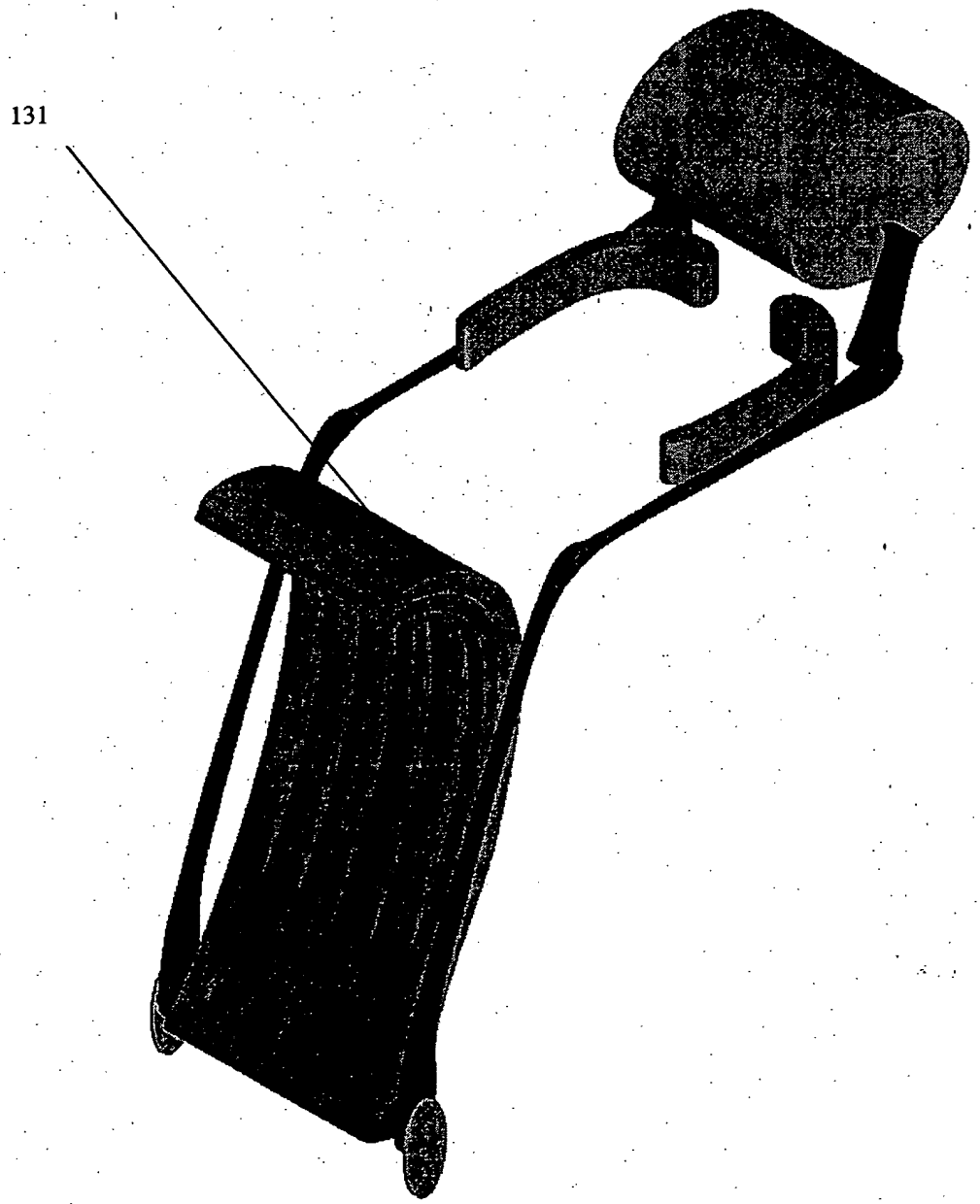


FIGURE 12 J 2

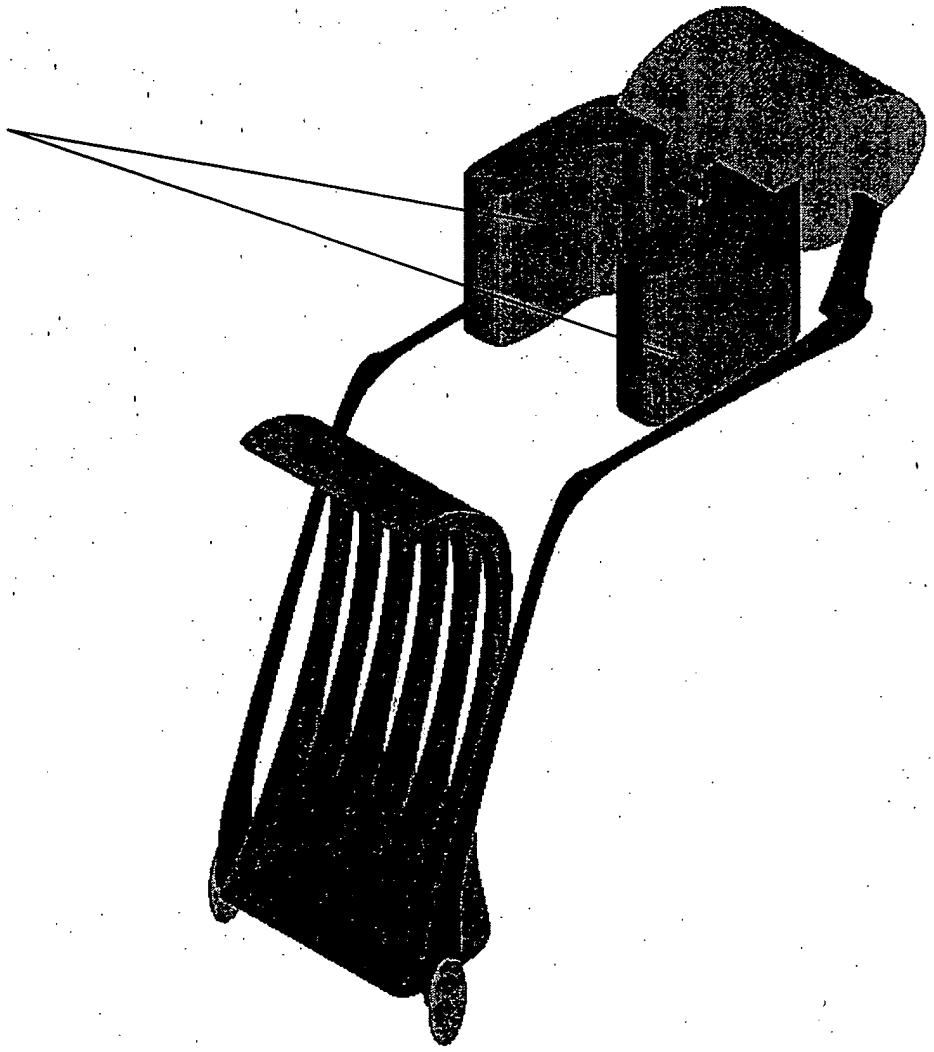


FIGURE 13

AN ISOMETRIC VIEW

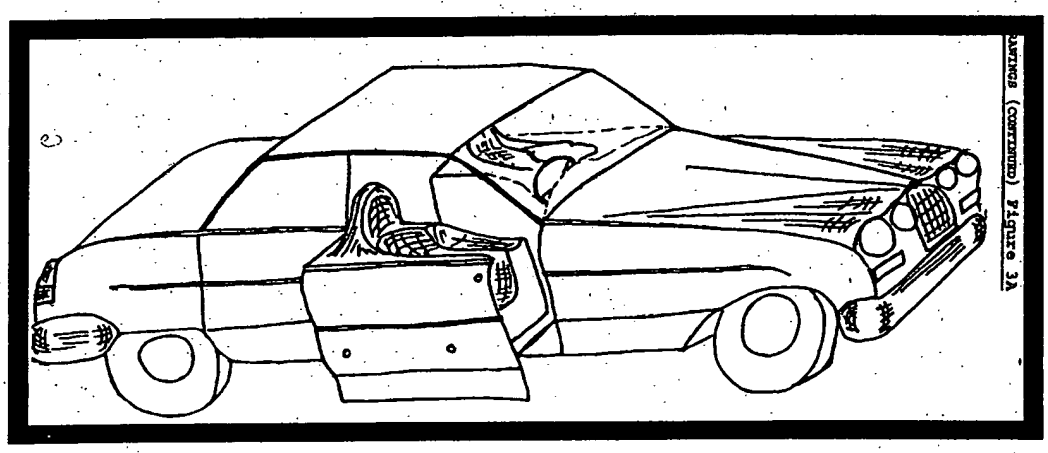


FIGURE 14

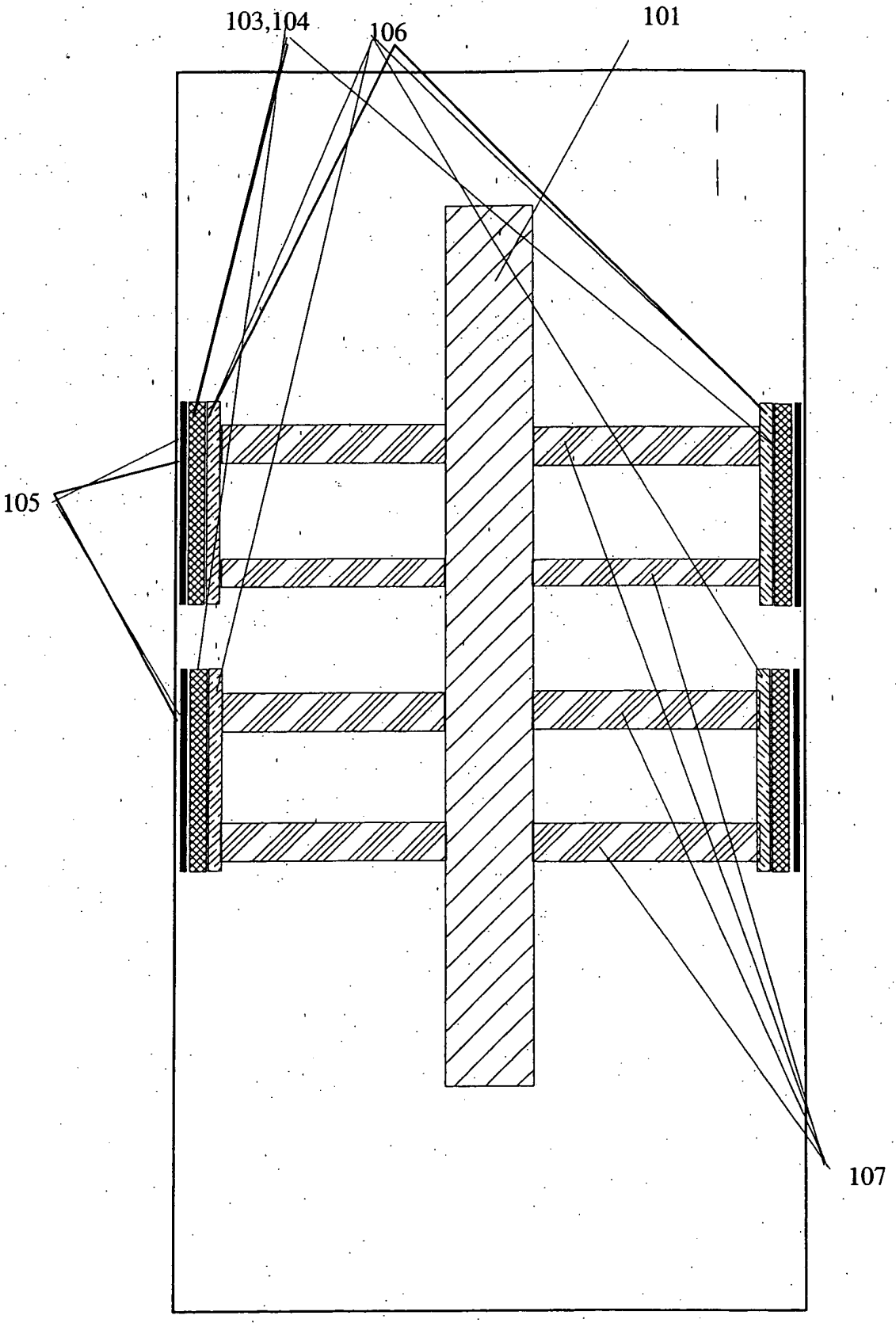


FIGURE 17 A and B

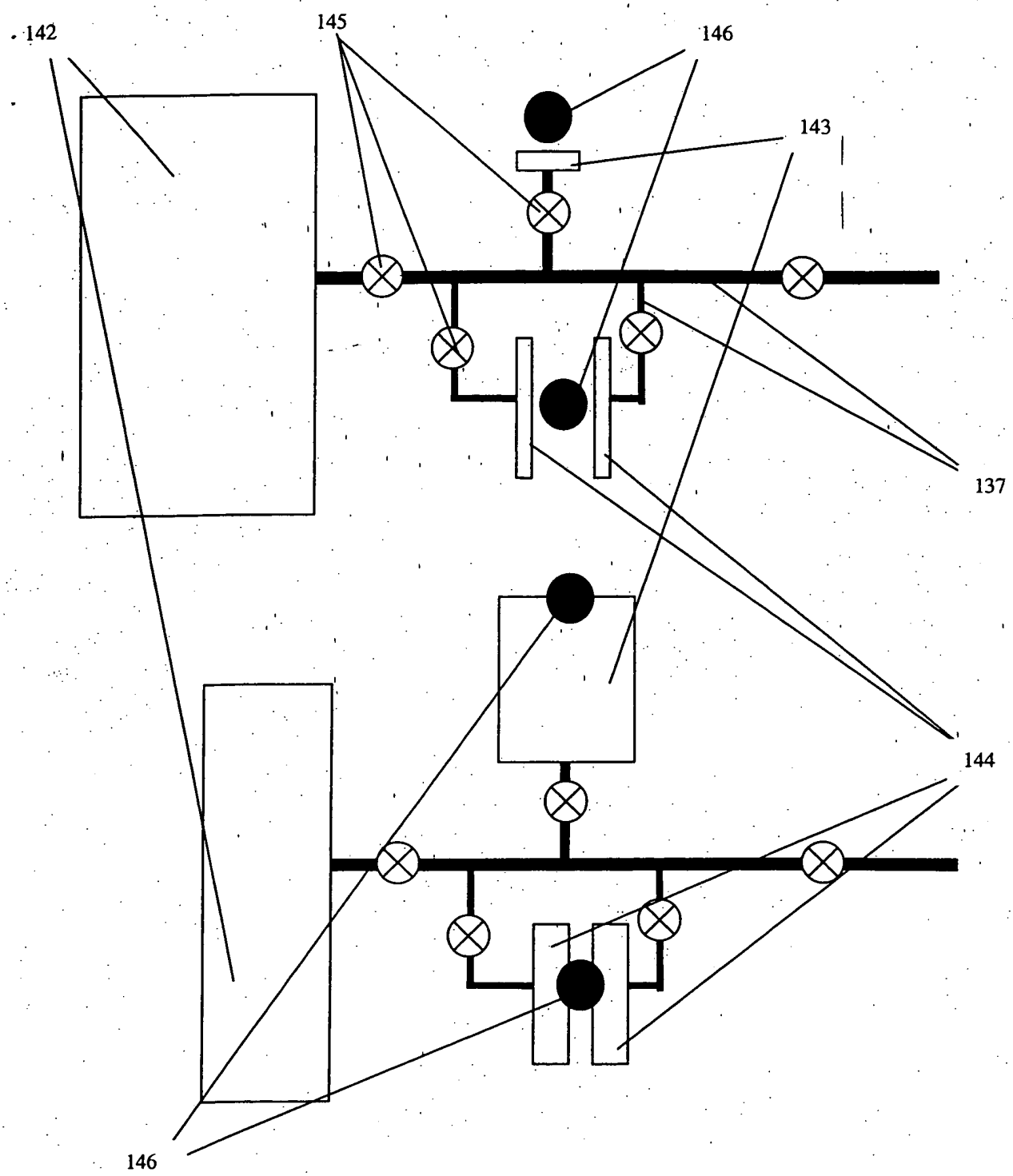


FIGURE 19 A

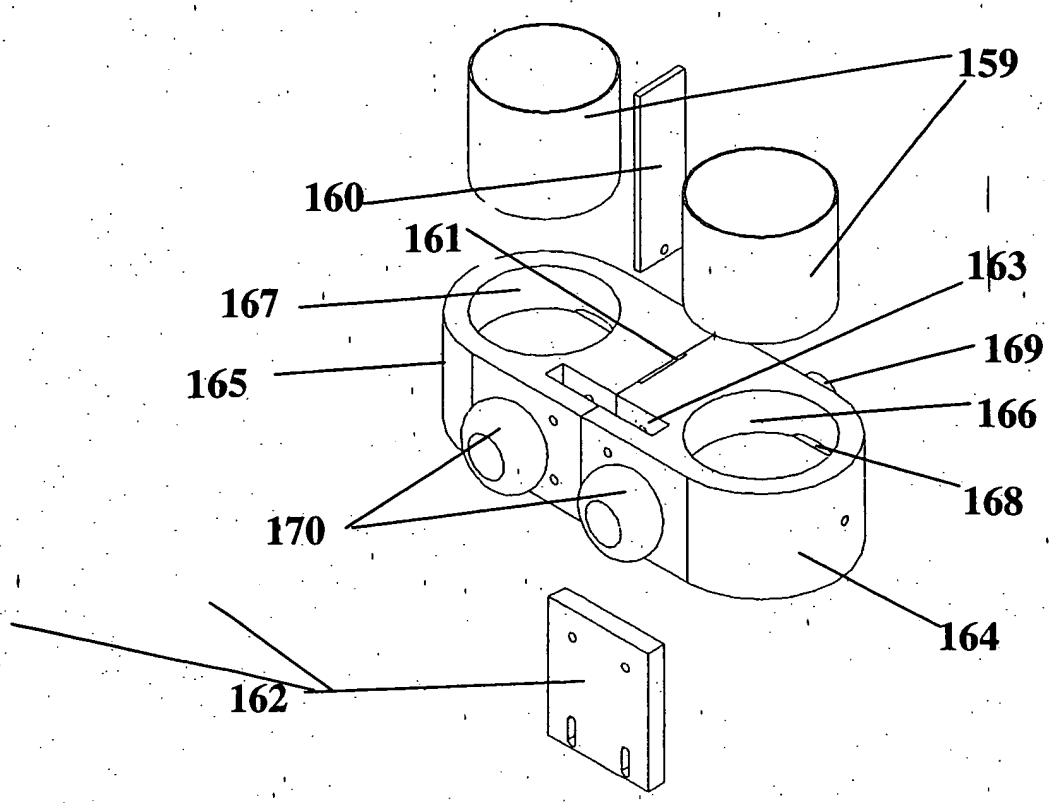


FIGURE 19 B

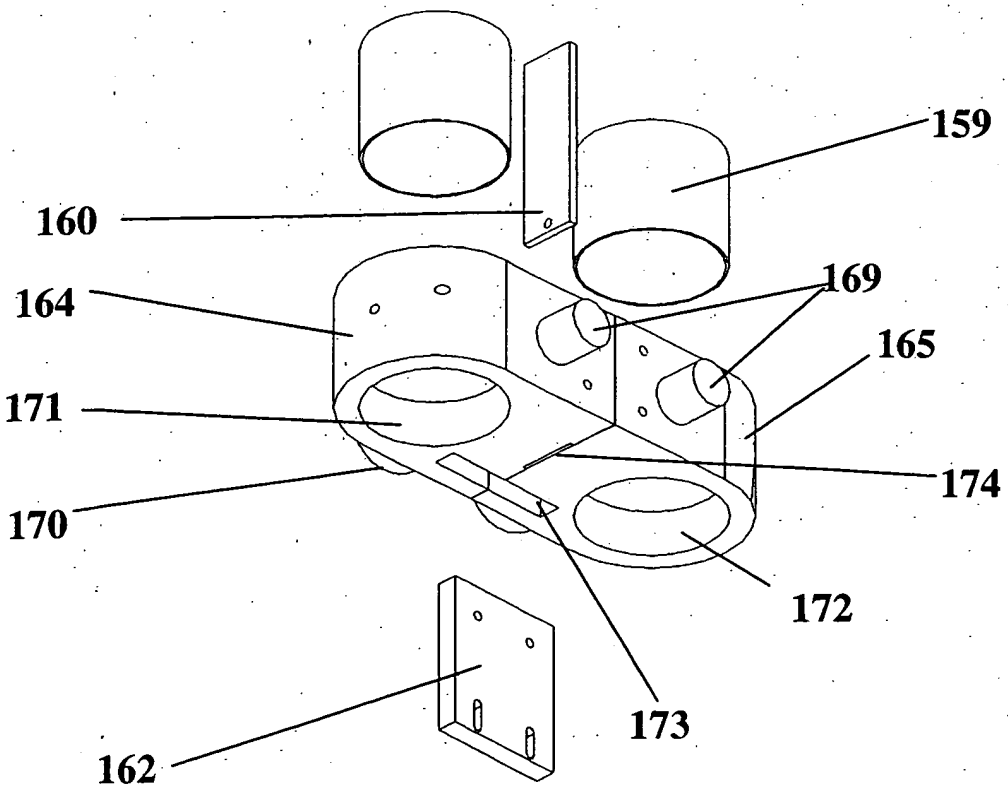


FIGURE 19 C

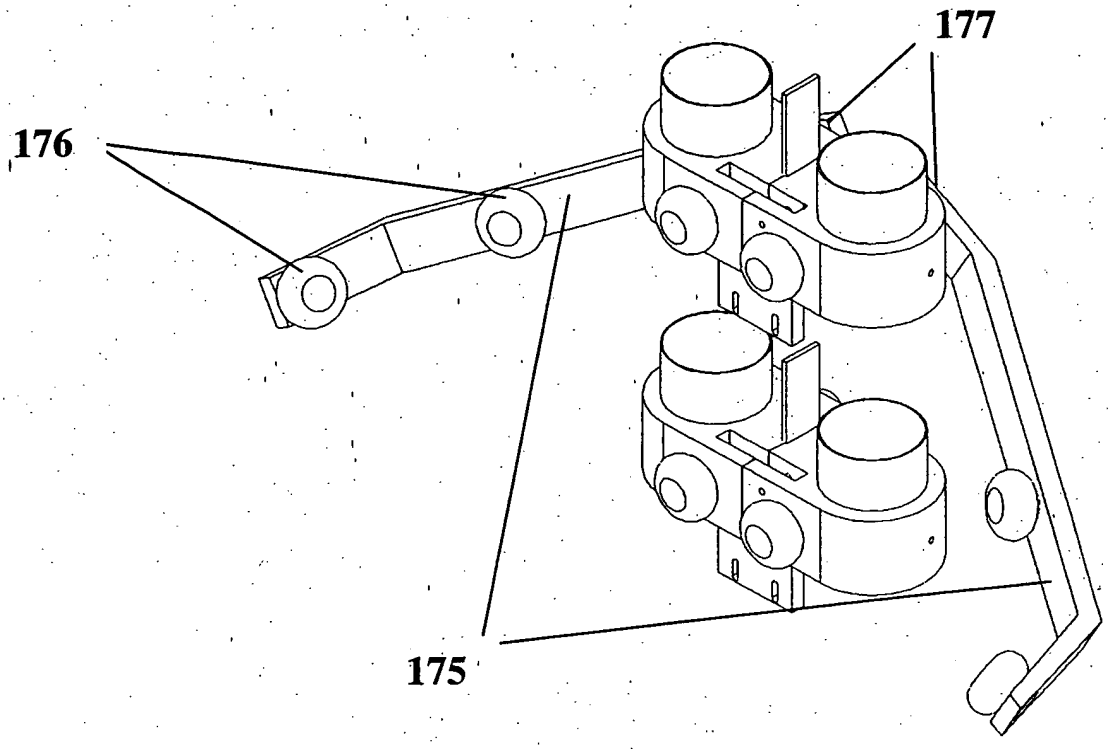


FIGURE 19 D

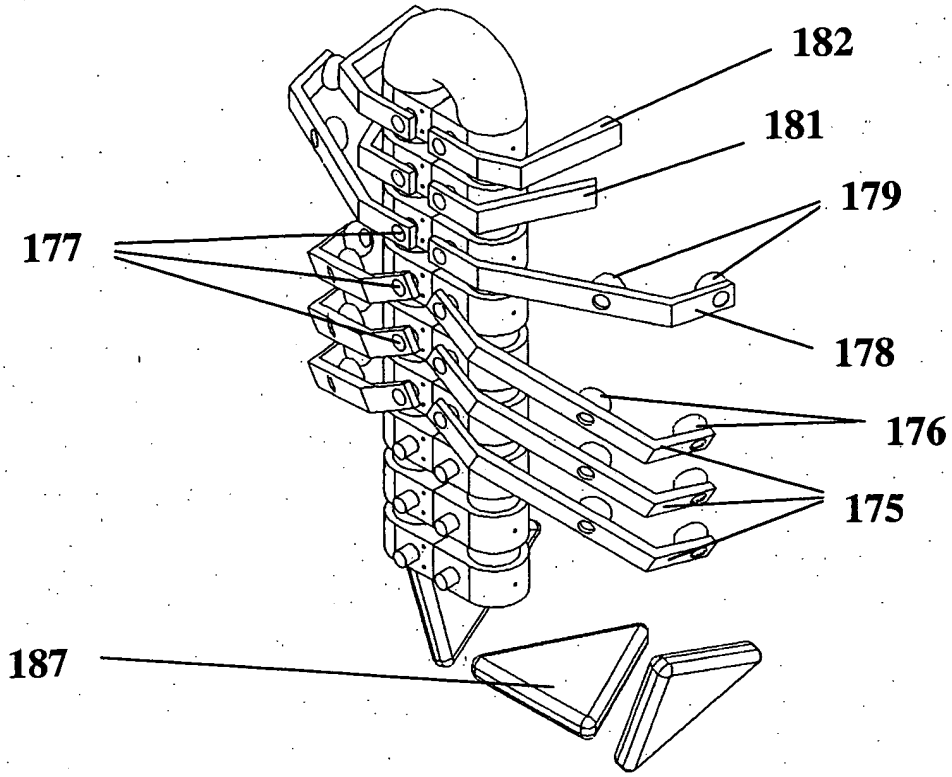


