

<b>IN THE UNITED STATES PATENT AND TRADEMARK OFFICE RESPONSE TO OFFICE ACTION</b>		
First Named Inventor: <b>Larry Steven Eoff</b>	Docket Number: <b>087638-0891</b>	
Application Number: <b>14/366,219</b>	Art Unit: <b>3674</b>	Conf. Number: <b>3312</b>
Filing Date: <b>June 17, 2014</b>	Examiner: <b>Joseph A. Defazio</b>	
Title: <b>Acid Diversion Treatments in Injection Wells Using Permeability Modifiers</b>		

**STATEMENT OF THE SUBSTANCE OF THE INTERVIEW**

Dear Honorable Commissioner:

In response to the Interview conducted on December 14, 2016 and the Applicant-Initiated Interview Summary dated December 21, 2016, Applicant submits the following:

Applicant thanks Examiners Ashish Varma and Angela DiTrani for discussing this application with Applicant's representative, Donna Haynes and Valerie Moore, on December 14, 2016. During the communication and in response to the Applicant-Initiated Interview Summary dated December 21, 2016, Applicant provides this statement of the substance of the Interview, in which amendments to or cancellation of claims 1, 4, 10-11 and 20-21 were discussed. The Examiners agreed that the amendments and proffered arguments in the prior Office Action Response were persuasive and allowable. An Examiner's Amendment and Notice of Allowability was posted.

The time and consideration of the Examiners is appreciated.

Respectfully submitted,

/Iona N. Kaiser/  
Iona N. Kaiser  
Reg. No. 53,086  
McDermott Will & Emery  
1000 Louisiana, Suite 3900

Application Serial No. 14/366,219  
Attorney Docket No.: 087638-0891  
Client Docket No. 2013-IP-072509 U1 US

Houston, TX 77002-5005  
Telephone: 713.653.1724  
Facsimile: 713.739.7592  
Email: ikaiser@mwe.com

Date: January 19, 2017  
DMH

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	28104816
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser/Kaylen Gonzalez
<b>Filer Authorized By:</b>	Iona Niven Kaiser
<b>Attorney Docket Number:</b>	087638-0891
<b>Receipt Date:</b>	19-JAN-2017
<b>Filing Date:</b>	17-JUN-2014
<b>Time Stamp:</b>	11:48:34
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant summary of interview with examiner	087638-0891_SubstIntSummary.pdf	55411 <small>6dd48096821a4dd91c8fee2ec51cfd6b87a31f4f</small>	no	2

### Warnings:

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**Information:****Total Files Size (in bytes):**

55411

**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](http://www.uspto.gov)

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/366,219	02/07/2017	9562423	087638-0891	3312

99633 7590 01/18/2017  
McDermott Will & Emery LLP  
The McDermott Building  
500 North Capitol Street, N.W.  
Washington, DC 20001

## 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):

Larry Steven Eoff, Duncan, OK;  
Halliburton Energy Services, Inc., Houston, TX;  
B. Raghava Reddy, The Woodlands, TX;  
Eric Davidson, Aberdeen, UNITED KINGDOM;  
Alexandra Clare Morrison, Inverurie, SOUTH AFRICA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit [SelectUSA.gov](http://SelectUSA.gov).

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE  
 Commissioner for Patents  
 P.O. Box 1450  
 Alexandria, Virginia 22313-1450  
**or Fax** (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

99635 2590 07/31/2016  
 McDermott Will & Emery LLP  
 The McDermott Building  
 500 North Capitol Street, N.W.  
 Washington, DC 20001

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Kaylen Gonzalez	(Depositor's name)
/Kaylen Gonzalez/	(Signature)
via EFS web December 22, 2016	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/366,219	06/17/2014	Larry Steven Eoff	087618-0891	3312

TITLE OF INVENTION: ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS

APPL. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEES DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	03/21/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
VARMA, ASHISH K	3674	165-30000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).  
 Change of correspondence address (for 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. McDermott Will & Emery LLP  
 2. Craig Roddy  
 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: Halliburton Energy Services, Inc.  
 (B) RESIDENCE: (CITY and STATE OR COUNTRY) Houston, Texas

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:  
 Issue Fee  
 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 credits any overpayment, to Deposit Account Number 500417..... (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)  
 Applicant certifying micro entity status. See 37 CFR 1.29  
 Applicant asserting small entity status. See 37 CFR 1.37  
 Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.  
 NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.  
 NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature: /Iona N. Kaiser/ Date: December 22, 2016  
 Typed or printed name: Iona N. Kaiser Registration No. 53086

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	14366219
<b>Filing Date:</b>	17-Jun-2014
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Filer:</b>	Iona Niven Kaiser/Kaylen Gonzalez
<b>Attorney Docket Number:</b>	087638-0891

Filed as Large Entity

### Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
UTILITY APPL ISSUE FEE	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Extension-of-Time:</b>				
<b>Miscellaneous:</b>				
<b>Total in USD (\$)</b>				<b>960</b>

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	27879418
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser/Kaylen Gonzalez
<b>Filer Authorized By:</b>	Iona Niven Kaiser
<b>Attorney Docket Number:</b>	087638-0891
<b>Receipt Date:</b>	22-DEC-2016
<b>Filing Date:</b>	17-JUN-2014
<b>Time Stamp:</b>	13:48:32
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$960
RAM confirmation Number	122316INTEFSW00000090500417
Deposit Account	
Authorized User	

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

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**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	087638-0891_IssueFeePayment.pdf	310453  da616c6ebd0bbc488f7d2ce8e3ff5c5a4b2b1c91	no	1

**Warnings:**

**Information:**

2	Fee Worksheet (SB06)	fee-info.pdf	30866  e5d47a8558dfb0badc23fa526fb90ad0ec6daf13d	no	2
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**Warnings:**

**Information:**

<b>Total Files Size (in bytes):</b>	341319
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**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.**



NOTICE OF ALLOWANCE AND FEE(S) DUE

99633 7590 12/21/2016
McDermott Will & Emery LLP
The McDermott Building
500 North Capitol Street, N.W.
Washington, DC 20001

EXAMINER

VARMA, ASHISH K

ART UNIT PAPER NUMBER

3674

DATE MAILED: 12/21/2016

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.

14/366,219 06/17/2014 Larry Steven Eoff 087638-0891 3312

TITLE OF INVENTION: ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS

Table with 7 columns: APPLN. TYPE, ENTITY STATUS, ISSUE FEE DUE, PUBLICATION FEE DUE, PREV. PAID ISSUE FEE, TOTAL FEE(S) DUE, DATE DUE

nonprovisional UNDISCOUNTED \$960 \$0 \$0 \$960 03/21/2017

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE 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.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

**PART B - FEE(S) TRANSMITTAL**

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE  
 Commissioner for Patents  
 P.O. Box 1450  
 Alexandria, Virginia 22313-1450  
 or Fax (571)-273-2885**

**INSTRUCTIONS:** This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

99633                      7590                      12/21/2016  
**McDermott Will & Emery LLP**  
 The McDermott Building  
 500 North Capitol Street, N.W.  
 Washington, DC 20001

**Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/366,219	06/17/2014	Larry Steven Eoff	087638-0891	3312

TITLE OF INVENTION: ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	03/21/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
VARMA, ASHISH K	3674	166-300000

<p>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</p> <p><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.</p> <p><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. <b>Use of a Customer Number is required.</b></p>	<p>2. For printing on the patent front page, list</p> <p>(1) The names of up to 3 registered patent attorneys or agents OR, alternatively, _____ 1</p> <p>(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. _____ 2</p> <p>_____ 3</p>
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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

<p>4a. The following fee(s) are submitted:</p> <p><input type="checkbox"/> Issue Fee</p> <p><input type="checkbox"/> Publication Fee (No small entity discount permitted)</p> <p><input type="checkbox"/> Advance Order - # of Copies _____</p>	<p>4b. Payment of Fee(s): (<b>Please first reapply any previously paid issue fee shown above</b>)</p> <p><input type="checkbox"/> A check is enclosed.</p> <p><input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.</p> <p><input type="checkbox"/> The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).</p>
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5. **Change in Entity Status** (from status indicated above)

Applicant certifying micro entity status. See 37 CFR 1.29

Applicant asserting small entity status. See 37 CFR 1.27

Applicant changing to regular undiscouted fee status.

**NOTE:** Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

**NOTE:** If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

**NOTE:** Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

**NOTE:** This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature \_\_\_\_\_ Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_ Registration No. \_\_\_\_\_





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

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
14/366,219 06/17/2014 Larry Steven Eoff 087638-0891 3312

99633 7590 12/21/2016
McDermott Will & Emery LLP
The McDermott Building
500 North Capitol Street, N.W.
Washington, DC 20001

EXAMINER

VARMA, ASHISH K

ART UNIT PAPER NUMBER

3674

DATE MAILED: 12/21/2016

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

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

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.

## OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B 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. 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.

### 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.

<b>Notice of Allowability</b>	<b>Application No.</b> 14/366,219	<b>Applicant(s)</b> EOFF ET AL.	
	<b>Examiner</b> ASHISH VARMA	<b>Art Unit</b> 3674	<b>AIA (First Inventor to File) Status</b> Yes

**-- 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 Applicant's response 09/20/16 & interview request.  
 A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
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 1-8 and 11-18. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).
4.  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

- 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.  CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.  
 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).**
6.  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. <input type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                  |
| 2. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date _____      | 6. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material   | 7. <input type="checkbox"/> Other _____.   |
| 4. <input checked="" type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date <u>20161214</u> . |  |

/ASHISH VARMA/  
Examiner, Art Unit 3674

/Angela M DiTrani/  
Primary Examiner, Art Unit 3674

## DETAILED ACTION

### *Notice of Pre-AIA or AIA Status*

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### *Applicant's Response*

1. In the response date 09/20/16, the Applicant amended claims 1 and 11, added new claim 21 and argued against the Non-Final rejection dated 07/29/16.

### *Examiner's Amendment*

2. 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.

Claims 1, 4, 10-11 and 20-21 have been amended as below.

### **Claim #1:**

A method comprising:

- (a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator, wherein the permeability modifier deactivator is present in an amount in the range of from 0.001% to about 200% by weight of the ~~relative~~ permeability modifier;
- (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,

Art Unit: 3674

wherein the first treatment zone comprises formation damage;

(c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;

(d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;

(e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;

(f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to at least about 20% of the first aqueous formation permeability,

wherein the permeability modifier deactivator blocks hydrophobic functional groups present on the permeability modifier from forming intermolecular or intramolecular associations;

(g) removing the treatment fluid from the injection well; and

(h) performing an operation in the injection well selected from the group consisting of a waterflood operation, a pressure maintenance operation, an enhanced oil recovery operation, and any combination thereof.

**Claim #4:**

The method of claim 1, wherein the permeability modifier deactivator deactivates the permeability modifier by an additional mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; ~~blocking~~

Art Unit: 3674

~~hydrophobic functional groups present on the permeability modifier;~~ and any combination thereof.

**Claim #10:** cancelled.

**Claim #11:**

A method comprising:

(a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier;

~~wherein the permeability modifier deactivator is present in an amount in the range of from about 0.001% to about 200% by weight of the relative permeability modifier;~~

(b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator,

wherein the permeability modifier deactivator is present in an amount in the range of from about 0.001% to about 200% by weight of the permeability modifier;

(c) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,

wherein the first treatment zone comprises formation damage;

(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone;

(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;

Art Unit: 3674

(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;

(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;

(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to at least about 20% of the first aqueous formation permeability,

wherein the permeability modifier deactivator blocks hydrophobic functional groups present on the permeability modifier from forming intermolecular or intramolecular associations;

(i) removing the treatment fluid from the injection well; and

(j) performing an operation in the injection well selected from the group consisting of a waterflood operation, a pressure maintenance operation, an enhanced oil recovery operation, and any combination thereof.

**Claims #20 and 21: cancelled.**

*Reasons for Allowance*

In the response date, the applicant argued wherein Watanabe in combination with references Eoff and Card fail to disclose and/or teach “wherein the permeability modifier deactivator blocks hydrophobic functional groups present on the permeability modifier from

Art Unit: 3674

forming intermolecular or intramolecular associations" as required by Independent claims 1 and 11.

3. Applicant's arguments with respect to claims 1-8 and 11-18 have been fully considered and are persuasive. The previous rejection and references have been withdrawn and after updating the examiner's search, the examiner concludes the claim limitations in the Independent claims 1 and 11 (and their corresponding dependent claims) are allowable.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ASHISH VARMA whose telephone number is (571)272-9565. The examiner can normally be reached on Monday-Friday 9-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doug Hutton can be reached on 571-272-4137. 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.

/Angela M DiTrani/

Primary Examiner, Art Unit 3674

/ASHISH VARMA/

Examiner, Art Unit 3674



<b>Applicant-Initiated Interview Summary</b>	<b>Application No.</b> 14/366,219	<b>Applicant(s)</b> EOFF ET AL.	
	<b>Examiner</b> ASHISH VARMA	<b>Art Unit</b> 3674	

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

- (1) ASHISH VARMA. (3) Donna Haynes (attorney).  
(2) Angela DiTrani (Primary Examiner). (4) \_\_\_\_\_.

Date of Interview: 14 December 2016.

Type:  Telephonic  Video Conference  
 Personal [copy given to:  applicant  applicant's representative]

Exhibit shown or demonstration conducted:  Yes  No.  
If Yes, brief description: \_\_\_\_\_.

Issues Discussed 101 112 102 103 Others  
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1-8,10-18 and 20.

Identification of prior art discussed: Watanabe (U.S 4,487,265) and Card (U.S 5,979,557).

**Substance of Interview**

(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

The examiners and attorney were able to discuss the claims. The examiners agreed the applicant's arguments were persuasive in view of the previous rejections and references used. The examiners did mention the claims were now allowable and got approval on the claim amendments included in the Examiner's Amendment. The examiners will post the Notice of Allowability.

**Applicant recordation instructions:** 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

**Examiner recordation instructions:** Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

Attachment

/ASHISH VARMA/  
Examiner, Art Unit 3674

/Angela M DiTrani/  
Primary Examiner, Art Unit 3674

## 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.

<b>Search Notes</b>  	<b>Application/Control No.</b>  14366219	<b>Applicant(s)/Patent Under Reexamination</b>  EOFF ET AL.
	<b>Examiner</b>  JOSEPH DEFAZIO	<b>Art Unit</b>  3674

<b>CPC- SEARCHED</b>		
<b>Symbol</b>	<b>Date</b>	<b>Examiner</b>
E21B 33/13; E21B 43/295; C09K 8/68; E21B 43/00; E21B 43/25; E21B 43/16; E21B 43/27; C09K 8/60; E21B 29/10; E21B 33/138; E21B 43/162; C09K 8/74	7/30/2015	JD
E21B33/13	02/17/16, 12/14/16	AV
E21B43/295	02/17/16, 12/14/16	AV
C09K8/68	02/17/16, 12/14/16	AV
E21B43/00	02/17/16, 12/14/16	AV
E21B43/25	02/17/16, 12/14/16	AV

<b>CPC COMBINATION SETS - SEARCHED</b>		
<b>Symbol</b>	<b>Date</b>	<b>Examiner</b>

<b>US CLASSIFICATION SEARCHED</b>			
<b>Class</b>	<b>Subclass</b>	<b>Date</b>	<b>Examiner</b>
166	300	7/30/2015	JD
166	300	02/17/16, 12/14/16	AV

<b>SEARCH NOTES</b>		
<b>Search Notes</b>	<b>Date</b>	<b>Examiner</b>
Consult with A. DiTrani	7/27/2015	JD
PALM Inventor Name Search	7/28/2015	JD
EAST Inventor Name Search	7/28/2015	JD
EAST Assignee/Applicant/Assignee as Inventor Name Search	7/30/2015	JD

/ASHISH VARMA/ Examiner.Art Unit 3674	
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## SEARCH NOTES

Search Notes	Date	Examiner
EAST Keyword Search	7/28/2015	JD
Google Patent/NPL Name Search	7/29/2015	JD
Consulted with Angela DiTrani (Primary Examiner)	02/17/16	AV
Forward/Backward Citation Search	02/17/16	AV
Text Search	02/17/16	AV
Searched EAST (see updated search history)	02/21/16	AV
Consulted with Angela DiTrani (Primary Examiner)	04/14/16, 07/13/16	AV
Searched EAST (see updated search history)	04/16/16, 07/24/16	AV
Searched EAST (see updated search history)	10/12/16	AV
Consulted with Angela DiTrani (Primary Examiner)	12/14/16	AV
Searched EAST (see updated search history)	12/14/16	AV

## INTERFERENCE SEARCH

US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	See attached EAST Search History document	12/14/16	AV

/ASHISH VARMA/  
Examiner.Art Unit 3674

## EAST Search History

## EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2787	166/300	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:02
L2	16071	E21B33/13	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:02
L3	1564	E21B43/295	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:02
L4	9044	C09K8/68	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:02
L5	40216	E21B43/00	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:02
L6	10256	E21B43/25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:02
L7	1599	(surfactant\$1 (mutual adj solvent\$1) (free\$1radical adj compound\$1)) and l1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:03
L8	138	(permeability WITH (modifier\$1	US-PGPUB;	OR	ON	2016/12/14

		deactivator\$1)) and I1	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			18:03
L9	84	(permeability WITH (modifier\$1 deactivator\$1)) and I2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:03
L10	3	(permeability WITH (modifier\$1 deactivator\$1)) and I3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:03
L11	164	(permeability WITH (modifier\$1 deactivator\$1)) and I4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:03
L12	79	(permeability WITH (modifier\$1 deactivator\$1)) and I5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:03
L13	97	(permeability WITH (modifier\$1 deactivator\$1)) and I6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/12/14 18:03
S1	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106"   "20120168166"   "20120264885"   "5122549"   "6516885"   "7114568"   "20050178549"   "4982793"   "7182136"   "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292"   "5979557"   "7117942"   "7563750").FN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/17 13:34
S2	248230	(subterranean oil\$1well\$1 oil\$1field\$1 down\$1hole\$1 down\$1field\$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 10:56
S3	866	(permeability WITH (modifier\$1 deactivator\$1)) and S2	US-PGPUB; USPAT;	OR	ON	2016/02/18 11:13

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S4	348	(acid\$1 WITH permeabilit\$4) and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:14
S5	249	(treat\$4 WITH (permeabilit\$4)) and S4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:16
S6	228	(polymer\$1 (hydrophobic\$4 WITH polymer\$1)) and S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:17
S7	216	(surfactant\$1 (mutual adj solvent\$1) (free\$1radical adj compound\$1)) and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:17
S8	191	(restor\$5 desorp\$4 degrad\$5 block\$5) and S7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:18
S9	2741	166/300	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:19
S10	2396	S2 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:19
S11	135	S3 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20

S12	14440	E21B33/13	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S13	1448	E21B43/295	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S14	7853	C09K8/68	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S15	37816	E21B43/00	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S16	9601	E21B43/25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S17	57	S12 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S18	3	S13 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S19	133	S14 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S20	62	S15 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2016/02/18 11:21




			DERWENT; IBM_TDB			
S21	63	S16 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S22	1	("2011/0034351").URPN.	USPAT	OR	ON	2016/02/18 11:34
S23	12	("2005/0178549").URPN.	USPAT	OR	ON	2016/02/18 11:51
S24	1	("4487265").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:56
S25	1	("20050178549").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:57
S26	1	("20080110624").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:57
S27	1	("20110034351").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:57
S28	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106"   "20120168166"   "20120264885"   "5122549"   "6516885"   "7114568"   "20050178549"   "4982793"   "7182136"   "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292"   "5979557"   "7117942"   "7563750").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/21 15:16
S29	1	("5979557").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/21 15:18
S31	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "5979557"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106"   "20120168166"   "20120264885"   "5122549"   "6516885"   "7114568"   "20050178549"   "4982793"   "7182136"   "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292"   "5979557"   "4487265"   "7117942"   "7563750"   "20050178549").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/04/16 14:24
S32	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "5979557"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106"   "20120168166"   "20120264885"   "5122549"   "6516885"   "7114568"   "20050178549"   "4982793"   "7182136"   "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292"   "5979557"   "4487265"   "7117942"   "7563750"   "20050178549").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/07/24 14:19

## EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L14	1	((permeability adj modifier\$1 adj deactivator\$1) AND acid\$1 AND (permeabilit\$3) AND (restor\$3) AND (remov\$3)).clm.	US-PGPUB; USPAT	OR	ON	2016/12/14 18:06

12/ 14/ 2016 6:06:56 PM


C:\Users\avarma\Documents\EAST\Workspaces\14366219\Prior Art Search History.wsp

<b>Issue Classification</b> 	<b>Application/Control No.</b> 14366219	<b>Applicant(s)/Patent Under Reexamination</b> EOFF ET AL.	
	<b>Examiner</b> ASHISH VARMA	<b>Art Unit</b> 3674	

CPC						
Symbol					Type	Version
E21B		43		162	F	2013-01-01
E21B		43		25	I	2013-01-01
C09K		8		74	I	2013-01-01
C09K		8		78	I	2013-01-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

/ASHISH VARMA/ Examiner.Art Unit 3674  (Assistant Examiner)	12/14/2016  (Date)	<b>Total Claims Allowed:</b>  17	
/Angela M DiTrani/ Primary Examiner.Art Unit 3674  (Primary Examiner)	12/15/2016  (Date)	O.G. Print Claim(s)  1	O.G. Print Figure  1

<b>Issue Classification</b> 	<b>Application/Control No.</b> 14366219	<b>Applicant(s)/Patent Under Reexamination</b> EOFF ET AL.
	<b>Examiner</b> ASHISH VARMA	<b>Art Unit</b> 3674

US ORIGINAL CLASSIFICATION						INTERNATIONAL CLASSIFICATION								
CLASS		SUBCLASS				CLAIMED				NON-CLAIMED				
						E	2	1	B	33 / 13 (2006.01.01)				
<b>CROSS REFERENCE(S)</b>														
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)													

/ASHISH VARMA/ Examiner.Art Unit 3674  (Assistant Examiner)	12/14/2016  (Date)	<b>Total Claims Allowed:</b>  17	
/Angela M DiTrani/ Primary Examiner.Art Unit 3674  (Primary Examiner)	12/15/2016  (Date)	O.G. Print Claim(s)  1	O.G. Print Figure  1





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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/366,219	06/17/2014	Larry Steven Eoff	087638-0891	3312
99633	7590	10/21/2016	EXAMINER	
McDermott Will & Emery LLP The McDermott Building 500 North Capitol Street, N.W. Washington, DC 20001			VARMA, ASHISH K	
			ART UNIT	PAPER NUMBER
			3674	
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			10/21/2016	ELECTRONIC

**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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com  
ikaiser@mwe.com



## **DETAILED ACTION**

### ***Notice of Pre-AIA or AIA Status***

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### ***Applicant's Response***

1. In the response date 09/20/16, the Applicant amended claims 1 and 11, added new claim 21 and argued against the rejections in the RCE Non-Final rejection dated 07/29/16.

### ***Claim Rejections - 35 USC § 103***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5-8, 10-13 and 15-18 and 20 are rejected under 35 U.S.C. 103 as being unpatentable over US 4,487,265 (“Watanabe”) in view of US 2005/0178549 (“Eoff”).

### ***Claim 1:***

Regarding Claim 1, Watanabe discloses:

*A method comprising:*



*(a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator;* (Watanabe: Abstract (aqueous solution of an acid, glycol ether, water-soluble nitrogen containing polymer); Col. 3, lines 44-48 (treatment fluid is a 25% to 95% by volume aqueous solution of hydrochloric or hydrofluoric acid); Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups); Col. 5, lines 1-22 (permeability modifier deactivator glycol ethers, including preferred embodiment ethylene glycol monobutyl ether (“EGMBE”)); Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents))

*(b) providing an injection well in a subterranean formation* (Watanabe: Col. 8, lines 2-5)  
*... , wherein the first treatment zone comprises formation damage;* (Watanabe: Col. 1, lines 22-32 (plugging damage))

*(c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;* (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 11 (producing interval), 18-23 (preflush aqueous solution of hydrochloric acid, EGMBE and polyacrylamide), 26-33 (aqueous solution of hydrochloric/hydrofluoric acid, EGMBE and polyacrylamide))

*(d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;* (Watanabe: Col. 9, lines 23-25)

...;

Art Unit: 3674

*(g) removing the treatment fluid from the injection well. (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 34-37 (afterflush));*

*and (h) performing an operation in the injection well selected from the group consisting of a waterflood operation, a pressure maintenance operation, an enhanced oil recovery operation, and any combination thereof (Abstract; Col 1, lines 37-42 → Watanabe discloses this limitation by injecting enhanced recovery drive fluids in order to increase production of fluids).*

Watanabe does not disclose:

*(a) wherein the permeability modifier deactivator is present in an amount in the range of from 0.001% to about 200% by weight of the relative permeability modifier;*

*(b) a first treatment zone comprising a first aqueous formation permeability, . . . ;*

*(e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;*

*(f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability;*

However, Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well (Eoff: Abstract) where a treatment zone with an initial aqueous permeability (Eoff: [0041], [0042] Table I) is reacted with a permeability modifier (Eoff: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (Eoff: [0042] Table I).

Art Unit: 3674

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by Watanabe by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone with a specific concentration of the permeability modifier deactivator, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

With regards to claim 1, the reference Eoff discloses a permeability modifier deactivator concentration from about 1% to about 25% by weight (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20; paragraph [0039]), causing the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I). Although silent to wherein the permeability modifier deactivator has a presence in the range of from 0.001% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because it has been held "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

*Claim 2:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.* (Eoff '759: [0009] (repeat the treatment at selected zones in the well)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to repeat, as taught by Eoff, the treatment steps disclosed by Watanabe in view of Eoff '759, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

*Claim 3:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.* (Eoff: [0042] Table I (aqueous permeability decreases to 85% less than its original value)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to decrease the aqueous formation permeability of the zone, disclosed by Watanabe in view of Eoff, to 85% less than its pretreatment value, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of

Art Unit: 3674

50%-90% less than the original value of the formation aqueous permeability overlaps the value of 85% disclosed by Eoff.

*Claim 5:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.* (Watanabe: Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups)).

*Claim 6:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.* (Eoff: [0024] (0.01% - 10% by weight)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier, disclosed by Watanabe in view of Eoff, present in the amount from 0.01% - 10% by weight of the treatment fluid, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.05% to about 5% by weight of permeability modifier present in the treatment fluid overlaps the range of 0.01% - 10% disclosed by Eoff.

*Claim 7:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.* (Watanabe: Col. 5, lines 32-34 (aqueous solution comprises 5-28% by weight hydrogen chloride); Col. 3, lines 44-48 (water 25-95% by volume, so EGMBE is 5-75% by volume, taking water with density of 1 g/L and EGMBE with density of 0.902 g/L, gives water 27-95.5% by weight, and hydrogen chloride in the range of 1.35 – 26.74 % by weight  $((0.05*27)\% - ((0.28*95.5)\%))$ ).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.5% to about 8% by weight of acid present in the treatment fluid overlaps the range of 1.35% - 26.74% disclosed by Watanabe.

*Claim 8:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Art Unit: 3674

Watanabe further discloses *wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.* (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

*Claim 10:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.* (Eoff: [0041], [0042] Table I (restored to 98% of its original value, which is a restoration of 83% (((100-2) – (100-85))%)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the aqueous formation permeability of the treatment zone, disclosed by Watanabe in view of Eoff, restored to 98% of its original value, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of restoration to at least 20% of the treatment zone's original aqueous formation permeability overlaps the value of 98% disclosed by Eoff.

Art Unit: 3674

*Claim 11:*

Regarding Claim 11, Watanabe discloses:

*A method comprising:*

*(a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier;* (Watanabe: Abstract (aqueous solution of an acid, glycol ether, water-soluble nitrogen containing polymer); Col. 3, lines 44-48 (treatment fluid is a 25% to 95% by volume aqueous solution of hydrochloric or hydrofluoric acid); Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups))

...;

*(c) providing an injection well in a subterranean formation having a first treatment zone* (Watanabe: Col. 8, lines 2-5) . . . , *wherein the first treatment zone comprises formation damage;* (Watanabe: Col. 1, lines 22-32 (plugging damage))

*(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone;* (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 11 (producing interval), 18-23 (preflush aqueous solution of hydrochloric acid and polyacrylamide), 26-33 (aqueous solution of hydrochloric/hydrofluoric acid and polyacrylamide))

*(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;* (Watanabe: Col. 9, lines 23-25)

...;



Art Unit: 3674

*(i) removing the treatment fluid from the injection well. (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 34-37 (afterflush)).*

*and (j) performing an operation in the injection well selected from the group consisting of a waterflood operation, a pressure maintenance operation, an enhanced oil recovery operation, and any combination thereof (Abstract; Col 1, lines 37-42 → Watanabe discloses this limitation by injecting enhanced recovery drive fluids in order to increase production of fluids).*

Watanabe does not disclose:

*(a) wherein the permeability modifier deactivator is present in an amount in the range of from 0.001% to about 200% by weight of the relative permeability modifier;*

*(b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;*

*(c) . . . a first treatment zone comprising a first aqueous formation permeability . . . ;*

*(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;*

*(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;*

*(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability, wherein the permeability modifier*

Art Unit: 3674

*deactivator blocks hydrophobic functional groups present on the permeability modifier from forming intermolecular or intramolecular associations;*

However, Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well (Eoff: Abstract) where a treatment zone with an initial aqueous permeability (Eoff: [0041], [0042] Table I) is reacted with a permeability modifier (Eoff: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (Eoff: [0042] Table I).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by Watanabe by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone with the permeability modifier deactivator, with the permeability modifier deactivator in a aqueous treatment fluid separate from the fluid with the permeability modifier, as taught by Eoff, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]) and restoring selected treated sections with second separate aqueous treatment fluid containing permeability modifier deactivator (Eoff: [0006] and [0039]).

With regards to claim 11, the reference Eoff discloses a permeability modifier deactivator concentration from about 1% to about 25% by weight (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20; paragraph [0039]), causing the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I). Although silent to wherein the permeability modifier deactivator has a presence in the range of from 0.001% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been obvious to one having

Art Unit: 3674

ordinary skill in the art at the time the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because it has been held “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

*Claim 12:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.* (Eoff ‘759: [0009] (repeat the treatment at selected zones in the well)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to repeat, as taught by Eoff, the treatment steps disclosed by Watanabe in view of Eoff ‘759, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

*Claim 13:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.* (Eoff: [0042] Table I (aqueous permeability decreases to 85% less than its original value)).

Art Unit: 3674

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to decrease the aqueous formation permeability of the zone, disclosed by Watanabe in view of Eoff, to 85% less than its pretreatment value, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of 50%-90% less than the original value of the formation aqueous permeability overlaps the value of 85% disclosed by Eoff.

*Claim 15:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.* (Watanabe: Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups)).

*Claim 16:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Art Unit: 3674

Eoff further discloses *wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.* (Eoff: [0024] (0.01% - 10% by weight)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier, disclosed by Watanabe in view of Eoff, present in the amount from 0.01% - 10% by weight of the treatment fluid, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.05% to about 5% by weight of permeability modifier present in the treatment fluid overlaps the range of 0.01% - 10% disclosed by Eoff.

*Claim 17:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.* (Watanabe: Col. 5, lines 32-34 (aqueous solution comprises 5-28% by weight hydrogen chloride); Col. 3, lines 44-48 (water 25-95% by volume, so EGMBE is 5-75% by volume, taking water with density of 1 g/L and EGMBE with density of 0.902 g/L, gives water 27-95.5% by weight, and hydrogen chloride in the range of 1.35 – 26.74 % by weight  $((0.05*27)\% - ((0.28*95.5)\%))$ ).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.5% to about 8% by weight of acid present in the treatment fluid overlaps the range of 1.35% - 26.74% disclosed by Watanabe.

*Claim 18:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *w18. The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.* (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

*Claim 20:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.* (Eoff: [0041], [0042] Table I (restored to 98% of its original value, which is a restoration of 83% (((100-2) – (100-85)) %)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the aqueous formation permeability of the treatment zone, disclosed by Watanabe in view of Eoff, restored to 98% of its original

Art Unit: 3674

value, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of restoration to at least 20% of the treatment zone’s original aqueous formation permeability overlaps the value of 83% disclosed by Eoff.

Claims 4, 14 and 21 are rejected under 35 U.S.C. 103 as being unpatentable over US 4,487,265 (“Watanabe”) in view of US 2005/0178549 (“Eoff”), as further evidenced by US 5,979,557 (“Card”).

*Claim 4:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

*Claim 14:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by an additional mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

*Claim 21:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group*



*consisting of degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

### ***Response to Arguments***

Applicant's arguments filed 09/20/16 have been fully considered but are not persuasive.

The applicant argues wherein the combination of Watanabe and Eoff fails to teach or suggest "wherein the permeability modifier deactivator is present in an amount in the range of from 0.001% to about 200% by weight of the relative permeability modifier" as recited by independent claim 1. Furthermore, the applicant argues wherein the combination of references Watanabe and Eoff fail to teach and/or suggest "performing an operation in the injection well selected from the group consisting of a waterflood operation, a pressure maintenance operation, an enhanced oil recovery operation, and any combination thereof."

The examiner respectfully disagrees.

With respect to Independent Claim 1, the examiner brought in reference Eoff to teach a permeability modifier deactivator concentration from about 1% to about 25% by weight (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20; paragraph [0039]), causing the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I).

The examiner would like to emphasize the following arguments once again: In the previous claim amendments, the applicant claimed "wherein the permeability modifier deactivator is present in an amount in the range of from about 40% to about 200% by weight of

Art Unit: 3674

the relative permeability modifier," upon which the examiner used **optimization** to reject this broad limitation by stating "Although silent to wherein the permeability modifier deactivator has a presence in the range of from about 40% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been **obvious to one having ordinary skill in the art before the effective filing date the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because** it has been held "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

The applicant's current reply consists of a broader claim limitation "wherein the permeability modifier deactivator is present in an amount in the range of from 0.001% to about 200% by weight of the relative permeability modifier," which still falls under the range reference Eoff teaches (a concentration from about 1% to about 25% by weight). Since the examiner had previously rejected this claim limitation using optimization stating it would have been obvious for one of ordinary skill in the art before the effective filing date of the invention under routine experimentation to include a permeability modifier deactivator at a concentration in the range previously disclosed, the reference still covers the concentration range and the rejection stands as previously set forth.

Furthermore, primary reference Watanabe discloses acidizing subterranean formations in order to increase and/or restore the permeability of subterranean reservoirs to facilitate the flow of formation fluids, including oil as well as other enhanced recovery drive fluids (Abstract; Col 1, lines 37-42 → Watanabe discloses this limitation by injecting enhanced recovery drive fluids

Art Unit: 3674

in order to increase production of fluids). Therefore, in light of the arguments present above, the rejection stands as previously set forth.

*Conclusion*

2. 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 ASHISH VARMA whose telephone number is (571)272-9565. The examiner can normally be reached on Monday-Friday 9-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doug Hutton can be reached on 571-272-4137. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3674

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.

/ASHISH VARMA/  
Examiner, Art Unit 3674

/Doug Hutton/  
Supervisory Patent Examiner, Art Unit 3674

<b>Notice of References Cited</b>	Application/Control No. 14/366,219	Applicant(s)/Patent Under Reexamination EOFF ET AL.	
	Examiner ASHISH VARMA	Art Unit 3674	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A US-4,487,265 A	12-1984	Watanabe; David J.	C09K8/60	166/307
*	B US-5,979,557 A	11-1999	Card; Roger J.	C09K8/68	166/281
*	C US-2005/0178549 A1	08-2005	Eoff, Larry S.	C09K8/508	166/295
	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	CPC Classification
	N				
	O				
	P				
	Q				
	R				
	S				
	T				

**NON-PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	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.

<b>Search Notes</b>  	<b>Application/Control No.</b>  14366219	<b>Applicant(s)/Patent Under Reexamination</b>  EOFF ET AL.
	<b>Examiner</b>  JOSEPH DEFAZIO	<b>Art Unit</b>  3674

<b>CPC- SEARCHED</b>		
<b>Symbol</b>	<b>Date</b>	<b>Examiner</b>
E21B 33/13; E21B 43/295; C09K 8/68; E21B 43/00; E21B 43/25; E21B 43/16; E21B 43/27; C09K 8/60; E21B 29/10; E21B 33/138; E21B 43/162; C09K 8/74	7/30/2015	JD
E21B33/13	02/17/16	AV
E21B43/295	02/17/16	AV
C09K8/68	02/17/16	AV
E21B43/00	02/17/16	AV
E21B43/25	02/17/16	AV

<b>CPC COMBINATION SETS - SEARCHED</b>		
<b>Symbol</b>	<b>Date</b>	<b>Examiner</b>

<b>US CLASSIFICATION SEARCHED</b>			
<b>Class</b>	<b>Subclass</b>	<b>Date</b>	<b>Examiner</b>
166	300	7/30/2015	JD
166	300	02/17/16	AV

<b>SEARCH NOTES</b>		
<b>Search Notes</b>	<b>Date</b>	<b>Examiner</b>
Consult with A. DiTrani	7/27/2015	JD
PALM Inventor Name Search	7/28/2015	JD
EAST Inventor Name Search	7/28/2015	JD
EAST Assignee/Applicant/Assignee as Inventor Name Search	7/30/2015	JD
EAST Keyword Search	7/28/2015	JD
Google Patent/NPL Name Search	7/29/2015	JD
Consulted with Angela DiTrani (Primary Examiner)	02/17/16	AV
Forward/Backward Citation Search	02/17/16	AV
Text Search	02/17/16	AV
Searched EAST (see updated search history)	02/21/16	AV

/ASHISH VARMA/ Examiner.Art Unit 3674	
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### SEARCH NOTES

<b>Search Notes</b>	<b>Date</b>	<b>Examiner</b>
Consulted with Angela DiTrani (Primary Examiner)	04/14/16, 07/13/16	AV
Searched EAST (see updated search history)	04/16/16, 07/24/16	AV
Searched EAST (see updated search history)	10/12/16	AV

### INTERFERENCE SEARCH

<b>US Class/ CPC Symbol</b>	<b>US Subclass / CPC Group</b>	<b>Date</b>	<b>Examiner</b>

/ASHISH VARMA/  
Examiner.Art Unit 3674

<b>Index of Claims</b>  	<b>Application/Control No.</b> 14366219	<b>Applicant(s)/Patent Under Reexamination</b> EOFF ET AL.
	<b>Examiner</b> JOSEPH DEFAZIO	<b>Art Unit</b> 3674

✓	<b>Rejected</b>
=	<b>Allowed</b>

-	<b>Cancelled</b>
÷	<b>Restricted</b>

N	<b>Non-Elected</b>
I	<b>Interference</b>

A	<b>Appeal</b>
O	<b>Objected</b>

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

CLAIM		DATE										
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	21					✓						



## EAST Search History

## EAST Search History (Prior Art)

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S2	248230	(subterranean oil\$1well\$1 oil\$1field\$1 down\$1hole\$1 down\$1field\$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 10:56
S3	866	(permeability WITH (modifier\$1 deactivator\$1)) and S2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:13
S4	348	(acid\$1 WITH permeabilit\$4) and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:14
S5	249	(treat\$4 WITH (permeabilit\$4)) and S4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:16

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S7	216	(surfactant\$1 (mutual adj solvent\$1) (free\$1radical adj compound\$1)) and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:17
S8	191	(restor\$5 desorp\$4 degrad\$5 block\$5) and S7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:18
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S10	2396	S2 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:19
S11	135	S3 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S12	14440	E21B33/13	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S13	1448	E21B43/295	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S14	7853	C09K8/68	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2016/02/18 11:20

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S16	9601	E21B43/25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
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S18	3	S13 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
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S23	12	("2005/0178549").URPN.	USPAT	OR	ON	2016/02/18 11:51
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S26	1	("20080110624").PN.	US-PGPUB;	OR	OFF	2016/02/18

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**EAST Search History (Interference)**

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**10/ 12/ 2016 11:29:55 AM****C:\Users\avarma\Documents\EAST\Workspaces\14366219\Prior Art Search History.wsp**

<b>IN THE UNITED STATES PATENT AND TRADEMARK OFFICE RESPONSE TO OFFICE ACTION</b>		
First Named Inventor: <b>Larry Steven Eoff</b>	Docket Number: <b>087638-0891</b>	
Application Number: <b>14/366,219</b>	Art Unit: <b>3674</b>	Conf. Number: <b>3312</b>
Filing Date: <b>June 17, 2014</b>	Examiner: <b>Joseph A. Defazio</b>	
Title: <b>Acid Diversion Treatments in Injection Wells Using Permeability Modifiers</b>		

**RESPONSE TO NON-FINAL OFFICE ACTION DATED JULY 29, 2016**

Dear Honorable Commissioner:

In response to the Non-Final Office Action mailed on July 29, 2016 (the "Office Action"), Applicant submits the following:

**Amendments to the Claims**, which begin on page 2 of this paper; and  
**Remarks/Arguments**, which begin on page 6 of this paper.