FIGURE 19 E

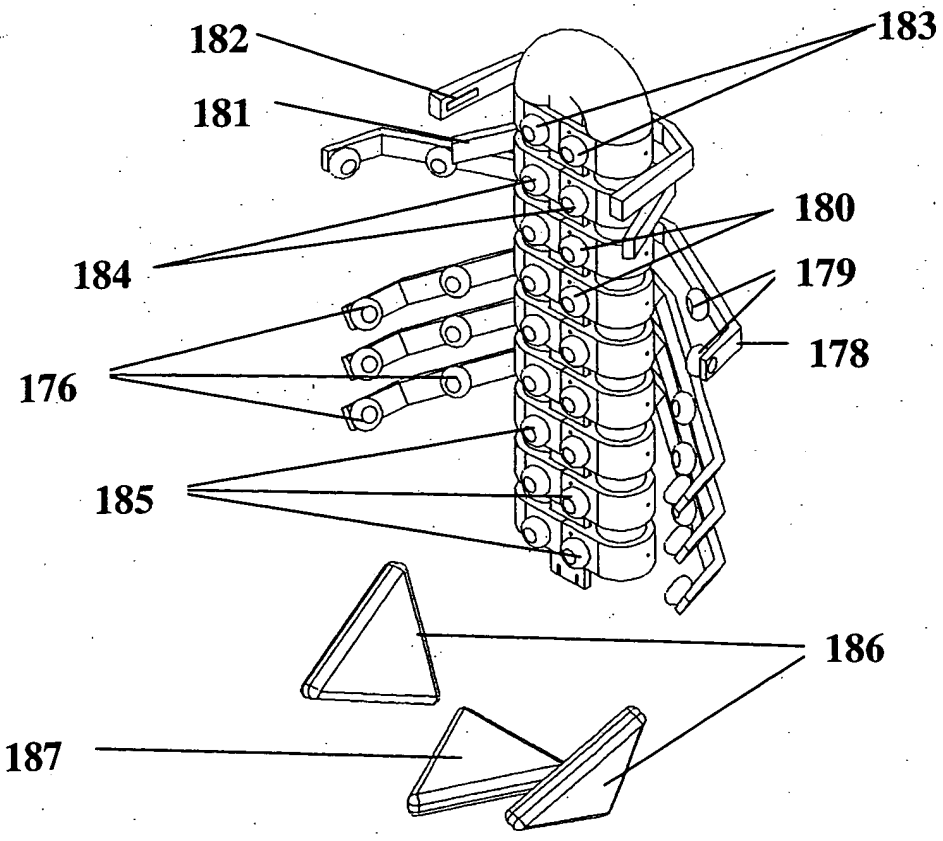


FIGURE 20 A

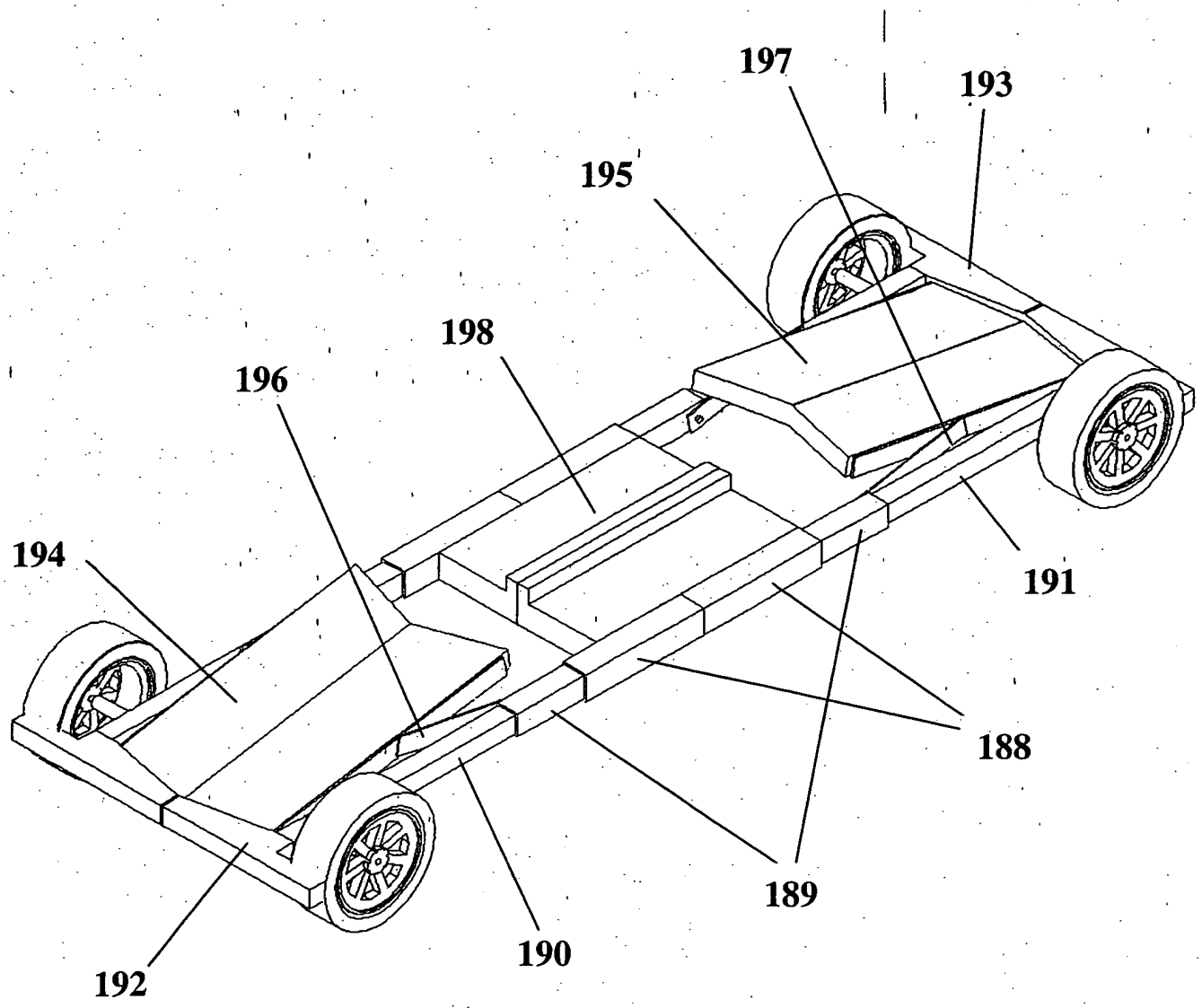


FIGURE 20C

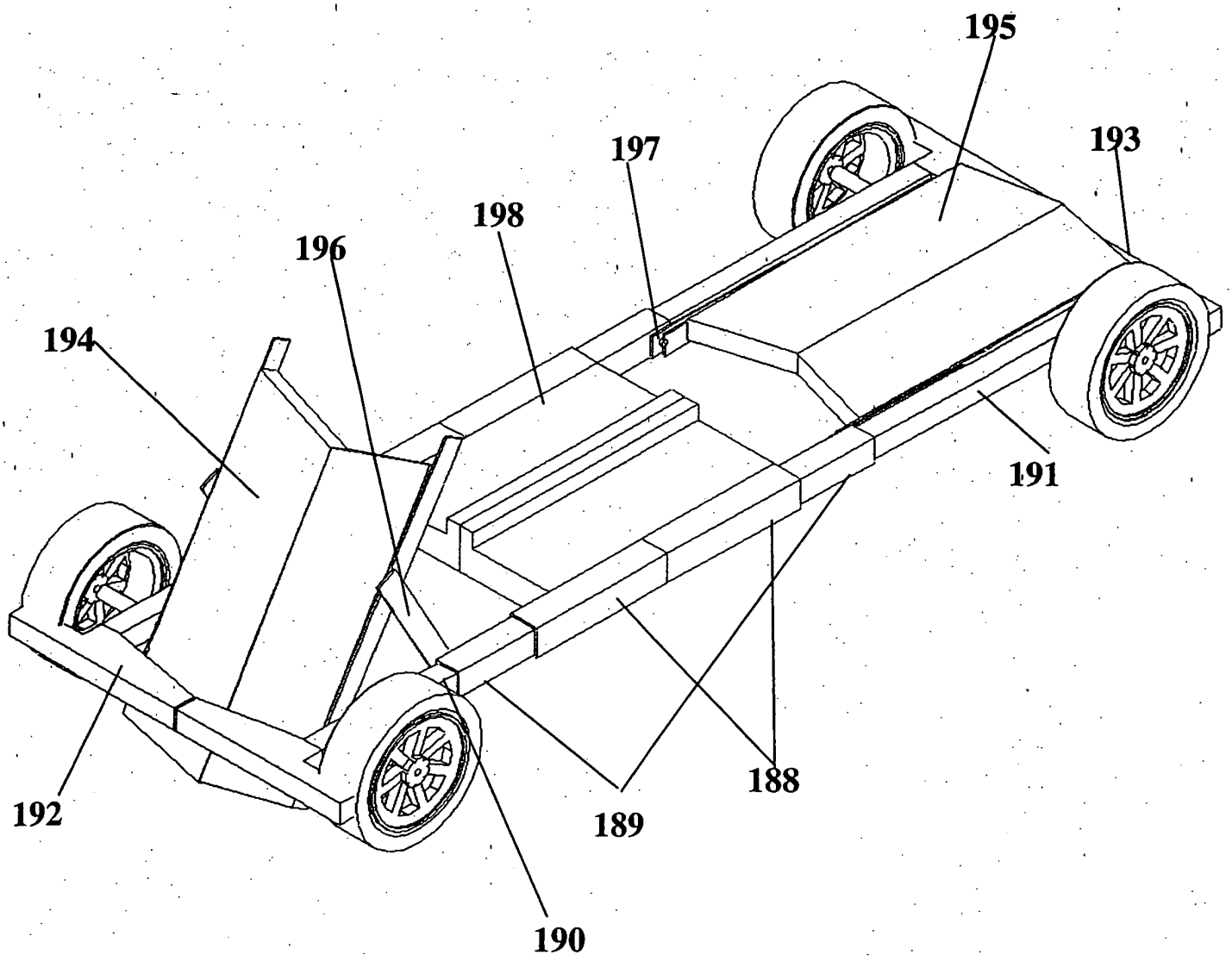


FIGURE 20 B

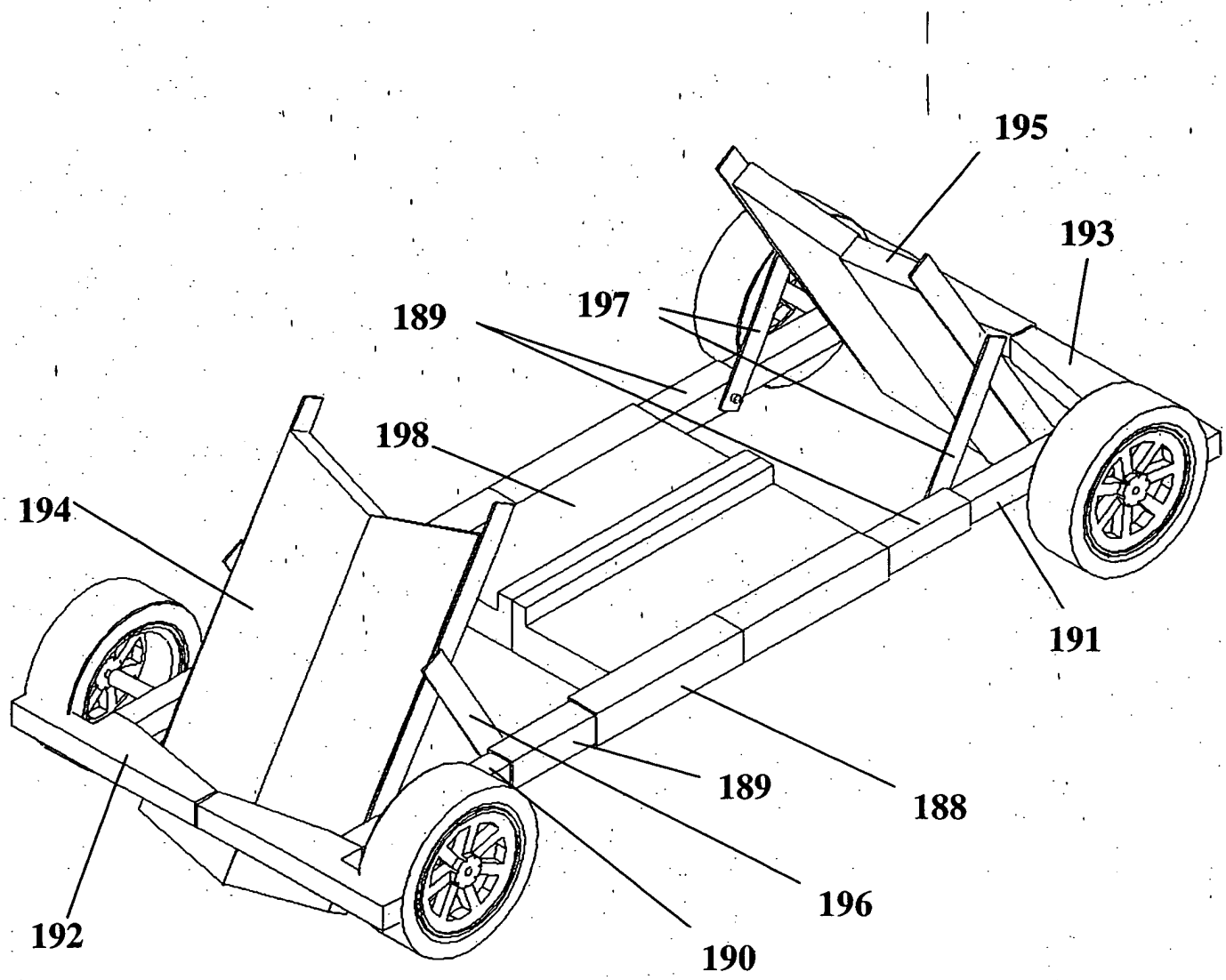


Fig 20 D

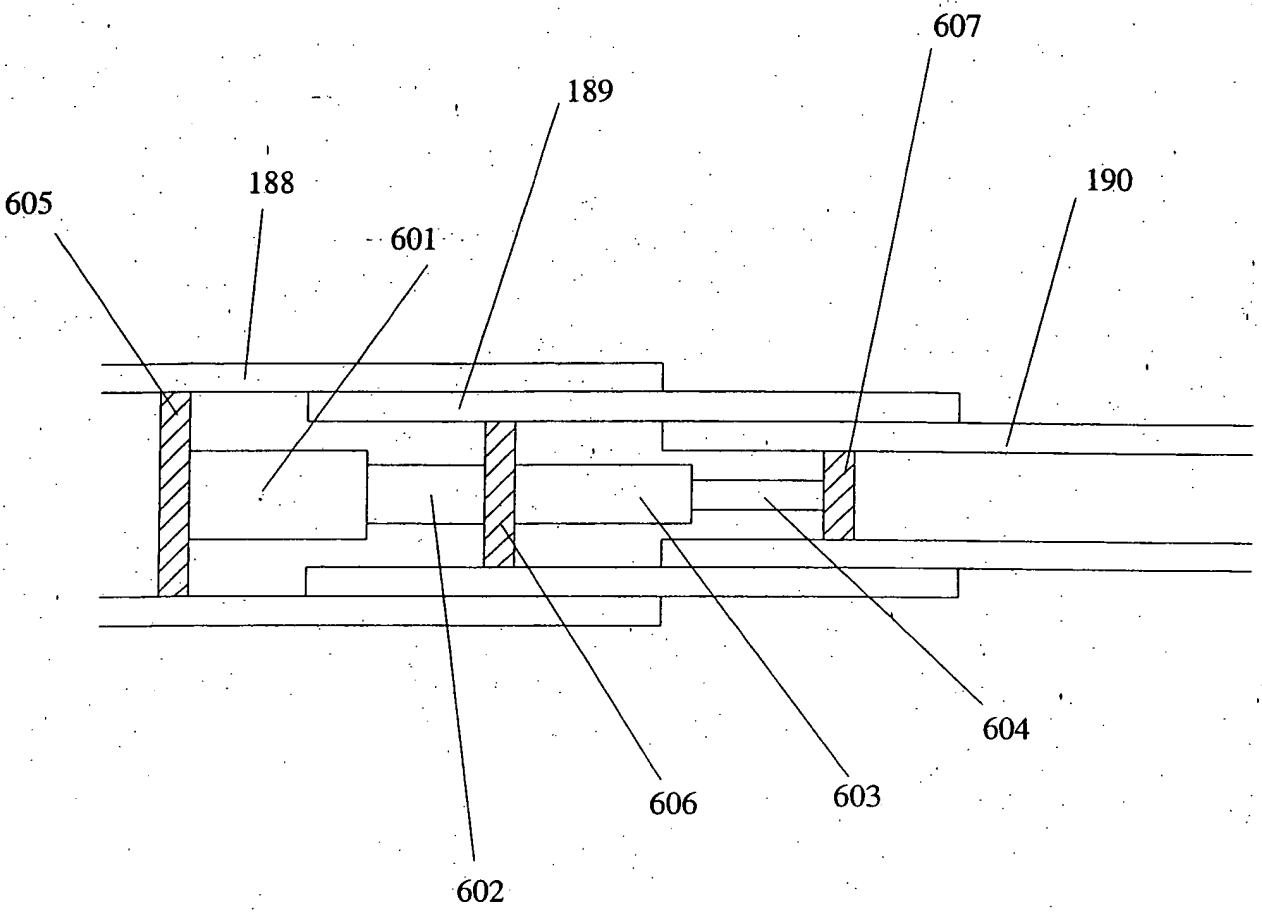


Fig 21 A

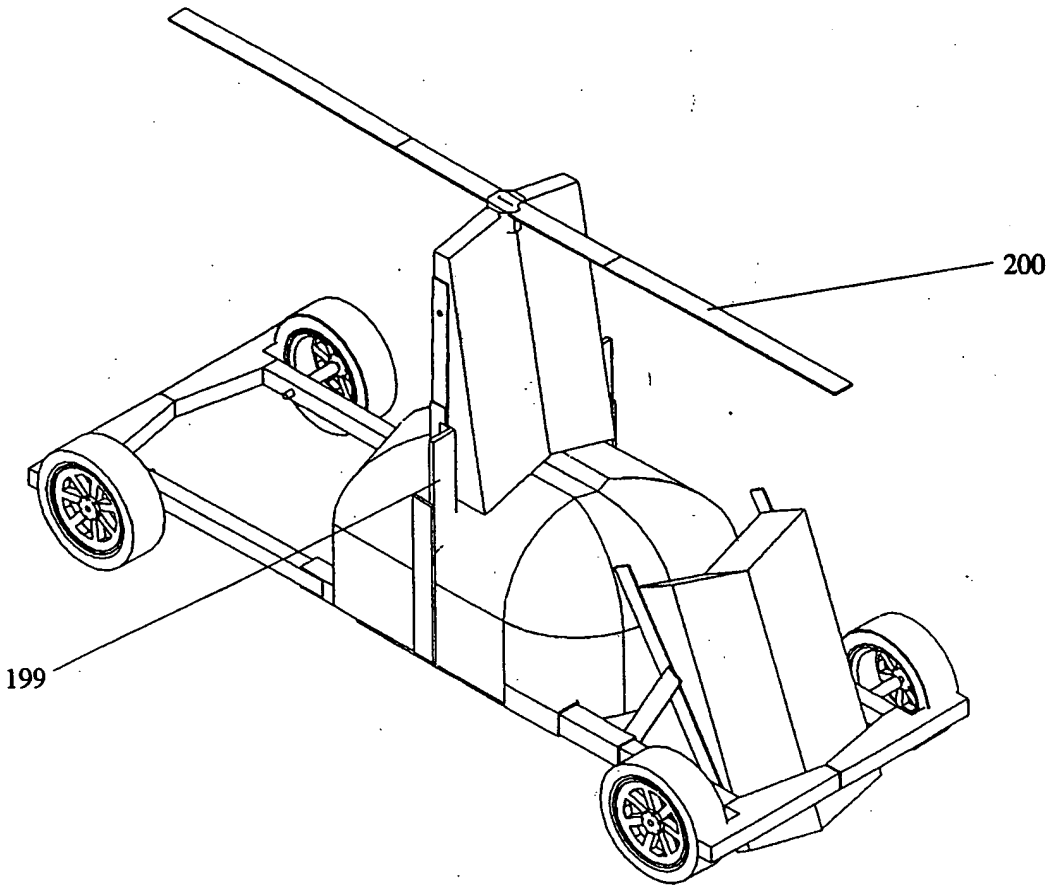


Fig 21 B

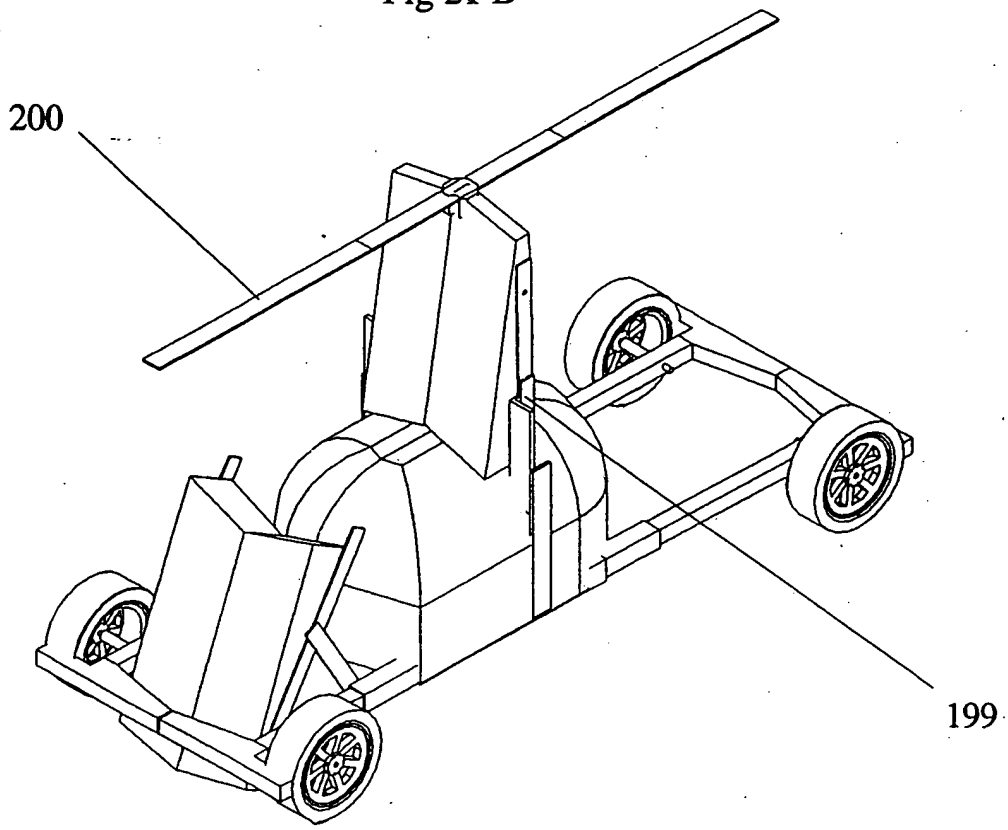


Fig 21 C

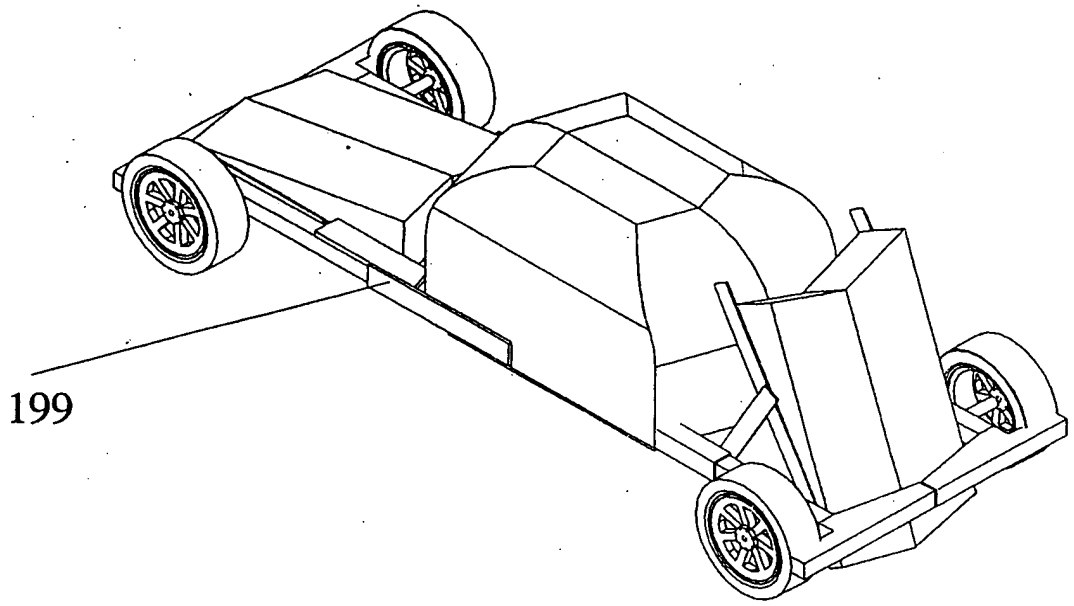


Fig 21 D

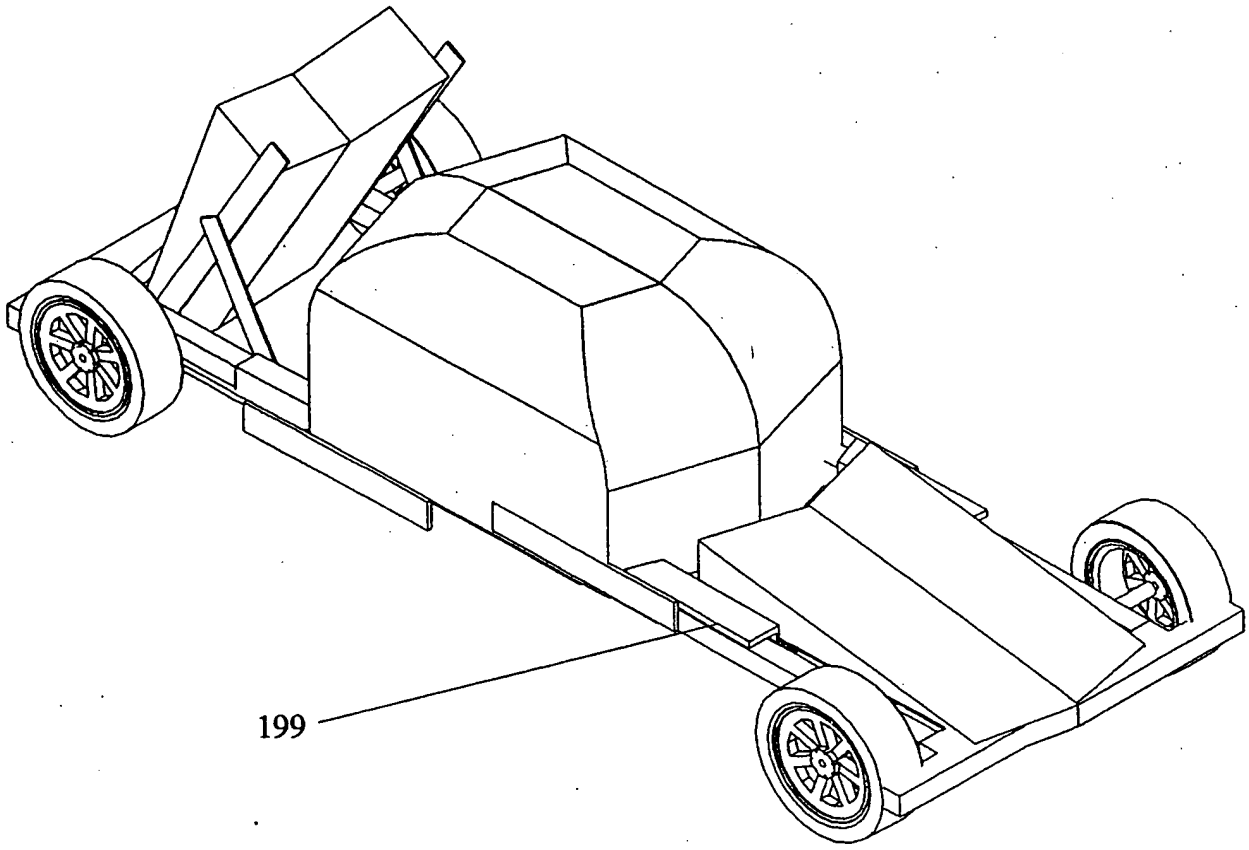
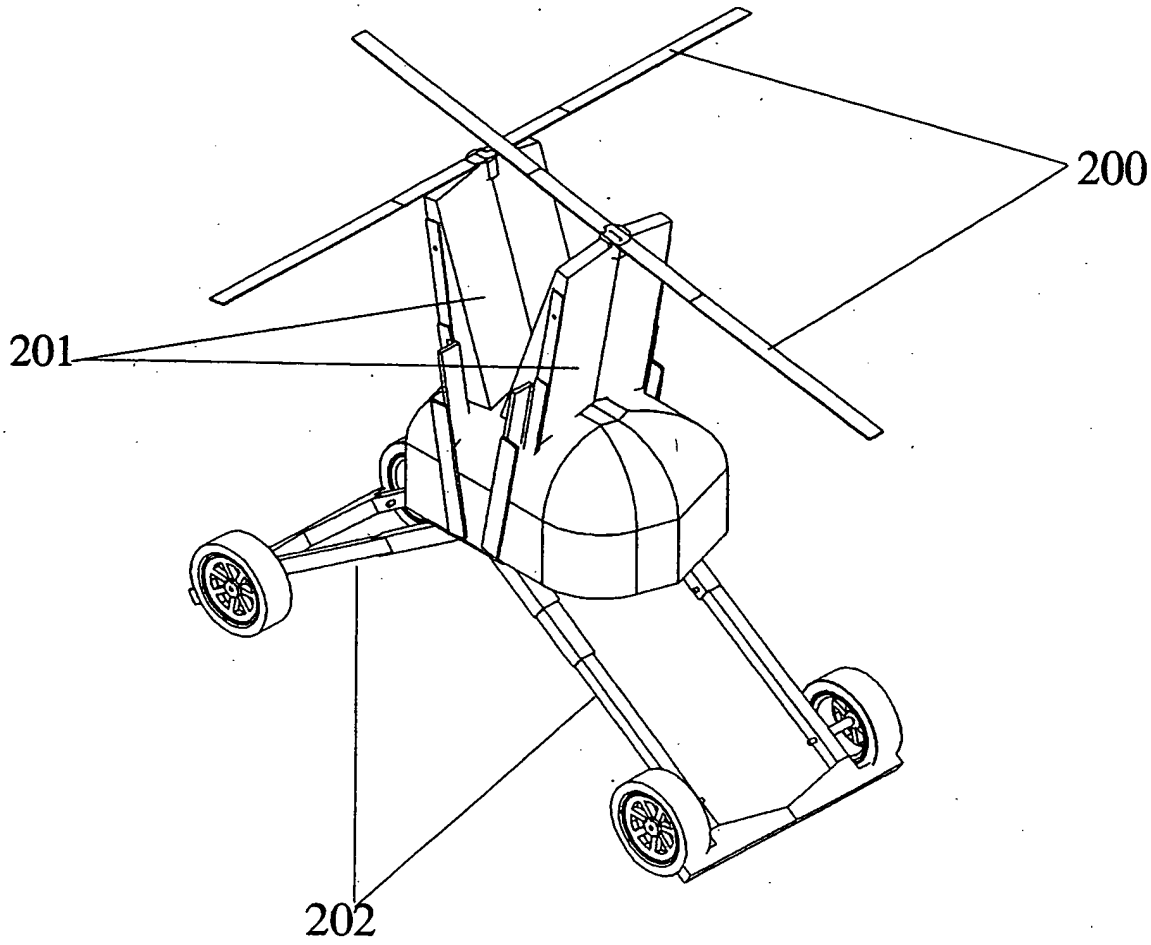


Fig 21 E



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Office of Patent Application Process
Office of Initial Processing Division

Original Application Number: 12/924354

Name of Contact: Sndi Rajasingham

Phone Number: 301 320-7702

NO telephone conversation with the applicant on _____
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(Please print name)
Office of Initial Processing Division

PTO/SB/06 (12-04)

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PATENT APPLICATION FEE DETERMINATION RECORD

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12/924,354

APPLICATION AS FILED – PART I

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BASIC FEE (37 CFR 1.16(a), (b), or (c))				165			
SEARCH FEE (37 CFR 1.16(k), (i), or (m))				270			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))				110			
TOTAL CLAIMS (37 CFR 1.16(i))	7 minus 20 =		X 26 =			X 52 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =		X 110 =			X 220 =	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $270 ($135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			N/A			N/A	
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	545		TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X =		OR	X =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X =		OR	X =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
					TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X =		OR	X =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X =		OR	X =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
					TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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Application or Docket Number

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BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	165		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	270		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	110		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	x =	0	OR	x =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	x =	0		x =	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $260 ($130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			N/A			N/A	
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	545		TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/06 (12-04)

Date: 09/24/10

Approved for use through 7/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 12/924,354

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	165		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	270		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	110		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	7 minus 20 =		x$26		OR	x$52	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*	x$110			x$220	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $260 ($130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			195			390	
			TOTAL	545		TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
					TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
					TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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