### **AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions of claims in the application:

1. (Currently Amended) A method comprising:
  - (a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator,  
wherein the permeability modifier deactivator is present in an amount in the range of from ~~[[40]]~~0.001% to about 200% by weight of the relative permeability modifier;
  - (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,  
wherein the first treatment zone comprises formation damage;
  - (c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;
  - (d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;
  - (e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;
  - (f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability;~~and~~
  - (g) removing the treatment fluid from the injection well; and
  - (h) performing an operation in the injection well selected from the group consisting of a waterflood operation, a pressure maintenance operation, an enhanced oil recovery operation, and any combination thereof.
2. (Original) The method of claim 1, wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.

3. (Original) The method of claim 1, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

4. (Original) The method of claim 1, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.

5. (Original) The method of claim 1, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

6. (Original) The method of claim 1, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

7. (Original) The method of claim 1, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

8. (Original) The method of claim 1, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

9. (Cancelled)

10. (Original) The method of claim 1, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

11. (Currently Amended) A method comprising:

(a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier,

wherein the permeability modifier deactivator is present in an amount in the range of from about 0.001% to about 200% by weight of the relative permeability modifier;

(b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;

(c) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,

wherein the first treatment zone comprises formation damage;

(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone;

(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;

(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;

(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;

(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability,

wherein the permeability modifier deactivator blocks hydrophobic functional groups present on the permeability modifier from forming intermolecular or intramolecular associations; ~~and~~

(i) removing the treatment fluid from the injection well; and

(j) performing an operation in the injection well selected from the group consisting of a waterflood operation, a pressure maintenance operation, an enhanced oil recovery operation, and any combination thereof.

12. (Original) The method of claim 11, wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.



13. (Original) The method of claim 11, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

14. (Previously Presented) The method of claim 11, wherein the permeability modifier deactivator deactivates the permeability modifier by an additional mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; and any combination thereof.

15. (Original) The method of claim 11, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

16. (Original) The method of claim 11, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

17. (Original) The method of claim 11, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

18. (Original) The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

19. (Cancelled)

20. (Original) The method of claim 11, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

21. (New) The method of claim 1, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of degradation of the permeability modifier; blocking hydrophobic

functional groups present on the permeability modifier; and any combination thereof.

**REMARKS / ARGUMENTS**

**I. General Remarks and Disposition of the Claims**

Please consider the application in view of the following remarks. Applicant thanks the Examiner for careful consideration of this application, including the references that Applicant has submitted in this case.

At the time of the Office Action, claims 1-8, 10-18, and 20 were pending in this application, and claims 1-8, 10-18, and 20 were rejected in the Office Action.

In this response, Applicant has amended claims 1 and 11, and added claim 21. Applicant submits that these proposed amendments do not raise new issues that would require further consideration and/or search, do not raise the issue of new matter, and put the application in better form. Therefore, Applicant respectfully requests that these amendments be entered.

**II. Remarks Regarding Rejections under 35 U.S.C. § 103(a)**

To support an obviousness rejection, MPEP § 2143.03 requires that "all words of a claim to be considered" and MPEP §2141.02 requires consideration of the "[claimed] invention and prior art as a whole." Further, a proper, post-*KSR* obviousness determination requires the Examiner make a "searching comparison of the claimed invention – including all its limitations – with the teaching of the prior art." (*CFMT v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003)). The Supreme Court in *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 127 S.Ct. 1727, 1731 (2007) noted that the analysis supporting a rejection under 35 U.S.C. § 103 should be made explicit. Further, the Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." (*In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)). In sum, it is well-settled law that an obviousness rejection requires a teaching or suggestion of all of the claim elements.

**A. Rejections over *Watanabe* in view of *Eoff***

Claims 1-3, 5-8, 10-13, 15-18, and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 4,487,265 (hereinafter "*Watanabe*") in view of U.S. Patent Application Publication 2005/0178549 (hereinafter "*Eoff*"). Applicant respectfully disagrees.

In particular, the combination of *Watanabe* and *Eoff* fails to teach or suggest at least the element of "performing an operation in the injection well selected from the group consisting of a waterflood operation, a pressure maintenance operation, an enhanced oil recovery operation, and any combination thereof," as recited by independent claims 1 and 11. The Office Action relies on *Watanabe* for allegedly disclosing treatments in an injection well, however, *Watanabe* merely states that "Following an acidizing treatment, the treated well or wells are generally placed back in service either as production wells or injection wells." (*Watanabe*, col. 8, ll. 3-5). However, the Instant Application as claimed does not merely describe acidizing an injection well, but instead the combination of acidizing an injection well and restoring the permeability of the injection well prior to placing the injection well in service.

The Office Action then relies on *Eoff*, first stating that "Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well." (Office Action at pg. 4) **This is patently not true and counter to usage of well-defined industry language.** The word "injection well" does not appear anywhere in *Eoff*; indeed the single word "injection" does not appear anywhere in *Eoff*. The Office Action points to the Abstract of *Eoff*, which provides **absolutely no reference to an injection well:**

Methods of temporarily reducing the permeability of one or more selected sections of a subterranean formation penetrated by a horizontal well bore and the flow of water or water and hydrocarbons or hydrocarbons therefrom are provided. The methods comprise the steps of preparing or providing an aqueous treating fluid comprising water and a water-soluble formation permeability reducing agent, introducing the aqueous treating fluid into one or more selected sections and when required, contacting the one or more selected

sections with an aqueous treating fluid comprising water and a formation permeability restoring chemical.

*Eoff* does not disclose, teach, or suggest any treatment for injection wells. Instead, *Eoff* is directed to the control of "production rates from different segments of horizontal wells or from different horizontal well bores" to solve the "problem that often occurs in the production of hydrocarbons from horizontal well bores in producing zones." (*Eoff* at [0005]). A producing horizontal wellbore cannot be conflated with an injection well, to which the Instant Application is directed. A "producing well" is a "well producing fluids (gas, oil or water)." (Oilfield Glossary, "Producing Well," [http://www.glossary.oilfield.slb.com/Terms/p/producing\\_well.aspx](http://www.glossary.oilfield.slb.com/Terms/p/producing_well.aspx)). An "injection well" is a "well in which fluids are injected rather than produced." (Oilfield Glossary, "Injection Well," [http://www.glossary.oilfield.slb.com/Terms/i/injection\\_well.aspx](http://www.glossary.oilfield.slb.com/Terms/i/injection_well.aspx)). Indeed, the Instant Application makes this point: "[a]n injection well is a wellbore in a subterranean formation used to pump fluids into a producing reservoir (e.g., a hydrocarbon producing reservoir)." (Instant Application at [0002]). That is, **a producing wellbore (horizontal or otherwise) is wholly different than an injection well**, and the distinction is well known to one of skill in the art.

**The Instant Application explains clearly that producing wells and injection wells react differently:**

Permeability modifiers have been effective acid diverters for hydrocarbon producing wells. They are capable of altering the relative permeability of a portion of a wellbore that they come into contact with, resulting in blockage of water production and/or diversion of aqueous fluids away from that portion of the wellbore. As such, they are particularly useful in hydrocarbon producing wells where they have no effect on hydrocarbon permeability and where there is no concern that the effects of the permeability modifier (e.g., reduction in water permeability) may remain in effect for a period longer than desired or permanently. Injection wells, on the other hand, typically involve injection of water rather than hydrocarbons and minimal pressure during fluid injection is desirable. Thus, the use of permeability modifiers, although effective acid diverters, in injection wells may result in undesirable or irreversible reduction in water permeability of the wellbore.

Necessarily, then, neither *Watanabe* nor *Eoff* discloses, teaches, or suggests the element of “performing an operation in the injection well selected from the group consisting of a waterflood operation, a pressure maintenance operation, an enhanced oil recovery operation, and any combination thereof,” as recited by independent claims 1 and 11.

Second, with reference to independent claim 11, the combination of *Watanabe* and *Eoff* further fails to teach or suggest the element of “wherein the permeability modifier deactivator blocks hydrophobic functional groups present on the permeability modifier from forming intermolecular or intramolecular associations,” as recited by independent claim 11. The Office Action does not even address this limitation of independent claim 11. (See Office Action at pg. 10-13). Instead, with reference to other independent claims, the Office Action admits that “*Watanabe* in view of *Eoff* does not disclose wherein the permeability modifier deactivates the permeability modifier by a mechanism...[of] blocking hydrophobic functional groups present on the permeability modifier.” (Office Action at pg. 17). The Office Action turns to *Card* for its alleged teaching that “EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations.” (Office Action at pg. 17). However, none of the cited references disclose, teach, or suggest “wherein the permeability modifier deactivator blocks hydrophobic functional groups present on the permeability modifier from forming intermolecular or intramolecular associations,” as recited by independent claim 11.

Therefore, Applicant respectfully asserts that independent claims 1 and 11 and their dependent claims are not rendered obvious by the combination of *Watanabe* and *Eoff*. Accordingly, Applicant respectfully requests withdrawal of this rejection.

#### **B. Rejections over *Watanabe*, *Eoff*, and *Card***

Claims 4 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Watanabe* in view of *Eoff*, as further evidenced by U.S. Patent 5,979,557 (hereinafter “*Card*”). Applicant respectfully disagrees.

For at least the reasons discussed in Section II.A above, the combination of *Watanabe*, *Eoff*, and/or *Card* fails to teach or suggest each and every limitation of

independent claims 1 and 11. Accordingly, the combination of *Watanabe*, *Eoff*, and *Card* fails to establish that every limitation of independent claims 1 and 11 and their dependent claims were known in the prior art. Therefore, Applicant respectfully asserts that independent claims 1 and 11 and their dependent claims are not rendered obvious by the combination of *Watanabe*, *Eoff*, and *Card*. Accordingly, Applicant respectfully requests withdrawal of this rejection.

### **III. No Waiver**

All of Applicant's arguments and amendments are without prejudice or disclaimer. Applicant has merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicant reserves the right to discuss these additional distinctions in a later Response or on Appeal, if appropriate. By not responding to additional statements made by the Examiner, Applicant does not acquiesce to the Examiner's additional statements, such as, for example, any statements relating to what would be obvious to a person of ordinary skill in the art.

### **SUMMARY**

In light of the above, Applicant respectfully requests reconsideration and withdrawal of the outstanding rejections. Applicant further submits that the application is now in condition for allowance. Should the Examiner have any questions, comments or suggestions, the Examiner is invited to contact the attorney of record by telephone, facsimile, or electronic mail.

Applicant believes that no fees are due with this response. Should the Commissioner deem that any fees are due, including any fees for extensions of time, Applicant requests that the Commissioner accept this as a Petition Therefore, and direct that any additional fees be charged to McDermott Will & Emery's Deposit Account No. 500417, Order Number 087638-0891.

Respectfully submitted,

/Iona N. Kaiser/  
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Application Serial No. 14/366,219  
Attorney Docket No.: 087638-0891  
Client Docket No. 2013-IP-072509 U1 US

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Date: September 20, 2016  
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## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	26975757
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser/Kaylen Gonzalez
<b>Filer Authorized By:</b>	Iona Niven Kaiser
<b>Attorney Docket Number:</b>	087638-0891
<b>Receipt Date:</b>	20-SEP-2016
<b>Filing Date:</b>	17-JUN-2014
<b>Time Stamp:</b>	12:20:54
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		087638-0891_RespOA.pdf	131457  48ec57a5bfb33d6548aaa4a744c92c55f7831f9b	yes	12

<b>Multipart Description/PDF files in .zip description</b>			
<b>Document Description</b>		<b>Start</b>	<b>End</b>
Amendment/Req. Reconsideration-After Non-Final Reject		1	1
Claims		2	6
Applicant Arguments/Remarks Made in an Amendment		7	12

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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.**

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**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.**

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<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875	Application or Docket Number <b>14/366,219</b>	Filing Date <b>06/17/2014</b>	<input type="checkbox"/> To be Mailed
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ENTITY:  LARGE  SMALL  MICRO

**APPLICATION AS FILED – PART I**

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE <small>(37 CFR 1.16(a), (b), or (c))</small>	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE <small>(37 CFR 1.16(k), (l), or (m))</small>	N/A	N/A	N/A	
<input type="checkbox"/> EXAMINATION FEE <small>(37 CFR 1.16(o), (p), or (q))</small>	N/A	N/A	N/A	
TOTAL CLAIMS <small>(37 CFR 1.16(i))</small>	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS <small>(37 CFR 1.16(h))</small>	minus 3 =	*	X \$ =	
<input type="checkbox"/> APPLICATION SIZE FEE <small>(37 CFR 1.16(s))</small>	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 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).			
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT <small>(37 CFR 1.16(j))</small>				
<small>* If the difference in column 1 is less than zero, enter "0" in column 2.</small>			TOTAL	

**APPLICATION AS AMENDED – PART II**

	(Column 1)	(Column 2)	(Column 3)	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	
<b>AMENDMENT</b>	<b>09/20/2016</b>	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR				
		* 19	Minus	** 20	= 0	X \$80 = 0	
		* 2	Minus	***3	= 0	X \$420 = 0	
		<input type="checkbox"/> Application Size Fee <small>(37 CFR 1.16(s))</small>					
		<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>					
					TOTAL ADD'L FEE	<b>0</b>	

	(Column 1)	(Column 2)	(Column 3)	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	
<b>AMENDMENT</b>		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR				
		*	Minus	**	=	X \$ =	
		*	Minus	***	=	X \$ =	
		<input type="checkbox"/> Application Size Fee <small>(37 CFR 1.16(s))</small>					
		<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>					
					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.

LIE  
/ERIC V. BURNS/



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14/366,219	06/17/2014	Larry Steven Eoff	087638-0891	3312

99633 7590 07/29/2016  
McDermott Will & Emery LLP  
The McDermott Building  
500 North Capitol Street, N.W.  
Washington, DC 20001

EXAMINER
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VARMA, ASHISH K

ART UNIT	PAPER NUMBER
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3674

NOTIFICATION DATE	DELIVERY MODE
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07/29/2016

ELECTRONIC

**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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com  
ikaiser@mwe.com



## **DETAILED ACTION**

### ***Notice of Pre-AIA or AIA Status***

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/30/16 has been entered.

### ***Applicant's Response***

2. In the response date 06/21/16, the Applicant amended claims 1, 11 and 14 and argued against the rejections in the Final rejection dated 04/21/16.

### ***Claim Rejections - 35 USC § 103***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to

Art Unit: 3674

which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5-8, 10-13 and 15-18 and 20 are rejected under 35 U.S.C. 103 as being unpatentable over US 4,487,265 (“Watanabe”) in view of US 2005/0178549 (“Eoff”).

*Claim 1:*

Regarding Claim 1, Watanabe discloses:

*A method comprising:*

*(a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator;* (Watanabe: Abstract (aqueous solution of an acid, glycol ether, water-soluble nitrogen containing polymer); Col. 3, lines 44-48 (treatment fluid is a 25% to 95% by volume aqueous solution of hydrochloric or hydrofluoric acid); Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups); Col. 5, lines 1-22 (permeability modifier deactivator glycol ethers, including preferred embodiment ethylene glycol monobutyl ether (“EGMBE”); Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents))

*(b) providing an injection well in a subterranean formation* (Watanabe: Col. 8, lines 2-5)  
*. . . , wherein the first treatment zone comprises formation damage;* (Watanabe: Col. 1, lines 22-32 (plugging damage))

*(c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;* (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 11

Art Unit: 3674

(producing interval), 18-23 (preflush aqueous solution of hydrochloric acid, EGMBE and polyacrylamide), 26-33 (aqueous solution of hydrochloric/hydrofluoric acid, EGMBE and polyacrylamide))

*(d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;* (Watanabe: Col. 9, lines 23-25)

. . . ;

*and (g) removing the treatment fluid from the injection well.* (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 34-37 (afterflush)).

Watanabe does not disclose:

*(a) wherein the permeability modifier deactivator is present in an amount in the range of from 40% to about 200% by weight of the relative permeability modifier;*

*(b) a first treatment zone comprising a first aqueous formation permeability, . . . ;*

*(e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;*

*(f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability;*

However, Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well (Eoff: Abstract) where a treatment zone with an initial aqueous permeability (Eoff: [0041], [0042] Table I) is reacted



Art Unit: 3674

with a permeability modifier (Eoff: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (Eoff: [0042] Table I).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by Watanabe by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone with a specific concentration of the permeability modifier deactivator, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

With regards to claim 1, the reference Eoff discloses a permeability modifier deactivator concentration from about 1% to about 25% by weight (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20; paragraph [0039]), causing the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I). Although silent to wherein the permeability modifier deactivator has a presence in the range of from 40% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because it has been held "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

*Claim 2:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.* (Eoff '759: [0009] (repeat the treatment at selected zones in the well)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to repeat, as taught by Eoff, the treatment steps disclosed by Watanabe in view of Eoff '759, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

*Claim 3:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.* (Eoff: [0042] Table I (aqueous permeability decreases to 85% less than its original value)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to decrease the aqueous formation permeability of the zone, disclosed by Watanabe in view of Eoff, to 85% less than its pretreatment value, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of

Art Unit: 3674

50%-90% less than the original value of the formation aqueous permeability overlaps the value of 85% disclosed by Eoff.

*Claim 5:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.* (Watanabe: Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups)).

*Claim 6:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.* (Eoff: [0024] (0.01% - 10% by weight)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier, disclosed by Watanabe in view of Eoff, present in the amount from 0.01% - 10% by weight of the treatment fluid, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.05% to about 5% by weight of permeability modifier present in the treatment fluid overlaps the range of 0.01% - 10% disclosed by Eoff.

*Claim 7:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.* (Watanabe: Col. 5, lines 32-34 (aqueous solution comprises 5-28% by weight hydrogen chloride); Col. 3, lines 44-48 (water 25-95% by volume, so EGMBE is 5-75% by volume, taking water with density of 1 g/L and EGMBE with density of 0.902 g/L, gives water 27-95.5% by weight, and hydrogen chloride in the range of 1.35 – 26.74 % by weight  $((0.05*27)\% - ((0.28*95.5)\%))$ ).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.5% to about 8% by weight of acid present in the treatment fluid overlaps the range of 1.35% - 26.74% disclosed by Watanabe.

*Claim 8:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Art Unit: 3674

Watanabe further discloses *wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof*. (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

*Claim 10:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability*. (Eoff: [0041], [0042] Table I (restored to 98% of its original value, which is a restoration of 83%  $((100-2) - (100-85))\%$ )).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the aqueous formation permeability of the treatment zone, disclosed by Watanabe in view of Eoff, restored to 98% of its original value, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of restoration to at least 20% of the treatment zone's original aqueous formation permeability overlaps the value of 98% disclosed by Eoff.

Art Unit: 3674

*Claim 11:*

Regarding Claim 11, Watanabe discloses:

*A method comprising:*

*(a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier; (Watanabe: Abstract (aqueous solution of an acid, glycol ether, water-soluble nitrogen containing polymer); Col. 3, lines 44-48 (treatment fluid is a 25% to 95% by volume aqueous solution of hydrochloric or hydrofluoric acid); Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups))*

...;

*(c) providing an injection well in a subterranean formation having a first treatment zone (Watanabe: Col. 8, lines 2-5) . . . , wherein the first treatment zone comprises formation damage; (Watanabe: Col. 1, lines 22-32 (plugging damage))*

*(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone; (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 11 (producing interval), 18-23 (preflush aqueous solution of hydrochloric acid and polyacrylamide), 26-33 (aqueous solution of hydrochloric/hydrofluoric acid and polyacrylamide))*

*(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage; (Watanabe: Col. 9, lines 23-25)*

...;

Art Unit: 3674

*and (i) removing the treatment fluid from the injection well. (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 34-37 (afterflush)).*

Watanabe does not disclose:

*(a) wherein the permeability modifier deactivator is present in an amount in the range of from 0.001% to about 200% by weight of the relative permeability modifier;*

*(b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;*

*(c) . . . a first treatment zone comprising a first aqueous formation permeability . . . ;*

*(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;*

*(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;*

*(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability, wherein the permeability modifier deactivator blocks hydrophobic functional groups present on the permeability modifier from forming intermolecular or intramolecular associations;*

However, Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well (Eoff: Abstract) where a treatment zone with an initial aqueous permeability (Eoff: [0041], [0042] Table I) is reacted

Art Unit: 3674

with a permeability modifier (Eoff: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (Eoff: [0042] Table I).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by Watanabe by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone with the permeability modifier deactivator, with the permeability modifier deactivator in a aqueous treatment fluid separate from the fluid with the permeability modifier, as taught by Eoff, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]) and restoring selected treated sections with second separate aqueous treatment fluid containing permeability modifier deactivator (Eoff: [0006] and [0039]).

With regards to claim 11, the reference Eoff discloses a permeability modifier deactivator concentration from about 1% to about 25% by weight (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20; paragraph [0039]), causing the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I). Although silent to wherein the permeability modifier deactivator has a presence in the range of from 0.001% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because it has been held "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).



Art Unit: 3674

*Claim 12:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.* (Eoff '759: [0009] (repeat the treatment at selected zones in the well)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to repeat, as taught by Eoff, the treatment steps disclosed by Watanabe in view of Eoff '759, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

*Claim 13:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.* (Eoff: [0042] Table I (aqueous permeability decreases to 85% less than its original value)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to decrease the aqueous formation permeability of the zone, disclosed by Watanabe in view of Eoff, to 85% less than its pretreatment value, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In*

Art Unit: 3674

*re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of 50%-90% less than the original value of the formation aqueous permeability overlaps the value of 85% disclosed by Eoff.

*Claim 15:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof*. (Watanabe: Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups)).

*Claim 16:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid*. (Eoff: [0024] (0.01% - 10% by weight)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier, disclosed by Watanabe in view of Eoff, present in the amount from 0.01% - 10% by weight of the treatment fluid, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.05% to about 5% by weight of permeability modifier present in the treatment fluid overlaps the range of 0.01% - 10% disclosed by Eoff.

*Claim 17:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.* (Watanabe: Col. 5, lines 32-34 (aqueous solution comprises 5-28% by weight hydrogen chloride); Col. 3, lines 44-48 (water 25-95% by volume, so EGMBE is 5-75% by volume, taking water with density of 1 g/L and EGMBE with density of 0.902 g/L, gives water 27-95.5% by weight, and hydrogen chloride in the range of 1.35 – 26.74 % by weight  $((0.05*27)\% - ((0.28*95.5)\%))$ ).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.5% to about 8% by weight of acid present in the treatment fluid overlaps the range of 1.35% - 26.74% disclosed by Watanabe.

*Claim 18:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Art Unit: 3674

Watanabe further discloses *w18*. *The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.* (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

*Claim 20:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.* (Eoff: [0041], [0042] Table I (restored to 98% of its original value, which is a restoration of 83% (((100-2) – (100-85)) %)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the aqueous formation permeability of the treatment zone, disclosed by Watanabe in view of Eoff, restored to 98% of its original value, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of restoration to at least 20% of the treatment zone's original aqueous formation permeability overlaps the value of 83% disclosed by Eoff.

Claims 4 and 14 are rejected under 35 U.S.C. 103 as being unpatentable over US 4,487,265 (“Watanabe”) in view of US 2005/0178549 (“Eoff”), as further evidenced by US 5,979,557 (“Card”).

*Claim 4:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

*Claim 14:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by an additional mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

### ***Response to Arguments***

Applicant's arguments filed 06/21/16 have been fully considered but are not persuasive.

The applicant argues wherein the combination of Watanabe and Eoff fails to teach or suggest "wherein the permeability modifier deactivator is present in an amount in the range of from 40% to about 200% by weight of the relative permeability modifier" as recited by independent claim 1 and "in the range of from 0.001% to about 200% by weight of the relative permeability modifier" as recited by independent claim 11.

The examiner respectfully disagrees.

The examiner brought in reference Eoff to teach a permeability modifier deactivator concentration from about 1% to about 25% by weight (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20; paragraph [0039]), causing the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I).

The examiner would like to emphasize the following arguments once again: In the previous claim amendments, the applicant claimed "wherein the permeability modifier deactivator is present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier," upon which the examiner used **optimization** to reject this

Art Unit: 3674

broad limitation by stating “Although silent to wherein the permeability modifier deactivator has a presence in the range of from about 10% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been **obvious to one having ordinary skill in the art before the effective filing date the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because** it has been held “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

The applicant's current reply consists of a more narrow claim limitation “wherein the permeability modifier deactivator is present in an amount in the range of from 40% to about 200% by weight of the relative permeability modifier,” simply to try and overcome the previous rejection of art. However, because the examiner had previously rejected this claim limitation using optimization stating it would have been obvious for one of ordinary skill in the art before the effective filing date of the invention under routine experimentation to include a permeability modifier deactivator at a concentration in the range previously disclosed, the reference still covers the concentration range and the rejection stands as previously set forth.

Therefore, in light of the arguments present above, the rejection stands as previously set forth.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ASHISH VARMA whose telephone number is (571)272-9565.

The examiner can normally be reached on Monday-Friday 9-5:30pm.

Art Unit: 3674

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doug Hutton can be reached on 571-272-4137. 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.

/ASHISH VARMA/  
Examiner, Art Unit 3674

/Doug Hutton/  
Supervisory Patent Examiner, Art Unit 3674



<b>Notice of References Cited</b>	Application/Control No. 14/366,219	Applicant(s)/Patent Under Reexamination EOFF ET AL.	
	Examiner ASHISH VARMA	Art Unit 3674	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A US-4,487,265 A	12-1984	Watanabe; David J.	C09K8/60	166/307
*	B US-5,979,557 A	11-1999	Card; Roger J.	C09K8/68	166/281
*	C US-2005/0178549 A1	08-2005	Eoff, Larry S.	C09K8/508	166/295
	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	CPC Classification
	N				
	O				
	P				
	Q				
	R				
	S				
	T				

**NON-PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	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.

<b>Search Notes</b>  	<b>Application/Control No.</b>  14366219	<b>Applicant(s)/Patent Under Reexamination</b>  EOFF ET AL.
	<b>Examiner</b>  JOSEPH DEFAZIO	<b>Art Unit</b>  3674

<b>CPC- SEARCHED</b>		
<b>Symbol</b>	<b>Date</b>	<b>Examiner</b>
E21B 33/13; E21B 43/295; C09K 8/68; E21B 43/00; E21B 43/25; E21B 43/16; E21B 43/27; C09K 8/60; E21B 29/10; E21B 33/138; E21B 43/162; C09K 8/74	7/30/2015	JD
E21B33/13	02/17/16	AV
E21B43/295	02/17/16	AV
C09K8/68	02/17/16	AV
E21B43/00	02/17/16	AV
E21B43/25	02/17/16	AV

<b>CPC COMBINATION SETS - SEARCHED</b>		
<b>Symbol</b>	<b>Date</b>	<b>Examiner</b>

<b>US CLASSIFICATION SEARCHED</b>			
<b>Class</b>	<b>Subclass</b>	<b>Date</b>	<b>Examiner</b>
166	300	7/30/2015	JD
166	300	02/17/16	AV

<b>SEARCH NOTES</b>		
<b>Search Notes</b>	<b>Date</b>	<b>Examiner</b>
Consult with A. DiTrani	7/27/2015	JD
PALM Inventor Name Search	7/28/2015	JD
EAST Inventor Name Search	7/28/2015	JD
EAST Assignee/Applicant/Assignee as Inventor Name Search	7/30/2015	JD
EAST Keyword Search	7/28/2015	JD
Google Patent/NPL Name Search	7/29/2015	JD
Consulted with Angela DiTrani (Primary Examiner)	02/17/16	AV
Forward/Backward Citation Search	02/17/16	AV
Text Search	02/17/16	AV
Searched EAST (see updated search history)	02/21/16	AV

/ASHISH VARMA/ Examiner.Art Unit 3674	
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**SEARCH NOTES**

<b>Search Notes</b>	<b>Date</b>	<b>Examiner</b>
Consulted with Angela DiTrani (Primary Examiner)	04/14/16, 07/13/16	AV
Searched EAST (see updated search history)	04/16/16, 07/24/16	AV

**INTERFERENCE SEARCH**

<b>US Class/ CPC Symbol</b>	<b>US Subclass / CPC Group</b>	<b>Date</b>	<b>Examiner</b>

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Examiner.Art Unit 3674

## EAST Search History

## EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "5979557"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106"   "20120168166"   "20120264885"   "5122549"   "6516885"   "7114568"   "20050178549"   "4982793"   "7182136"   "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292"   "5979557"   "4487265"   "7117942"   "7563750"   "20050178549").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/07/24 14:19
S1	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106"   "20120168166"   "20120264885"   "5122549"   "6516885"   "7114568"   "20050178549"   "4982793"   "7182136"   "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292"   "5979557"   "7117942"   "7563750").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/17 13:34
S2	248230	(subterranean oil\$1well\$1 oil\$1field\$1 down\$1hole\$1 down\$1field\$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 10:56
S3	866	(permeability WITH (modifier\$1 deactivator\$1)) and S2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:13
S4	348	(acid\$1 WITH permeabilit\$4) and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:14
S5	249	(treat\$4 WITH (permeabilit\$4)) and S4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:16

S6	228	(polymer\$1 (hydrophobic\$4 WITH polymer\$1)) and S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:17
S7	216	(surfactant\$1 (mutual adj solvent\$1) (free\$1radical adj compound\$1)) and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:17
S8	191	(restor\$5 desorp\$4 degrad\$5 block\$5) and S7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:18
S9	2741	166/300	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:19
S10	2396	S2 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:19
S11	135	S3 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S12	14440	E21B33/13	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S13	1448	E21B43/295	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S14	7853	C09K8/68	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2016/02/18 11:20


			DERWENT; IBM_TDB			
S15	37816	E21B43/00	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S16	9601	E21B43/25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S17	57	S12 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S18	3	S13 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S19	133	S14 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S20	62	S15 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S21	63	S16 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S22	1	("2011/0034351").URPN.	USPAT	OR	ON	2016/02/18 11:34
S23	12	("2005/0178549").URPN.	USPAT	OR	ON	2016/02/18 11:51
S24	1	("4487265").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:56
S25	1	("20050178549").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:57
S26	1	("20080110624").PN.	US-PGPUB;	OR	OFF	2016/02/18

			USPAT			11:57
S27	1	("20110034351").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:57
S28	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106" "20120168166"   "20120264885"   "5122549"   "6516885"   "7114568"   "20050178549"   "4982793"   "7182136" "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292" "5979557"   "7117942"   "7563750").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/21 15:16
S29	1	("5979557").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/21 15:18
S31	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "5979557"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106"   "20120168166"   "20120264885"   "5122549"   "6516885" "7114568"   "20050178549"   "4982793"   "7182136"   "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292"   "5979557"   "4487265"   "7117942"   "7563750"   "20050178549").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/04/16 14:24

**EAST Search History (Interference)**

&lt;This search history is empty&gt;

**7/ 24/ 2016 2:32:08 PM****C:\ Users\ avarma\ Documents\ EAST\ Workspaces\ 14366219\ Prior Art Search History.wsp**

<b><i>Index of Claims</i></b>  	<b>Application/Control No.</b> 14366219	<b>Applicant(s)/Patent Under Reexamination</b> EOFF ET AL.
	<b>Examiner</b> JOSEPH DEFAZIO	<b>Art Unit</b> 3674

✓	<b>Rejected</b>
=	<b>Allowed</b>

-	<b>Cancelled</b>
÷	<b>Restricted</b>

N	<b>Non-Elected</b>
I	<b>Interference</b>

A	<b>Appeal</b>
O	<b>Objected</b>

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

CLAIM		DATE							
Final	Original	07/30/2015	02/21/2016	04/16/2016	07/24/2016				
	1	✓	✓	✓	✓				
	2	✓	✓	✓	✓				
	3	✓	✓	✓	✓				
	4	✓	✓	✓	✓				
	5	✓	✓	✓	✓				
	6	✓	✓	✓	✓				
	7	✓	✓	✓	✓				
	8	✓	✓	✓	✓				
	9	✓	-	-	-				
	10	✓	✓	✓	✓				
	11	✓	✓	✓	✓				
	12	✓	✓	✓	✓				
	13	✓	✓	✓	✓				
	14	✓	✓	✓	✓				
	15	✓	✓	✓	✓				
	16	✓	✓	✓	✓				
	17	✓	✓	✓	✓				
	18	✓	✓	✓	✓				
	19	✓	-	-	-				
	20	✓	✓	✓	✓				



# REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

First Named Inventor: <b>Larry Steven Eoff</b>	Docket Number: <b>087638-0891</b>	
Application Number: <b>14/366,219</b>	Art Unit: <b>3674</b>	Conf. Number: <b>3312</b>
Filing Date: <b>June 17, 2014</b>	Examiner: <b>Joseph A. Defazio</b>	
Title: <b>Acid Diversion Treatments in Injection Wells Using Permeability Modifiers</b>		

**This is a Request for Continued Examination (RCE) under 37 CFR 1.114 .**

1. **Submission required under 37 CFR 1.114.** Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with RCE will be entered in the order in which they were filed unless applicant instructs otherwise.
- a.  Previously submitted in response to final Office action submitted on June 21, 2016
    - i.  Consider the arguments in the Appeal Brief or Reply Brief submitted on \_\_\_\_\_
    - ii.  Other
  - b.  Enclosed
    - i.  Amendment/Reply
    - ii.  Affidavit(s)/Declaration(s)
    - iii.  Information Disclosure Statement (IDS)
    - iv.  Other
2. **Miscellaneous.**
- a.  Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of \_\_\_\_\_ months. (Not to exceed three months; fee under 37 CFR 1.17(i) required)
3. **Fees.** The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.
- a.  The Director is hereby authorized to charge the following fee, any under payments, or credit any over payments to Deposit Account No. 500417, Order Number 087638-0891
    - i.  RCE fee, under 1.17(e)(1) or (e)(2) for non-small entity.
    - ii.  Extension of time fee for \_\_\_\_\_ months at \$\_\_\_\_\_.
    - iii.  Other
  - b.  Payment by credit card (Form PTO-2038 enclosed)

## SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

I am the <input type="checkbox"/> applicant / inventor  <input type="checkbox"/> assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed <input checked="" type="checkbox"/> attorney or agent of record or acting under 37 CFR 1.34. Registration Number: <u>53,086</u>	Signature <u>/Iona N. Kaiser/</u>
	Printed Name <u>Iona N. Kaiser</u>
	Telephone Number <u>713-653-1724</u>
	Date <u>June 30, 2016</u>

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	14366219
<b>Filing Date:</b>	17-Jun-2014
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Filer:</b>	Iona Niven Kaiser
<b>Attorney Docket Number:</b>	087638-0891

Filed as Large Entity

### Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Miscellaneous:</b>				
Request for Continued Examination	1801	1	1200	1200
<b>Total in USD (\$)</b>				<b>1200</b>

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	26222902
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	087638-0891
<b>Receipt Date:</b>	30-JUN-2016
<b>Filing Date:</b>	17-JUN-2014
<b>Time Stamp:</b>	12:19:31
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$1200
RAM confirmation Number	063016INTEFSW00013253500417
Deposit Account	500417
Authorized User	Iona Kaiser

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

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**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	087638_0891_RCE.pdf	42422 42e447b8fa862e451f847f24def34b1e4806f46	no	1

**Warnings:**

This is not a USPTO supplied RCE SB30 form.

**Information:**

2	Fee Worksheet (SB06)	fee-info.pdf	30800 7806514eb7b21fabf24dc0ce8799a2e8c5a88c5d	no	2
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**Warnings:**

**Information:**

<b>Total Files Size (in bytes):</b>	73222
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**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.

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.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875	Application or Docket Number <b>14/366,219</b>	Filing Date <b>06/17/2014</b>	<input type="checkbox"/> To be Mailed
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ENTITY:  LARGE  SMALL  MICRO

**APPLICATION AS FILED – PART I**

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE <small>(37 CFR 1.16(a), (b), or (c))</small>	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE <small>(37 CFR 1.16(k), (l), or (m))</small>	N/A	N/A	N/A	
<input type="checkbox"/> EXAMINATION FEE <small>(37 CFR 1.16(o), (p), or (q))</small>	N/A	N/A	N/A	
TOTAL CLAIMS <small>(37 CFR 1.16(i))</small>	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS <small>(37 CFR 1.16(h))</small>	minus 3 =	*	X \$ =	
<input type="checkbox"/> APPLICATION SIZE FEE <small>(37 CFR 1.16(s))</small>	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 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).			
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT <small>(37 CFR 1.16(j))</small>				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

**APPLICATION AS AMENDED – PART II**

	(Column 1)	(Column 2)	(Column 3)	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
<b>AMENDMENT</b>	<b>06/30/2016</b>	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR			
	Total <small>(37 CFR 1.16(i))</small>	* 19	Minus	** 20	= 0	X \$80 = 0
	Independent <small>(37 CFR 1.16(h))</small>	* 2	Minus	***3	= 0	X \$420 = 0
	<input type="checkbox"/> Application Size Fee <small>(37 CFR 1.16(s))</small>					
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>						
					TOTAL ADD'L FEE	<b>0</b>

	(Column 1)	(Column 2)	(Column 3)	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
<b>AMENDMENT</b>		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR			
	Total <small>(37 CFR 1.16(i))</small>	*	Minus	**	=	X \$ =
	Independent <small>(37 CFR 1.16(h))</small>	*	Minus	***	=	X \$ =
	<input type="checkbox"/> Application Size Fee <small>(37 CFR 1.16(s))</small>					
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>						
					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.

LIE  
 ALA HUNTER

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.*



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/366,219	06/17/2014	Larry Steven Eoff	087638-0891	3312
99633	7590	06/28/2016	EXAMINER	
McDermott Will & Emery LLP The McDermott Building 500 North Capitol Street, N.W. Washington, DC 20001			VARMA, ASHISH K	
			ART UNIT	PAPER NUMBER
			3674	
			NOTIFICATION DATE	DELIVERY MODE
			06/28/2016	ELECTRONIC

**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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com  
ikaiser@mwe.com

<b>Advisory Action Before the Filing of an Appeal Brief</b>	<b>Application No.</b> 14/366,219	<b>Applicant(s)</b> EOFF ET AL.	
	<b>Examiner</b> ASHISH VARMA	<b>Art Unit</b> 3674	<b>AIA (First Inventor to File) Status</b> Yes

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

THE REPLY FILED 21 June 2016 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

**NO NOTICE OF APPEAL FILED**

1.  The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

- a)  The period for reply expires 3 months from the mailing date of the final rejection.
- b)  The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
- c)  A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires \_\_\_\_\_ months from the mailing date of the prior Advisory Action or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

*Examiner Note:* If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**NOTICE OF APPEAL**

2.  The Notice of Appeal was filed on \_\_\_\_\_. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

**AMENDMENTS**

3.  The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
- a)  They raise new issues that would require further consideration and/or search (see NOTE below);
  - b)  They raise the issue of new matter (see NOTE below);
  - c)  They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
  - d)  They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: See Continuation Sheet. (See 37 CFR 1.116 and 41.33(a)).

4.  The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5.  Applicant's reply has overcome the following rejection(s): \_\_\_\_\_.

6.  Newly proposed or amended claim(s) \_\_\_\_\_ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7.  For purposes of appeal, the proposed amendment(s): (a)  will not be entered, or (b)  will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

**AFFIDAVIT OR OTHER EVIDENCE**

8.  A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.

9.  The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

10.  The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

11.  The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

**REQUEST FOR RECONSIDERATION/OTHER**

12.  The request for reconsideration has been considered but does NOT place the application in condition for allowance because: See Continuation Sheet.

13.  Note the attached Information *Disclosure Statement(s)*. (PTO/SB/08) Paper No(s). \_\_\_\_\_

14.  Other: \_\_\_\_\_.

**STATUS OF CLAIMS**

15. The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: \_\_\_\_\_  
 Claim(s) objected to: \_\_\_\_\_  
 Claim(s) rejected: 1-8,10-18 and 20.  
 Claim(s) withdrawn from consideration: \_\_\_\_\_

/Angela M DiTrani/ Primary Examiner, Art Unit 3674	/ASHISH VARMA/ Examiner, Art Unit 3674
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Continuation of 3. NOTE: The proposed amendments require further consideration and/or search.

Continuation of 12. does NOT place the application in condition for allowance because: The proposed amendments require further consideration and/or search.

<b>IN THE UNITED STATES PATENT AND TRADEMARK OFFICE RESPONSE TO OFFICE ACTION</b>		
First Named Inventor: <b>Larry Steven Eoff</b>	Docket Number: <b>2013-IP-072509 U1 US</b>	
Application Number: <b>14/366,219</b>	Art Unit: <b>3674</b>	Conf. Number: <b>3312</b>
Filing Date: <b>June 17, 2014</b>	Examiner: <b>Joseph A. Defazio</b>	
Title: <b>Acid Diversion Treatments in Injection Wells Using Permeability Modifiers</b>		

**RESPONSE TO FINAL OFFICE ACTION, MAILED APRIL 21, 2016**

Dear Honorable Commissioner:

In response to the Final Office Action mailed on April 11, 2016 (the "Office Action"), Applicant submits this response and respectfully requests reconsideration of the Examiner's rejections. Because this response has been timely filed, Applicant respectfully requests that the Examiner issue an advisory action if the claims are not found to be allowable in light of the remarks contained herein. Applicant submits the following:

**Amendments to the Claims**, which begin on page 2 of this paper; and  
**Remarks/Arguments**, which begin on page 6 of this paper.

<b>IN THE UNITED STATES PATENT AND TRADEMARK OFFICE RESPONSE TO OFFICE ACTION</b>		
First Named Inventor: <b>Larry Steven Eoff</b>	Docket Number: <b>2013-IP-072509 U1 US</b>	
Application Number: <b>14/366,219</b>	Art Unit: <b>3674</b>	Conf. Number: <b>3312</b>
Filing Date: <b>June 17, 2014</b>	Examiner: <b>Joseph A. Defazio</b>	
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**Amendments to the Claims**, which begin on page 2 of this paper; and  
**Remarks/Arguments**, which begin on page 6 of this paper.

**AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions of claims in the application:

1. (Currently Amended) A method comprising:
  - (a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator,  
wherein the permeability modifier deactivator is present in an amount in the range of from ~~30%~~40% to about 200% by weight of the relative permeability modifier;
  - (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,  
wherein the first treatment zone comprises formation damage;
  - (c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;
  - (d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;
  - (e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;
  - (f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability; and
  - (g) removing the treatment fluid from the injection well.
2. (Original) The method of claim 1, wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.
3. (Original) The method of claim 1, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

4. (Original) The method of claim 1, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.

5. (Original) The method of claim 1, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

6. (Original) The method of claim 1, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

7. (Original) The method of claim 1, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

8. (Original) The method of claim 1, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

9. (Cancelled)

10. (Original) The method of claim 1, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

11. (Currently Amended) A method comprising:

(a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier,

wherein the permeability modifier deactivator is present in an amount in the range of from ~~30%~~about 0.001% to about 200% by weight of the relative permeability modifier;

(b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;

(c) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,

wherein the first treatment zone comprises formation damage;

(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone;

(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;

(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;

(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;

(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability,

wherein the permeability modifier deactivator blocks hydrophobic functional groups present on the permeability modifier from forming intermolecular or intramolecular associations; and

(i) removing the treatment fluid from the injection well.

12. (Original) The method of claim 11, wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.

13. (Original) The method of claim 11, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

14. (Currently Amended) The method of claim 11, wherein the permeability modifier deactivator deactivates the permeability modifier by an additional mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; ~~blocking~~

~~hydrophobic functional groups present on the permeability modifier; and any combination thereof.~~

15. (Original) The method of claim 11, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

16. (Original) The method of claim 11, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

17. (Original) The method of claim 11, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

18. (Original) The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

19. (Cancelled)

20. (Original) The method of claim 11, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

**REMARKS / ARGUMENTS**

**I. General Remarks and Disposition of the Claims**

Please consider the application in view of the following remarks. Applicant thanks the Examiner for careful consideration of this application, including the references that Applicant has submitted in this case.

At the time of the Office Action, claims 1-8, 10-18, and 20 were pending in this application, all claims were rejected in the Office Action.

In this response, Applicant has amended claims 1, 11, and 14. Applicant submits that these proposed amendments do not raise new issues that would require further consideration and/or search, do not raise the issue of new matter, and put the application in better form. Therefore, Applicant respectfully requests that these amendments be entered.

**II. Remarks Regarding Rejections under 35 U.S.C. § 103(a)**

To support an obviousness rejection, MPEP § 2143.03 requires that “all words of a claim to be considered” and MPEP §2141.02 requires consideration of the “[claimed] invention and prior art as a whole.” Further, a proper, post-*KSR* obviousness determination requires the Examiner make a “searching comparison of the claimed invention – including all its limitations – with the teaching of the prior art.” (*CFMT v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003)). The Supreme Court in *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 127 S.Ct. 1727, 1731 (2007) noted that the analysis supporting a rejection under 35 U.S.C. § 103 should be made explicit. Further, the Federal Circuit has stated that “rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” (*In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)). In sum, it is well-settled law that an obviousness rejection requires a teaching or suggestion of all of the claim elements.



**A. Rejections over *Watanabe* in view of *Eoff***

Claims 1-3, 5-8, 10-13, 15-18, and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 4,487,265 (hereinafter "*Watanabe*") in view of U.S. Patent Application Publication 2005/0178549 (hereinafter "*Eoff*"). Applicant respectfully disagrees.

**1. Independent Claim 1**

In particular, the combination of *Watanabe* and *Eoff* fails to teach or suggest "wherein the permeability modifier deactivator is present in an amount in the range of from 40% to about 200% by weight of the relative permeability modifier," as recited by independent claim 1. Support for this element can at least be found at paragraph [0038]. Indeed, in *Ex Parte Moraes Barros* (BPAI 2010-006399), the Applicant claimed a chemical composition that recited a range of values for a chemical. The pending specification only disclosed a larger range that encompassed the smaller, claimed range that was recited, but the smaller range itself was not set out in the specification. On appeal, the BPAI reasoned:

"The original disclosure of a broader range may support the recitation of a narrower range, even though the narrower range had not been explicitly disclosed. *In re Wertheim*, 541 F.2d 257, 262-63 (CCPA 1976). ... We note that a range is a shorthand format for presenting information, where the range is understood to encompass each discrete point."

In light of the above, the BPAI agreed that the smaller range was adequately disclosed in the specification. Thus, the specification need not disclose each and every permutation of a range of values when writing a chemical application. Rather, the presentation of a broad a range of values is sufficient.

In fact, this reasoning is consistent with the guidance in MPEP 2163.05, which states "each claim limitation must be expressly, implicitly, or inherently supported in the originally filed disclosure." As recognized by the Board, the citation of a range inherently discloses all of the endpoints along the range. Indeed, the example cited in MPEP 2163.05, citing *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976), is also consistent with the finding that the claims amendments are supported. MPEP 2163.05 describes the *In re Wertheim* holding as follows:

In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976), the ranges described in the original specification included a range of "25%- 60%" and specific examples of "36%" and "50%." A corresponding new claim limitation to "at least 35%" did not meet the description requirement because the phrase "at least" had no upper limit and caused the claim to read literally on embodiments outside the "25% to 60%" range, however a limitation to "between 35% and 60%" did meet the description requirement.

Thus, even the example in the MPEP supports that fact that points that fall within the range set out in the initial disclosure are supported.

The Office Action admits that "Watanabe does not disclose...wherein the permeability modifier deactivator is present in an amount in the range of from 30% to about 200% by weight of the relative permeability modifier[.]" (Office Action at pg. 4). The Office Action then relies on *Eoff*, first stating that "Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well." (*Id.*) **This is patently not true.** The word "injection well" does not appear anywhere in *Eoff*; indeed the single word "injection" does not appear anywhere in *Eoff*. The Office Action points to the Abstract of *Eoff*, which provides **absolutely no reference to an injection well**:

Methods of temporarily reducing the permeability of one or more selected sections of a subterranean formation penetrated by a horizontal well bore and the flow of water or water and hydrocarbons or hydrocarbons therefrom are provided. The methods comprise the steps of preparing or providing an aqueous treating fluid comprising water and a water-soluble formation permeability reducing agent, introducing the aqueous treating fluid into one or more selected sections and when required, contacting the one or more selected sections with an aqueous treating fluid comprising water and a formation permeability restoring chemical.

*Eoff* does not disclose, teach, or suggest any treatment for injection wells. Instead, *Eoff* is directed to the control of "production rates from different segments of horizontal wells or from different horizontal well bores" to solve the "problem that often occurs in the production of hydrocarbons from horizontal well bores in producing zones." (*Eoff* at [0005]). A producing horizontal wellbore cannot be conflated with an injection well, to which the Instant Application is directed. A "producing well" is a "well producing fluids (gas, oil or water)." (Oilfield Glossary,

“Producing Well,”  
[http://www.glossary.oilfield.slb.com/Terms/p/producing\\_well.aspx](http://www.glossary.oilfield.slb.com/Terms/p/producing_well.aspx)). An “injection well” is a “well in which fluids are injected rather than produced.” (Oilfield Glossary, “Injection Well,”  
[http://www.glossary.oilfield.slb.com/Terms/i/injection\\_well.aspx](http://www.glossary.oilfield.slb.com/Terms/i/injection_well.aspx)). Indeed, the Instant Application makes this point: “[a]n injection well is a wellbore in a subterranean formation used to pump fluids into a producing reservoir (e.g., a hydrocarbon producing reservoir).” (Instant Application at [0002]). That is, **a producing wellbore (horizontal or otherwise) is wholly different that an injection well**, and the distinction is well known to one of skill in the art.

The Office Action then further relies on *Eoff*, stating:

With regards to claim 1, the reference *Eoff* discloses a permeability modifier deactivator concentration from about 1% to about 25% by weight... Although silent to wherein the permeability modifier deactivator has a presence in the range of from 30% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because it has been held that “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

(Office Action at pg. 5). Applicant respectfully disagrees. First, *Eoff* does not disclose the instantly claimed range of permeability modifier deactivator, as admitted by the Office Action above.

Second, Applicant respectfully disagrees with Office Action’s unevicenced, conclusory statement and submits that citation of *In re Aller* is inappropriate. *In re Aller* established two conditions for a conclusion of obviousness:(1) the general conditions of the claim must be disclosed in the prior art; and (2) discovery of the optimum or workable range must be a matter of routine experimentation for a person of ordinary skill in the art. (*In re Aller*, 220 F.2d at 456). Here, the Office Action inadequately addresses the second condition of *In re Aller* by failing to explain how optimization using routine skill would have resulted in the claimed range of permeability modifier deactivator in view of *Eoff’s* much lower

concentrations. Indeed, *Eoff's* disclosure of a producing well and not an injection well makes such optimization using routine skill impossible. **The Instant Application explains clearly that producing wells and injection wells react differently:**

Permeability modifiers have been effective acid diverters for hydrocarbon producing wells. They are capable of altering the relative permeability of a portion of a wellbore that they come into contact with, resulting in blockage of water production and/or diversion of aqueous fluids away from that portion of the wellbore. As such, they are particularly useful in hydrocarbon producing wells where they have no effect on hydrocarbon permeability and where there is no concern that the effects of the permeability modifier (e.g., reduction in water permeability) may remain in effect for a period longer than desired or permanently. Injection wells, on the other hand, typically involve injection of water rather than hydrocarbons and minimal pressure during fluid injection is desirable. Thus, the use of permeability modifiers, although effective acid diverters, in injection wells may result in undesirable or irreversible reduction in water permeability of the wellbore.

It is therefore desirable to provide an acid diversion treatment for use in an injection well comprising a permeability modifier, whose effects can be reversed after the treatment is complete.

(Instant Application at [0004]-[0005]). The concentration of permeability modifier deactivator are thus necessarily different between the Instant Application and *Eoff* because the type well being treated is completely different. Applicant asserts that *Eoff* provides no direction or guidance that would lead one skilled in the art to arrive at the claimed concentration of permeability modifier deactivator through an optimization exercise. As such, Applicant submits that higher concentrations of permeability modifier deactivator as currently claimed are not rendered obvious over *Eoff*.

Lastly, the instant concentrations of permeability modifier deactivator and is neither overlapping, nor close to *Eoff's* concentration of about 1% to about 25% of permeability restoring chemical, and thus no prima facie evidence of obviousness exists. The Office Action states that "Eoff provides a permeability modifier deactivator concentration from about 1% to about 25% by weight... The term 'about' is open for interpretation and could very well provide a permeability modifier deactivator concentration up to 30% as instantly claimed." (Office Action at pg.

19). As instantly claimed, the permeability modifier deactivator concentration is "40% to about 200%," and 40% is 60% greater than the upper limit of "about 25%" allegedly disclosed in *Eoff*. The "the 'about'...is a descriptive term commonly used in patent claims to avoid a strict numerical boundary to the specified parameter." *Ecolab, Inc. v. Environchem, Inc.*, 264 F.3d 1358, 1367 (Fed. Cir. 2001). The term "about" cannot be used to extrapolate to an amount that is 60% greater than an amount disclosed in a cited reference.

Indeed, in *In re Patel*, the Federal Circuit found that without some teaching in the art that there was some basis for a person of ordinary skill to believe a material having a weight percentage of 26% would have "the same or similar properties" as one having the 25%, no prima facie case of obviousness existed. No. 2013-1301 (Fed. Cir. 2014). The Court stated:

Depending on the technology, even small differences in formulations can be meaningful. Where differences clearly exist and there is no evidence that they are either not meaningful or one of skill in the art would know to discard the limits set by the prior art, proximity alone is not enough to establish a prima facie case of obviousness. We find that the PTAB erred in finding that the examiner established a prima facie case of obviousness solely because the claimed range and the prior art range approach one another.

**No such teaching evidence exists.** As previously stated, **the concentration of permeability modifier deactivator are necessarily different between the Instant Application and *Eoff* because the type well being treated is completely different.**

To the extent the Examiner is relying upon "common knowledge" or "well known" principles to establish the rejection, Applicants request that a reference be provided in support of the position that a concentration of alleged permeability modifier deactivator for use in a production well can in any way be used to extrapolate the concentration of a permeability modifier deactivator for use in an injection well, pursuant to MPEP § 2144.03. Furthermore, to the extent that the Examiner maintains any rejection based on an "Official Notice" or other information within the Examiner's personal knowledge, Applicants respectfully request that the Examiner cite a reference as documentary evidence in support of this position or provide an affidavit in accordance with MPEP § 2144.03 and 37 C.F.R. 1.104(d)(2).

Accordingly, the combination of *Watanabe* and *Eoff* fails to establish that every limitation of independent claims 1 and 11 were known in the prior art. Therefore, Applicant respectfully asserts that independent claims 1 and 11 and their dependent claims are not rendered obvious by the combination of *Watanabe* and *Eoff*. Accordingly, Applicant respectfully requests withdrawal of this rejection.

## **2. Independent Claims 11**

Applicant maintains all above arguments with reference to independent claim 11 and further asserts that the combination of *Watanabe* and *Eoff* further fails to teach or suggest the element of “wherein the permeability modifier deactivator blocks hydrophobic functional groups present on the permeability modifier from forming intermolecular or intramolecular associations,” as recited by independent claim 11. Indeed, the Office Action admits that “Watanabe in view of Eoff does not disclose wherein the permeability modifier deactivates the permeability modifier by a mechanism...[of] blocking hydrophobic functional groups present on the permeability modifier.” (Office Action at pg. 17). The Office Action turns to *Card* for its alleged teaching that “EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations.” (Office Action at pg. 17). However, none of the cited references disclose, teach, or suggest “wherein the permeability modifier deactivator blocks hydrophobic functional groups present on the permeability modifier from forming intermolecular or intramolecular associations,” as recited by independent claim 11.

Therefore, Applicant respectfully asserts that independent claim 11 and its dependent claims are not rendered obvious by the combination of *Watanabe* and *Eoff*. Accordingly, Applicant respectfully requests withdrawal of this rejection.

### **B. Rejections over *Watanabe*, *Eoff*, and *Card***

Claims 4 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Watanabe* in view of *Eoff*, as further evidenced by U.S. Patent 5,979,557 (hereinafter “*Card*”). Applicant respectfully disagrees.

For at least the reasons discussed in Section II.A above, the combination of *Watanabe*, *Eoff*, and/or *Card* fails to teach or suggest each and every limitation of

independent claims 1 and 11. Accordingly, the combination of *Watanabe*, *Eoff*, and *Card* fails to establish that every limitation of independent claims 1 and 11 and their dependent claims were known in the prior art. Therefore, Applicant respectfully asserts that independent claims 1 and 11 and their dependent claims are not rendered obvious by the combination of *Watanabe*, *Eoff*, and *Card*. Accordingly, Applicant respectfully requests withdrawal of this rejection.

### **III. Request for Evidentiary Support**

Once again, should any of the above asserted rejections be maintained, Applicant respectfully requests appropriate evidentiary support. Additionally, if the Examiner is relying upon “common knowledge” or “well known” principles to establish the rejection, Applicant requests that a reference be provided in support of this position pursuant to MPEP § 2144.03. Furthermore, to the extent that the Examiner maintains any rejection based on an “Official Notice” or other information within the Examiner’s personal knowledge, Applicant respectfully requests that the Examiner cite a reference as documentary evidence in support of this position or provide an affidavit in accordance with MPEP § 2144.03 and 37 C.F.R. 1.104(d)(2).

### **IV. No Waiver**

All of Applicant’s arguments and amendments are without prejudice or disclaimer. Applicant has merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicant reserves the right to discuss these additional distinctions in a later Response or on Appeal, if appropriate. By not responding to additional statements made by the Examiner, Applicant does not acquiesce to the Examiner’s additional statements, such as, for example, any statements relating to what would be obvious to a person of ordinary skill in the art.

**SUMMARY**

In light of the above, Applicant respectfully requests reconsideration and withdrawal of the outstanding rejections. Applicant further submits that the application is now in condition for allowance. Should the Examiner have any questions, comments or suggestions, the Examiner is invited to contact the attorney of record by telephone, facsimile, or electronic mail.

Applicant believes that no fees are due with this response. Should the Commissioner deem that any fees are due, including any fees for extensions of time, Applicant requests that the Commissioner accept this as a Petition Therefore, and direct that any additional fees be charged to McDermott Will & Emery's Deposit Account No. 500417, Order Number 087638-0891.

Respectfully submitted,

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Date: June 21, 2016  
DMH



## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	26129106
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser/Kaylen Gonzalez
<b>Filer Authorized By:</b>	Iona Niven Kaiser
<b>Attorney Docket Number:</b>	087638-0891
<b>Receipt Date:</b>	21-JUN-2016
<b>Filing Date:</b>	17-JUN-2014
<b>Time Stamp:</b>	15:24:22
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		087638-0891_RFOA.pdf	145165 2092f1f8cd95aaa929dd8f9921966907e65d a8cc	yes	14

<b>Multipart Description/PDF files in .zip description</b>			
<b>Document Description</b>		<b>Start</b>	<b>End</b>
Response After Final Action		1	1
Claims		2	5
Applicant Arguments/Remarks Made in an Amendment		6	14

**Warnings:**

**Information:**

<b>Total Files Size (in bytes):</b>	145165
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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.**

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<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875	Application or Docket Number <b>14/366,219</b>	Filing Date <b>06/17/2014</b>	<input type="checkbox"/> To be Mailed
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ENTITY:  LARGE  SMALL  MICRO

**APPLICATION AS FILED – PART I**

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =	
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 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).			
<input type="checkbox"/> 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	

**APPLICATION AS AMENDED – PART II**

	(Column 1)	(Column 2)	(Column 3)	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
<b>AMENDMENT</b>	<b>06/21/2016</b>	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR			
	Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0	X \$80 = 0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X \$420 = 0
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))					
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	<b>0</b>

	(Column 1)	(Column 2)	(Column 3)	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
<b>AMENDMENT</b>		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR			
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))					
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					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.

LIE  
 /BURNELL L. ROSS/

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.**  
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Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
14/366,219 06/17/2014 Larry Steven Eoff 2013-IP-072509 U1 US 3312

99633 7590 04/21/2016
McDermott Will & Emery LLP
The McDermott Building
500 North Capitol Street, N.W.
Washington, DC 20001

Table with 1 column: EXAMINER

VARMA, ASHISH K

Table with 2 columns: ART UNIT, PAPER NUMBER

3674

Table with 2 columns: NOTIFICATION DATE, DELIVERY MODE

04/21/2016

ELECTRONIC

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

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## DETAILED ACTION

### *Notice of Pre-AIA or AIA Status*

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### *Applicant's Response*

1. In the response date 04/04/16, the Applicant amended claims 1 and 11 and argued against the rejections in the non-final rejection dated 03/01/16.

### *Claim Rejections - 35 USC § 103*

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5-8, 10-13 and 15-18 and 20 are rejected under 35 U.S.C. 103 as being unpatentable over US 4,487,265 (“Watanabe”) in view of US 2005/0178549 (“Eoff”).

### *Claim 1:*

Regarding Claim 1, Watanabe discloses:

*A method comprising:*

*(a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator; (Watanabe: Abstract (aqueous solution of an acid, glycol ether, water-soluble nitrogen containing polymer); Col. 3, lines 44-48 (treatment fluid is a 25% to 95% by volume aqueous solution of hydrochloric or hydrofluoric acid); Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups); Col. 5, lines 1-22 (permeability modifier deactivator glycol ethers, including preferred embodiment ethylene glycol monobutyl ether (“EGMBE”); Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents))*

*(b) providing an injection well in a subterranean formation (Watanabe: Col. 8, lines 2-5) . . . , wherein the first treatment zone comprises formation damage; (Watanabe: Col. 1, lines 22-32 (plugging damage))*

*(c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone; (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 11 (producing interval), 18-23 (preflush aqueous solution of hydrochloric acid, EGMBE and polyacrylamide), 26-33 (aqueous solution of hydrochloric/hydrofluoric acid, EGMBE and polyacrylamide))*

*(d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage; (Watanabe: Col. 9, lines 23-25)*

. . . ;

*and (g) removing the treatment fluid from the injection well. (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 34-37 (afterflush)).*

Watanabe does not disclose:

*(a) wherein the permeability modifier deactivator is present in an amount in the range of from 30% to about 200% by weight of the relative permeability modifier;*

*(b) a first treatment zone comprising a first aqueous formation permeability, . . . ;*

*(e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;*

*(f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability;*

However, Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well (Eoff: Abstract) where a treatment zone with an initial aqueous permeability (Eoff: [0041], [0042] Table I) is reacted with a permeability modifier (Eoff: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (Eoff: [0042] Table I).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by Watanabe by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone with a specific



Art Unit: 3674

concentration of the permeability modifier deactivator, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

With regards to claim 1, the reference Eoff discloses a permeability modifier deactivator concentration from about 1% to about 25% by weight (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20; paragraph [0039]), causing the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I). Although silent to wherein the permeability modifier deactivator has a presence in the range of from 30% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because it has been held “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

*Claim 2:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.* (Eoff ‘759: [0009] (repeat the treatment at selected zones in the well)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to repeat, as taught by Eoff, the treatment

Art Unit: 3674

steps disclosed by Watanabe in view of Eoff '759, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

*Claim 3:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.* (Eoff: [0042] Table I (aqueous permeability decreases to 85% less than its original value)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to decrease the aqueous formation permeability of the zone, disclosed by Watanabe in view of Eoff, to 85% less than its pretreatment value, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of 50%-90% less than the original value of the formation aqueous permeability overlaps the value of 85% disclosed by Eoff.

*Claim 5:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.* (Watanabe: Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups)).

*Claim 6:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.* (Eoff: [0024] (0.01% - 10% by weight)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier, disclosed by Watanabe in view of Eoff, present in the amount from 0.01% - 10% by weight of the treatment fluid, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.05% to about 5% by weight of permeability modifier present in the treatment fluid overlaps the range of 0.01% - 10% disclosed by Eoff.

Art Unit: 3674

*Claim 7:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.* (Watanabe: Col. 5, lines 32-34 (aqueous solution comprises 5-28% by weight hydrogen chloride); Col. 3, lines 44-48 (water 25-95% by volume, so EGMBE is 5-75% by volume, taking water with density of 1 g/L and EGMBE with density of 0.902 g/L, gives water 27-95.5% by weight, and hydrogen chloride in the range of 1.35 – 26.74 % by weight  $((0.05*27)\% - ((0.28*95.5)\%))$ ).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.5% to about 8% by weight of acid present in the treatment fluid overlaps the range of 1.35% - 26.74% disclosed by Watanabe.

*Claim 8:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.* (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

*Claim 10:*

Art Unit: 3674

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.* (Eoff: [0041], [0042] Table I (restored to 98% of its original value, which is a restoration of 83%  $((100-2) - (100-85))\%$ )).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the aqueous formation permeability of the treatment zone, disclosed by Watanabe in view of Eoff, restored to 98% of its original value, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of restoration to at least 20% of the treatment zone's original aqueous formation permeability overlaps the value of 98% disclosed by Eoff.

*Claim 11:*

Regarding Claim 11, Watanabe discloses:

*A method comprising:*

*(a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier;* (Watanabe: Abstract (aqueous solution of an acid, glycol ether, water-soluble nitrogen containing polymer); Col. 3, lines 44-48 (treatment fluid is a 25% to 95% by

Art Unit: 3674

volume aqueous solution of hydrochloric or hydrofluoric acid); Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups))

...;

*(c) providing an injection well in a subterranean formation having a first treatment zone (Watanabe: Col. 8, lines 2-5) . . . , wherein the first treatment zone comprises formation damage; (Watanabe: Col. 1, lines 22-32 (plugging damage))*

*(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone; (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 11 (producing interval), 18-23 (preflush aqueous solution of hydrochloric acid and polyacrylamide), 26-33 (aqueous solution of hydrochloric/hydrofluoric acid and polyacrylamide))*

*(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage; (Watanabe: Col. 9, lines 23-25)*

...;

*and (i) removing the treatment fluid from the injection well. (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 34-37 (afterflush)).*

Watanabe does not disclose:

*(a) wherein the permeability modifier deactivator is present in an amount in the range of from 30% to about 200% by weight of the relative permeability modifier;*

*(b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;*

Art Unit: 3674

*(c) . . . a first treatment zone comprising a first aqueous formation permeability . . . ;*

*(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;*

*(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;*

*(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability;*

However, Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well (Eoff: Abstract) where a treatment zone with an initial aqueous permeability (Eoff: [0041], [0042] Table I) is reacted with a permeability modifier (Eoff: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (Eoff: [0042] Table I).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by Watanabe by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone with the permeability modifier deactivator, with the permeability modifier deactivator in a aqueous treatment fluid separate from the fluid with the permeability modifier, as taught by Eoff, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]) and restoring selected

Art Unit: 3674

treated sections with second separate aqueous treatment fluid containing permeability modifier deactivator (Eoff: [0006] and [0039]).

With regards to claim 11, the reference Eoff discloses a permeability modifier deactivator concentration from about 1% to about 25% by weight (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20; paragraph [0039]), causing the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I). Although silent to wherein the permeability modifier deactivator has a presence in the range of from 30% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because it has been held “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

*Claim 12:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.* (Eoff ‘759: [0009] (repeat the treatment at selected zones in the well)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to repeat, as taught by Eoff, the treatment steps disclosed by Watanabe in view of Eoff ‘759, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).



*Claim 13:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.* (Eoff: [0042] Table I (aqueous permeability decreases to 85% less than its original value)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to decrease the aqueous formation permeability of the zone, disclosed by Watanabe in view of Eoff, to 85% less than its pretreatment value, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of 50%-90% less than the original value of the formation aqueous permeability overlaps the value of 85% disclosed by Eoff.

*Claim 15:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.* (Watanabe: Col. 6, lines 13-15,

Art Unit: 3674

22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups)).

*Claim 16:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.* (Eoff: [0024] (0.01% - 10% by weight)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier, disclosed by Watanabe in view of Eoff, present in the amount from 0.01% - 10% by weight of the treatment fluid, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.05% to about 5% by weight of permeability modifier present in the treatment fluid overlaps the range of 0.01% - 10% disclosed by Eoff.

*Claim 17:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Art Unit: 3674

Watanabe further discloses *wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.* (Watanabe: Col. 5, lines 32-34 (aqueous solution comprises 5-28% by weight hydrogen chloride); Col. 3, lines 44-48 (water 25-95% by volume, so EGMBE is 5-75% by volume, taking water with density of 1 g/L and EGMBE with density of 0.902 g/L, gives water 27-95.5% by weight, and hydrogen chloride in the range of 1.35 – 26.74 % by weight  $((0.05*27)\% - ((0.28*95.5)\%))$ ).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.5% to about 8% by weight of acid present in the treatment fluid overlaps the range of 1.35% - 26.74% disclosed by Watanabe.

*Claim 18:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *w18. The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.* (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

*Claim 20:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.* (Eoff: [0041], [0042] Table I (restored to 98% of its original value, which is a restoration of 83%  $((100-2) - (100-85)) \%$ )).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the aqueous formation permeability of the treatment zone, disclosed by Watanabe in view of Eoff, restored to 98% of its original value, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of restoration to at least 20% of the treatment zone's original aqueous formation permeability overlaps the value of 83% disclosed by Eoff.

Claims 4 and 14 are rejected under 35 U.S.C. 103 as being unpatentable over US 4,487,265 (“Watanabe”) in view of US 2005/0178549 (“Eoff”), as further evidenced by US 5,979,557 (“Card”).

*Claim 4:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Art Unit: 3674

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

*Claim 14:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

*Response to Arguments*

Applicant's arguments filed 04/04/16 have been fully considered but are not persuasive.

The applicant argues wherein the combination of Watanabe and Eoff fails to teach or suggest "wherein the permeability modifier deactivator is present in an amount in the range of from 30% to about 200% by weight of the relative permeability modifier" as recited by independent claims 1 and 11.

The examiner respectfully disagrees.

The examiner brought in reference Eoff to teach a permeability modifier deactivator concentration from about 1% to about 25% by weight (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20; paragraph [0039]), causing the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I).

In the previous claim amendments, the applicant claimed "wherein the permeability modifier deactivator is present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier," upon which the examiner used **optimization** to reject this broad limitation by stating "Although silent to wherein the permeability modifier deactivator has a presence in the range of from about 10% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been **obvious to one having ordinary skill in the art before the effective filing date the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because** it has been held "[W]here the general conditions of a claim are disclosed in the prior art, it is not

Art Unit: 3674

inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

The applicant's current reply consists of a more narrow claim limitation “wherein the permeability modifier deactivator is present in an amount in the range of from 30% to about 200% by weight of the relative permeability modifier,” simply to try and overcome the previous rejection of art. However, because the examiner had previously rejected this claim limitation using optimization stating it would have been obvious for one of ordinary skill in the art before the effective filing date of the invention under routine experimentation to include a permeability modifier deactivator at a concentration in the range previously disclosed, the reference still covers the concentration range and the rejection stands as previously set forth.

Furthermore, the examiner would like to point out that reference Eoff provides a permeability modifier deactivator concentration from **about 1% to about 25%** by weight (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20; paragraph [0039]). The term “about” is open for interpretation and could very well provide a permeability modifier deactivator concentration up to 30% as instantly claimed.

Therefore, in light of the arguments present above, the rejection stands as previously set forth.

### *Conclusion*

2. **THIS ACTION IS MADE FINAL.** 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**

Art Unit: 3674

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 mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ASHISH VARMA whose telephone number is (571)272-9565. The examiner can normally be reached on Monday-Friday 9-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doug Hutton can be reached on 571-272-4137. 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.

/Angela M DiTrani/  
Primary Examiner, Art Unit 3674

/ASHISH VARMA/



Application/Control Number: 14/366,219

Page 21

Art Unit: 3674

Examiner, Art Unit 3674

<b>Notice of References Cited</b>	Application/Control No. 14/366,219	Applicant(s)/Patent Under Reexamination EOFF ET AL.	
	Examiner ASHISH VARMA	Art Unit 3674	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A US-4,487,265 A	12-1984	Watanabe; David J.	C09K8/60	166/307
*	B US-5,979,557 A	11-1999	Card; Roger J.	C09K8/68	166/281
*	C US-2005/0178549 A1	08-2005	Eoff, Larry S.	C09K8/508	166/295
	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	CPC Classification
	N				
	O				
	P				
	Q				
	R				
	S				
	T				

**NON-PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	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.

<b>Search Notes</b>  	<b>Application/Control No.</b>  14366219	<b>Applicant(s)/Patent Under Reexamination</b>  EOFF ET AL.
	<b>Examiner</b>  JOSEPH DEFAZIO	<b>Art Unit</b>  3674

<b>CPC- SEARCHED</b>		
<b>Symbol</b>	<b>Date</b>	<b>Examiner</b>
E21B 33/13; E21B 43/295; C09K 8/68; E21B 43/00; E21B 43/25; E21B 43/16; E21B 43/27; C09K 8/60; E21B 29/10; E21B 33/138; E21B 43/162; C09K 8/74	7/30/2015	JD
E21B33/13	02/17/16	AV
E21B43/295	02/17/16	AV
C09K8/68	02/17/16	AV
E21B43/00	02/17/16	AV
E21B43/25	02/17/16	AV

<b>CPC COMBINATION SETS - SEARCHED</b>		
<b>Symbol</b>	<b>Date</b>	<b>Examiner</b>

<b>US CLASSIFICATION SEARCHED</b>			
<b>Class</b>	<b>Subclass</b>	<b>Date</b>	<b>Examiner</b>
166	300	7/30/2015	JD
166	300	02/17/16	AV

<b>SEARCH NOTES</b>		
<b>Search Notes</b>	<b>Date</b>	<b>Examiner</b>
Consult with A. DiTrani	7/27/2015	JD
PALM Inventor Name Search	7/28/2015	JD
EAST Inventor Name Search	7/28/2015	JD
EAST Assignee/Applicant/Assignee as Inventor Name Search	7/30/2015	JD
EAST Keyword Search	7/28/2015	JD
Google Patent/NPL Name Search	7/29/2015	JD
Consulted with Angela DiTrani (Primary Examiner)	02/17/16	AV
Forward/Backward Citation Search	02/17/16	AV
Text Search	02/17/16	AV
Searched EAST (see updated search history)	02/21/16	AV

/ASHISH VARMA/ Examiner.Art Unit 3674	
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**SEARCH NOTES**

<b>Search Notes</b>	<b>Date</b>	<b>Examiner</b>
Consulted with Angela DiTrani (Primary Examiner)	04/14/16	AV
Searched EAST (see updated search history)	04/16/16	AV

**INTERFERENCE SEARCH**

<b>US Class/ CPC Symbol</b>	<b>US Subclass / CPC Group</b>	<b>Date</b>	<b>Examiner</b>

/ASHISH VARMA/  
Examiner.Art Unit 3674

## EAST Search History

## EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
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S1	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106"   "20120168166"   "20120264885"   "5122549"   "6516885"   "7114568"   "20050178549"   "4982793"   "7182136"   "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292"   "5979557"   "7117942"   "7563750").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/17 13:34
S2	248230	(subterranean oil\$1well\$1 oil\$1field\$1 down\$1hole\$1 down\$1field\$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 10:56
S3	866	(permeability WITH (modifier\$1 deactivator\$1)) and S2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:13
S4	348	(acid\$1 WITH permeabilit\$4) and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:14
S5	249	(treat\$4 WITH (permeabilit\$4)) and S4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2016/02/18 11:16

			DERWENT; IBM_TDB			
S6	228	(polymer\$1 (hydrophobic\$4 WITH polymer\$1)) and S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:17
S7	216	(surfactant\$1 (mutual adj solvent\$1) (free\$1radical adj compound\$1)) and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:17
S8	191	(restor\$5 desorp\$4 degrad\$5 block\$5) and S7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:18
S9	2741	166/300	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:19
S10	2396	S2 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:19
S11	135	S3 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S12	14440	E21B33/13	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S13	1448	E21B43/295	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S14	7853	C09K8/68	US-PGPUB; USPAT; USOCR;	OR	ON	2016/02/18 11:20

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
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S16	9601	E21B43/25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S17	57	S12 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S18	3	S13 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S19	133	S14 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S20	62	S15 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S21	63	S16 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S22	1	("2011/0034351").URPN.	USPAT	OR	ON	2016/02/18 11:34
S23	12	("2005/0178549").URPN.	USPAT	OR	ON	2016/02/18 11:51
S24	1	("4487265").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:56
S25	1	("20050178549").PN.	US-PGPUB;	OR	OFF	2016/02/18


			USPAT			11:57
S26	1	("20080110624").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:57
S27	1	("20110034351").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:57
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S29	1	("5979557").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/21 15:18

**EAST Search History (Interference)**

&lt; This search history is empty &gt;

**4/ 16/ 2016 2:55:42 PM****C:\Users\avarma\Documents\EAST\Workspaces\14366219\Prior Art Search History.wsp**



<b><i>Index of Claims</i></b>  	<b>Application/Control No.</b> 14366219	<b>Applicant(s)/Patent Under Reexamination</b> EOFF ET AL.
	<b>Examiner</b> JOSEPH DEFAZIO	<b>Art Unit</b> 3674

✓	<b>Rejected</b>
=	<b>Allowed</b>

-	<b>Cancelled</b>
÷	<b>Restricted</b>

N	<b>Non-Elected</b>
I	<b>Interference</b>

A	<b>Appeal</b>
O	<b>Objected</b>

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

CLAIM		DATE							
Final	Original	07/30/2015	02/21/2016	04/16/2016					
	1	✓	✓	✓					
	2	✓	✓	✓					
	3	✓	✓	✓					
	4	✓	✓	✓					
	5	✓	✓	✓					
	6	✓	✓	✓					
	7	✓	✓	✓					
	8	✓	✓	✓					
	9	✓	-	-					
	10	✓	✓	✓					
	11	✓	✓	✓					
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	13	✓	✓	✓					
	14	✓	✓	✓					
	15	✓	✓	✓					
	16	✓	✓	✓					
	17	✓	✓	✓					
	18	✓	✓	✓					
	19	✓	-	-					
	20	✓	✓	✓					

<b>IN THE UNITED STATES PATENT AND TRADEMARK OFFICE RESPONSE TO OFFICE ACTION</b>		
First Named Inventor: <b>Larry Steven Eoff</b>	Docket Number: <b>2013-IP-072509 U1 US</b>	
Application Number: <b>14/366,219</b>	Art Unit: <b>3674</b>	Conf. Number: <b>3312</b>
Filing Date: <b>June 17, 2014</b>	Examiner: <b>Joseph A. Defazio</b>	
Title: <b>Acid Diversion Treatments in Injection Wells Using Permeability Modifiers</b>		

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**AMENDMENTS AND RESPONSE TO NON-FINAL OFFICE ACTION,  
MAILED MARCH 1, 2016**

Dear Honorable Commissioner:

In response to the Office Action mailed on March 1, 2016 (the "Office Action"), Applicant submits the following:

**Amendments to the Claims**, which begin on page 2 of this paper; and  
**Remarks/Arguments**, which begin on page 6 of this paper.

### **AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions of claims in the application:

Claims:

1. (Currently Amended) A method comprising:
  - (a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator,  
wherein the permeability modifier deactivator is present in an amount in the range of from ~~about 10~~30% to about 200% by weight of the relative permeability modifier;
  - (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,  
wherein the first treatment zone comprises formation damage;
  - (c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;
  - (d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;
  - (e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;
  - (f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability; and
  - (g) removing the treatment fluid from the injection well.
2. (Original) The method of claim 1, wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.
3. (Original) The method of claim 1, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

4. (Original) The method of claim 1, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.

5. (Original) The method of claim 1, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

6. (Original) The method of claim 1, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

7. (Original) The method of claim 1, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

8. (Original) The method of claim 1, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

9. (Cancelled)

10. (Original) The method of claim 1, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

11. (Currently Amended) A method comprising:

(a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier,

wherein the permeability modifier deactivator is present in an amount in the range of from ~~about 10~~30% to about 200% by weight of the relative permeability modifier;

(b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;

(c) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,

wherein the first treatment zone comprises formation damage;

(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone;

(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;

(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;

(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;

(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability; and

(i) removing the treatment fluid from the injection well.

12. (Original) The method of claim 11, wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.

13. (Original) The method of claim 11, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

14. (Original) The method of claim 11, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.

15. (Original) The method of claim 11, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically

modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

16. (Original) The method of claim 11, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

17. (Original) The method of claim 11, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

18. (Original) The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

19. (Cancelled)

20. (Original) The method of claim 11, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

## **REMARKS / ARGUMENTS**

### **I. General Remarks and Disposition of the Claims**

Please consider the application in view of the following remarks. Applicant thanks the Examiner for careful consideration of this application, including the references that Applicant has submitted in this case.

At the time of the Office Action, claims 1-8, 10-18, and 20 were pending in this application. Claims 1-8, 10-18, and 20 were rejected in the Office Action.

By this paper, claims 1 and 11 have been amended. These amendments are supported by the specification as filed. All the amendments are made in a good faith effort to advance the prosecution on the merits of this case. It should not be assumed that the amendments made herein were made for reasons related to patentability. Applicant requests that the above amendments be entered and further requests reconsideration in light of the amendments and remarks contained herein.

### **II. Remarks Regarding Rejections under 35 U.S.C. § 103(a)**

To support an obviousness rejection, MPEP § 2143.03 requires that "all words of a claim to be considered" and MPEP §2141.02 requires consideration of the "[claimed] invention and prior art as a whole." Further, a proper, post-*KSR* obviousness determination requires the Examiner make a "searching comparison of the claimed invention – including all its limitations – with the teaching of the prior art." (*CFMT v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003)). The Supreme Court in *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 127 S.Ct. 1727, 1731 (2007) noted that the analysis supporting a rejection under 35 U.S.C. § 103 should be made explicit. Further, the Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." (*In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)). In sum, it is well-settled law that an obviousness rejection requires a teaching or suggestion of all of the claim elements.

**A. Rejections over *Watanabe* in view of *Eoff***

Claims 1-3, 5-13, and 15-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 4,487,265 (hereinafter "*Watanabe*") in view of U.S. Patent Application Publication 2005/0178549 (hereinafter "*Eoff*"). Applicant respectfully disagrees.

In particular, the combination of *Watanabe* and *Eoff* fails to teach or suggest "wherein the permeability modifier deactivator is present in an amount in the range of from 30% to about 200% by weight of the relative permeability modifier," as recited by independent claims 1 and 11. Support for this element can at least be found at paragraph [0038]. Indeed, in *Ex Parte Moraes Barros* (BPAI 2010-006399), the Applicant claimed a chemical composition that recited a range of values for a chemical. The pending specification only disclosed a larger range that encompassed the smaller, claimed range that was recited, but the smaller range itself was not set out in the specification. On appeal, the BPAI reasoned:

"The original disclosure of a broader range may support the recitation of a narrower range, even though the narrower range had not been explicitly disclosed. *In re Wertheim*, 541 F.2d 257, 262-63 (CCPA 1976). ... We note that a range is a shorthand format for presenting information, where the range is understood to encompass each discrete point."

In light of the above, the BPAI agreed that the smaller range was adequately disclosed in the specification. Thus, the specification need not disclose each and every permutation of a range of values when writing a chemical application. Rather, the presentation of a broad a range of values is sufficient.

In fact, this reasoning is consistent with the guidance in MPEP 2163.05, which states "each claim limitation must be expressly, implicitly, or inherently supported in the originally filed disclosure." As recognized by the Board, the citation of a range inherently discloses all of the endpoints along the range. Indeed, the example cited in MPEP 2163.05, citing *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976), is also consistent with the finding that the claims amendments are supported. MPEP 2163.05 describes the *In re Wertheim* holding as follows:



In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976), the ranges described in the original specification included a range of "25%- 60%" and specific examples of "36%" and "50%." A corresponding new claim limitation to "at least 35%" did not meet the description requirement because the phrase "at least" had no upper limit and caused the claim to read literally on embodiments outside the "25% to 60%" range, however a limitation to "between 35% and 60%" did meet the description requirement.

Thus, even the example in the MPEP supports that fact that points that fall within the range set out in the initial disclosure are supported.

The Office Action admits that "Watanabe does not disclose...wherein the permeability modifier deactivator is present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier[.]" (Office Action at pg. 4). The Office Action then relies on *Eoff*, first stating that "Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well." (*Id.*) This is patently not true. The word "injection well" does not appear anywhere in *Eoff*; indeed the single word "injection" does not appear anywhere in *Eoff*.

*Eoff* does not disclose, teach, or suggest any treatment for injection wells. Instead, *Eoff* is directed to the control of "production rates from different segments of horizontal wells or from different horizontal well bores" to solve the "problem that often occurs in the production of hydrocarbons from horizontal well bores in producing zones." (*Eoff* at [0005]). A producing horizontal wellbore cannot be conflated with an injection well, to which the Instant Application is directed. A "producing well" is a "well producing fluids (gas, oil or water)." (Oilfield Glossary, "Producing Well," [http://www.glossary.oilfield.slb.com/Terms/p/producing\\_well.aspx](http://www.glossary.oilfield.slb.com/Terms/p/producing_well.aspx)). An "injection well" is a "well in which fluids are injected rather than produced." (Oilfield Glossary, "Injection Well," [http://www.glossary.oilfield.slb.com/Terms/i/injection\\_well.aspx](http://www.glossary.oilfield.slb.com/Terms/i/injection_well.aspx)). Indeed, the Instant Application makes this point: "[a]n injection well is a wellbore in a subterranean formation used to pump fluids into a producing reservoir (e.g., a hydrocarbon producing reservoir)." (Instant Application at [0002]). That is, a

producing wellbore (horizontal or otherwise) is wholly different than an injection well, and the distinction is well known to one of skill in the art.

The Office Action then further relies on *Eoff*, stating:

With regards to claim 1, the reference *Eoff* discloses a permeability modifier deactivator concentration from about 1% to about 25% by weight.... Although silent to wherein the permeability modifier deactivator has a presence in the range of from about 10% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because it has been held that "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

(Office Action at pg. 5). Applicant respectfully disagrees. First, *Eoff* does not disclose the instantly claimed range of permeability modifier deactivator, as admitted by the Office Action above.

Second, Applicant respectfully disagrees with Office Action's unevidenced, conclusory statement and submits that citation of *In re Aller* is inappropriate. *In re Aller* established two conditions for a conclusion of obviousness: (1) the general conditions of the claim must be disclosed in the prior art; and (2) discovery of the optimum or workable range must be a matter of routine experimentation for a person of ordinary skill in the art. (*In re Aller*, 220 F.2d at 456). Here, the Office Action inadequately addresses the second condition of *In re Aller* by failing to explain how optimization using routine skill would have resulted in the claimed range of permeability modifier deactivator in view of *Eoff's* much lower concentrations. Indeed, *Eoff's* disclosure of a producing well and not an injection well makes such optimization using routine skill impossible. The Instant Application explains clearly that producing wells and injection wells react differently:

Permeability modifiers have been effective acid diverters for hydrocarbon producing wells. They are capable of altering the relative permeability of a portion of a wellbore that they come into contact with, resulting in blockage of water production and/or diversion of aqueous fluids away from that portion of the wellbore. As such, they are particularly useful in hydrocarbon producing wells where they have no effect on hydrocarbon permeability and where there is no concern

that the effects of the permeability modifier (e.g., reduction in water permeability) may remain in effect for a period longer than desired or permanently. Injection wells, on the other hand, typically involve injection of water rather than hydrocarbons and minimal pressure during fluid injection is desirable. Thus, the use of permeability modifiers, although effective acid diverters, in injection wells may result in undesirable or irreversible reduction in water permeability of the wellbore.

It is therefore desirable to provide an acid diversion treatment for use in an injection well comprising a permeability modifier, whose effects can be reversed after the treatment is complete.

(Instant Application at [0004]-[0005]). The concentration of permeability modifier deactivator are thus necessarily different between the Instant Application and *Eoff* because the type well being treated is completely different. Applicant asserts that *Eoff* provides no direction or guidance that would lead one skilled in the art to arrive at the claimed concentration of permeability modifier deactivator through an optimization exercise. As such, Applicant submits that higher concentrations of permeability modifier deactivator as currently claimed are not rendered obvious over *Eoff*.

Lastly, the instant concentrations of permeability modifier deactivator and is neither overlapping, nor close to *Eoff's* concentration of about 1% to about 25% of permeability restoring chemical, and thus no prima facie evidence of obviousness exists. Indeed, in *In re Patel*, the Federal Circuit found that without some teaching in the art that there was some basis for a person of ordinary skill to believe a material having a weight percentage of 26% would have "the same or similar properties" as one having the 25%, no prima facie case of obviousness existed. No. 2013-1301 (Fed. Cir. 2014). The Court stated:

Depending on the technology, even small differences in formulations can be meaningful. Where differences clearly exist and there is no evidence that they are either not meaningful or one of skill in the art would know to discard the limits set by the prior art, proximity alone is not enough to establish a prima facie case of obviousness. We find that the PTAB erred in finding that the examiner established a prima facie case of obviousness solely because the claimed range and the prior art range approach one another.

No such teaching evidence exists.

Accordingly, the combination of *Watanabe* and *Eoff* fails to establish that every limitation of independent claims 1 and 11 were known in the prior art. Therefore, Applicant respectfully asserts that independent claims 1 and 11 and their dependent claims are not rendered obvious by the combination of *Watanabe* and *Eoff*. Accordingly, Applicant respectfully requests withdrawal of this rejection.

**B. Rejections over *Watanabe*, *Eoff*, and *Card***

Claims 4 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Watanabe* in view of *Eoff*, as further evidenced by U.S. Patent 5,979,557 (hereinafter "*Card*"). Applicant respectfully disagrees.

For at least the reasons discussed in Section III.A above, the combination of *Watanabe* and *Eoff* fails to teach or suggest each and every limitation of independent claims 1 and 11. Moreover, *Card* does not remedy the deficiencies of *Watanabe* and *Eoff*. Rather, the Office Action merely relied on *Card* for its alleged teaching that "EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations." (Office Action at pg. 18-19).

Accordingly, the combination of *Watanabe*, *Eoff*, and *Card* fails to establish that every limitation of independent claims 1 and 11 and their dependent claims were known in the prior art. Therefore, Applicant respectfully asserts that independent claims 1 and 11 and their dependent claims are not rendered obvious by the combination of *Watanabe*, *Eoff*, and *Card*. Accordingly, Applicant respectfully requests withdrawal of this rejection.

**III. No Waiver**

All of Applicant's arguments and amendments are without prejudice or disclaimer. Applicant has merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicant reserves the right to discuss these additional distinctions in a later Response or on Appeal, if appropriate. By not responding to additional statements made by the Examiner, Applicant does not acquiesce to the Examiner's additional statements, such as, for example, any statements relating to what would be obvious to a person of ordinary skill in the art.

**SUMMARY**

In light of the above, Applicant respectfully requests reconsideration and withdrawal of the outstanding rejections. Applicant further submits that the application is now in condition for allowance. Should the Examiner have any questions, comments or suggestions, the Examiner is invited to contact the attorney of record by telephone, facsimile, or electronic mail.

Applicant believes that no fees are due with this response. Should the Commissioner deem that any fees are due, including any fees for extensions of time, Applicant requests that the Commissioner accept this as a Petition Therefore, and directs that any additional fees be charged to McDermott Will & Emery's Deposit Account No. 500417, Order Number 087638-0891.

Respectfully submitted,

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Date: April 4, 2016

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	25385244
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser
<b>Filer Authorized By:</b>	
<b>Attorney Docket Number:</b>	2013-IP-072509 U1 US
<b>Receipt Date:</b>	04-APR-2016
<b>Filing Date:</b>	17-JUN-2014
<b>Time Stamp:</b>	12:53:15
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		087638_0891_ROA.pdf	135162 a8a3212251ac40a5b4db441a02281d0d64c7fde7	yes	12

<b>Multipart Description/PDF files in .zip description</b>			
<b>Document Description</b>		<b>Start</b>	<b>End</b>
Amendment/Req. Reconsideration-After Non-Final Reject		1	1
Claims		2	5
Applicant Arguments/Remarks Made in an Amendment		6	12

**Warnings:**

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<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875	Application or Docket Number <b>14/366,219</b>	Filing Date <b>06/17/2014</b>	<input type="checkbox"/> To be Mailed
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ENTITY:  LARGE  SMALL  MICRO

**APPLICATION AS FILED – PART I**

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE <small>(37 CFR 1.16(a), (b), or (c))</small>	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE <small>(37 CFR 1.16(k), (l), or (m))</small>	N/A	N/A	N/A	
<input type="checkbox"/> EXAMINATION FEE <small>(37 CFR 1.16(o), (p), or (q))</small>	N/A	N/A	N/A	
TOTAL CLAIMS <small>(37 CFR 1.16(i))</small>	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS <small>(37 CFR 1.16(h))</small>	minus 3 =	*	X \$ =	
<input type="checkbox"/> APPLICATION SIZE FEE <small>(37 CFR 1.16(s))</small>	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 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).			
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT <small>(37 CFR 1.16(j))</small>				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

**APPLICATION AS AMENDED – PART II**

	(Column 1)	(Column 2)	(Column 3)	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
<b>AMENDMENT</b>	<b>04/04/2016</b>	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR			
	Total <small>(37 CFR 1.16(i))</small>	* 18	Minus	** 20	= 0	X \$80 = 0
	Independent <small>(37 CFR 1.16(h))</small>	* 2	Minus	***3	= 0	X \$420 = 0
	<input type="checkbox"/> Application Size Fee <small>(37 CFR 1.16(s))</small>					
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>					
					TOTAL ADD'L FEE	<b>0</b>

	(Column 1)	(Column 2)	(Column 3)	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
<b>AMENDMENT</b>		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR			
	Total <small>(37 CFR 1.16(i))</small>	*	Minus	**	=	X \$ =
	Independent <small>(37 CFR 1.16(h))</small>	*	Minus	***	=	X \$ =
	<input type="checkbox"/> Application Size Fee <small>(37 CFR 1.16(s))</small>					
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>					
					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.

LIE  
 /LAMONT MCLAUGHLIN/

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.**

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99633 7590 03/01/2016  
McDermott Will & Emery LLP  
The McDermott Building  
500 North Capitol Street, N.W.  
Washington, DC 20001

EXAMINER
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VARMA, ASHISH K

ART UNIT	PAPER NUMBER
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3674

NOTIFICATION DATE	DELIVERY MODE
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03/01/2016

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**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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com



## **DETAILED ACTION**

### ***Notice of Pre-AIA or AIA Status***

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### ***Applicant's Response***

1. In the response date 11/04/15, the Applicant amended claims 1 and 11, cancelled claims 9 and 19 and argued against the rejections in the non-final rejection dated 08/06/15.

In light of the amendments, the examiner withdraws the claim objections previously set forth.

### ***Claim Rejections - 35 USC § 103***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5-13 and 15-20 are rejected under 35 U.S.C. 103 as being unpatentable over US 4,487,265 (“Watanabe”) in view of US 2005/0178549 (“Eoff”).

Art Unit: 3674

*Claim 1:*

Regarding Claim 1, Watanabe discloses:

*A method comprising:*

*(a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator;* (Watanabe: Abstract (aqueous solution of an acid, glycol ether, water-soluble nitrogen containing polymer); Col. 3, lines 44-48 (treatment fluid is a 25% to 95% by volume aqueous solution of hydrochloric or hydrofluoric acid); Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups); Col. 5, lines 1-22 (permeability modifier deactivator glycol ethers, including preferred embodiment ethylene glycol monobutyl ether (“EGMBE”)); Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents))

*(b) providing an injection well in a subterranean formation* (Watanabe: Col. 8, lines 2-5)  
*. . . , wherein the first treatment zone comprises formation damage;* (Watanabe: Col. 1, lines 22-32 (plugging damage))

*(c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;* (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 11 (producing interval), 18-23 (preflush aqueous solution of hydrochloric acid, EGMBE and polyacrylamide), 26-33 (aqueous solution of hydrochloric/hydrofluoric acid, EGMBE and polyacrylamide))

*(d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;* (Watanabe: Col. 9, lines 23-25)

. . . ;

*and (g) removing the treatment fluid from the injection well.* (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 34-37 (afterflush)).

Watanabe does not disclose:

*(a) wherein the permeability modifier deactivator is present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier;*

*(b) a first treatment zone comprising a first aqueous formation permeability, . . . ;*

*(e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;*

*(f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability;*

However, Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well (Eoff: Abstract) where a treatment zone with an initial aqueous permeability (Eoff: [0041], [0042] Table I) is reacted with a permeability modifier (Eoff: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (Eoff: [0042] Table I). Eoff further teaches contacting the reacted zone with a permeability modifier deactivator that is present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier (Abstract; Page

Art Unit: 3674

4, [0035], lines 1-5; [0037], lines 1-20), which causes the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by Watanabe by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone with a specific concentration of the permeability modifier deactivator, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

With regards to claim 1, the reference Eoff discloses a permeability modifier deactivator concentration from about 1% to about 25% by weight (Page 4, [0037], lines 16-20). Although silent to wherein the permeability modifier deactivator has a presence in the range of from about 10% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because it has been held “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

*Claim 2:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.* (Eoff '759: [0009] (repeat the treatment at selected zones in the well)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to repeat, as taught by Eoff, the treatment steps disclosed by Watanabe in view of Eoff '759, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

*Claim 3:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.* (Eoff: [0042] Table I (aqueous permeability decreases to 85% less than its original value)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to decrease the aqueous formation permeability of the zone, disclosed by Watanabe in view of Eoff, to 85% less than its pretreatment value, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of

Art Unit: 3674

50%-90% less than the original value of the formation aqueous permeability overlaps the value of 85% disclosed by Eoff.

*Claim 5:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.* (Watanabe: Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups)).

*Claim 6:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.* (Eoff: [0024] (0.01% - 10% by weight)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier, disclosed by Watanabe in view of Eoff, present in the amount from 0.01% - 10% by weight of the treatment fluid, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).



Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.05% to about 5% by weight of permeability modifier present in the treatment fluid overlaps the range of 0.01% - 10% disclosed by Eoff.

*Claim 7:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.* (Watanabe: Col. 5, lines 32-34 (aqueous solution comprises 5-28% by weight hydrogen chloride); Col. 3, lines 44-48 (water 25-95% by volume, so EGMBE is 5-75% by volume, taking water with density of 1 g/L and EGMBE with density of 0.902 g/L, gives water 27-95.5% by weight, and hydrogen chloride in the range of 1.35 – 26.74 % by weight  $((0.05*27)\% - ((0.28*95.5)\%))$ ).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.5% to about 8% by weight of acid present in the treatment fluid overlaps the range of 1.35% - 26.74% disclosed by Watanabe.

*Claim 8:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Art Unit: 3674

Watanabe further discloses *wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.* (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

*Claim 10:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.* (Eoff: [0041], [0042] Table I (restored to 98% of its original value, which is a restoration of 83% (((100-2) – (100-85))%)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the aqueous formation permeability of the treatment zone, disclosed by Watanabe in view of Eoff, restored to 98% of its original value, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of restoration to at least 20% of the treatment zone's original aqueous formation permeability overlaps the value of 98% disclosed by Eoff.

Art Unit: 3674

*Claim 11:*

Regarding Claim 11, Watanabe discloses:

*A method comprising:*

*(a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier; (Watanabe: Abstract (aqueous solution of an acid, glycol ether, water-soluble nitrogen containing polymer); Col. 3, lines 44-48 (treatment fluid is a 25% to 95% by volume aqueous solution of hydrochloric or hydrofluoric acid); Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups))*

...;

*(c) providing an injection well in a subterranean formation having a first treatment zone (Watanabe: Col. 8, lines 2-5) . . . , wherein the first treatment zone comprises formation damage; (Watanabe: Col. 1, lines 22-32 (plugging damage))*

*(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone; (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 11 (producing interval), 18-23 (preflush aqueous solution of hydrochloric acid and polyacrylamide), 26-33 (aqueous solution of hydrochloric/hydrofluoric acid and polyacrylamide))*

*(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage; (Watanabe: Col. 9, lines 23-25)*

...;

Art Unit: 3674

*and (i) removing the treatment fluid from the injection well. (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 34-37 (afterflush)).*

Watanabe does not disclose:

*(a) wherein the permeability modifier deactivator is present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier;*

*(b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;*

*(c) . . . a first treatment zone comprising a first aqueous formation permeability . . . ;*

*(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;*

*(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;*

*(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability;*

However, Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well (Eoff: Abstract) where a treatment zone with an initial aqueous permeability (Eoff: [0041], [0042] Table I) is reacted with a permeability modifier (Eoff: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (Eoff: [0042] Table I). Eoff further teaches contacting the reacted zone with a second treatment fluid comprising a permeability modifier deactivator that is

Art Unit: 3674

present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier (Abstract; Page 4, [0035], lines 1-5; [0037], lines 1-20) in an aqueous base fluid (Eoff: [0039]), causing the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by Watanabe by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone with the permeability modifier deactivator, with the permeability modifier deactivator in a aqueous treatment fluid separate from the fluid with the permeability modifier, as taught by Eoff, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]) and restoring selected treated sections with second separate aqueous treatment fluid containing permeability modifier deactivator (Eoff: [0006] and [0039]).

With regards to claim 11, the reference Eoff discloses a permeability modifier deactivator concentration from about 1% to about 25% by weight (Page 4, [0037], lines 16-20). Although silent to wherein the permeability modifier deactivator has a presence in the range of from about 10% to about 200% by weight of the relative permeability modifier as instantly claimed, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide for a permeability modifier deactivator concentration as claimed insofar as because it has been held "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Art Unit: 3674

*Claim 12:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.* (Eoff '759: [0009] (repeat the treatment at selected zones in the well)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to repeat, as taught by Eoff, the treatment steps disclosed by Watanabe in view of Eoff '759, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

*Claim 13:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.* (Eoff: [0042] Table I (aqueous permeability decreases to 85% less than its original value)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to decrease the aqueous formation permeability of the zone, disclosed by Watanabe in view of Eoff, to 85% less than its pretreatment value, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In*

Art Unit: 3674

*re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of 50%-90% less than the original value of the formation aqueous permeability overlaps the value of 85% disclosed by Eoff.

*Claim 15:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof*. (Watanabe: Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups)).

*Claim 16:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid*. (Eoff: [0024] (0.01% - 10% by weight)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier, disclosed by Watanabe in view of Eoff, present in the amount from 0.01% - 10% by weight of the treatment fluid, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.05% to about 5% by weight of permeability modifier present in the treatment fluid overlaps the range of 0.01% - 10% disclosed by Eoff.

*Claim 17:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.* (Watanabe: Col. 5, lines 32-34 (aqueous solution comprises 5-28% by weight hydrogen chloride); Col. 3, lines 44-48 (water 25-95% by volume, so EGMBE is 5-75% by volume, taking water with density of 1 g/L and EGMBE with density of 0.902 g/L, gives water 27-95.5% by weight, and hydrogen chloride in the range of 1.35 – 26.74 % by weight  $((0.05*27)\% - ((0.28*95.5)\%))$ ).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.5% to about 8% by weight of acid present in the treatment fluid overlaps the range of 1.35% - 26.74% disclosed by Watanabe.

*Claim 18:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.



Art Unit: 3674

Watanabe further discloses *w18*. *The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.* (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

*Claim 19:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier deactivator is present in an amount in the range of from about 0.0001% to about 200% by weight of the permeability modifier.* . (Eoff: [0024] (0.01% - 10% by weight of permeability modifier in treatment fluid; [0042] (6.8% by weight percent of permeability modifier deactivator in second fluid, second fluid is about 5% of total fluid volume; assuming equal densities, permeability modifier deactivator is 0.34% by weight percent of total treatment fluid, so deactivator is present in a range 0.034% - 3.4% by weight of permeability modifier)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier deactivator, disclosed by Watanabe in view of Eoff, present in the amount from 0.034% - 3.4% by weight of the permeability modifier, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of

Art Unit: 3674

from about 0.0001% to about 200% by weight of permeability modifier deactivator present with respect to the permeability modifier overlaps the range of 0.034% - 3.4% disclosed by Eoff.

*Claim 20:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.* (Eoff: [0041], [0042] Table I (restored to 98% of its original value, which is a restoration of 83% (((100-2) – (100-85)) %)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the aqueous formation permeability of the treatment zone, disclosed by Watanabe in view of Eoff, restored to 98% of its original value, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of restoration to at least 20% of the treatment zone's original aqueous formation permeability overlaps the value of 83% disclosed by Eoff.

Claims 4 and 14 are rejected under 35 U.S.C. 103 as being unpatentable over US 4,487,265 (“Watanabe”) in view of US 2005/0178549 (“Eoff”), as further evidenced by US 5,979,557 (“Card”).

Art Unit: 3674

*Claim 4:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

*Claim 14:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier;*

Art Unit: 3674

*blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

### ***Response to Arguments***

Applicant's arguments filed 11/04/15, with respect to the rejection(s) of claim(s) 1-8, 10-18 and 20 have been fully considered and are persuasive in view of Applicant's amendments to the claims. Therefore, the rejection has been withdrawn. However, upon further consideration, a new interpretation of the rejection previously made is as set forth above.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ASHISH VARMA whose telephone number is (571)272-9565. The examiner can normally be reached on Monday-Friday 9-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doug Hutton can be reached on 571-272-4137. 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.

/Angela M DiTrani/  
Primary Examiner, Art Unit 3674

/ASHISH VARMA/  
Examiner, Art Unit 3674

<b>Notice of References Cited</b>	Application/Control No. 14/366,219	Applicant(s)/Patent Under Reexamination EOFF ET AL.	
	Examiner ASHISH VARMA	Art Unit 3674	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A US-4,487,265 A	12-1984	Watanabe; David J.	C09K8/60	166/307
*	B US-5,979,557 A	11-1999	Card; Roger J.	C09K8/68	166/281
*	C US-2005/0178549 A1	08-2005	Eoff, Larry S.	C09K8/508	166/295
	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	CPC Classification
	N				
	O				
	P				
	Q				
	R				
	S				
	T				

**NON-PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	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.

<b><i>Index of Claims</i></b>  	<b>Application/Control No.</b> 14366219	<b>Applicant(s)/Patent Under Reexamination</b> EOFF ET AL.
	<b>Examiner</b> JOSEPH DEFAZIO	<b>Art Unit</b> 3674

✓	<b>Rejected</b>
=	<b>Allowed</b>

-	<b>Cancelled</b>
÷	<b>Restricted</b>

N	<b>Non-Elected</b>
I	<b>Interference</b>

A	<b>Appeal</b>
O	<b>Objected</b>

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

CLAIM		DATE							
Final	Original	07/30/2015	02/21/2016						
	1	✓	✓						
	2	✓	✓						
	3	✓	✓						
	4	✓	✓						
	5	✓	✓						
	6	✓	✓						
	7	✓	✓						
	8	✓	✓						
	9	✓	-						
	10	✓	✓						
	11	✓	✓						
	12	✓	✓						
	13	✓	✓						
	14	✓	✓						
	15	✓	✓						
	16	✓	✓						
	17	✓	✓						
	18	✓	✓						
	19	✓	-						
	20	✓	✓						

## EAST Search History

## EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106"   "20120168166"   "20120264885"   "5122549"   "6516885"   "7114568"   "20050178549"   "4982793"   "7182136"   "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292"   "5979557"   "7117942"   "7563750").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/21 15:16
L2	1	("5979557").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/21 15:18
S1	78	("20120231978"   "5067565"   "7589048"   "7595283"   "8008235"   "6207771"   "6364016"   "8273692"   "6476169"   "7727936"   "20100230106"   "20120168166"   "20120264885"   "5122549"   "6516885"   "7114568"   "20050178549"   "4982793"   "7182136"   "4487265"   "20080110624"   "20110034351"   "7552771"   "7759292"   "5979557"   "7117942"   "7563750").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/17 13:34
S2	248230	(subterranean oil\$1well\$1 oil\$1field\$1 down\$1hole\$1 down\$1field\$1)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 10:56
S3	866	(permeability WITH (modifier\$1 deactivator\$1)) and S2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:13
S4	348	(acid\$1 WITH permeabilit\$4) and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:14
S5	249	(treat\$4 WITH (permeabilit\$4)) and S4	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2016/02/18 11:16

			EPO; JPO; DERWENT; IBM_TDB			
S6	228	(polymer\$1 (hydrophobic\$4 WITH polymer\$1)) and S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:17
S7	216	(surfactant\$1 (mutual adj solvent\$1) (free\$1radical adj compound\$1)) and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:17
S8	191	(restor\$5 desorp\$4 degrad\$5 block\$5) and S7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:18
S9	2741	166/300	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:19
S10	2396	S2 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:19
S11	135	S3 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S12	14440	E21B33/13	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S13	1448	E21B43/295	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S14	7853	C09K8/68	US-PGPUB; USPAT;	OR	ON	2016/02/18 11:20



			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S15	37816	E21B43/00	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S16	9601	E21B43/25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S17	57	S12 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:20
S18	3	S13 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S19	133	S14 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S20	62	S15 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S21	63	S16 and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/18 11:21
S22	1	("2011/0034351").URPN.	USPAT	OR	ON	2016/02/18 11:34
S23	12	("2005/0178549").URPN.	USPAT	OR	ON	2016/02/18 11:51
S24	1	("4487265").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:56

S25	1	("20050178549").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:57
S26	1	("20080110624").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:57
S27	1	("20110034351").PN.	US-PGPUB; USPAT	OR	OFF	2016/02/18 11:57

**EAST Search History (Interference)**

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**2/ 21/ 2016 3:19:29 PM**

**C:\ Users\ avarma\ Documents\ EAST\ Workspaces\ 14366219\ Prior Art Search History.wsp**

<b>Search Notes</b>  	<b>Application/Control No.</b>  14366219	<b>Applicant(s)/Patent Under Reexamination</b>  EOFF ET AL.
	<b>Examiner</b>  JOSEPH DEFAZIO	<b>Art Unit</b>  3674

<b>CPC- SEARCHED</b>		
<b>Symbol</b>	<b>Date</b>	<b>Examiner</b>
E21B 33/13; E21B 43/295; C09K 8/68; E21B 43/00; E21B 43/25; E21B 43/16; E21B 43/27; C09K 8/60; E21B 29/10; E21B 33/138; E21B 43/162; C09K 8/74	7/30/2015	JD
E21B33/13	02/17/16	AV
E21B43/295	02/17/16	AV
C09K8/68	02/17/16	AV
E21B43/00	02/17/16	AV
E21B43/25	02/17/16	AV

<b>CPC COMBINATION SETS - SEARCHED</b>		
<b>Symbol</b>	<b>Date</b>	<b>Examiner</b>

<b>US CLASSIFICATION SEARCHED</b>			
<b>Class</b>	<b>Subclass</b>	<b>Date</b>	<b>Examiner</b>
166	300	7/30/2015	JD
166	300	02/17/16	AV

<b>SEARCH NOTES</b>		
<b>Search Notes</b>	<b>Date</b>	<b>Examiner</b>
Consult with A. DiTrani	7/27/2015	JD
PALM Inventor Name Search	7/28/2015	JD
EAST Inventor Name Search	7/28/2015	JD
EAST Assignee/Applicant/Assignee as Inventor Name Search	7/30/2015	JD
EAST Keyword Search	7/28/2015	JD
Google Patent/NPL Name Search	7/29/2015	JD
Consulted with Angela DiTrani (Primary Examiner)	02/17/16	AV
Forward/Backward Citation Search	02/17/16	AV
Text Search	02/17/16	AV
Searched EAST (see updated search history)	02/21/16	AV

/ASHISH VARMA/ Examiner.Art Unit 3674	
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**INTERFERENCE SEARCH**

<b>US Class/ CPC Symbol</b>	<b>US Subclass / CPC Group</b>	<b>Date</b>	<b>Examiner</b>

/ASHISH VARMA/  
Examiner.Art Unit 3674

## TRANSMITTAL FORM

First Named Inventor: <b>Larry Steven Eoff</b>	Docket Number: <b>2013-IP-072509 U1 US</b>	
Application Number: <b>14/366,219</b>	Art Unit: <b>3674</b>	Conf. Number: <b>3312</b>
Filing Date: <b>June 17, 2014</b>	Examiner: <b>Joseph A. Defazio</b>	

Title:  
**Acid Diversion Treatments in Injection Wells Using Permeability Modifiers**

### ENCLOSURES (Check all that apply)

<input type="checkbox"/> Fee Transmittal	<input type="checkbox"/> Drawings	<input type="checkbox"/> After Allowance Communication to Technology Center
<input type="checkbox"/> Fee Attached	<input type="checkbox"/> Licensing-Related Papers	<input type="checkbox"/> Appeal Communication
<input checked="" type="checkbox"/> Amendment / Reply	<input type="checkbox"/> Petition	<input type="checkbox"/> Proprietary Information
<input type="checkbox"/> After Final	<input type="checkbox"/> Petition to Convert Provisional Application	<input type="checkbox"/> Status Letter
<input type="checkbox"/> Affidavit / Declaration	<input type="checkbox"/> Power of Attorney, Revocation, Change of Correspondence Address	<input type="checkbox"/> Other Enclosure(s) (identified below):
<input type="checkbox"/> Extension of Time Request	<input type="checkbox"/> Terminal Disclaimer	
<input type="checkbox"/> Express Abandonment	<input type="checkbox"/> Request for Refund	
<input type="checkbox"/> Information Disclos. Stmt.	<input type="checkbox"/> CD, No. of CD's <b>0</b>	
<input type="checkbox"/> Certified Priority Documents	<input type="checkbox"/> Landscape Table on CD	
<input type="checkbox"/> Reply to Missing Parts	Remarks:	

### SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

I am the <input type="checkbox"/> applicant / inventor  <input type="checkbox"/> assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed <input checked="" type="checkbox"/> attorney or agent of record or acting under 37 CFR 1.34.	Signature /Iona N. Kaiser/
Registration Number: <u>53,086</u>	Printed Name Iona N. Kaiser
	Telephone Number 713-653-1724
	Date November 4, 2015

<b>IN THE UNITED STATES PATENT AND TRADEMARK OFFICE RESPONSE TO OFFICE ACTION</b>		
First Named Inventor: <b>Larry Steven Eoff</b>	Docket Number: <b>2013-IP-072509 U1 US</b>	
Application Number: <b>14/366,219</b>	Art Unit: <b>3674</b>	Conf. Number: <b>3312</b>
Filing Date: <b>June 17, 2014</b>	Examiner: <b>Joseph A. Defazio</b>	
Title: <b>Acid Diversion Treatments in Injection Wells Using Permeability Modifiers</b>		

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**AMENDMENTS AND RESPONSE UNDER 37 C.F.R. § 1.111 TO  
NON-FINAL OFFICE ACTION, MAILED AUGUST 6, 2015**

Dear Honorable Commissioner:

In response to the Office Action mailed on August 6, 2015 (the "Office Action"), Applicant submits the following:

**Amendments to the Claims**, which begin on page 2 of this paper; and  
**Remarks/Arguments**, which begin on page 6 of this paper.

**AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions of claims in the application:

Claims:

1. (Currently Amended) A method comprising:
  - (a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator,  
wherein the permeability modifier deactivator is present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier;
  - (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,  
wherein the first treatment zone comprises formation damage;
  - (c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;
  - (d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;
  - (e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;
  - (f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability; and
  - (g) removing the treatment fluid from the injection well.
2. (Original) The method of claim 1, wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.
3. (Original) The method of claim 1, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

4. (Original) The method of claim 1, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.
5. (Original) The method of claim 1, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.
6. (Original) The method of claim 1, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.
7. (Original) The method of claim 1, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.
8. (Original) The method of claim 1, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.
9. (Cancelled)
10. (Original) The method of claim 1, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.
11. (Currently Amended) A method comprising:
  - (a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier,  
wherein the permeability modifier deactivator is present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier;
  - (b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;



(c) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,

wherein the first treatment zone comprises formation damage;

(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone;

(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;

(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;

(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;

(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability; and

~~(g)~~(i) removing the treatment fluid from the injection well.

12. (Original) The method of claim 11, wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.

13. (Original) The method of claim 11, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

14. (Original) The method of claim 11, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.

15. (Original) The method of claim 11, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified

polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

16. (Original) The method of claim 11, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

17. (Original) The method of claim 11, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

18. (Original) The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

19. (Cancelled)

20. (Original) The method of claim 11, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

**REMARKS / ARGUMENTS**

**I. General Remarks and Disposition of the Claims**

Please consider the application in view of the following remarks. Applicant thanks the Examiner for careful consideration of this application, including the references that Applicant has submitted in this case.

At the time of the Office Action, claims 1-20 were pending in this application. Claims 1-20 were rejected in the Office Action.

By this paper, claims 1 and 11 have been amended, and claims 9 and 19 have been cancelled. These amendments are supported by the specification as filed. All the amendments are made in a good faith effort to advance the prosecution on the merits of this case. It should not be assumed that the amendments made herein were made for reasons related to patentability. Applicant requests that the above amendments be entered and further requests reconsideration in light of the amendments and remarks contained herein.

**II. Remarks Regarding Objections to the Claims**

Claims 1 and 11 stand objected to. With regards to this objection, the Office Action states: Claims 1 and 11 are objected to because of the following informalities:

Claim 1:

Line 6 of Claim 1 recites "wherein first treatment zone comprises formation damage."

Claim 11:

Line 21 of Claim 11 recites in part "restore first treatment zone."

The last line of Claim 11 recites "(g) removing the treatment fluid from the injection well."

Applicant has amended claims 1 and 11 and believes that these amendments resolve the Examiner's concerns regarding informalities in claims 1 and 11. Accordingly, Applicant respectfully requests the withdrawal of this objection.

**III. Remarks Regarding Rejections under 35 U.S.C. § 103(a)**

To support an obviousness rejection, MPEP § 2143.03 requires that "all words of a claim to be considered" and MPEP §2141.02 requires consideration of the

"[claimed] invention and prior art as a whole." Further, a proper, post-*KSR* obviousness determination requires the Examiner make a "searching comparison of the claimed invention – including all its limitations – with the teaching of the prior art." (*CFMT v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003)). The Supreme Court in *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 127 S.Ct. 1727, 1731 (2007) noted that the analysis supporting a rejection under 35 U.S.C. § 103 should be made explicit. Further, the Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." (*In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)). In sum, it is well-settled law that an obviousness rejection requires a teaching or suggestion of all of the claim elements.

**A. Rejections over *Watanabe* in view of *Eoff***

Claims 1-3, 5-13 and 15-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 4,487,265 (hereinafter "*Watanabe*") in view of U.S. Patent Application Publication 2005/0178549 (hereinafter "*Eoff*"). Applicant respectfully disagrees.

In particular, the combination of *Watanabe* and *Eoff* fails to teach or suggest the limitation of "wherein the permeability modifier deactivator is present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier," as recited by independent claims 1 and 11. Support for this limitation can at least be found in paragraph [0038] and Example 3 of the Instant Application. The Office Action at pg. 5 relies on *Eoff* for allegedly providing:

[A] method of temporarily reducing the permeability of selected zones of a subterranean formation penetrated by a horizontal injection well (*Eoff*: Abstract) where a treatment zone with an initial aqueous permeability (*Eoff*: [0041], 40042] Table I) is reacted with a permeability modifier (*Eoff*: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (*Eoff*: [0042] Table 1)... It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by *Watanabe* by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone with the permeability modifier deactivator,

as taught by Eoff, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

Applicant respectfully disagrees.

*Eoff* does not disclose, teach, or suggest any treatment for injection wells. Instead, *Eoff* is directed to the control of “production rates from different segments of horizontal wells or from different horizontal well bores” to solve the “problem that often occurs in the production of hydrocarbons from horizontal well bores in producing zones.” (*Eoff*, [0005]). A producing horizontal wellbore cannot be conflated with an injection well, to which the Instant Application is directed. Rather, “[a]n injection well is a wellbore in a subterranean formation used to pump fluids into a producing reservoir (e.g., a hydrocarbon producing reservoir).” (Instant Application, [0002]). Accordingly, a producing wellbore (horizontal or otherwise) is wholly different than an injection well.

Nevertheless, the Office Action relies on *Eoff* for allegedly disclosing a “deactivator [that] is present in a range of 0.034% - 3.4% by weight of permeability modifier.” (Office Action at pg. 10). The Office Action further states that “[i]t would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant’s claimed invention to have the permeability modifier deactivator, disclosed by Watanabe in view of Eoff, present in an amount from 0.034% - 3.4% by weight of the permeability modifier, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).” (*Id.*). Neither *Watanabe* nor *Eoff* teach or suggest the instantly claimed limitation of wherein the permeability modifier deactivator is present in an amount in the range of from about 10% to about 200% by weight of the relative permeability modifier,” as recited by independent claims 1 and 11.

Therefore, Applicant respectfully asserts that independent claims 1 and 11 and their dependent claims are not rendered obvious by the combination of *Watanabe* and *Eoff*. Accordingly, Applicant respectfully requests withdrawal of this rejection.

**B. Rejections over *Watanabe* in view of *Eoff*, as Further Evidenced by *Card***

Claims 4 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Watanabe* in view of *Eoff*, as further evidenced by U.S. Patent 5,979,557 (hereinafter "*Card*"). Applicant respectfully disagrees.

For at least the reasons discussed in Section III.A above, the combination of *Watanabe* and *Eoff* fails to teach or suggest each and every limitation of independent claims 1 and 11. Moreover, *Card* does not remedy the deficiencies of *Watanabe* and *Eoff*. Rather, the Office Action merely relied on *Card* for its alleged teaching that "EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations." (Office Action at pg. 20). Accordingly, the combination of *Watanabe*, *Eoff*, and *Card* fails to establish that every limitation of independent claims 1 and 11 and their dependent claims were known in the prior art.

Therefore, Applicant respectfully asserts that independent claims 1 and 11 and their dependent claims are not rendered obvious by the combination of *Watanabe*, *Eoff*, and *Card*. Accordingly, Applicant respectfully requests withdrawal of this rejection.

**IV. No Waiver**

All of Applicant's arguments and amendments are without prejudice or disclaimer. Applicant has merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicant reserves the right to discuss these additional distinctions in a later Response or on Appeal, if appropriate. By not responding to additional statements made by the Examiner, Applicant does not acquiesce to the Examiner's additional statements, such as, for example, any statements relating to what would be obvious to a person of ordinary skill in the art.

**SUMMARY**

In light of the above, Applicant respectfully requests reconsideration and withdrawal of the outstanding rejections. Applicant further submits that the application is now in condition for allowance. Should the Examiner have any

questions, comments or suggestions, the Examiner is invited to contact the attorney of record by telephone, facsimile, or electronic mail.

Applicant believes that no fees are due with this response. Should the Commissioner deem that any fees are due, including any fees for extensions of time, Applicant requests that the Commissioner accept this as a Petition Therefore, and directs that any additional fees be charged to McDermott Will & Emery's Deposit Account No. 500417, Order Number 087638-0891.

Respectfully submitted,

/Iona N. Kaiser/

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Date: November 4, 2015

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	23981220
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser/Debbie Allen
<b>Filer Authorized By:</b>	Iona Niven Kaiser
<b>Attorney Docket Number:</b>	2013-IP-072509 U1 US
<b>Receipt Date:</b>	04-NOV-2015
<b>Filing Date:</b>	17-JUN-2014
<b>Time Stamp:</b>	10:39:18
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	0876380891ROA.pdf	131429 <small>3c45e2fb25bce6d47698f7d69e9f61f80a69c0f9</small>	no	11

### Warnings:

### Information:



**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.**

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.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875	Application or Docket Number <b>14/366,219</b>	Filing Date <b>06/17/2014</b>	<input type="checkbox"/> To be Mailed
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ENTITY:  LARGE  SMALL  MICRO

**APPLICATION AS FILED – PART I**

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE <small>(37 CFR 1.16(a), (b), or (c))</small>	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE <small>(37 CFR 1.16(k), (l), or (m))</small>	N/A	N/A	N/A	
<input type="checkbox"/> EXAMINATION FEE <small>(37 CFR 1.16(o), (p), or (q))</small>	N/A	N/A	N/A	
TOTAL CLAIMS <small>(37 CFR 1.16(i))</small>	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS <small>(37 CFR 1.16(h))</small>	minus 3 =	*	X \$ =	
<input type="checkbox"/> APPLICATION SIZE FEE <small>(37 CFR 1.16(s))</small>	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 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).			
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT <small>(37 CFR 1.16(j))</small>				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

**APPLICATION AS AMENDED – PART II**

	(Column 1)	(Column 2)	(Column 3)	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
<b>AMENDMENT</b>	<b>11/04/2015</b>	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR			
	Total <small>(37 CFR 1.16(i))</small>	* 18	Minus	** 20	= 0	X \$80 = 0
	Independent <small>(37 CFR 1.16(h))</small>	* 2	Minus	***3	= 0	X \$420 = 0
	<input type="checkbox"/> Application Size Fee <small>(37 CFR 1.16(s))</small>					
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>						
					TOTAL ADD'L FEE	<b>0</b>

	(Column 1)	(Column 2)	(Column 3)	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
<b>AMENDMENT</b>		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR			
	Total <small>(37 CFR 1.16(i))</small>	*	Minus	**	=	X \$ =
	Independent <small>(37 CFR 1.16(h))</small>	*	Minus	***	=	X \$ =
	<input type="checkbox"/> Application Size Fee <small>(37 CFR 1.16(s))</small>					
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM <small>(37 CFR 1.16(j))</small>						
					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.

LIE  
/William Phillips/

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.**  
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Table with 4 columns: APPLICATION NUMBER (14/366,219), FILING OR 371(C) DATE (06/17/2014), FIRST NAMED APPLICANT (Larry Steven Eoff), ATTY. DOCKET NO./TITLE (2013-IP-072509 U1 US)

CONFIRMATION NO. 3312

PUBLICATION NOTICE



99633
McDermott Will & Emery LLP
The McDermott Building
500 North Capitol Street, N.W.
Washington, DC 20001

Title:ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS

Publication No.US-2015-0300140-A1

Publication Date:10/22/2015

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 Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
14/366,219 06/17/2014 Larry Steven Eoff 2013-IP-072509 U1 US 3312

99633 7590 08/06/2015
McDermott Will & Emery LLP
The McDermott Building
500 North Capitol Street, N.W.
Washington, DC 20001

Table with 1 column: EXAMINER

DEFAZIO, JOSEPH A

Table with 2 columns: ART UNIT, PAPER NUMBER

3674

Table with 2 columns: NOTIFICATION DATE, DELIVERY MODE

08/06/2015

ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com

**Office Action Summary**

**Application No.**  
14/366,219

**Applicant(s)**  
EOFF ET AL.

**Examiner**  
JOSEPH DEFAZIO

**Art Unit**  
3674

**AIA (First Inventor to File)  
Status**  
Yes

**-- 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 MONTHS 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 06/17/2014.  
 A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
- 2a)  This action is **FINAL**.                      2b)  This action is non-final.
- 3)  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.
- 4)  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\***

- 5)  Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 6)  Claim(s) \_\_\_\_\_ is/are allowed.
- 7)  Claim(s) 1-20 is/are rejected.
- 8)  Claim(s) \_\_\_\_\_ is/are objected to.
- 9)  Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

**Application Papers**

- 10)  The specification is objected to by the Examiner.
- 11)  The drawing(s) filed on 06/17/2014 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).

**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).

**Certified copies:**

- 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)).

\*\* 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)  Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)  
Paper No(s)/Mail Date 06/17/2014; 03/13/2015
- 3)  Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_ .
- 4)  Other: \_\_\_\_\_.

## DETAILED ACTION

### ***Notice of Pre-AIA or AIA Status***

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### ***Claim Objections***

Claims 1 and 11 are objected to because of the following informalities:

*Claim 1:*

Line 6 of Claim 1 recites “wherein first treatment zone comprises formation damage”. This is probably a typographical error. Examiner suggests the correction “wherein the first treatment zone comprises formation damage”.

*Claim 11:*

Line 21 of Claim 11 recites in part “restore first treatment zone”. This is probably a typographical error. Examiner suggests the correction “restore the first treatment zone”.

The last line of Claim 11 recites “(g) removing the treatment fluid from the injection well.” This is probably a typographical error. Examiner suggests the correction “(i) removing the treatment fluid from the injection well.”

Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5-13 and 15-20 are rejected under 35 U.S.C. 103 as being unpatentable over US 4,487,265 (“Watanabe”) in view of US 2005/0178549 (“Eoff”).

*Claim 1:*

Regarding Claim 1, Watanabe discloses:

*A method comprising:*

*(a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator; (Watanabe: Abstract*

Art Unit: 3674

(aqueous solution of an acid, glycol ether, water-soluble nitrogen containing polymer);

Col. 3, lines 44-48 (treatment fluid is a 25% to 95% by volume aqueous solution of hydrochloric or hydrofluoric acid); Col. 6, lines 13-15, 22-30 (permeability modifier

polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups);

Col. 5, lines 1-22 (permeability modifier deactivator glycol ethers, including preferred

embodiment ethylene glycol monobutyl ether (“EGMBE”); Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents))

*(b) providing an injection well in a subterranean formation (Watanabe: Col. 8, lines 2-5) . . . , wherein [the] first treatment zone comprises formation damage;*

(Watanabe: Col. 1, lines 22-32 (plugging damage))

*(c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;* (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells);

Col. 9, lines 11 (producing interval), 18-23 (preflush aqueous solution of hydrochloric acid, EGMBE and polyacrylamide), 26-33 (aqueous solution of hydrochloric/hydrofluoric acid, EGMBE and polyacrylamide))

*(d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;* (Watanabe: Col. 9, lines 23-25)

. . . ;

*and (g) removing the treatment fluid from the injection well.* (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 34-37 (afterflush)).

Watanabe does not disclose:



Art Unit: 3674

*(b) a first treatment zone comprising a first aqueous formation permeability, . . . ;*

*(e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;*

*(f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability;*

However, Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well (Eoff: Abstract) where a treatment zone with an initial aqueous permeability (Eoff: [0041], [0042] Table I) is reacted with a permeability modifier (Eoff: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (Eoff: [0042] Table I). Eoff further teaches contacting the reacted zone with a permeability modifier deactivator that causes the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by Watanabe by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone with the permeability modifier deactivator, as taught by Eoff, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

*Claim 2:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.* (Eoff '759: [0009] (repeat the treatment at selected zones in the well)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to repeat, as taught by Eoff, the treatment steps disclosed by Watanabe in view of Eoff '759, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

*Claim 3:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.* (Eoff: [0042] Table I (aqueous permeability decreases to 85% less than its original value)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to decrease the aqueous formation permeability of the zone, disclosed by Watanabe in view of Eoff, to 85% less than its

Art Unit: 3674

pretreatment value, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of 50%-90% less than the original value of the formation aqueous permeability overlaps the value of 85% disclosed by Eoff.

*Claim 5:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.* (Watanabe: Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups)).

*Claim 6:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Art Unit: 3674

Eoff further discloses *wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.* (Eoff: [0024] (0.01% - 10% by weight)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier, disclosed by Watanabe in view of Eoff, present in the amount from 0.01% - 10% by weight of the treatment fluid, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.05% to about 5% by weight of permeability modifier present in the treatment fluid overlaps the range of 0.01% - 10% disclosed by Eoff.

*Claim 7:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.* (Watanabe: Col. 5, lines 32-34 (aqueous solution comprises 5-28% by weight hydrogen chloride); Col. 3, lines 44-48 (water 25-95% by volume, so EGMBE is 5-75% by volume, taking water

Art Unit: 3674

with density of 1 g/L and EGMBE with density of 0.902 g/L, gives water 27-95.5% by weight, and hydrogen chloride in the range of 1.35 – 26.74 % by weight  $((0.05*27)\% - ((0.28*95.5)\%))$ .

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.5% to about 8% by weight of acid present in the treatment fluid overlaps the range of 1.35% - 26.74% disclosed by Watanabe.

*Claim 8:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses *wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.* (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

*Claim 9:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Eoff further discloses *wherein the permeability modifier deactivator is present in an amount in the range of from about 0.0001% to about 200% by weight of the*

Art Unit: 3674

*permeability modifier*. (Eoff: [0024] (0.01% - 10% by weight of permeability modifier in treatment fluid; [0042] (6.8% by weight percent of permeability modifier deactivator in second fluid, second fluid is about 5% of total fluid volume; assuming equal densities, permeability modifier deactivator is 0.34% by weight percent of total treatment fluid, so deactivator is present in a range 0.034% - 3.4% by weight of permeability modifier)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier deactivator, disclosed by Watanabe in view of Eoff, present in the amount from 0.034% - 3.4% by weight of the permeability modifier, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.0001% to about 200% by weight of permeability modifier deactivator present with respect to the permeability modifier overlaps the range of 0.034% - 3.4% disclosed by Eoff.

*Claim 10:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Art Unit: 3674

Eoff further discloses *wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.* (Eoff: [0041], [0042] Table I (restored to 98% of its original value, which is a restoration of 83%  $((100-2) - (100-85))\%$  ).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the aqueous formation permeability of the treatment zone, disclosed by Watanabe in view of Eoff, restored to 98% of its original value, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of restoration to at least 20% of the treatment zone's original aqueous formation permeability overlaps the value of 98% disclosed by Eoff.

*Claim 11:*

Regarding Claim 11, Watanabe discloses:

*A method comprising:*

*(a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier;* (Watanabe: Abstract (aqueous solution of an acid, glycol ether, water-soluble nitrogen containing polymer); Col. 3, lines 44-48 (treatment fluid is

Art Unit: 3674

a 25% to 95% by volume aqueous solution of hydrochloric or hydrofluoric acid); Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups))

...;

*(c) providing an injection well in a subterranean formation having a first treatment zone (Watanabe: Col. 8, lines 2-5) . . . , wherein the first treatment zone comprises formation damage; (Watanabe: Col. 1, lines 22-32 (plugging damage))*

*(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone; (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 11 (producing interval), 18-23 (preflush aqueous solution of hydrochloric acid and polyacrylamide), 26-33 (aqueous solution of hydrochloric/hydrofluoric acid and polyacrylamide))*

*(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage; (Watanabe: Col. 9, lines 23-25)*

...;

*and ([i]) removing the treatment fluid from the injection well. (Watanabe: Col. 8, lines 2-5 (wells can be production or injection wells); Col. 9, lines 34-37 (afterflush)).*

Watanabe does not disclose:

*(b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;*

*(c) . . . a first treatment zone comprising a first aqueous formation permeability . .*

. ;



*(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;*

*(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;*

*(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore [the] first treatment zone to about the first aqueous formation permeability;*

However, Eoff teaches a method of temporarily reducing the permeability of selected zones of subterranean formation penetrated by a horizontal injection well (Eoff: Abstract) where a treatment zone with an initial aqueous permeability (Eoff: [0041], [0042] Table I) is reacted with a permeability modifier (Eoff: [0038], [0041]) causing the aqueous permeability of the zone to decrease to 15% of its original value (Eoff: [0042] Table I). Eoff further teaches contacting the reacted zone with a second treatment fluid with a permeability modifier deactivator in an aqueous base fluid (Eoff: [0039]) that causes the permeability of the zone to be restored to 98% of its original value (Eoff: [0041], [0042] Table I).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to modify the method disclosed by Watanabe by reacting the permeability modifier with the first zone, causing the zone's aqueous formation permeability to decrease, followed by contacting the reacted zone

Art Unit: 3674

with the permeability modifier deactivator, with the permeability modifier deactivator in a aqueous treatment fluid separate from the fluid with the permeability modifier, as taught by Eoff, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]) and restoring selected treated sections with second separate aqueous treatment fluid containing permeability modifier deactivator (Eoff: [0039]).

*Claim 12:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.* (Eoff '759: [0009] (repeat the treatment at selected zones in the well)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to repeat, as taught by Eoff, the treatment steps disclosed by Watanabe in view of Eoff '759, for the purpose of treating selected sections of horizontal wellbores (Eoff: [0007]).

*Claim 13:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.*

Art Unit: 3674

(Eoff: [0042] Table I (aqueous permeability decreases to 85% less than its original value)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to decrease the aqueous formation permeability of the zone, disclosed by Watanabe in view of Eoff, to 85% less than its pretreatment value, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of 50%-90% less than the original value of the formation aqueous permeability overlaps the value of 85% disclosed by Eoff.

*Claim 15:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.* (Watanabe: Col. 6, lines 13-15, 22-30 (permeability modifier polyacrylamide and partially hydrolyzed polyacrylamide containing carboxyl groups)).

Art Unit: 3674

*Claim 16:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.* (Eoff: [0024] (0.01% - 10% by weight)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier, disclosed by Watanabe in view of Eoff, present in the amount from 0.01% - 10% by weight of the treatment fluid, as taught by Eoff, for the purpose of achieving zonal isolation in the well bore (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.05% to about 5% by weight of permeability modifier present in the treatment fluid overlaps the range of 0.01% - 10% disclosed by Eoff.

*Claim 17:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Art Unit: 3674

Watanabe further discloses *wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.* (Watanabe: Col. 5, lines 32-34 (aqueous solution comprises 5-28% by weight hydrogen chloride); Col. 3, lines 44-48 (water 25-95% by volume, so EGMBE is 5-75% by volume, taking water with density of 1 g/L and EGMBE with density of 0.902 g/L, gives water 27-95.5% by weight, and hydrogen chloride in the range of 1.35 – 26.74 % by weight  $((0.05*27)\%$  -  $((0.28*95.5)\%$ )).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.5% to about 8% by weight of acid present in the treatment fluid overlaps the range of 1.35% - 26.74% disclosed by Watanabe.

*Claim 18:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses *w18. The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.* (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Art Unit: 3674

*Claim 19:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier deactivator is present in an amount in the range of from about 0.0001% to about 200% by weight of the permeability modifier.* . (Eoff: [0024] (0.01% - 10% by weight of permeability modifier in treatment fluid; [0042] (6.8% by weight percent of permeability modifier deactivator in second fluid, second fluid is about 5% of total fluid volume; assuming equal densities, permeability modifier deactivator is 0.34% by weight percent of total treatment fluid, so deactivator is present in a range 0.034% - 3.4% by weight of permeability modifier)).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the permeability modifier deactivator, disclosed by Watanabe in view of Eoff, present in the amount from 0.034% - 3.4% by weight of the permeability modifier, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of from about 0.0001% to about 200% by weight of permeability modifier deactivator present with respect to the permeability modifier overlaps the range of 0.034% - 3.4% disclosed by Eoff.

Art Unit: 3674

*Claim 20:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Eoff further discloses *wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.* (Eoff: [0041], [0042] Table I (restored to 98% of its original value, which is a restoration of 83%  $((100-2) - (100-85))\%$  ).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of applicant's claimed invention to have the aqueous formation permeability of the treatment zone, disclosed by Watanabe in view of Eoff, restored to 98% of its original value, as taught by Eoff, for the purpose of controlling production from regions of varying permeability in the treatment zone (Eoff: [0006]).

Where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (MPEP § 2144.05 I). Here, the claimed range of restoration to at least 20% of the treatment zone's original aqueous formation permeability overlaps the value of 83% disclosed by Eoff.

Claims 4 and 14 are rejected under 35 U.S.C. 103 as being unpatentable over US 4,487,265 (“Watanabe”) in view of US 2005/0178549 (“Eoff”), as further evidenced by US 5,979,557 (“Card”).

Art Unit: 3674

*Claim 4:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 1.

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

*Claim 14:*

As discussed above, Watanabe in view of Eoff discloses all of the elements of Claim 11.

Watanabe further discloses EGMBE as a mutual solvent in the treatment fluid (Watanabe: Col. 8, lines 13-18 (EGMBE and tertiary carboxylic acid alkylated amide behave as mutual solvents)).



Art Unit: 3674

Watanabe in view of Eoff does not disclose *wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.*

However, Card provides evidence that EGMBE is a preferred agent for desorption of agents from the surface of subterranean formations (Card: Col. 14, lines 12-16).

### **Conclusion**

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US 7,281,579 (Abstract: discloses a method of placing an aqueous phase polymer and/or resin that at a designated set up time solidifies and blocks water conduits in a subterranean formation, and subsequent displacement of the polymer and/or resin).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOSEPH DEFAZIO whose telephone number is (571)272-2764. The examiner can normally be reached on Mon - Fri: 8:30AM - 6:30PM Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doug Hutton can be reached on 571-272-4137. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3674

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/JOSEPH DEFAZIO/  
Examiner, Art Unit 3674

/Doug Hutton/  
Supervisory Patent Examiner, Art Unit 3674

<b>Notice of References Cited</b>	Application/Control No. 14/366,219	Applicant(s)/Patent Under Reexamination EOFF ET AL.	
	Examiner JOSEPH DEFAZIO	Art Unit 3674	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A US-4,487,265	12-1984	Watanabe, David J.	166/307
*	B US-2005/0178549	08-2005	Eoff et al.	166/295
*	C US-5,979,557	11-1999	Card et al.	166/300
	D US-			
	E US-			
	F US-			
	G US-			
	H US-			
	I US-			
	J US-			
	K US-			
	L US-			
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**FOREIGN PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N				
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**NON-PATENT DOCUMENTS**

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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<b>Search Notes</b>  	<b>Application/Control No.</b>  14366219	<b>Applicant(s)/Patent Under Reexamination</b>  EOFF ET AL.
	<b>Examiner</b>  JOSEPH DEFAZIO	<b>Art Unit</b>  3674

CPC- SEARCHED		
Symbol	Date	Examiner
E21B 33/13; E21B 43/295; C09K 8/68; E21B 43/00; E21B 43/25; E21B 43/16; E21B 43/27; C09K 8/60; E21B 29/10; E21B 33/138; E21B 43/162; C09K 8/74	7/30/2015	JD

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
166	300	7/30/2015	JD

SEARCH NOTES		
Search Notes	Date	Examiner
Consult with A. DiTrani	7/27/2015	JD
PALM Inventor Name Search	7/28/2015	JD
EAST Inventor Name Search	7/28/2015	JD
EAST Assignee/Applicant/Assignee as Inventor Name Search	7/30/2015	JD
EAST Keyword Search	7/28/2015	JD
Google Patent/NPL Name Search	7/29/2015	JD

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**BIB DATA SHEET**
**CONFIRMATION NO. 3312**

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
14/366,219	06/17/2014	166	3674	2013-IP-072509 U1 US		
<b>APPLICANTS</b> Halliburton Energy Services, Inc., Houston, TX;						
<b>INVENTORS</b> Larry Steven Eoff, Duncan, OK; B. Raghava Reddy, The Woodlands, TX; Eric Davidson, Aberdeen, UNITED KINGDOM; Alexandra Clare Morrison, Inverurie, SOUTH AFRICA;						
<b>** CONTINUING DATA *****</b> This application is a 371 of PCT/US2013/056726 08/27/2013						
<b>** FOREIGN APPLICATIONS *****</b>						
<b>** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **</b> 07/01/2015						
Foreign Priority claimed 35 USC 119(a-d) conditions met	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Met after Allowance Initials	<b>STATE OR COUNTRY</b> OK	<b>SHEETS DRAWINGS</b> 2	<b>TOTAL CLAIMS</b> 20	<b>INDEPENDENT CLAIMS</b> 2
<b>ADDRESS</b> McDermott Will & Emery LLP The McDermott Building 500 North Capitol Street, N.W. Washington, DC 20001 UNITED STATES						
<b>TITLE</b> ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS						
<b>FILING FEE RECEIVED</b> 1480	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit			

Doc code: IDS

PTO/SB/08a (01-10)

Doc description: Information Disclosure Statement (IDS) Filed

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		14366219	
	Filing Date		2014-06-17	
	First Named Inventor	Larry S. EOFF		
	Art Unit		N/A	
	Examiner Name	Not Yet Assigned		
	Attorney Docket Number		2013-IP-072509 U1 US	

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2</sup>	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1	2015030721	WO	A1	2015-03-05	Halliburton Energy Services, Inc.		<input checked="" type="checkbox"/>

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NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		14366219	
Filing Date		2014-06-17	
First Named Inventor	Larry S. EOFF		
Art Unit	N/A		
Examiner Name	Not Yet Assigned		
Attorney Docket Number	2013-IP-072509 U1 US		

1		<input type="checkbox"/>
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**EXAMINER SIGNATURE**

Examiner Signature	/Joseph Defazio/	Date Considered	07/30/2015
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

Doc code: IDS

PTO/SB/08a (01-10)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2012. OMB 0651-0031  
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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		2014-06-17
	First Named Inventor	Larry S. EOFF	
	Art Unit		N/A
	Examiner Name	Not Yet Assigned	
	Attorney Docket Number		2013-IP-072509 U1 US

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4982793		1991-01-08	Holtmyer et al.	
	2	5067565		1991-11-26	Holtmyer et al.	
	3	5122549		1992-06-16	Holtmyer et al.	
	4	6207771		2001-03-27	Larson	
	5	6364016		2002-04-02	Dalrymple et al.	
	6	6476169		2002-11-05	Eoff et al.	
	7	6516885		2003-02-11	Munday	
	8	7114568		2006-10-03	Eoff et al.	



**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		14366219 - GAU: 3674
Filing Date		2014-06-17
First Named Inventor	Larry S. EOFF	
Art Unit		N/A
Examiner Name	Not Yet Assigned	
Attorney Docket Number		2013-IP-072509 U1 US

9	7117942		2006-10-10	Dalrymple et al.	
10	7182136		2007-02-27	Dalrymple et al.	
11	7552771		2009-06-30	Eoff et al.	
12	7563750		2009-07-21	Eoff et al.	
13	7589048		2009-09-15	Eoff et al.	
14	7595283		2009-09-29	Eoff et al.	
15	7727936	A1	2010-06-01	Pauls et al.	
16	7759292	A1	2010-07-20	Eoff et al.	
17	8008235	A1	2011-08-30	Eoff et al.	
18	8273692		2012-09-25	Eoff et al.	

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**U.S.PATENT APPLICATION PUBLICATIONS**

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		14366219 - GAU: 3674	
Filing Date		2014-06-17	
First Named Inventor	Larry S. EOFF		
Art Unit	N/A		
Examiner Name	Not Yet Assigned		
Attorney Docket Number	2013-IP-072509 U1 US		

Examiner Initial*	Cite No	Publication Number	Kind Code <sup>1</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20080110624		2008-05-15	Nguyen et al.	
	2	20100230106		2010-09-16	Milne et al.	
	3	20110034351		2011-02-10	Eoff et al.	
	4	20120168166		2012-07-05	Dalrymple et al.	
	5	20120231978		2012-09-13	Eoff et al.	
	6	20120264885		2012-10-18	Eoff et al.	

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**FOREIGN PATENT DOCUMENTS**

Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2</sup> i	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1							<input type="checkbox"/>

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**NON-PATENT LITERATURE DOCUMENTS**

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		14366219 - GAU: 3674	
Filing Date		2014-06-17	
First Named Inventor	Larry S. EOFF		
Art Unit	N/A		
Examiner Name	Not Yet Assigned		
Attorney Docket Number	2013-IP-072509 U1 US		

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1	International Search Report and Written Opinion for PCT/US2013/056726 dated May 23, 2014	<input type="checkbox"/>

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**EXAMINER SIGNATURE**

Examiner Signature	/Joseph Defazio/	Date Considered	07/30/2015
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

## EAST Search History

## EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	24729	(E21B33/13 OR E21B43/295 OR C09K8/68 OR E21B43/00 OR E21B43/25 OR E21B43/16 OR E21B43/27 OR C09K8/60 OR E21B29/10 OR E21B33/138 OR E21B43/162 OR C09K8/74).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 11:32
L2	44	L1 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 11:33
L3	179	(subterranean well\$1bore\$1 bore\$1hole\$1 down\$1hole\$1 oil\$1well\$1 oil\$1field\$1) AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 11:34
L4	3	L2 NOT L3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 11:34
L5	33	166/300.CCLS. AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 11:38
L6	0	L5 NOT L3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 11:38
L7	223	Halliburton.AS. AND ((permeable OR permeability) AND (water OR water\$1based OR aqueous) AND acid).CLM.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 11:49
L8	640	((Eoff NEAR3 Larry) OR (B\$1 NEAR3	US-	OR	ON	2015/07/30

		Reddy) OR (ERIC NEAR3 DAVIDSON) OR (MORRISON NEAR3 ALEXANDRA)).IN.	PGPUB; USPAT; USOCR			11:51
L9	90	L8 AND ((permeable OR permeability) AND (water OR water\$1based OR aqueous) AND acid).CLM.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 11:51
L10	157	L7 NOT L9	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 11:51
L11	13	Halliburton.AANM. AND ((permeable OR permeability) AND (water OR water\$1based OR aqueous) AND acid).CLM.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 12:15
L12	1	L11 NOT (L9 OR L7)	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 12:16
L13	0	Halliburton.IN. AND ((permeable OR permeability) AND (water OR water\$1based OR aqueous) AND acid).CLM.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/30 12:17
S1	2393	((Eoff NEAR3 Larry) OR (B\$1 NEAR3 Reddy) OR (ERIC NEAR3 DAVIDSON) OR (MORRISON NEAR3 ALEXANDRA)).IN.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 13:23
S2	640	((Eoff NEAR3 Larry) OR (B\$1 NEAR3 Reddy) OR (ERIC NEAR3 DAVIDSON) OR (MORRISON NEAR3 ALEXANDRA)).IN.	US- PGPUB; USPAT; USOCR	OR	ON	2015/07/28 13:23
S3	127	S2 AND (permeable OR permeability).CLM.	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 13:24
S4	90	S2 AND ((permeable OR permeability) AND (water OR water\$1based OR aqueous) AND acid).CLM.	US- PGPUB; USPAT; USOCR; FPRS;	OR	ON	2015/07/28 13:25

			EPO; JPO; DERWENT			
S5	9	(US-20040229757-\$ or US-20050194140-\$ or US-20060137875-\$ or US-20110214865-\$ or US-20090291863-\$ or US-20080070805-\$ or US-20060283592-\$ or US-20040229756-\$ or US-20050178549-\$).did.	US-PGPUB	OR	ON	2015/07/28 14:10
S6	6	S5 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME acid).CLM.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 14:11
S7	0	S5 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (surfactant OR solvent OR restore\$2) SAME acid).CLM.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 14:12
S8	3	S5 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME acid).CLM. AND (surfactant OR solvent OR restore\$2).CLM.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 14:14
S12	547	(subterranean well\$1bore\$1 bore\$1hole\$1 down\$1hole\$1 oil\$1well\$1 oil\$1field\$1) AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 16:16
S13	179	(subterranean well\$1bore\$1 bore\$1hole\$1 down\$1hole\$1 oil\$1well\$1 oil\$1field\$1) AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 16:18
S14	1	("4,464,268").PN.	US-PGPUB; USPAT	OR	OFF	2015/07/28 18:36
S15	1	("5,199,490").PN.	US-PGPUB; USPAT	OR	OFF	2015/07/28 19:04
S16	62	(US-20040229757-\$ or US-20050194140-\$ or US-20060137875-\$ or US-20110214865-\$ or US-20090291863-\$ or US-20080070805-\$ or US-20060283592-\$ or US-20040229756-\$ or US-20050178549-\$ or US-20030054962-\$ or US-20050252659-\$ or US-20060042797-\$ or US-20060157248-\$ or US-20060175059-\$ or US-20070235189-\$ or US-20080096774-\$ or US-20090118143-\$ or US-20090260813-\$ or US-20090308609-\$ or US-20100004146-\$ or	US-PGPUB; USPAT; USOCR; FPRS; DERWENT	OR	ON	2015/07/28 19:40

		US-20110048708-\$ or US-20140166291-\$ or US-20140290943-\$ or US-20140332212-\$ or US-20150075798-\$).did. or (US-3938594-\$ or US-4460627-\$ or US-4487265-\$ or US-4532052-\$ or US-4534412-\$ or US-4694906-\$ or US-4783492-\$ or US-4830108-\$ or US-4846981-\$ or US-5038864-\$ or US-5129457-\$ or US-5268112-\$ or US-5735349-\$ or US-6189615-\$ or US-4464268-\$ or US-7281579-\$ or US-7595283-\$ or US-5199490-\$).did. or (US-3308885-\$ or US-3315744-\$ or US-3336977-\$ or US-3343599-\$ or US-3415319-\$ or US-3482636-\$ or US-3500928-\$ or US-3516496-\$ or US-3529669-\$ or US-3836465-\$).did. or (EP-2436748-\$ or CA-2098829-\$ or WO-9518910-\$).did. or (CA-2283019-\$ or US-20090301722-\$ or US-20150060072-\$ or WO-2015013112-\$).did.				
S17	19	S16 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer SAME (degrad\$5 OR desorb\$4 OR block\$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 19:42
S18	41	S16 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer) AND (degrad\$5 OR desorb\$4 OR block\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 19:51
S19	5	S16 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer) AND (degrad\$5 OR desorb\$4 OR block\$4) AND ((acid OR acidiz\$6) WITH (damage OR repair))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 20:02
S20	50	S16 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/28 20:11
S22	1	("20050178544").PN.	US-PGPUB; USPAT	OR	OFF	2015/07/29 10:40
S23	4	((("20050178544") or ("20090260813") or ("20050178549") or ("20040229756")).PN.	US-PGPUB; USPAT	OR	OFF	2015/07/29 10:44
S24	1	S23 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2015/07/29 10:47

			DERWENT			
S25	0	S23 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer) AND (degrad\$5 OR desorb\$4 OR block\$4) AND ((acid OR acidiz\$6) WITH (damage OR repair))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 10:48
S26	1	S23 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer) AND (degrad\$5 OR desorb\$4 OR block\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 10:49
S27	1	S23 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 10:50
S28	5	(("20050178544") or ("20090260813") or ("20050178549") or ("20040229756") or ("7281579")).PN.	US-PGPUB; USPAT	OR	OFF	2015/07/29 10:51
S29	2	S28 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid\$3 OR pH) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 10:51
S30	63	(US-20040229757-\$ or US-20050194140-\$ or US-20060137875-\$ or US-20110214865-\$ or US-20090291863-\$ or US-20080070805-\$ or US-20060283592-\$ or US-20040229756-\$ or US-20050178549-\$ or US-20030054962-\$ or US-20050252659-\$ or US-20060042797-\$ or US-20060157248-\$ or US-20060175059-\$ or US-20070235189-\$ or US-20080096774-\$ or US-20090118143-\$ or US-20090260813-\$ or US-20090308609-\$ or US-20100004146-\$ or US-20110048708-\$ or US-20140166291-\$ or US-20140290943-\$ or US-20140332212-\$ or US-20150075798-\$ or US-20050178544-\$).did. or (US-3938594-\$ or US-4460627-\$ or US-4487265-\$ or US-4532052-\$ or US-4534412-\$ or US-4694906-\$ or US-4783492-\$ or US-4830108-\$ or US-4846981-\$ or US-5038864-\$ or US-5129457-\$ or US-5268112-\$ or US-5735349-\$ or US-6189615-\$ or US-4464268-\$ or US-7281579-\$ or US-7595283-\$ or US-5199490-\$).did. or (US-3308885-\$ or US-3315744-\$ or US-3336977-\$ or US-3343599-\$ or US-3415319-\$ or US-3482636-\$ or US-3500928-\$ or US-3516496-\$ or US-3529669-\$ or US-	US-PGPUB; USPAT; USOCR; FPRS; DERWENT	OR	ON	2015/07/29 11:33



		3836465-\$).did. or (EP-2436748-\$ or CA-2098829-\$ or WO-9518910-\$).did. or (CA-2283019-\$ or US-20090301722-\$ or US-20150060072-\$ or WO-2015013112-\$).did.				
S31	45	S30 AND ((permeable OR permeability) SAME (water OR water\$1based OR aqueous) SAME (acid or acidiz\$4 or acidization) SAME (surfactant OR solvent OR restore\$2 OR \$3activat\$3) SAME inject\$4 SAME polymer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 11:35
S32	17	S30 and ((water WITH soluble WITH polymer) SAME (surfactant OR (free WITH radical)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 11:46
S33	24	("4982793") or ("5067565") or ("5122549") or ("6207771") or ("6364016") or ("6476169") or ("6516885") or ("7114568") or ("7117942") or ("7182136") or ("7552771") or ("7563750") or ("7589048") or ("7595283") or ("7727936") or ("7759292") or ("8008235") or ("8273692") or ("20080110624") or ("20100230106") or ("20110034351") or ("20120168166") or ("20120231978") or ("20120264885").PN.	US-PGPUB; USPAT	OR	OFF	2015/07/29 12:12
S35	80	(US-20040229757-\$ or US-20050194140-\$ or US-20060137875-\$ or US-20110214865-\$ or US-20090291863-\$ or US-20080070805-\$ or US-20060283592-\$ or US-20040229756-\$ or US-20050178549-\$ or US-20030054962-\$ or US-20050252659-\$ or US-20060042797-\$ or US-20060157248-\$ or US-20060175059-\$ or US-20070235189-\$ or US-20080096774-\$ or US-20090118143-\$ or US-20090260813-\$ or US-20090308609-\$ or US-20100004146-\$ or US-20110048708-\$ or US-20140166291-\$ or US-20140290943-\$ or US-20140332212-\$ or US-20150075798-\$ or US-20050178544-\$).did. or (US-20120168166-\$ or US-20110034351-\$ or US-20100230106-\$ or US-20080110624-\$).did. or (US-7182136-\$ or US-3938594-\$ or US-4460627-\$ or US-4487265-\$ or US-4532052-\$ or US-4534412-\$ or US-4694906-\$ or US-4783492-\$ or US-4830108-\$ or US-4846981-\$ or US-5038864-\$ or US-5129457-\$ or US-5268112-\$ or US-5735349-\$ or US-6189615-\$ or US-4464268-\$ or US-7281579-\$ or US-7595283-\$ or US-5199490-\$ or US-7727936-\$ or US-7589048-\$ or US-7563750-\$ or US-7552771-\$ or US-7114568-\$ or US-6516885-\$ or US-6476169-\$).did. or (US-	US-PGPUB; USPAT; USOCR; FPRS; DERWENT	OR	ON	2015/07/29 14:07

		6364016-\$ or US-6207771-\$ or US-5122549-\$ or US-5067565-\$ or US-4982793-\$).did. or (US-3308885-\$ or US-3315744-\$ or US-3336977-\$ or US-3343599-\$ or US-3415319-\$ or US-3482636-\$ or US-3500928-\$ or US-3516496-\$ or US-3529669-\$ or US-3836465-\$).did. or (EP-2436748-\$ or CA-2098829-\$ or WO-9518910-\$).did. or (CA-2283019-\$ or US-20090301722-\$ or US-20150060072-\$ or WO-2015013112-\$).did.				
S36	21	S35 and ((water WITH soluble WITH polymer) SAME (surfactant OR (free WITH radical)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 14:08
S37	10	S35 and (acidizing WITH permeability)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 15:18
S38	2	S35 and (acidizing WITH permeability) and (restore\$2 OR deactivat\$3 or desorpt\$4 OR (free WITH radical))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 15:29
S39	30	S35 and (restore\$2 OR deactivat\$3 or desorpt\$4 OR (free WITH radical))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 15:31
S40	2	(US-7552771-\$ or US-4487265-\$).did.	USPAT	OR	ON	2015/07/29 16:29
S41	2	S40 and (permeable OR permeability)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 16:30
S42	14	S35 and polyacrylamide and (ethylene WITH glycol)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 16:58
S43	9	S35 and polyacrylamide and (ethylene WITH glycol WITH ether)	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2015/07/29 17:01


			EPO; JPO; DERWENT			
S44	1	("20090120642").PN.	US- PGPUB; USPAT	OR	OFF	2015/07/29 17:11
S45	9	S35 and (ethylene WITH glycol WITH ether)	US- PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/07/29 17:46
S47	1	("5979557").PN.	US- PGPUB; USPAT	OR	OFF	2015/07/29 18:56

**EAST Search History (Interference)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S9	316	((Eoff NEAR3 Larry) OR (B\$1 NEAR3 Reddy) OR (ERIC NEAR3 DAVIDSON) OR (MORRISON NEAR3 ALEXANDRA)).IN.	USPAT; UPAD	OR	ON	2015/07/28 13:55
S10	41	S9 AND ((permeable OR permeability) AND (water OR water\$1based OR aqueous) AND acid).CLM.	USPAT; UPAD	OR	ON	2015/07/28 13:56
S11	2	"Term Removed"	USPAT	OR	ON	2015/07/28 14:10
S21	2	"Term Removed"	USPAT	OR	ON	2015/07/28 19:40
S34	2	"Term Removed"	USPAT	OR	ON	2015/07/29 11:33
S46	1	"Term Removed"	USPAT	OR	ON	2015/07/29 14:07

7/ 30/ 2015 12:18:54 PM

C:\Users\jdefazio\Documents\EAST\Workspaces\14366219.wsp

<b><i>Index of Claims</i></b>  	<b>Application/Control No.</b> 14366219	<b>Applicant(s)/Patent Under Reexamination</b> EOFF ET AL.
	<b>Examiner</b> JOSEPH DEFAZIO	<b>Art Unit</b> 3674

✓	<b>Rejected</b>
=	<b>Allowed</b>

-	<b>Cancelled</b>
÷	<b>Restricted</b>

N	<b>Non-Elected</b>
I	<b>Interference</b>

A	<b>Appeal</b>
O	<b>Objected</b>

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

CLAIM		DATE							
Final	Original	07/30/2015							
	1	✓							
	2	✓							
	3	✓							
	4	✓							
	5	✓							
	6	✓							
	7	✓							
	8	✓							
	9	✓							
	10	✓							
	11	✓							
	12	✓							
	13	✓							
	14	✓							
	15	✓							
	16	✓							
	17	✓							
	18	✓							
	19	✓							
	20	✓							



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

Table with 3 columns: U.S. APPLICATION NUMBER NO. (14/366,219), FIRST NAMED INVENTOR (Larry Steven Eoff), ATTY. DOCKET NO. (2013-IP-072509 U1 US)

99633
McDermott Will & Emery LLP
The McDermott Building
500 North Capitol Street, N.W.
Washington, DC 20001

Table with 2 columns: INTERNATIONAL APPLICATION NO. (PCT/US2013/056726), I.A. FILING DATE (08/27/2013), PRIORITY DATE

CONFIRMATION NO. 3312
371 ACCEPTANCE LETTER



Date Mailed: 07/13/2015

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office, in its capacity as a Designated / Elected Office (37 CFR 1.495), has ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE or 371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1) and (c)(2) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN BELOW. The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363)

06/17/2014
DATE OF RECEIPT OF 35 U.S.C.
371(c)(1) and (c)(2) REQUIREMENTS

The following items have been received:

- Copy of the International Application filed on 06/17/2014
• English Translation of the IA filed on 06/17/2014
• Copy of the International Search Report filed on 06/17/2014
• Copy of IPE Report filed on 06/17/2014
• Information Disclosure Statements filed on 06/17/2014
• Inventor's Oath or Declaration filed on 06/17/2014
• Request for Immediate Examination filed on 06/17/2014
• U.S. Basic National Fees filed on 06/17/2014
• Assignee Statement for PGPUB filed on 06/24/2014
• Power of Attorney filed on 06/24/2014
• Authorization to Permit Access filed on 06/17/2014
• Application Data Sheet (37 CFR 1.76) filed on 06/17/2014

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

PATRICIA A BOOKER

---

Telephone: (571) 272-3882



**PATENT APPLICATION FEE DETERMINATION RECORD**

Substitute for Form PTO-875

Application or Docket Number  
14/366,219

**APPLICATION AS FILED - PART I**

(Column 1) (Column 2)

FOR	NUMBER FILED	NUMBER EXTRA
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A
TOTAL CLAIMS (37 CFR 1.16(j))	20	minus 20 = *
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 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))		

**SMALL ENTITY**

RATE(\$)	FEE(\$)
N/A	
N/A	
N/A	
TOTAL	

**OR OTHER THAN SMALL ENTITY**

RATE(\$)	FEE(\$)
N/A	280
N/A	480
N/A	720
x 80 =	0.00
x 420 =	0.00
	0.00
	0.00
TOTAL	1480

\* If the difference in column 1 is less than zero, enter "0" in column 2.

**APPLICATION AS AMENDED - PART II**

(Column 1) (Column 2) (Column 3)

AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total (37 CFR 1.16(j))	*	Minus	**	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=
	Application Size Fee (37 CFR 1.16(s))				
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					

**SMALL ENTITY**

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

**OR OTHER THAN SMALL ENTITY**

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

(Column 1) (Column 2) (Column 3)

AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total (37 CFR 1.16(j))	*	Minus	**	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=
	Application Size Fee (37 CFR 1.16(s))				
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					

**SMALL ENTITY**

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

**OR OTHER THAN SMALL ENTITY**

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
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 found in the appropriate box in column 1.





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Table with 6 columns: APPLICATION NUMBER, FILING or 371(c) DATE, GRP ART UNIT, FIL FEE REC'D, ATTY. DOCKET NO, TOT CLAIMS, IND CLAIMS. Row 1: 14/366,219, 06/17/2014, 1480, 2013-IP-072509 U1 US, 20, 2

CONFIRMATION NO. 3312

FILING RECEIPT

99633
McDermott Will & Emery LLP
The McDermott Building
500 North Capitol Street, N.W.
Washington, DC 20001



Date Mailed: 07/13/2015

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)

Larry Steven Eoff, Duncan, OK;
B. Raghava Reddy, The Woodlands, TX;
Eric Davidson, Aberdeen, UNITED KINGDOM;
Alexandra Clare Morrison, Inverurie, SOUTH AFRICA;

Applicant(s)

Halliburton Energy Services, Inc., Houston, TX;

Assignment For Published Patent Application

Halliburton Energy Services, Inc., Houston, TX

Power of Attorney: The patent practitioners associated with Customer Number 99633

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/US2013/056726 08/27/2013

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 - A proper Authorization to Permit Access to Application by Participating Offices (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 07/01/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is US 14/366,219

**Projected Publication Date:** 10/22/2015

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS

**Preliminary Class**

**Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:** No

## **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).

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**Title 35, United States Code, Section 184**  
**Title 37, Code of Federal Regulations, 5.11 & 5.15**

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		14366219	
	Filing Date		2014-06-17	
	First Named Inventor	Larry S. EOFF		
	Art Unit		N/A	
	Examiner Name	Not Yet Assigned		
	Attorney Docket Number		2013-IP-072509 U1 US	

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS						
Examiner Initial*	Cite No	Publication Number	Kind Code <sup>1</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2</sup>	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1	2015030721	WO	A1	2015-03-05	Halliburton Energy Services, Inc.		<input checked="" type="checkbox"/>

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		14366219
	Filing Date		2014-06-17
	First Named Inventor	Larry S. EOFF	
	Art Unit		N/A
	Examiner Name	Not Yet Assigned	
	Attorney Docket Number		2013-IP-072509 U1 US

	1		<input type="checkbox"/>
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**EXAMINER SIGNATURE**

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number	14366219
	Filing Date	2014-06-17
	First Named Inventor	Larry S. EOFF
	Art Unit	N/A
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	2013-IP-072509 U1 US

### CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

#### SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Iona N. Kaiser/	Date (YYYY-MM-DD)	2015-03-13
Name/Print	Iona N. Kaiser	Registration Number	53086

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**



- (51) **International Patent Classification:**  
*E21B 33/13* (2006.01)    *E21B 33/138* (2006.01)  
*E21B 29/10* (2006.01)
- (21) **International Application Number:**  
PCT/US2013/056726
- (22) **International Filing Date:**  
27 August 2013 (27.08.2013)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (71) **Applicant:** HALLIBURTON ENERGY SERVICES, INC. [US/US]; 10200 Bellaire Boulevard, Houston, TX 77072 (US).
- (72) **Inventors:** EOFF, Larry, Steven; 2201 Cedar, Duncan, OK 73533 (US). REDDY, Raghava, B.; 72 Laughing Brook Court, The Woodlands, TX 77380 (US). DAVIDSON, Eric; 26 Ashfield Road, Cults, Aberdeen, Uk AB15 9NQ (GB). MORRISON, Alexandra, Clare; Mains Of Blackhall Cottage, AB 51 5JJ Inverurie (ZA).
- (74) **Agents:** JORDAN, Carey, C. et al.; McDermott Will & Emery LLP, 500 North Capitol Street, N.W., Washington, DC 20001 (US).
- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

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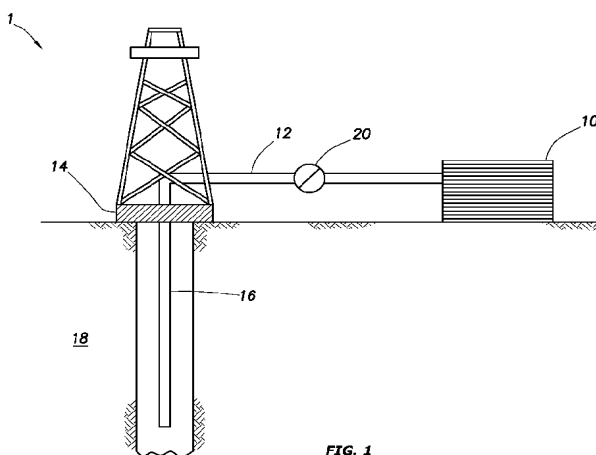


FIG. 1

(57) **Abstract:** Some embodiments herein comprise providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator; providing an injection well having a first treatment zone comprising a first aqueous formation permeability, wherein the first treatment zone comprises formation damage; introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone; reacting the acid with the first treatment zone so as to repair a portion of the formation damage; reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability to adopt a second, lesser aqueous formation permeability; and contacting the permeability modifier deactivator with the permeability modifier so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability.

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## ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS

### BACKGROUND

5           **[0001]**       The methods of the embodiments described herein relate to acid diversion treatments in injection wells using permeability modifiers.

**[0002]**       An injection well is a wellbore in subterranean formation used to pump fluids into a producing reservoir (e.g., a hydrocarbon producing reservoir). Injection wells are typically used for waterflood, pressure  
10 maintenance, and enhanced oil recovery purposes. Injection wells are often composed of multiple subterranean zonal portions that are not homogeneous in terms of permeability, porosity, and/or the degree of damage experienced in the particular zone compared to surrounding zones. These nonhomogeneous zones can impede fluid injectivity into producing wellbores and may require increased  
15 pressure to adequately inject fluids.

**[0003]**       It is common to perform acid diversion treatments in injection wells to combat the nonhomogeneous nature of the well. An aqueous acid treatment may be injected into an injection well, where the acid is expected to dissolve portions of the formation rock in the near wellbore region, thereby  
20 reducing the lack of zonal homogeneity in the injection well. Acids, however, follow the path of least resistance and tend to flow to high permeability zones. In order to uniformly treat an injection well with an acid, diversion techniques are typically employed. Diversion techniques encourage the acid to flow from high permeability zones to low permeability zones.

25           **[0004]**       Permeability modifiers have been effective acid diverters for hydrocarbon producing wells. They are capable of altering the relative permeability of a portion of a wellbore that they come into contact with, resulting in blockage of water production and/or diversion of aqueous fluids away from that portion of the wellbore. As such, they are particularly useful in  
30 hydrocarbon producing wells where they have no effect on hydrocarbon permeability and where there is no concern that the effects of the permeability modifier (e.g., reduction in water permeability) may remain in effect for a period longer than desired or permanently. Injection wells, on the other hand, typically involve injection of water rather than hydrocarbons and minimal pressure during  
35 fluid injection is desirable. Thus, the use of permeability modifiers, although



**2013-IP-072509U1 PCT**

effective acid diverters, in injection wells may result in undesirable or irreversible reduction in water permeability of the wellbore.

**[0005]** It is therefore desirable to provide an acid diversion treatment for use in an injection well comprising a permeability modifier, whose effects can be reversed after the treatment is complete.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**[0006]** The following figures are included to illustrate certain aspects of the embodiments herein, and should not be viewed as exclusive embodiments. The subject matter disclosed is capable of considerable modifications, alterations, combinations, and equivalents in form and function, as will occur to those skilled in the art and having the benefit of this disclosure.

**[0007]** FIG. 1 depicts an embodiment of a system configured for delivering the treatment fluids comprising the acid diversion compositions described in some embodiments herein to a downhole location.

**[0008]** FIG. 2 shows a graphical representation of a fluid loss control test demonstrating the ability of a surfactant to be used as a permeability modifier deactivator as disclosed in some embodiments herein.

20

**DETAILED DESCRIPTION**

**[0009]** The methods of the embodiments described herein relate to acid diversion treatments in injection wells using permeability modifiers.

**[0010]** Although the embodiments disclosed herein focus on providing treatment fluids for use in acid diversion treatments in injection wells, the treatment fluids may be effectively used in any other subterranean formation or subterranean formation treatment operation that may benefit from an acid diversion treatment with reversible permeability modification effects. Such formations may include, but are not limited to, hydrocarbon producing wells, gas producing wells, and the like. Such subterranean formation treatment operations may include acid-fracturing treatments, remedial treatments, completion treatments, and the like. Additionally, although the treatment fluids described herein relate to acid diversion treatments, they may also be used without the acid for other diverting subterranean treatment operations.

35

**2013-IP-072509U1 PCT**

**[0011]** One or more illustrative embodiments are presented below. Not all features of an actual implementation are described or shown in this application for the sake of clarity. It is understood that in the development of an actual embodiment, numerous implementation-specific decisions must be made  
5 to achieve the developer's goals, such as compliance with system-related, business-related, government-related and other constraints, which vary by implementation and from time to time. While a developer's efforts might be complex and time-consuming, such efforts would be, nevertheless, a routine undertaking for those of ordinary skill in the art having benefit of this disclosure.

**[0012]** It should be noted that when "about" is provided herein at the beginning of a numerical list, the term modifies each number of the numerical list. In some numerical listings of ranges, some lower limits listed may be greater than some upper limits listed. One skilled in the art will recognize that the selected subset will require the selection of an upper limit in excess of the  
15 selected lower limit. Unless otherwise indicated, all numbers expressing quantities of ingredients, properties such as molecular weight, reaction conditions, and so forth used in the present specification and associated claims are to be understood as being modified in all instances by the term "about." Accordingly, unless indicated to the contrary, the numerical parameters set forth  
20 in the following specification and attached claims are approximations that may vary depending upon the desired properties sought to be obtained by the exemplary embodiments described herein. At the very least, and not as an attempt to limit the application of the doctrine of equivalents to the scope of the claim, each numerical parameter should at least be construed in light of the  
25 number of reported significant digits and by applying ordinary rounding techniques.

**[0013]** While compositions and methods are described in terms of "comprising" various components or steps, the compositions and methods can also "consist essentially of" or "consist of" the various components and steps.  
30 When "comprising" is used in a claim, it is open-ended.

**[0014]** In some embodiments described herein, a method is provided comprising introducing a treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier into an injection well at a first treatment zone. In some embodiments, the treatment fluid may further  
35 comprise a permeability modifier deactivator, whereas in other embodiments the

**2013-IP-072509U1 PCT**

permeability modifier deactivator may be included in a later-placed fluid. The first treatment zone is characterized by a first aqueous formation permeability and comprises formation damage thereon (e.g., formation fines, other particulates, and the like). As used herein, the term "aqueous formation permeability" refers to the ability of a subterranean formation to transmit aqueous fluids, which may include aqueous fluids comprising acids for acid diversion treatments. As used herein, the term "formation damage" refers to undesirable deposits in a subterranean formation that may reduce its permeability (e.g., scale, skin, hydrates, geological deposits on the pore throats of the formation, and the like).

**[0015]** The acid in the treatment fluid is reacted with the formation at the first treatment zone so as to repair a portion of the formation damage in the first treatment zone, thereby increasing the overall permeability. The permeability modifier is reacted with the first treatment zone so as to cause the first aqueous formation permeability to decrease and adopt a second aqueous formation permeability. Thus, the permeability modifier is capable of reducing the water permeability of the first treatment zone. The permeability modifier deactivator and the permeability modifier are then contacted at the first treatment zone so as to deactivate the permeability modifier and restore first treatment zone to about the first aqueous formation permeability. After deactivation, the treatment fluid and any particulates formed as a result of repairing the formation damage may be removed from the injection well. In other embodiments, the acid and the permeability modifier are first introduced into the injection well in a first treatment fluid, so as to acidize and reduce the aqueous permeability of the first treatment zone, followed by introduction of a second treatment fluid comprising the permeability modifier deactivator. This provides methods wherein as a first treatment zone is exposed to an acid to remove formation damage (and thus increase the overall permeability that first treatment zone) the first treatment zone is simultaneously exposed to a permeability modifier that acts over time to reduce the aqueous permeability of the first treatment zone. In this way, as the treatment progresses, the first treatment zone will become gradually less permeable to the treatment fluid (which is itself aqueous based) and so may tend to self-divert the treatment fluid (containing the acid and the permeability modifier and the optional permeability

**2013-IP-072509U1 PCT**

modifier deactivator) to a second or subsequent treatment zone. The process of treating zonal portions of the injection well may be repeated in multiple zones.

**[0016]** The acid for use in the treatment fluids of the embodiments described herein may include any acid capable of removing formation damage from a subterranean formation, provided the acid does not adversely affect the function of the permeability modifier and permeability modifier deactivator in the treatment fluid. Examples of suitable acids include, but are not limited to, hydrochloric acid; hydrofluoric acid; acetic acid; formic acid; sulfuric acid; sulfamic acid; chloroacetic acid; nitric acid; phosphoric acid; tartaric acid; oxalic acid; lactic acid; glycolic acid; aminopolycarboxylic acid; polyaminopolycarboxylic acid; citric acid; ethylene diamine tetra acetic acid; and any combination thereof. In some embodiments, hydrochloric acid; acetic acid; and formic acid are preferred. In some embodiments, the acid may be present in the treatment fluid in the range of from about a lower amount in the range of from about 0.5%, 1%, 3%, 5%, 8%, 12%, and 15% to about an upper limit of 30%, 28%, 25%, 21%, 18%, and 15% by weight of the treatment fluid.

**[0017]** As used herein, the term "permeability modifier" refers to a material capable of reducing the permeability of a subterranean formation to aqueous fluids. In some embodiments, the permeability modifier preferably adsorbs to surfaces within the porosity of the subterranean formation, thereby resisting the flow of aqueous fluids thereon. The permeability modifier thus allows the aqueous treatment fluid described herein to be diverted past the first treatment zone after it has been acidized and to flow to a second treatment zone, if desired, for contact with the acid, permeability modifier, and permeability modifier deactivator. The process of treating zonal portions of the injection well may be repeated in multiple zones. Suitable permeability modifiers include, but are not limited to, an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

**[0018]** One of ordinary skill in the art will appreciate that a variety of different water-soluble polymers may be suitable for use as the permeability modifiers disclosed herein. In some embodiments, the water-soluble polymers may be formed by a polymerization reaction of water-soluble monomers. Suitable examples of water-soluble polymers include, but are not limited to, homo-, co-, and terpolymers of: acrylamide; alkyl acrylate; 2-acrylamido-2-

**2013-IP-072509U1 PCT**

methyl propane sulfonic acid; N,N-dimethylacrylamide; vinyl pyrrolidone; dimethylaminoethyl methacrylate; acrylic acid; dimethylaminopropyl methacrylamide; vinyl amine; vinyl alcohol; vinyl acetate; trimethylammoniummethyl methacrylate chloride; methacrylamide; hydroxyethyl acrylate; vinyl sulfonic acid; vinyl phosphonic acid; methacrylic acid; vinyl caprolactam; N-vinylformamide; N,N-diallylacetamide; dimethyldiallyl ammonium halide; itaconic acid; styrene sulfonic acid; methacrylamidoethyltrimethyl ammonium halide; quaternary ammonium salt derivatives of acrylamide; quaternary ammonium salt derivatives of acrylic acid; cellulose; chitosan; a polyamide; a polyetheramine; a polyethyleneimine; a polyhydroxyetheramine; a lysine; a polysulfone; a gum; a starch; any derivative thereof; and any combinations thereof. Any monomer used to synthesize these polymers may be used in synthesizing the water-soluble polymers disclosed herein. As used herein, the term "derivative" refers to any compound that is made from one of the listed compounds, for example, by replacing one atom in one of the listed compounds with another atom or group of atoms, ionizing one of the listed compounds, or creating a salt of one of the listed compounds. Where the water-soluble polymer is a starch, it may preferably be a cationic starch formed by reacting the starch (e.g., corn, maize, waxy maize, potato, tapioca, and the like) with the reaction product of epichlorohydrin and trialkylamine.

**[0019]** Specific examples of water-soluble polymers for use as the permeability modifiers described in some embodiments herein include, but are not limited to, polyacrylamide; polyvinylamine; poly(vinylamine/vinyl alcohol) copolymer; polydimethylaminoethyl methacrylate; polydimethylaminopropyl methacrylamide; poly(acrylamide/dimethylaminoethyl methacrylate) copolymer; poly(methacrylic acid/dimethylaminoethyl methacrylate) copolymer; poly(2-acrylamido-2-methyl propane sulfonic acid/dimethylaminoethyl methacrylate) copolymer; poly(acrylamide/dimethylaminopropyl methacrylamide) copolymer; poly (acrylic acid/dimethylaminopropyl methacrylamide) copolymer; poly(methacrylic acid/dimethylaminopropyl methacrylamide); any derivative thereof; and any combinations thereof.

**[0020]** In some embodiments, water-soluble hydrophobically modified polymers may be suitable for use as the permeability modifier described herein. As described herein, the term "hydrophobically modified" in all

**2013-IP-072509U1 PCT**

of its variations (*e.g.*, "hydrophobic modification") refers to the incorporation into a water-soluble polymer structure hydrophobic groups having an alkyl chain length of about 4 to about 22 carbons. Although hydrophobic groups are incorporated into the polymer structure, the water-soluble hydrophobic modified polymers remain soluble in aqueous fluids. In some embodiments, a mole ratio of a water-soluble monomer to the hydrophobic groups in the water-soluble hydrophobically modified polymer is in the range of from about 99.98:0.02 to about 90:10. In certain embodiments, the water-soluble hydrophobically modified polymer may comprise a polymer backbone that comprises polar heteroatoms. Generally, the polar heteroatoms present within the polymer backbone of the water-soluble hydrophobically modified polymers include, but are not limited to, oxygen, nitrogen, sulfur, or phosphorous.

**[0021]** Exemplary water-soluble hydrophobically modified polymers may contain a water-soluble polymer backbone and a hydrophobic group, such as a hydrophobic branched alkyl chain of about 4 to about 22 carbons. In certain exemplary embodiments, the hydrophobic branch may have an alkyl chain length of about 7 to about 22 carbons. In other exemplary embodiments, the hydrophobic branch may have an alkyl chain length of about 12 to about 18 carbons.

**[0022]** Suitable examples of water-soluble hydrophobically modified polymers that may be utilized in the embodiments disclosed herein include, but are not limited to, acrylamide/octadecyldimethylammoniummethyl methacrylate bromide copolymer; dimethylaminoethyl methacrylate/vinyl pyrrolidone/hexadecyldimethylammoniummethyl methacrylate bromide terpolymer; acrylamide/2-acrylamido-2-methyl propane sulfonic acid/2-ethylhexyl methacrylate terpolymer; alkylamino alkylene methacrylate/alkyl ammonium alkylene methacrylate copolymer (*e.g.*, dimethylaminoethyl methacrylate/alkyl-dimethylammoniummethyl methacrylate copolymer and dimethylaminoethyl methacrylate/hexadecyldimethylammoniummethyl methacrylate copolymer); any derivative thereof; and any combinations thereof. As discussed in more detail below, these water-soluble hydrophobically modified polymers may be formed, in exemplary embodiments, by reactions with a variety of alkyl halides. For example, in some exemplary embodiments, the water-soluble hydrophobically modified polymer may comprise a

**2013-IP-072509U1 PCT**

dimethylaminoethyl methacrylate/hexadecyldimethylammoniumethyl methacrylate bromide copolymer.

**[0023]** The water-soluble hydrophobically modified polymers described herein may be synthesized by any suitable technique known in the art. In some embodiments, the water-soluble hydrophobically modified polymers may be formed by the reaction product of one or more water-soluble polymers and one or more hydrophobic groups. In other embodiments, the water-soluble hydrophobically modified polymers may be prepared from a polymerization reaction of water-soluble monomers, followed by hydrophobic modification of the resultant polymer. In still other embodiments, hydrophobic groups may be reacted with water-soluble monomers that are then polymerized to form the water-soluble hydrophobically modified polymers disclosed herein. In yet other embodiments, the water-soluble hydrophobically modified polymers may be formed by the polymerization reaction of hydrophobically modified water-soluble monomers and water-soluble monomers. One of skill in the art, with the benefit of this disclosure, will recognize what method of synthesis to choose based on a particular application. Factors that may influence the type of synthesis selected include, but are not limited to, reaction conditions, the type of starting material (*e.g.*, water-soluble monomers *v.* water-soluble polymers) available, and the like.

**[0024]** Water-soluble polymers that may be used for forming the water-soluble hydrophobically modified polymers disclosed herein may be any of the water-soluble polymers and their derivatives that may be alone used as permeability modifiers, as discussed above. In some embodiments, the water-soluble polymer selected may preferably comprise reactive amino groups in the polymer backbone or as pendent groups, which may be capable of reacting with hydrophobic groups. In some exemplary embodiments, the amino groups are dialkyl amino pendent groups. In some exemplary embodiments, the water-soluble hydrophobically modified polymers are formed from monomers comprising dimethylaminoethyl methacrylate or dimethylaminopropyl methacrylamide, with hydrophobic dimethyl amino pendant groups.

**[0025]** The hydrophobic groups that are capable of reacting with the water-soluble polymers to form the water-soluble hydrophobically modified polymers for use as permeability modifiers include, but are not limited to, an alkyl halide; a sulfonate; a sulfate; a hydrophobic organic acid; any derivative

**2013-IP-072509U1 PCT**

thereof; and any combinations thereof. Suitable examples of hydrophobic organic acids and organic acid derivatives may include, but are not limited to, octenyl succinic acid; dodecenyl succinic acid; anhydrides, esters, imides, and amides thereof; and any combination thereof.

5           **[0026]**       As discussed, in some embodiments, the water-soluble hydrophobically modified polymers may be prepared from the polymerization reaction of hydrophobically modified water-soluble monomers and water-soluble monomers. In such cases, the polymerization reactions may have estimated molecular weights in the range of from a lower limit of about 100,000; 250,000; 10 500,000; 750,000; 1,000,000; 1,250,000; 1,500,000; 1,750,000; 2,000,000; 2,250,000; 2,500,000; 2,750,000; 3,000,000; 3,250,000; 3,500,000; 3,750,000; 4,000,000; 4,250,000; 4,500,000; 4,750,000; and 5,000,000 to an upper limit of about 10,000,000; 9,750,000; 9,500,000; 9,250,000; 9,000,000; 8,750,000; 8,500,000; 8,250,000; 8,000,000; 7,750,000; 7,500,000; 15 7,250,000; 7,000,000; 6,750,000; 6,500,000; 6,250,000; 6,000,000; 5,750,000; 5,500,000; 5,250,000; and 5,000,000. In some embodiments, the mole ratios of the water-soluble monomer(s) to the hydrophobically modified water-soluble monomer(s) in the range of from about 99.98:0.02; 98.08:0.92; 98.18:1.82; 97.28:2.72; 96.38:3.62; 95.48:4.52; 94.58:5.42; 93.68:6.32; 20 92.78:7.22; 97.88:8.12; 90.98:9.02; to about 90:10. Suitable water-soluble monomers that may be used to synthesize the water-soluble hydrophobically modified polymers (*i.e.*, both the water-soluble non-hydrophobically modified monomers and the hydrophobically modified water-soluble monomers) include any of those listed for forming the water-soluble polymers, as discussed 25 previously. Examples of hydrophobically modified water-soluble polymers may include, but are not limited to, alkyl acrylates; alkyl methacrylates; alkyl acrylamides; alkyl methacrylamides alkyl dimethylammoniummethyl methacrylate halides;       alkyl       dimethylammoniumpropyl       methacrylamide halidesoctadecyldimethylammoniummethyl       methacrylate       bromide; 30 hexadecyldimethylammoniummethyl       methacrylate       bromide; hexadecyldimethylammoniumpropyl methacrylamide bromide; 2-ethylhexyl methacrylate; hexadecyl methacrylamide; and any combination thereof, wherein the alkyl groups have from about 4 to about 22 carbon atoms.

35           **[0027]**       In some embodiments, water-soluble hydrophilically modified polymers may be used as the permeability modifiers described herein. As used



**2013-IP-072509U1 PCT**

herein, the term "hydrophilically modified" in all of its variations (e.g., "hydrophilic modification") refers to the incorporation of hydrophilic groups into a water-soluble polymer structure. In exemplary embodiments, the hydrophilic groups are branched to increase the degree of branching of the water-soluble polymer. The water-soluble hydrophilically modified polymers typically have molecular weights in the range of from about 100,000 to about 10,000,000 and may have weight ratios of the hydrophilic polymers to the polyethers in the range of from about 1:1; 1.5:1; 2:1; 2.5:1; 3:1; 3.5:1; 4:1; 4.5:1; 5:1; 5.5:1; 6:1; 6.5:1; 7:1; 7.5:1; 8:1; 8.5:1; 9:1; 9.5:1; to about 10:1. In certain embodiments, the water-soluble hydrophilically modified polymers comprise a polymer backbone, the polymer backbone comprising polar heteroatoms including, but not limited to, oxygen, nitrogen, sulfur, or phosphorous.

**[0028]** Specific examples of suitable water-soluble hydrophilically modified polymers include, but are not limited to, the reaction product of polydimethylaminoethyl methacrylate and epichlorohydrin-terminated polyethyleneoxide methyl ether; the reaction product of polydimethylaminopropyl methacrylamide and epichlorohydrin-terminated polyethyleneoxide methyl ether; the reaction product of poly(acrylamide/dimethylaminopropyl methacrylamide) and epichlorohydrin-terminated polyethyleneoxide methyl ether; the reaction product of a polydimethylaminoethyl methacrylate and epichlorohydrin-terminated polyethyleneoxide methyl ether having a weight ratio of polydimethylaminoethyl methacrylate to epichlorohydrin-terminated polyethyleneoxide methyl ether of about 3:1; any derivative thereof; and any combinations thereof.

**[0029]** The water-soluble hydrophilically modified polymers described herein may be synthesized by any suitable technique known in the art. In some embodiments, the water-soluble hydrophilically modified polymers may be formed by the reaction product of one or more water-soluble polymers and compounds comprising one or more hydrophilic groups. In other embodiments, the water-soluble hydrophilically modified polymers may be prepared from a polymerization reaction of water-soluble monomers, followed by hydrophilic modification of the resultant polymer. In still other embodiments, compounds comprising hydrophilic groups may be reacted with water-soluble monomers that are then polymerized to form the water-soluble hydrophilically modified polymers disclosed herein. In yet other embodiments, the water-soluble

**2013-IP-072509U1 PCT**

hydrophilically modified polymers may be formed by the polymerization reaction of hydrophilically modified water-soluble monomers and water-soluble monomers. One of skill in the art, with the benefit of this disclosure, will recognize what method of synthesis to choose based on a particular application.

5 Factors that may influence the type of synthesis selected include, but are not limited to, reaction conditions, the type of starting material (*e.g.*, water-soluble monomers *v.* water-soluble polymers) available, the desired degree of branching, and the like. In all cases, suitable water-soluble polymers and monomers for use in forming the water-soluble hydrophilically modified polymers  
10 described herein include any of the water-soluble polymers and monomers and their derivatives that may be alone used as permeability modifiers, as discussed above.

**[0030]** Suitable hydrophilic groups that may be present in a hydrophilic compound may include, but are not limited to, a hydroxyl group; a carbonyl  
15 group; a carboxyl group; a sulfhydryl group; an amino group; a phosphate group; a polyether group; any derivative thereof; and any combination thereof. Preferably, if a polyether group is used for hydrophilic modification, it also comprises a halogen; sulfonate; sulfate; organic acid; epichlorohydrin-terminated polyethylene oxide methyl ether; or a derivative thereof. Suitable  
20 polyether groups include, but are not limited to, polyethylene oxide; polypropylene oxide; polybutylene oxide; copolymers thereof; terpolymers thereof; and any combination thereof.

**[0031]** In some embodiments, the permeability modifier is present in the range of from a lower limit of from about 0.05%, 0.1%, 0.5%, 1%, 1.5%,  
25 and 2% to an upper limit of from about 5%, 4.5%, 4%, 3.5%, 3%, and 2.5% by weight of the treatment fluid. The permeability modifier disclosed in some embodiments may reduce the permeability of a subterranean formation in the range of from a lower limit of about 45%; 47.5%; 50%; 52.5%; 55%; 57.5%;  
30 60%; 62.5%; 65%; and 67.5% to an upper limit of about 90%; 87.5%; 85%; 82.5%; 80%; 77.5%; 75%; 72.5%; 70%; and 67.5% from a first aqueous formation permeability to a second aqueous formation permeability upon contact with the subterranean formation.

**[0032]** The permeability modifier deactivator in the exemplary embodiments herein is capable of deactivating the permeability modifier and  
35 reversing its effects. That is, the permeability modifier deactivator is able to

**2013-IP-072509U1 PCT**

restore a subterranean formation treated with the permeability modifier (*i.e.*, experiencing a reduced permeability to water due to contact with the permeability modifier) back to approximately the original untreated aqueous permeability (*i.e.*, before exposure to the permeability modifier. As such, the  
5 exemplary acid diverting qualities of the permeability modifier may be used in an injection well without the well experiencing substantial adverse permeability reduction. In some embodiments, the permeability modifier deactivator may be included in the same treatment fluid as the permeability modifier without effecting the action of the permeability modifier, at least during the acid  
10 diversion treatment operation. That is, the permeability modifier deactivator can be designed to deactivate the permeability modifier at varying degrees of degradation and at variable durations and rates, thereby allowing the acid and permeability modifier to perform their functions prior to deactivation and restoration of the formations permeability to water, according to the needs of  
15 the operator. Indeed, in some embodiments, it is possible to shut in the injection well after introducing the treatment fluids described herein comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator for a substantial period of time, such as over a week. Generally, however, shut-in times may be no more than about 24 hours. In  
20 other embodiments, the permeability modifier and permeability modifier deactivator may be introduced into the formation in separate treatment fluids.

**[0033]** In some embodiments, the permeability modifier deactivator may deactivate the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the  
25 permeability modifier; blocking hydrophobic functional groups present on the permeability modifier (*e.g.*, blocking the hydrophobic functional groups from forming intermolecular or intramolecular hydrophobic associations); and any combination thereof. The permeability modifier deactivators that are capable of blocking hydrophobic functional groups may function by incorporating the  
30 hydrophobic functional groups on the permeability modifier into the micellar structures of the permeability modifier deactivator, thereby preventing the hydrophobic functional groups from association with similar groups on the permeability modifier or on other permeability modifiers. As used herein, the term "desorption" in all of its variants (*e.g.*, "desorbed," "desorbing," and the  
35 like) refers to the disassociation of an adsorbed substance from the substrate to

**2013-IP-072509U1 PCT**

which it was adsorbed. As used herein, the term "degradation" in all of its variants (*e.g.*, "degrade," "degradable," and the like) refers to lowering of a molecular weight to a less effective level. The term "deactivation" of the permeability modifier by the permeability modifier deactivator is not intended to  
5 imply 100% deactivation, but to a sufficient extent to return the original permeability (*e.g.*, to restore the first treatment zone to about the first aqueous formation permeability) within a range of, for example, from a lower limit of about 20%; 25%; 30%; 35%; 40%; 45%; and 50% to an upper limit of about 100%; 95%; 90%; 85%; 80%; 75%; 70%; 65%; 60%; 55%; and 50%.

10 **[0034]** The permeability modifier deactivator may include, but is not limited to, a free-radical generating compound (also referred to herein as "FRGC"); a mutual solvent; a surfactant; and any combination thereof. FRGCs may promote, among other things, the desorption and oxidation of the permeability modifiers disclosed herein (*e.g.*, promote the removal of the  
15 permeability modifier from the pores of the subterranean formation). Mutual solvents and surfactants may interfere with the hydrophobic functional groups that act to maintain the placement of the permeability modifier (*e.g.*, couple the hydrophobic groups with the aqueous base fluid), and at certain elevated concentrations, surfactants may desorb the permeability modifier itself.

20 **[0035]** Suitable examples of FRGC include, but are not limited an inorganic oxidizer compound; an organic peroxide; an azo compound; and any combination thereof. Suitable examples of inorganic oxidizer compounds that may be used as the FRGCs of some embodiments disclosed herein may include, but are not limited to, a hydrogen peroxide; an alkali metal persulfate; an alkali  
25 metal perborate; an alkali metal chlorite; an alkali metal bromate; an alkali metal chlorate; an alkali metal hypochlorite; an alkali metal permanganate; an oxidation-reduction system employing a reducing agent (*e.g.*, a sulfite) in combination with an oxidizer; ammonium persulfate; potassium persulfate; sodium persulfate; and any combination thereof. An example of a suitable  
30 commercially available inorganic oxidizer compound includes, but is not limited to VICON NF™, available from Halliburton Energy Services, Inc. in Houston, Texas. Suitable examples of organic peroxides that may be used as the FRGCs of some embodiments disclosed herein may include, but are not limited to, a hydroperoxide; a dialkyl peroxide; benzoyl peroxide; 2,2-bis(tert-butylperoxy)butane; 2,4-pentanedione peroxide; 2,5-di(tert-butylperoxy)-2,5-  
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**2013-IP-072509U1 PCT**

dimethyl-3-hexyne; 2-butanone peroxide; cumene hydroperoxide; di-tert-amyl peroxide; dicumyl peroxide; lauroyl peroxide; tert-butyl hydroperoxide; tert-butyl peracetate; tert-butyl peroxide; tert-butyl peroxybenzoate; tert-butylperoxy-2-ethylhexyl carbonate; and any combination thereof. In some  
5 embodiments, the organic peroxide has a water solubility of greater than about 5%. Suitable examples of azo compounds that may be used as the FRGCs of some embodiments disclosed herein may include, but are not limited to, 2'-azobis-(2- methylbutyronitrile); 2,2'-azobis(isobutyramidine hydrochloride); 2,2'-azobis[2-(2-imidazolin- 2-yl)propane]dihydrochloride; 1,1 '-  
10 azobis(cyclohexanecarbonitrile); 2,2'-azobis(2- methylpropionamidine) dihydrochloride; 4,4 '-azobis(4-cyano valeric acid); 2,2'-azobis(2-methyl-N-(2-hydroxyethyl)propionamide; and any combination thereof. In some embodiments, the azo compounds are water-soluble with a minimum solubility of greater than about 5%. A suitable commercially available azo compound  
15 includes, but is not limited, to PERM C™ available from Halliburton Energy Services, Inc. in Houston, Texas.

**[0036]** Suitable mutual solvents for use in the treatment fluids described herein include, but are not limited to, glycol ethers and alkoxylates of glycol ethers. Specific examples of suitable mutual solvents may include, but  
20 are not limited to, ethylene glycol monomethyl ether; ethylene glycol monoethyl ether; ethylene glycol monopropyl ether; ethylene glycol monoisopropyl ether; ethylene glycol monobutyl ether ("EGMBE"); ethylene glycol monophenyl ether; ethylene glycol monobenzyl ether; ethylene glycol monohexyl ether; propylene glycol monobutyl ether; diethylene glycol monomethyl ether; diethylene glycol  
25 monoethyl ether; diethylene glycol monobutyl ether; diethylene glycol monohexyl ether; diethylene glycol dimethyl ether; dipropylene glycol methyl ether; triethylene glycol monomethyl ether; triethylene glycol monoethyl ether; triethylene glycol monobutyl ether; any derivative thereof; and any combination thereof. Suitable commercially available mutual solvents include, but are not  
30 limited to, MUSOL® A Mutual Solvent and MUSOL® E Mutual Solvent, available from Halliburton Energy Services, Inc. in Houston, Texas.

**[0037]** Suitable surfactants for use as the permeability modifier deactivators in some embodiments described herein include, but are not limited to, nonionic, anionic, cationic, and zwitterionic surfactants. Specific examples  
35 may include, but are not limited to, an alkyl sulfonates; alkyl aryl sulfonate

**2013-IP-072509U1 PCT**

(*e.g.*, an alkyl benzyl sulfonate, such as a salt of dodecylbenzene sulfonic acid); alkyl trimethylammonium chloride; a branched alkyl ethoxylated alcohol; dioctyl sodium sulfosuccinate; linear alkyl ethoxylated alcohol; trialkyl benzylammonium chloride; a sulfated alkoxyate (*e.g.*, sodium dodecylsulfate); a sulfonated alkoxyate; an alkyl quarternary ammonium compound (*e.g.*, trimethyl hexadecyl ammonium bromide); an alkoxyated linear alcohol; C<sub>10</sub>-C<sub>20</sub> alkyl diphenyl ether sulfonate; polyethylene glycol; an ether of alkylated phenol; an alpha olefin sulfonate (*e.g.*, sodium dodecene sulfonate); any derivative thereof; and any combination thereof.

10           **[0038]**       In some embodiments, the permeability modifier deactivators may be present in the treatment fluid in the amount in the range of from a lower limit of about 0.0001%; .001%; .01%; .1%; 1%; 10%; 20%; 30%; 40%; 50%; 60%; 70%; 80%; 90%; and 100% to an upper limit of about 200%; 190%; 180%; 170%; 160%; 150%; 140%; 130%; 120%; 110%; and 100% by weight  
15 of the permeability modifier. In other embodiments, the permeability modifier deactivators may be present in the range of from about 1% to about 150% by weight of the permeability modifier. In yet other embodiments, the permeability modifier deactivators may be present in the range of from about 10% to about 100% by weight of the permeability modifier. One of ordinary skill in the art,  
20 with the benefit of this disclosure, will recognize and optimize the amount of permeability modifier deactivator to include in a particular treatment fluid. Factors that may affect the amount of permeability modifier deactivator to include in a treatment fluid may include, but are not limited to, the type of permeability modifier selected, the type of permeability modifier deactivator  
25 selected, the duration of time before deactivation of the permeability modifier is desired, and the like.

**[0039]** In various embodiments, systems configured for delivering the treatment fluids described herein to a downhole location are described. In various embodiments, the systems can comprise a pump fluidly coupled to a  
30 tubular, the tubular containing a treatment fluid comprising the permeability modifier and/or the permeability modifier deactivator.

**[0040]** The pump may be a high pressure pump in some embodiments. As used herein, the term "high pressure pump" will refer to a pump that is capable of delivering a fluid downhole at a pressure of about 1000 psi or greater.  
35 A high pressure pump may be used when it is desired to introduce the treatment

**2013-IP-072509U1 PCT**

fluid to a subterranean formation at or above a fracture gradient of the subterranean formation, but it may also be used in cases where fracturing is not desired. In some embodiments, the high pressure pump may be capable of fluidly conveying particulate matter, such as proppant particulates, into the subterranean formation. Suitable high pressure pumps will be known to one having ordinary skill in the art and may include, but are not limited to, floating piston pumps and positive displacement pumps.

**[0041]** In other embodiments, the pump may be a low pressure pump. As used herein, the term "low pressure pump" will refer to a pump that operates at a pressure of about 1000 psi or less. In some embodiments, a low pressure pump may be fluidly coupled to a high pressure pump that is fluidly coupled to the tubular. That is, in such embodiments, the low pressure pump may be configured to convey the treatment fluid to the high pressure pump. In such embodiments, the low pressure pump may "step up" the pressure of the treatment fluid before it reaches the high pressure pump.

**[0042]** In some embodiments, the systems described herein can further comprise a mixing tank that is upstream of the pump and in which the treatment fluid is formulated. In various embodiments, the pump (*e.g.*, a low pressure pump, a high pressure pump, or a combination thereof) may convey the treatment fluid from the mixing tank or other source of the treatment fluid to the tubular. In other embodiments, however, the treatment fluid can be formulated offsite and transported to a worksite, in which case the treatment fluid may be introduced to the tubular via the pump directly from its shipping container (*e.g.*, a truck, a railcar, a barge, or the like) or from a transport pipeline. In either case, the treatment fluid may be drawn into the pump, elevated to an appropriate pressure, and then introduced into the tubular for delivery downhole.

**[0043]** FIGURE 1 shows an illustrative schematic of a system that can deliver treatment fluids described herein to a downhole location, according to one or more embodiments. It should be noted that while FIGURE 1 generally depicts a land-based system, it is to be recognized that like systems may be operated in subsea locations as well. As depicted in FIGURE 1, system **1** may include mixing tank **10**, in which a treatment fluid disclosed in some embodiments herein may be formulated. The treatment fluid may be conveyed via line **12** to wellhead **14**, where the treatment fluid enters tubular **16**, tubular

**2013-IP-072509U1 PCT**

**16** extending from wellhead **14** into subterranean formation **18**. Upon being ejected from tubular **16**, the treatment fluid may subsequently penetrate into subterranean formation **18**. Pump **20** may be configured to raise the pressure of the treatment fluid to a desired degree before its introduction into tubular **16**.

5 It is to be recognized that system **1** is merely exemplary in nature and various additional components may be present that have not necessarily been depicted in FIGURE 1 in the interest of clarity. Non-limiting additional components that may be present include, but are not limited to, supply hoppers, valves, condensers, adapters, joints, gauges, sensors, compressors, pressure  
10 controllers, pressure sensors, flow rate controllers, flow rate sensors, temperature sensors, and the like.

[0044] Although not depicted in FIGURE 1, the treatment fluid may, in some embodiments, flow back to wellhead **14** and exit subterranean formation **18**. In some embodiments, the treatment fluid that has flowed back to wellhead  
15 **14** may subsequently be recovered and recirculated to subterranean formation **18**.

[0045] It is also to be recognized that the disclosed treatment fluids may also directly or indirectly affect the various downhole equipment and tools that may come into contact with the treatment fluids during operation. Such  
20 equipment and tools may include, but are not limited to, wellbore casing, wellbore liner, completion string, insert strings, drill string, coiled tubing, slickline, wireline, drill pipe, drill collars, mud motors, downhole motors and/or pumps, surface-mounted motors and/or pumps, centralizers, turbolizers, scratchers, floats (e.g., shoes, collars, valves, etc.), logging tools and related  
25 telemetry equipment, actuators (e.g., electromechanical devices, hydromechanical devices, etc.), sliding sleeves, production sleeves, plugs, screens, filters, flow control devices (e.g., inflow control devices, autonomous inflow control devices, outflow control devices, etc.), couplings (e.g., electro-hydraulic wet connect, dry connect, inductive coupler, etc.), control lines (e.g.,  
30 electrical, fiber optic, hydraulic, etc.), surveillance lines, drill bits and reamers, sensors or distributed sensors, downhole heat exchangers, valves and corresponding actuation devices, tool seals, packers, cement plugs, bridge plugs, and other wellbore isolation devices, or components, and the like. Any of these components may be included in the systems generally described above and  
35 depicted in FIGURE 1.



**2013-IP-072509U1 PCT**

**[0046]** Embodiments disclosed herein include:

**[0047]** A. A method comprising: (a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator; (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability, wherein first treatment zone comprises formation damage; (c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone; (d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage; (e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability; (f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability; and (g) removing the treatment fluid from the injection well.

**[0048]** B. method comprising: (a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier; (b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator; (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability, wherein the first treatment zone comprises formation damage; (c) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone; (d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage; (e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability; (f) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone; (g) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore first treatment zone to

**2013-IP-072509U1 PCT**

about the first aqueous formation permeability; and (g) removing the treatment fluid from the injection well.

**[0049]** Each of embodiments A and B may have one or more of the following additional elements in any combination:

5 **[0050]** Element 1: Wherein elements (a) through (f) are repeated at at least a second treatment zone in the injection well.

**[0051]** Element 2: Wherein elements (a) through (g) are repeated at at least a second treatment zone in the injection well.

10 **[0052]** Element 3: Wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

15 **[0053]** Element 4: Wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.

20 **[0054]** Element 5: Wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

**[0055]** Element 6: Wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

25 **[0056]** Element 7: Wherein the acid is selected from the group consisting of hydrochloric acid; hydrofluoric acid; acetic acid; formic acid; sulfuric acid; sulfamic acid; chloroacetic acid; nitric acid; phosphoric acid; tartaric acid; oxalic acid; lactic acid; glycolic acid; aminopolycarboxylic acid; polyaminopolycarboxylic acid; citric acid; ethylene diamine tetra acetic acid; and any combination thereof.

30 **[0057]** Element 8: Wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

**[0058]** Element 9: Wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

**2013-IP-072509U1 PCT**

**[0059]** Element 10: Wherein the permeability modifier deactivator is present in an amount in the range of from about 0.0001% to about 200% by weight of the permeability modifier.

**[0060]** Element 11: Wherein the permeability modifier deactivator  
5 that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

**[0061]** By way of non-limiting example, exemplary combinations applicable to A, B, C include: A in combination with 3, 10, and 11; A in  
10 combination with 1, 3, 5, and 7; B in combination with 5, 6, 7, and 11; and B in combination with 2, 3, 8, 9, and 10.

**[0062]** To facilitate a better understanding of the embodiments described herein, the following examples of preferred or representative  
15 embodiments are given. In no way should the following examples be read to limit, or to define, the scope of the disclosure.

**EXAMPLE 1**

**[0063]** In one example, a core flow test was performed to evaluate the performance of the permeability modifier when it is present in a single  
20 treatment fluid with a permeability modifier deactivator. A treatment fluid was prepared according to some embodiments described herein using 6.7 mL of a 3% active solution of a hydrophobically modified dimethylaminoethyl methacrylate permeability modifier, 2.5 mL of a 10% active solution of a sodium chlorate permeability modifier deactivator, and 90.8 mL of 2% KCl. 56 mL of  
25 the treatment fluid was pumped into a 2.56 cm x 15.24 cm (1 in x 6 in) sandstone core, having an initial permeability to brine (9% NaCl/1% CaCl<sub>2</sub>) of about 4,700 millidarcy ("mD"). Pressure increases were observed by means of pressure transducers connected to the flow system. Immediately thereafter, the core was flushed with a brine solution (9% NaCl/1% CaCl<sub>2</sub>) and a reduction in  
30 brine permeability of about 98% was observed due to the action of the dimethylaminoethyl methacrylate permeability modifier, without hindrance from the sodium chlorate permeability modifier deactivator. This example illustrates that when the treatment fluid comprises a permeability modifier as well as a permeability modifier deactivator, sufficient time is available for the permeability

**2013-IP-072509U1 PCT**

modifier to reduce the permeability of a subterranean formation prior to the action of the permeability modifier deactivator.

**EXAMPLE 2**

5           **[0064]**       In this example, a core flow test was performed to evaluate the ability of a permeability modifier deactivator to remove the permeability reduction brought about by the permeability modifier. A treatment fluid was prepared according to some embodiments described herein using 6.7 mL of a 3% active solution of a hydrophobically modified dimethylaminoethyl  
10 methacrylate permeability modifier, 1.0 g of sodium persulfate free-radical generating compound, 0.6 g sodium carbonate pH control agent, and 93.7 mL of 2% KCl. 19 mL of the treatment fluid was pumped into a 2.56 cm x 15.24 cm (1 in x 6 in) sandstone core, having an initial permeability to brine (9% NaCl/1% CaCl<sub>2</sub>) of about 1650 mD. Pressure increases were observed by means of  
15 pressure transducers connected to the flow system. Immediately thereafter, the core was shut-in for 10 minutes. Following this shut-in period brine (9% NaCl/1% CaCl<sub>2</sub>) was again pumped through the core and reduction in permeability to brine of about 94% was seen, illustrating that the permeability modifier deactivator had not removed the effect of the permeability modifier.  
20 Following this, the treatment fluid was again pumped into the core, followed by a shut-in time of 1 hour. After the shut-in period, brine (9% NaCl/1% CaCl<sub>2</sub>) was again pumped into the core and reduction in permeability to brine of about 17% was seen, indicating that the permeability modifier deactivator was able to reverse the permeability reduction of the core by the permeability modifier. This  
25 example illustrates that with the proper combination selection of the permeability modifier and the permeability modifier deactivator and, in this example, an adequate shut-in period, the effect of the permeability modifier can be reduced significantly.

30

**EXAMPLE 3**

**[0065]**       In this example, a core flow test was performed to evaluate the performance of the permeability modifier deactivator described in some embodiments herein to restore permeability after treatment with the permeability modifier. A first treatment fluid was prepared using 6.7% of a  
35 hydrophobically modified dimethylaminoethyl methacrylate permeability modifier

**2013-IP-072509U1 PCT**

in 1.25 sg of NaBr brine solution buffered at approximately pH 5.2. The first treatment fluid was flowed at 100 psi through four separate 10 micron Aloxite discs, composed of aluminum oxide, until flow ceased. Thereafter, four treatment fluids comprising 1.25 sg NaBr brine buffered at approximately pH 5.2 alone or comprising the permeability modifier deactivators described herein were prepared. Each was flowed at 100 psi and 40°C (104°F) and timed until 200g of fluid was collected through the Aloxite disc. The treatment fluid composition and results are shown in Table 1 and demonstrate that the permeability modifier deactivators in some embodiments described herein are effective at restoring reduced permeability caused by the permeability modifiers disclosed herein. For comparison, a control sample was run on an untreated Aloxite disc and it took 6 seconds to collect 200g of the 1.25 sg NaBr brine buffered at approximately pH 5.2.

15

**TABLE 1**

<b>Treatment Fluid Composition</b>	<b>Time (sec) to reach 200g fluid flow collection</b>
Brine alone	1800
20% EGMBE in brine	24
2% betain at pH 8.6 in brine	480
2% betain at pH 2.1	2100

**EXAMPLE 4**

**[0066]** In this example, the ability of a surfactant for use as the permeability modifier deactivators to restore water permeability that has been reduced by the permeability modifiers in some embodiments described herein was evaluated by measuring the fluid loss control ability of a water-soluble hydrophobically modified permeability modifier in the presence of an anionic surfactant. A control experiment was initially performed to determine the water permeability reducing ability of a water-soluble hydrophobically modified dimethylaminoethyl methacrylate permeability modifier solution by contacting a silica flour bed with the permeability modifier and determining the fluid loss control. The permeability modifier solution was prepared using 67 gallons of the permeability modifier per thousand gallons of solution, corresponding to a 0.2% permeability modifier concentration in 2% KCl. The fluid loss control tests were performed by measuring the flow rates of the permeability modifier solution

**2013-IP-072509U1 PCT**

followed by 2% KCl solution through a silica flour filter cake prepared by deposition of 10 grams of silica flour mixed in water onto filter paper placed over the bottom lid in a Filter Press HPHT fluid loss cell with a capacity of 175 ml supplied by Fann Instruments in Houston, Texas. The 2% KCl or permeability  
5 modifier solution was then poured onto top of the filter cake, and the flow rate was measured over a 10 minute period by applying a pressure of 30 psi. 100 ml of the permeability modifier solution was poured on the filter bed, and the flow rate was measured. A flow rate reduction of about 50% or more is assumed to be indicative of the permeability modifier's ability to reduce water permeability  
10 and is given a "pass" rating.

**[0067]** When the flow rate of permeability modifier solution was reduced significantly, indicating reduced water permeability, the remaining permeability modifier solution was poured out, and replaced with 100 ml of the 2% KCl solution. The apparatus was reassembled and the flow rates were  
15 measured. When the flow rate stabilized, the 2% KCl was replaced with 100 ml of 1.3% sodium dodecyl sulfate anionic surfactant (permeability modifier deactivator) solution. The apparatus was reassembled and the flow rate measurement was resumed. The flow rate increased quickly. After flowing the entire volume of the surfactant solution, the apparatus was recharged with 100  
20 ml of the 2% KCl solution, and flow rate measurement was resumed. The flow rates were close to that measured for the 2% KCl solution prior to treatment with the permeability modifier, indicating that the permeability reduction effect of the permeability modifier was nullified by treatment with the surfactant solution, thereby restoring the original permeability of the silica flour bed.  
25 FIGURE 2 shows a graphic representation of the results.

**[0068]** Therefore, the embodiments herein are well adapted to attain the ends and advantages mentioned as well as those that are inherent therein. The particular embodiments disclosed above are illustrative only, as the embodiments herein may be modified and practiced in different but equivalent  
30 manners apparent to those skilled in the art having the benefit of the teachings herein. Furthermore, no limitations are intended to the details of construction or design herein shown, other than as described in the claims below. It is therefore evident that the particular illustrative embodiments disclosed above may be altered, combined, or modified and all such variations are considered within the  
35 scope and spirit of the disclosure. The embodiments herein illustratively

**2013-IP-072509U1 PCT**

disclosed herein suitably may be practiced in the absence of any element that is not specifically disclosed herein and/or any optional element disclosed herein. While compositions and methods are described in terms of "comprising," "containing," or "including" various components or steps, the compositions and methods can also "consist essentially of" or "consist of" the various components and steps. All numbers and ranges disclosed above may vary by some amount. Whenever a numerical range with a lower limit and an upper limit is disclosed, any number and any included range falling within the range is specifically disclosed. In particular, every range of values (of the form, "from about a to about b," or, equivalently, "from approximately a to b," or, equivalently, "from approximately a-b") disclosed herein is to be understood to set forth every number and range encompassed within the broader range of values. Also, the terms in the claims have their plain, ordinary meaning unless otherwise explicitly and clearly defined by the patentee. Moreover, the indefinite articles "a" or "an," as used in the claims, are defined herein to mean one or more than one of the element that it introduces. If there is any conflict in the usages of a word or term in this specification and one or more patent or other documents that may be incorporated herein by reference, the definitions that are consistent with this specification should be adopted.

20

**2013-IP-072509U1 PCT****CLAIMS**

The invention claimed is:

1. A method comprising:
  - (a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator;
  - (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability, wherein first treatment zone comprises formation damage;
  - (c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;
  - (d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;
  - (e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;
  - (f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability; and
  - (g) removing the treatment fluid from the injection well.
2. The method of claim 1, wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.
3. The method of claim 1, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.
4. The method of claim 1, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.



**2013-IP-072509U1 PCT**

5. The method of claim 1, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

6. The method of claim 1, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

7. The method of claim 1, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

8. The method of claim 1, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

9. The method of claim 1, wherein the permeability modifier deactivator is present in an amount in the range of from about 0.0001% to about 200% by weight of the permeability modifier.

10. The method of claim 1, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

11. A method comprising:

(a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier;

(b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;

(c) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,

wherein the first treatment zone comprises formation damage;

**2013-IP-072509U1 PCT**

(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone;

(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;

(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;

(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;

(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore first treatment zone to about the first aqueous formation permeability; and

(g) removing the treatment fluid from the injection well.

12. The method of claim 11, wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.

13. The method of claim 11, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

14. The method of claim 11, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.

15. The method of claim 11, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

**2013-IP-072509U1 PCT**

16. The method of claim 11, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

17. The method of claim 11, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

18. The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

19. The method of claim 11, wherein the permeability modifier deactivator is present in an amount in the range of from about 0.0001% to about 200% by weight of the permeability modifier.

20. The method of claim 11, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

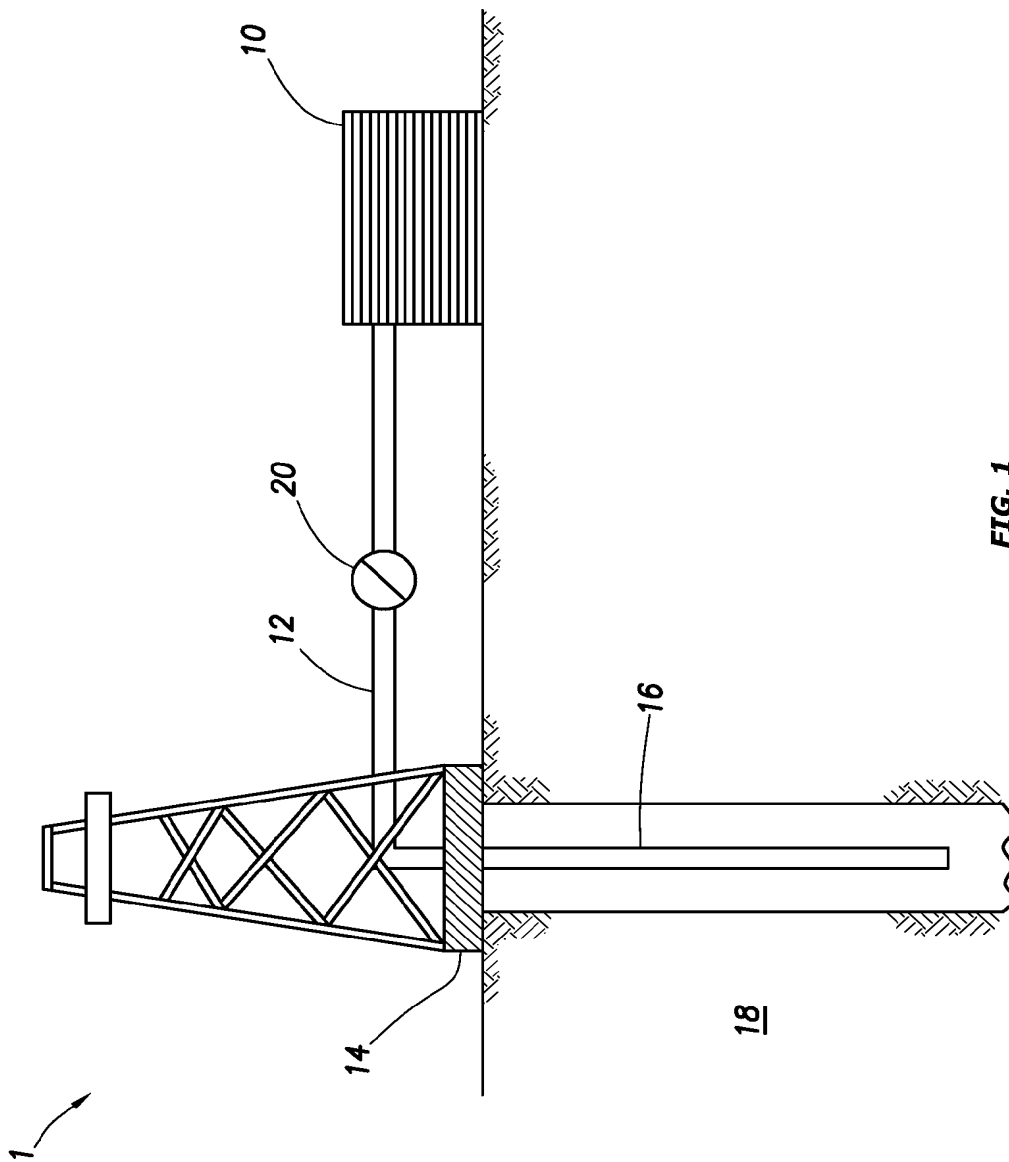


FIG. 1

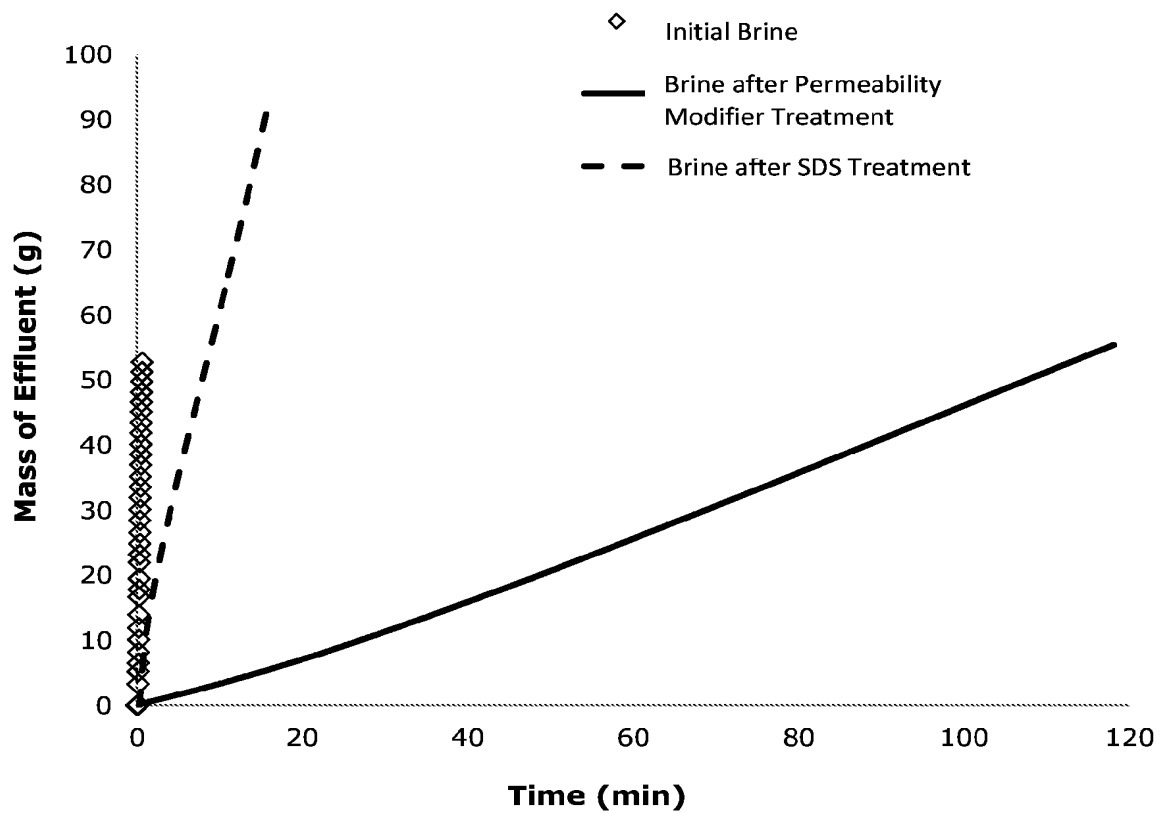


FIG. 2

**A. CLASSIFICATION OF SUBJECT MATTER****E21B 33/13(2006.01)i, E21B 29/10(2006.01)i, E21B 33/138(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

E21B 33/13; E21B 43/295; C09K 8/68; E21B 43/00; E21B 43/25; E21B 43/16; E21B 43/27; C09K 8/60; E21B 29/10; E21B 33/138

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) &amp; keywords: treatment fluid, acid, permeability modifier, permeability modifier deactivator and injection well

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7727936 B2 (PAULS et al.) 01 June 2010 See abstract and claims 1,7.	1-20
A	US 2010-0230106 A1 (MILNE et al.) 16 September 2010 See abstract and claims 1-4.	1-20
A	US 2012-0168166 A1 (DALRYMPLE et al.) 05 July 2012 See abstract and claim 24.	1-20
A	US 7552771 B2 (EOFF et al.) 30 June 2009 See abstract and claims 1-3.	1-20
A	US 7114568 B2 (EOFF et al.) 03 October 2006 See abstract and claim 1.	1-20

 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family


Date of the actual completion of the international search

23 May 2014 (23.05.2014)

Date of mailing of the international search report

**23 May 2014 (23.05.2014)**

Name and mailing address of the ISA/KR


 International Application Division  
 Korean Intellectual Property Office  
 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701,  
 Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

JEONG, A Ram

Telephone No. +82-42-481-3388



**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2013/056726**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date		
US 7727936 B2	01/06/2010	AU 2008-288334 A1	19/02/2009		
		CA 2694151 A1	19/02/2009		
		CA 2694151 C	30/07/2013		
		CN 101970598 A	09/02/2011		
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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2013/056726**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		EP 2009076 A1	31/12/2008
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		US 2006-0283592 A1	21/12/2006
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		WO 2008-007110 A1	17/01/2008



## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	21760637
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser/Debbie Allen
<b>Filer Authorized By:</b>	Iona Niven Kaiser
<b>Attorney Docket Number:</b>	2013-IP-072509 U1 US
<b>Receipt Date:</b>	13-MAR-2015
<b>Filing Date:</b>	
<b>Time Stamp:</b>	11:53:13
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	0876380891IDS.pdf	61059 <small>d5e610e5ff8775281f1f5be0e114689430997d79</small>	no	3

### Warnings:

### Information:

This is not an USPTO supplied IDS fillable form

2	Foreign Reference	0876380891IDSRef.pdf	1608992	no	34
			d1245532d536f21ffb57b354cb6d4a56c01c c575		

**Warnings:**

**Information:**

**Total Files Size (in bytes):** 1670051

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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

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.

14/366,219

FILING DATE

FIRST NAMED INVENTOR

ATTORNEY DOCKET NO.

CONFIRMATION NO.

Larry Steven Eoff

2013-IP-072509 U1 US

3312

99633 7590 09/12/2014

McDermott Will & Emery LLP
The McDermott Building
500 North Capitol Street, N.W.
Washington, DC 20001

Table with 1 column: EXAMINER

Table with 2 columns: ART UNIT, PAPER NUMBER

Table with 2 columns: NOTIFICATION DATE, DELIVERY MODE

09/12/2014

ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com



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 Application of

Eoff, Larry Steven

Application No.: 14/366,219

Filed: June 17, 2014

Attorney Docket No. 2013-IP-072509 U1 US

For: ACID DIVERSION TREATMENTS IN

INJECTION WELLS USING

PERMEABILITY MODIFIERS

: DECISION ON REQUEST TO  
: PARTICIPATE IN THE PATENT  
: PROSECUTION HIGHWAY  
: PROGRAM AND PETITION  
: TO MAKE SPECIAL UNDER  
: 37 CFR 1.102(a)

This is a decision on the request to participate in the Patent Prosecution Highway (PPH) program and the petition under 37 CFR 1.102(a), filed June 17, 2014, to make the above-identified application special.

The request and petition are **GRANTED**.

Discussion

A grantable request to participate in the PPH pilot program and petition to make special require:

1. The U.S. application for which participation in the Global/IP5 PPH pilot program is requested must have the same earliest date, whether this is the priority date or filing date, as that of a corresponding national or regional application filed with another Global/IP5 PPH participating office or a corresponding PCT international application for which one of the Global/IP5 PPH participating offices was the International Searching Authority (ISA) or the International Preliminary Examining Authority (IPEA).
2. Applicant must:
  - a. Ensure all the claims in the U.S. application must sufficiently correspond or be amended to sufficiently correspond to the allowable/patentable claim(s) in the corresponding Office of Earlier Examination (OEE) application and
  - b. Submit a claims correspondence table in English;
3. Examination of the U.S. application has not begun;
4. Applicant must submit:

- a. Documentation of prior office action:
    - i. a copy of the office action(s) just prior to the “Decision to Grant a Patent” from each of the Global/IP5 PPH participating office application(s) containing the allowable/patentable claim(s) or
    - ii. if the allowable/patentable claims(s) are from a “Notification of Reasons for Refusal” then the Notification of Reasons for Refusal or
    - iii. if the Global/IP5 PPH participating office application is a first action allowance then no office action from the Global/IP5 PPH participating office is necessary should be indicated on the request/petition form or
    - iv. the latest work product in the international phase of the OEE PCT application;
  - b. An English language translation of the Global/IP5 PPH participating office action or work product from (4)(a)(i)-(ii) or (iv) above;
5. Applicant must submit:
- a. An IDS listing the documents cited by the Global/IP5 PPH participating office examiner in the Global/IP5 PPH participating office action or work product (unless already submitted in this application)
  - b. Copies of the documents except U.S. patents or U.S. patent application publications (unless already submitted in this application);

The request to participate in the PPH pilot program and petition comply with the above requirements. Accordingly, the above-identified application has been accorded “special” status.

Telephone inquiries concerning this decision should be directed to the undersigned at (571) 272-3206.

All other inquiries concerning the examination or status of the application is accessible in the PAIR system at <http://www.uspto.gov/ebc/index.html>.

This application will be forwarded to the examiner for action on the merits commensurate with this decision once this application’s formality reviews have been completed.

*Liana Walsh*  
Liana Walsh  
Petitions Paralegal Specialist  
Office of Petitions

## Office of Petitions: Routing Sheet



**Application No. 14/366,219**

**This application is being forwarded to your office for further processing. A decision has been rendered on a petition filed in this application.**

**GRANTED**

**DISMISSED**

**DENIED**

Office of Petitions: Decision Count Sheet

Mailing Month

9

Application No.

14366219



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:

WALSH, LIANA

Count (1) - Palm Credit

14/366,219

FINANCE WORK NEEDED

Decision: GRANT

Form with a checkbox and the text "Select Check Box for YES".



Decision Type: 652 - Petition to make special-PPH



Notes:

Count (2)

Decision: n/a

FINANCE WORK NEEDED

Form with a checkbox and the text "Select Check Box for YES".

Decision Type: NONE

Notes:

Count (3)

Decision: n/a

FINANCE WORK NEEDED

Form with a checkbox and the text "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: 9/2/2014

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**POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO**

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

Practitioners associated with Customer Number: 99633

**OR**

Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number

Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

The address associated with Customer Number: 99633

**OR**

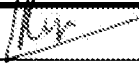
<input type="checkbox"/>	Firm or Individual Name			
	Address			
	City	State	Zip	
	Country			
	Telephone	Email		

Assignee Name and Address: Halliburton Energy Services, Inc.  
 3000 N. Sam Houston Parkway E.  
 Houston, TX 77032-3219

**A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.**

**SIGNATURE of Assignee of Record**

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	6/20/14
Name	Clive D. Menezes	Telephone	281-871-4374
Title	Vice President and Chief Patent Counsel, Halliburton Energy Services, Inc.		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. 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 1.11 and 1.14. This collection is estimated to take 3 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.

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REVIEWED  
 Leg: HS  
 Date: 6-20-14



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**STATEMENT UNDER 37 CFR 3.73(c)**Applicant/Patent Owner: Larry Steven EoffApplication No./Patent No.: 14/366,219 Filed/Issue Date: June 17, 2014Titled: ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERSHalliburton Energy Services, Inc., a corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1.  The assignee of the entire right, title, and interest.
2.  An assignee of less than the entire right, title, and interest (check applicable box):
- The extent (by percentage) of its ownership interest is \_\_\_\_\_%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3.  The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4.  The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

- A.  An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 033121, Frame 0474, or for which a copy thereof is attached.
- B.  A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:
1. From: \_\_\_\_\_ To: \_\_\_\_\_  
The document was recorded in the United States Patent and Trademark Office at  
Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.
2. From: \_\_\_\_\_ To: \_\_\_\_\_  
The document was recorded in the United States Patent and Trademark Office at  
Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). 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 1.11 and 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.*

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**STATEMENT UNDER 37 CFR 3.73(c)**

3. From: \_\_\_\_\_ To: \_\_\_\_\_

The document was recorded in the United States Patent and Trademark Office at  
Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.

4. From: \_\_\_\_\_ To: \_\_\_\_\_

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Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.

5. From: \_\_\_\_\_ To: \_\_\_\_\_

The document was recorded in the United States Patent and Trademark Office at  
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6. From: \_\_\_\_\_ To: \_\_\_\_\_

The document was recorded in the United States Patent and Trademark Office at  
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Additional documents in the chain of title are listed on a supplemental sheet(s).

As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Iona N. Kaiser/

June 24, 2014

Signature

Date

Iona N. Kaiser

53086

Printed or Typed Name

Title or Registration Number

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	19388445
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser/Debbie Allen
<b>Filer Authorized By:</b>	Iona Niven Kaiser
<b>Attorney Docket Number:</b>	2013-IP-072509 U1 US
<b>Receipt Date:</b>	24-JUN-2014
<b>Filing Date:</b>	
<b>Time Stamp:</b>	08:47:09
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		0876380891POA.pdf	408652 941cae7dbe7bb2f4647575e653a30ea89a2ec26e	yes	3

<b>Multipart Description/PDF files in .zip description</b>			
<b>Document Description</b>		<b>Start</b>	<b>End</b>
Power of Attorney		1	1
Assignee showing of ownership per 37 CFR 3.73.		2	3

**Warnings:**

**Information:**

<b>Total Files Size (in bytes):</b>	408652
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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.**

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<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371</b>		Attorney Docket No. 2013-IP-072509 U1 US
		U.S. Application No. (if known, see 37 CFR 1.5)
International Application No. PCT/US2013/56726	International Filing Date August 27, 2013	Priority Date Claimed
Title of Invention <b>ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS</b>		
First Named Inventor Larry Steven Eoff		
<b>Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.</b>		
<p>1. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received.</p> <p>2. <input type="checkbox"/> A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)).</p> <p>3. An English language translation of the International Application (35 U.S.C. 371(c)(2))</p> <p>a. <input type="checkbox"/> is attached hereto.</p> <p>b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</p> <p>4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))</p> <p>a. <input checked="" type="checkbox"/> is attached.</p> <p>b. <input type="checkbox"/> was previously filed in the international phase under PCT Rule 4.17(iv).</p>		
<b>Items 5 to 8 below concern amendments made in the international phase.</b>		
<u>PCT Article 19 and 34 amendments</u>		
<p>5. <input type="checkbox"/> Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)).</p> <p>6. <input type="checkbox"/> English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)).</p> <p>7. <input type="checkbox"/> English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)).</p>		
<u>Cancellation of amendments made in the international phase</u>		
<p>8a. <input type="checkbox"/> Do not enter the amendment made in the international phase under PCT Article 19.</p> <p>8b. <input type="checkbox"/> Do not enter the amendment made in the international phase under PCT Article 34.</p>		
NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).		
<b>The following items 9 to 17 concern a document(s) or information included.</b>		
<p>9. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>10. <input type="checkbox"/> A preliminary amendment.</p> <p>11. <input checked="" type="checkbox"/> An Application Data Sheet under 37 CFR 1.76.</p> <p>12. <input type="checkbox"/> A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b).</p> <p>13. <input type="checkbox"/> A power of attorney and/or change of address letter.</p> <p>14. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.3 and 37 CFR 1.821-1.825.</p> <p>15. <input type="checkbox"/> Assignment papers (<i>cover sheet and document(s)</i>). Name of Assignee: _____</p> <p>16. <input type="checkbox"/> 37 CFR 3.73(c) Statement (<i>when there is an Assignee</i>).</p>		

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. 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 1.11 and 1.14. This collection is estimated to take 15 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: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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.

U.S. APPLN. No. (if known – see 37 CFR 1.5)	INTERNATIONAL APPLICATION No. <b>PCT/US2013/56726</b>	ATTORNEY DOCKET No. <b>2013-IP-072509 U1 US</b>
17. <input type="checkbox"/> Other items or information:		
<b>The following fees have been submitted.</b>		CALCULATIONS      PTO USE ONLY
18. <input checked="" type="checkbox"/> Basic national fee (37 CFR 1.492(a)) .....	\$280	\$      280
19. <input checked="" type="checkbox"/> Examination fee (37 CFR 1.492(c)) If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) .....	\$0	\$      720
All other situations .....	\$720	
20. <input checked="" type="checkbox"/> Search fee (37 CFR 1.492(b)) If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) .....	\$0	\$      480
Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority .....	\$120	
International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB .....	\$480	
All other situations .....	\$600	
<b>TOTAL OF 18, 19, and 20 =</b>		<b>\$ 1480</b>
<input type="checkbox"/> Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)). Fee for each additional 50 sheets of paper or fraction thereof .....		\$400
Total Sheets	Extra Sheets	Number of each addition 50 or fraction thereof (round up to a whole number)
- 100 =	/ 50 =	x \$400
Surcharge of \$140.00 for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h)).		\$
CLAIMS	NUMBER FILED	NUMBER EXTRA
Total claims	- 20 =	x \$80
Independent claims	- 3 =	x \$420
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		+ \$780
Processing fee of \$140.00 for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)).		\$
<b>TOTAL OF ABOVE CALCULATIONS =</b>		<b>\$</b>
<input type="checkbox"/> Applicant asserts small entity status. See 37 CFR 1.27. Fees above are reduced by 1/2.		
<input type="checkbox"/> Applicant certifies micro entity status. See 37 CFR 1.29. Fees above are reduced by 3/4. Applicant must attach form PTO/SB/15A or B or equivalent.		
<b>TOTAL NATIONAL FEE =</b>		<b>\$ 1480</b>
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property.		\$
<b>TOTAL FEES ENCLOSED =</b>		<b>\$ 1480</b>
		Amount to be refunded: \$
		Amount to be charged: \$

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.

- a.  A check in the amount of \$ \_\_\_\_\_ to cover the above fees is enclosed.
- b.  Please charge my Deposit Account No. 500417 in the amount of \$ 1480 to cover the above fees.
- c.  The Director is hereby authorized to charge additional fees which may be required, or credit any overpayment, to Deposit Account No. 500417 as follows:
- i.  any required fee.
- ii.  any required fee except for excess claims fees required under 37 CFR 1.492(d) and (e) and multiple dependent claim fee required under 37 CFR 1.492(f).
- d.  Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. The PTO-2038 should only be mailed or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO.

**ADVISORY:** If filing by EFS-Web, do NOT attach the PTO-2038 form as a PDF along with your EFS-Web submission. Please be advised that this is not recommended and by doing so your credit card information may be displayed via PAIR. To protect your information, it is recommended to pay fees online by using the electronic payment method.

**NOTE:** Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the International Application to pending status.

#### 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 1:** 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.**

**NOTE 2:** A U.S. national stage application may not claim priority to the international application of which it is the national phase. The filing date of a U.S. national stage application is the international filing date. See 35 U.S.C. 363.

#### Correspondence Address

- The address associated with Customer Number: 99633 OR  Correspondence address below

Name					
Address					
City		State		Zip Code	
Country				Telephone	
Email					

Signature	/Iona N. Kaiser/	Date	June 17, 2014
Name (Print/Type)	Iona N. Kaiser	Registration No. (Attorney/Agent)	53086

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.

<b>Application Data Sheet 37 CFR 1.76</b>	Attorney Docket Number	2013-IP-072509 U1 US
	Application Number	
Title of Invention	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS	
<p>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.</p>		

**Secrecy Order 37 CFR 5.2**

<input type="checkbox"/>	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.)
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**Inventor Information:**

<b>Inventor 1</b>					<input type="button" value="Remove"/>
<b>Legal Name</b>					
<b>Prefix</b>	<b>Given Name</b>	<b>Middle Name</b>	<b>Family Name</b>	<b>Suffix</b>	
	Larry	Steven	Eoff		
<b>Residence Information (Select One)</b> <input checked="" type="radio"/> US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
<b>City</b>	Duncan	<b>State/Province</b>	OK	<b>Country of Residence</b>	US
<b>Mailing Address of Inventor:</b>					
<b>Address 1</b>	2201 Cedar				
<b>Address 2</b>					
<b>City</b>	Duncan	<b>State/Province</b>	OK		
<b>Postal Code</b>	73533	<b>Country i</b>	US		
<b>Inventor 2</b>					<input type="button" value="Remove"/>
<b>Legal Name</b>					
<b>Prefix</b>	<b>Given Name</b>	<b>Middle Name</b>	<b>Family Name</b>	<b>Suffix</b>	
	B.	Raghava	Reddy		
<b>Residence Information (Select One)</b> <input checked="" type="radio"/> US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
<b>City</b>	The Woodlands	<b>State/Province</b>	TX	<b>Country of Residence</b>	US
<b>Mailing Address of Inventor:</b>					
<b>Address 1</b>	72 Laughing Brook Court				
<b>Address 2</b>					
<b>City</b>	The Woodlands	<b>State/Province</b>	TX		
<b>Postal Code</b>	77380	<b>Country i</b>	US		
<b>Inventor 3</b>					<input type="button" value="Remove"/>
<b>Legal Name</b>					
<b>Prefix</b>	<b>Given Name</b>	<b>Middle Name</b>	<b>Family Name</b>	<b>Suffix</b>	
	Eric		Davidson		
<b>Residence Information (Select One)</b> <input type="radio"/> US Residency <input checked="" type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					



<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	2013-IP-072509 U1 US
		Application Number	
Title of Invention	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS		

City	Aberdeen	Country of Residence <sup>i</sup>	UK
------	----------	-----------------------------------	----

**Mailing Address of Inventor:**

Address 1	26 Ashfield Road, Cults		
Address 2			
City	Aberdeen	State/Province	UK
Postal Code	AB15 9NQ	Country <sup>i</sup>	UK

Inventor 4	<input type="button" value="Remove"/>			
<b>Legal Name</b>				
Prefix	Given Name	Middle Name	Family Name	Suffix
	Alexandra	Clare	Morrison	
Residence Information (Select One) <input type="radio"/> US Residency <input checked="" type="radio"/> Non US Residency <input type="radio"/> Active US Military Service				

City	Inverurie	Country of Residence <sup>i</sup>	ZA
------	-----------	-----------------------------------	----

**Mailing Address of Inventor:**

Address 1	Mains of Blackhall Cottage		
Address 2			
City	Inverurie	State/Province	
Postal Code	AB 51 5JJ	Country <sup>i</sup>	ZA

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

**Correspondence Information:**

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).	
<input type="checkbox"/> An Address is being provided for the correspondence information of this application.	
Customer Number	99633
Email Address	mweipdocket@mwe.com <input type="button" value="Add Email"/> <input type="button" value="Remove Email"/>

**Application Information:**

Title of the Invention	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS		
Attorney Docket Number	2013-IP-072509 U1 US	Small Entity Status Claimed	<input type="checkbox"/>
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	2	Suggested Figure for Publication (if any)	

<b>Application Data Sheet 37 CFR 1.76</b>	Attorney Docket Number	2013-IP-072509 U1 US
	Application Number	
Title of Invention	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS	

**Filing By Reference :**

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:	<input checked="" type="radio"/> Customer Number	<input type="radio"/> US Patent Practitioner	<input type="radio"/> Limited Recognition (37 CFR 11.9)
Customer Number	99633		

**Domestic Benefit/National Stage Information:**

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(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	Pending	<a href="#">Remove</a>	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	a 371 of international	PCT/US13/56726	2013-08-27

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

**Foreign Priority Information:**

<b>Application Data Sheet 37 CFR 1.76</b>	Attorney Docket Number	2013-IP-072509 U1 US
	Application Number	
Title of Invention	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS	

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(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)<sup>i</sup> the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(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).

Application Number	Country <sup>i</sup>	Filing Date (YYYY-MM-DD)	Access Code <sup>i</sup> (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

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.

<b>Application Data Sheet 37 CFR 1.76</b>	Attorney Docket Number	2013-IP-072509 U1 US
	Application Number	
Title of Invention	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS	

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 of 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.			
<b>Applicant 1</b>			
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.			
<input type="button" value="Clear"/>			
<input checked="" type="radio"/> Assignee	<input type="radio"/> Legal Representative under 35 U.S.C. 117	<input type="radio"/> Joint Inventor	
<input type="radio"/> Person to whom the inventor is obligated to assign.		<input type="radio"/> 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 : <input type="text"/>			
If the Applicant is an Organization check here. <input checked="" type="checkbox"/>			
Organization Name	Halliburton Energy Services, Inc.		
<b>Mailing Address Information For Applicant:</b>			
Address 1	10200 Bellaire Boulevard		
Address 2			
City	Houston	State/Province	TX
Country	US	Postal Code	77072
Phone Number		Fax Number	

<b>Application Data Sheet 37 CFR 1.76</b>	Attorney Docket Number	2013-IP-072509 U1 US
	Application Number	
Title of Invention	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS	

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 substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

<b>Assignee 1</b>	
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. <input checked="" type="checkbox"/>	
Organization Name	Halliburton Energy Services, Inc.

### Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	10200 Bellaire Boulevard		
Address 2			
City	Houston	State/Province	TX
Country <sup>i</sup>	US	Postal Code	77072
Phone Number		Fax Number	
Email Address			

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

## 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	/Iona N. Kaiser/			Date (YYYY-MM-DD)	2014-06-17
First Name	Iona N.	Last Name	Kaiser	Registration Number	53086

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

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.

<b>Application Data Sheet 37 CFR 1.76</b>	Attorney Docket Number	2013-IP-072509 U1 US
	Application Number	
Title of Invention	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS	

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.**

### DECLARATION AND ASSIGNMENT

As the below named inventor, I hereby declare that:

This declaration is directed to:

The attached application to be filed as a United States application or PCT international application, or

United States application or PCT international application number \_\_\_\_\_ filed on \_\_\_\_\_; and,

entitled "ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS." Regarding that application, I declare the following:

- The above-identified application was made, or authorized to be made, by me.
- I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.
- I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.
- I have reviewed and understand the subject matter of the above-identified application, including the claims.
- I am aware of and acknowledge my duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability under 37 CFR 1.56; including, for continuation-in-part applications, material information that became available between the filing of the prior application and the filing of the continuation-in-part application.

Moreover, Whereas, HALLIBURTON ENERGY SERVICES, INC., a Delaware Corporation, having a place of business at 10200 Bellaire Boulevard, Houston, TX 77072 (hereinafter "Assignee") is desirous of acquiring an interest therein;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, We, by these presents do sell, assign and transfer and convey unto Assignee, its successors and assigns, the full and exclusive right, for the United States of America and its territorial possessions and for any and all foreign countries, in and to the said invention, described in the Patent Application identified above, and any divisional, continuing or reissue application based on the present application preparatory to obtaining Letters Patent

of the United States therefore; said invention, application and any and all Letters Patent issuing there from to be held and enjoyed by Assignee, for its own use and benefit, and for its legal representatives, successors and assigns, to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held by me and had this assignment and sale not been made.

And I do further agree to sign all papers, make all rightful oaths and do all requisite acts for the filing of any disclaimer or for the filing and assignment of any divisional, continuing or reissue application or applications for patent based on the present application, as well as for any other U.S. or foreign application for patent which relates to the said invention.

And I do further agree to communicate to Assignee, its successors, assign or other legal representatives, such facts relating to the invention disclosed in the present application or Letters Patent issuing thereon as may be known to me, and to testify as to such facts in any interference or other litigation.

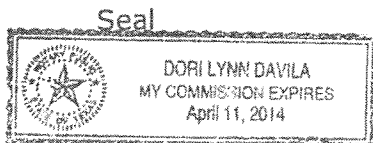
Executed this 1<sup>st</sup> day of August, 2013

Larry Steven Eoff  
LARRY STEVEN EOFF

STATE OF TEXAS )  
  )  
COUNTY OF HARRIS )

Before me personally appeared said LARRY STEVEN EOFF and acknowledged the foregoing instrument to be a free act and deed this 1 day of August, 2013.

[Signature]  
(Notary)





## DECLARATION AND ASSIGNMENT

As the below named inventor, I hereby declare that:

This declaration is directed to:

- The attached application to be filed as a United States application or PCT international application, or
- United States application or PCT international application number \_\_\_\_\_ filed on \_\_\_\_\_; and,

entitled "ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS." Regarding that application, I declare the following:

- The above-identified application was made, or authorized to be made, by me.
- I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.
- I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.
- I have reviewed and understand the subject matter of the above-identified application, including the claims.
- I am aware of and acknowledge my duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability under 37 CFR 1.56; including, for continuation-in-part applications, material information that became available between the filing of the prior application and the filing of the continuation-in-part application.

Moreover, Whereas, HALLIBURTON ENERGY SERVICES, INC., a Delaware Corporation, having a place of business at 10200 Bellaire Boulevard, Houston, TX 77072 (hereinafter "Assignee") is desirous of acquiring an interest therein;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, We, by these presents do sell, assign and transfer and convey unto Assignee, its successors and assigns, the full and exclusive right, for the United States of America and its territorial possessions and for any and all foreign countries, in and to the said invention, described in the Patent Application identified above, and any divisional, continuing or reissue application based on the present application preparatory to obtaining Letters Patent

of the United States therefore; said invention, application and any and all Letters Patent issuing there from to be held and enjoyed by Assignee, for its own use and benefit, and for its legal representatives, successors and assigns, to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held by me and had this assignment and sale not been made.

And I do further agree to sign all papers, make all rightful oaths and do all requisite acts for the filing of any disclaimer or for the filing and assignment of any divisional, continuing or reissue application or applications for patent based on the present application, as well as for any other U.S. or foreign application for patent which relates to the said invention.

And I do further agree to communicate to Assignee, its successors, assign or other legal representatives, such facts relating to the invention disclosed in the present application or Letters Patent issuing thereon as may be known to me, and to testify as to such facts in any interference or other litigation.

Executed this 1<sup>st</sup> day of August, 2013  
B. Raghava Reddy  
B. RAGHAVA REDDY

STATE OF TEXAS )  
                                  )  
COUNTY OF HARRIS )

Before me personally appeared said B. RAGHAVA REDDY and acknowledged the foregoing instrument to be a free act and deed this 1 day of August, 2013.

[Signature]  
(Notary)



**DECLARATION AND ASSIGNMENT**

As the below named inventor, I hereby declare that:

This declaration is directed to:

- The attached application to be filed as a United States application or PCT international application, or
- United States application or PCT international application number \_\_\_\_\_ filed on \_\_\_\_\_; and,

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of the United States therefore; said invention, application and any and all Letters Patent issuing there from to be held and enjoyed by Assignee, for its own use and benefit, and for its legal representatives, successors and assigns, to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held by me and had this assignment and sale not been made.

And I do further agree to sign all papers, make all rightful oaths and do all requisite acts for the filing of any disclaimer or for the filing and assignment of any divisional, continuing or reissue application or applications for patent based on the present application, as well as for any other U.S. or foreign application for patent which relates to the said invention.

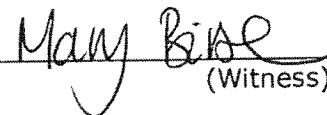
And I do further agree to communicate to Assignee, its successors, assign or other legal representatives, such facts relating to the invention disclosed in the present application or Letters Patent issuing thereon as may be known to me, and to testify as to such facts in any interference or other litigation.

Executed this 13<sup>th</sup> day of August, 2013

  
ERIC DAVIDSON

Before me personally appeared said ERIC DAVIDSON and acknowledged the foregoing instrument to be a free act and deed this 13<sup>th</sup> day of August, 2013.

Seal

  
(Witness)

### DECLARATION AND ASSIGNMENT

As the below named inventor, I hereby declare that:

This declaration is directed to:

The attached application to be filed as a United States application or PCT international application, or

United States application or PCT international application number \_\_\_\_\_ filed on \_\_\_\_\_; and,

entitled "ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS." Regarding that application, I declare the following:

- The above-identified application was made, or authorized to be made, by me.
- I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.
- I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.
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- I am aware of and acknowledge my duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability under 37 CFR 1.56; including, for continuation-in-part applications, material information that became available between the filing of the prior application and the filing of the continuation-in-part application.

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NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, We, by these presents do sell, assign and transfer and convey unto Assignee, its successors and assigns, the full and exclusive right, for the United States of America and its territorial possessions and for any and all foreign countries, in and to the said invention, described in the Patent Application identified above, and any divisional, continuing or reissue application based on the present application preparatory to obtaining Letters Patent



<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		2014-06-17
	First Named Inventor	Larry S. EOFF	
	Art Unit		N/A
	Examiner Name	Not Yet Assigned	
	Attorney Docket Number		2013-IP-072509 U1 US

**U.S.PATENTS**

Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4982793		1991-01-08	Holtmyer et al.	
	2	5067565		1991-11-26	Holtmyer et al.	
	3	5122549		1992-06-16	Holtmyer et al.	
	4	6207771		2001-03-27	Larson	
	5	6364016		2002-04-02	Dalrymple et al.	
	6	6476169		2002-11-05	Eoff et al.	
	7	6516885		2003-02-11	Munday	
	8	7114568		2006-10-03	Eoff et al.	

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
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Art Unit		N/A
Examiner Name	Not Yet Assigned	
Attorney Docket Number		2013-IP-072509 U1 US

	9	7117942		2006-10-10	Dalrymple et al.	
	10	7182136		2007-02-27	Dalrymple et al.	
	11	7552771		2009-06-30	Eoff et al.	
	12	7563750		2009-07-21	Eoff et al.	
	13	7589048		2009-09-15	Eoff et al.	
	14	7595283		2009-09-29	Eoff et al.	
	15	7727936	A1	2010-06-01	Pauls et al.	
	16	7759292	A1	2010-07-20	Eoff et al.	
	17	8008235	A1	2011-08-30	Eoff et al.	
	18	8273692		2012-09-25	Eoff et al.	

If you wish to add additional U.S. Patent citation information please click the Add button.

**U.S.PATENT APPLICATION PUBLICATIONS**



**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		2014-06-17
First Named Inventor	Larry S. EOFF	
Art Unit		N/A
Examiner Name	Not Yet Assigned	
Attorney Docket Number		2013-IP-072509 U1 US

Examiner Initial*	Cite No	Publication Number	Kind Code <sup>1</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20080110624		2008-05-15	Nguyen et al.	
	2	20100230106		2010-09-16	Milne et al.	
	3	20110034351		2011-02-10	Eoff et al.	
	4	20120168166		2012-07-05	Dalrymple et al.	
	5	20120231978		2012-09-13	Eoff et al.	
	6	20120264885		2012-10-18	Eoff et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button.

**FOREIGN PATENT DOCUMENTS**

Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2</sup> i	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1							<input type="checkbox"/>

If you wish to add additional Foreign Patent Document citation information please click the Add button

**NON-PATENT LITERATURE DOCUMENTS**

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		2014-06-17
	First Named Inventor	Larry S. EOFF	
	Art Unit		N/A
	Examiner Name	Not Yet Assigned	
	Attorney Docket Number		2013-IP-072509 U1 US

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1	International Search Report and Written Opinion for PCT/US2013/056726 dated May 23, 2014	<input type="checkbox"/>

If you wish to add additional non-patent literature document citation information please click the Add button

**EXAMINER SIGNATURE**

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		2014-06-17
First Named Inventor	Larry S. EOFF	
Art Unit		N/A
Examiner Name	Not Yet Assigned	
Attorney Docket Number		2013-IP-072509 U1 US

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Iona N. Kaiser/	Date (YYYY-MM-DD)	2014-06-17
Name/Print	Iona N. Kaiser	Registration Number	53086

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:  
KAISER. IONA N.  
  
MCDERMOTT WILL & EMERY LLP 500 NORTH CAPITOL STREET, N.W. WASHINGTON, D.C. 20001 USA  
  
**RECEIVED**  
JUN 4 2014  
McDermott Will & Emery LLP  
DC Office

**PCT**

**NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION**

(PCT Rule 44.1)

Applicant's or agent's file reference 2013IP072509U1PC	Date of mailing (day/month/year) 23 May 2014 (23.05.2014)
International application No. <b>PCT/US2013/056726</b>	International filing date (day/month/year) <b>27 August 2013 (27.08.2013)</b>
Applicant <b>HALLIBURTON ENERGY SERVICES, INC.</b>	
<b>FOR FURTHER ACTION</b> See paragraphs 1 and 4 below	

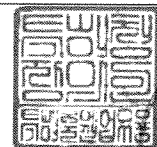
1.  The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.  
**Filing of amendments and statement under Article 19:**  
The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):  
**When?** The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.  
**Where?** Directly to the International Bureau of WIPO, 34 chemin des Colombettes  
1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70  
**For more detailed instructions, see PCT Applicant's Guide, International Phase, paragraphs 9.004 - 9.011.**

2.  The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3.  **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:  
 the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.  
 no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**  
The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.  
  
Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).  
  
Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.  
In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.  
  
For details about the applicable time limits, Office by Office, see [www.wipo.int/pct/en/texts/time\\_limits.html](http://www.wipo.int/pct/en/texts/time_limits.html) and the PCT Applicant's Guide, National Chapters.

Name and mailing address of the ISA/KR International Application Division Korean Intellectual Property Office 189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer  COMMISSIONER  Telephone No. 82-42-481-5875
--	--



\* Attention

Copies of the documents cited in the international search report can be searched in the following Korean Intellectual Property Office English website for six months(expire date : **2014.11.26** ) from the date of mailing of the international search report.

<http://www.kipo.go.kr/en/> => PCT Services => PCT Services

ID : PCT international application number

PW : **6NLC6L3**

Inquiries related to PCT International Search Report or Written Opinion prepared by KIPO as an International Searching Authority can be answered not only by KIPO but also through IPKC (Intellectual Property Korea Center), located in Vienna, VA, which functions as a PCT Help Desk for PCT applicants.

Homepage: <http://www.ipkcenter.com>

Email: [ipkc@ipkcenter.com](mailto:ipkc@ipkcenter.com)

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 2013IP072509U1PC	<b>FOR FURTHER ACTION</b> see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. <b>PCT/US2013/056726</b>	International filing date ( <i>day/month/year</i> ) <b>27 August 2013 (27.08.2013)</b>	(Earliest) Priority Date ( <i>day/month/year</i> )
Applicant <b>HALLIBURTON ENERGY SERVICES, INC.</b>		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

- the international application in the language in which it was filed  
 a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b.  This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c.  With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2.  **Certain claims were found unsearchable** (See Box No. II)

3.  **Unity of invention is lacking** (See Box No. III)

4. With regard to the **title**,



- the text is approved as submitted by the applicant.  
 the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- the text is approved as submitted by the applicant.  
 the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 1  
 as suggested by the applicant.  
 as selected by this Authority, because the applicant failed to suggest a figure.  
 as selected by this Authority, because this figure better characterizes the invention.
- b.  none of the figures is to be published with the abstract.

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> <b>E21B 33/13(2006.01)i, E21B 29/10(2006.01)i, E21B 33/138(2006.01)i</b>		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) E21B 33/13; E21B 43/295; C09K 8/68; E21B 43/00; E21B 43/25; E21B 43/16; E21B 43/27; C09K 8/60; E21B 29/10; E21B 33/138		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean utility models and applications for utility models Japanese utility models and applications for utility models		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS(KIPO internal) & keywords: treatment fluid, acid, permeability modifier, permeability modifier deactivator and injection well		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7727936 B2 (PAULS et al.) 01 June 2010 See abstract and claims 1,7.	1-20
A	US 2010-0230106 A1 (MILNE et al.) 16 September 2010 See abstract and claims 1-4.	1-20
A	US 2012-0168166 A1 (DALRYMPLE et al.) 05 July 2012 See abstract and claim 24.	1-20
A	US 7552771 B2 (EOFF et al.) 30 June 2009 See abstract and claims 1-3.	1-20
A	US 7114568 B2 (EOFF et al.) 03 October 2006 See abstract and claim 1.	1-20
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed		"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
Date of the actual completion of the international search 23 May 2014 (23.05.2014)		Date of mailing of the international search report <b>23 May 2014 (23.05.2014)</b>
Name and mailing address of the ISA/KR  International Application Division Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. +82-42-472-7140		Authorized officer JEONG, A Ram Telephone No. +82-42-481-3388 

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/056726

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7727936 B2	01/06/2010	AU 2008-288334 A1	19/02/2009
		CA 2694151 A1	19/02/2009
		CA 2694151 C	30/07/2013
		CN 101970598 A	09/02/2011
		CN 101970598 B	04/09/2013
		EP 1617039 A1	18/01/2006
		EP 1880081 A2	23/01/2008
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		EP 2185666 A1	19/05/2010
		US 2006-0014648 A1	19/01/2006
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		US 2006-0247135 A1	02/11/2006
		US 2007-0281868 A1	06/12/2007
		US 2008-0039347 A1	14/02/2008
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		US 7547665 B2	16/06/2009
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		US 7727937 B2	01/06/2010
		US 7825073 B2	02/11/2010
		WO 2006-117517 A2	09/11/2006
WO 2006-117517 A3	21/12/2006		
WO 2009-022106 A1	19/02/2009		
WO 2009-022107 A1	19/02/2009		
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		EA 201171117 A1	30/07/2012
		GB 201112947 D0	14/09/2011
		GB 2479317 A	05/10/2011
		MX 2011008732 A	15/09/2011
		US 8413719 B2	09/04/2013
		WO 2010-103421 A1	16/09/2010
		US 2012-0168166 A1	05/07/2012
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US 8592353 B2	26/11/2013		
US 7552771 B2	30/06/2009	AU 2008-322776 A1	22/05/2009
		AU 2008-322776 B2	25/07/2013
		EP 2195400 A2	16/06/2010
		EP 2195400 B1	01/08/2012
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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

**PCT/US2013/056726**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP 1644458 A1	12/04/2006
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		US 2004-0045712 A1	11/03/2004
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		WO 2006-106287 A1	12/10/2006
		WO 2008-007110 A1	17/01/2008

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:  
KAISER, IONA N.  
  
MCDERMOTT WILL & EMERY LLP 500 NORTH  
CAPITOL STREET, N.W. WASHINGTON, D.C. 20001 USA

**PCT**

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year) **23 May 2014 (23.05.2014)**

Applicant's or agent's file reference  
2013IP072509U1PC

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.

**PCT/US2013/056726**

International filing date (day/month/year)

**27 August 2013 (27.08.2013)**

Priority date(day/month/year)

International Patent Classification (IPC) or both national classification and IPC

**E21B 33/13(2006.01)i, E21B 29/10(2006.01)i, E21B 33/138(2006.01)i**

Applicant

**HALLIBURTON ENERGY SERVICES, INC.**

1. This opinion contains indications relating to the following items:


- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

<p>Name and mailing address of the ISA/KR International Application Division Korean Intellectual Property Office 189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea</p> <p>Facsimile No. +82-42-472-7140</p>	<p>Date of completion of this opinion</p> <p>23 May 2014 (23.05.2014)</p>	<p>Authorized officer</p> <p>JEONG, A Ram</p> <p>Telephone No. +82-42-481-3388</p> 
--	---	--

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2013/056726

Box No. 1 Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of :

- the international application in the language in which it was filed
- a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2.  This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

a. (means)

- on paper
- in electronic form

b. (time)

- in the international application as filed.
- together with the international application in electronic form.
- subsequently to this Authority for the purposes of search.

4.  In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
**PCT/US2013/056726**

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	<u>1-20</u>	YES
	Claims	<u>NONE</u>	NO
Inventive step (IS)	Claims	<u>1-20</u>	YES
	Claims	<u>NONE</u>	NO
Industrial applicability (IA)	Claims	<u>1-20</u>	YES
	Claims	<u>NONE</u>	NO

2. Citations and explanations :

Reference is made to the following documents:

D1: US 7727936 B2 (PAULS et al.) 01 June 2010

D2: US 2010-0230106 A1 (MILNE et al.) 16 September 2010

D3: US 2012-0168166 A1 (DALRYMPLE et al.) 05 July 2012

D4: US 7552771 B2 (EOFF et al.) 30 June 2009

D5: US 7114568 B2 (EOFF et al.) 03 October 2006

1. Novelty and Inventive Step

1.1 Independent Claim 1

The subject matter of claim 1 differs from these prior art documents in that it comprises the steps of: providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator; introducing the treatment fluid into an injection well so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with a first treatment zone; and contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability. And it is not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claim 1 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Continued on Supplemental Box

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.  
Continuation of: Box No. V

1.2 Dependent Claims 2-10

Claims 2-10 are dependent on claim 1. Therefore, claims 2-10 meet the requirements of PCT Article 33(2) and (3).

1.3 Independent Claim 11

The subject matter of claim 11 differs from these prior art documents in that it comprises the steps of: providing a second treatment fluid comprising an aqueous base fluid, and a permeability modifier deactivator; introducing the second treatment fluid into an injection well so as to contact the permeability modifier deactivator with the first treatment zone; and contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability. And it is not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claim 11 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

1.4 Dependent Claims 12-20

Claims 12-20 are dependent on claim 11. Therefore, claims 12-20 meet the requirements of PCT Article 33(2) and (3).

2. Industrial Applicability

Claims 1-20 are industrially applicable under PCT Article 33(4).

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	
<b>Filing Date:</b>	
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Filer:</b>	Iona Niven Kaiser/Debbie Allen
<b>Attorney Docket Number:</b>	2013-IP-072509 U1 US

Filed as Large Entity

### U.S. National Stage under 35 USC 371 Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Basic Filing:</b>				
National Stage Fee	1631	1	280	280
Natl Stage Search Fee - Report provided	1642	1	480	480
National Stage Exam - all other cases	1633	1	720	720

**Pages:**

**Claims:**

**Miscellaneous-Filing:**

**Petition:**

**Patent-Appeals-and-Interference:**

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				
<b>Miscellaneous:</b>				
			<b>Total in USD (\$)</b>	<b>1480</b>

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	19331184
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	PCT/US13/56726
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser/Debbie Allen
<b>Filer Authorized By:</b>	Iona Niven Kaiser
<b>Attorney Docket Number:</b>	2013-IP-072509 U1 US
<b>Receipt Date:</b>	17-JUN-2014
<b>Filing Date:</b>	
<b>Time Stamp:</b>	16:44:39
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$1480
RAM confirmation Number	3489
Deposit Account	500417
Authorized User	

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

Charge any Additional Fees required under 37 C.F.R. 1.492 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)



Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		0876380891PatAppl.pdf	1990809 <small>59fd1ea5f757088bc255a37fd12a3acc3afe0c24</small>	yes	23
<b>Multipart Description/PDF files in .zip description</b>					
	<b>Document Description</b>		<b>Start</b>		<b>End</b>
	Transmittal of New Application		1		3
	Application Data Sheet		4		10
	Oath or Declaration filed		11		18
	Information Disclosure Statement (IDS) Form (SB08)		19		23
<b>Warnings:</b>					
<b>Information:</b>					
2	Non Patent Literature	0876380891IDSRef.PDF	534880 <small>212cd94ec9880c7bca4f48e850d578a536cdcac3</small>	no	10
<b>Warnings:</b>					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
<b>Information:</b>					
3	Fee Worksheet (SB06)	fee-info.pdf	33708 <small>d5c8971b7b8d1a915c6a6b1a2ec73123f6f1c38d</small>	no	2
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<b>Information:</b>					
<b>Total Files Size (in bytes):</b>			2559397		

**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.**

## REQUEST FOR PARTICIPATION IN THE GLOBAL/IP5 PATENT PROSECUTION HIGHWAY (PPH) PILOT PROGRAM IN THE USPTO

Application No.:	14/366,219	First Named Inventor:	Larry Steven Eoff
Filing Date:	June 17, 2014	Attorney Docket No.:	2013-IP-072509 U1 US
Title of the Invention:	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS		

**THIS REQUEST FOR PARTICIPATION IN THE PPH PILOT PROGRAM ALONG WITH THE REQUIRED DOCUMENTS MUST BE SUBMITTED VIA EFS-WEB. INFORMATION REGARDING EFS-WEB IS AVAILABLE AT [HTTP://WWW.USPTO.GOV/PATENTS/PROCESS/FILE/EFS/](http://www.uspto.gov/patents/process/file/efs/).**

**APPLICANT HEREBY REQUESTS PARTICIPATION IN THE PATENT PROSECUTION HIGHWAY (PPH) PILOT PROGRAM AND PETITIONS TO MAKE THE ABOVE-IDENTIFIED APPLICATION SPECIAL UNDER THE PPH PILOT PROGRAM.**

**Office of earlier examination (OEE):** Korea (Korean Intellectual Property Office)

**OEE application number:** PCT/US2013/56726

**Both the OEE application and the above-identified U.S. application have the following earliest date (filing or priority date):** August 27, 2013

**Type of OEE work product relied upon:** Written Opinion of the International Searching Authority (WO/ISA)

**Mailing date of OEE work product:** \_\_\_\_\_

**I. Required Documents:**

- a. **A copy of the most recent office action prior to the decision to grant a patent or the most recent PCT work product (along with an English translation, if not in the English language):**

- is attached.
- is already present in the U.S. application.
- is not attached because it is available to the USPTO via the Dossier Access System or WIPO's PATENTSCOPE system.
- is not attached because the decision to grant a patent was the first office action.

- b. **(1) An information disclosure statement listing the documents cited in the OEE work product:**

- is attached.
- has already been filed in the U.S. application.
- is not attached because no references were cited in the document in section a. above.

**(2) Copies of all cited documents (except for U.S. patents or U.S. patent application publications)**

- are attached.
- have already been filed in the U.S. application.
- are not attached because no references were cited in the document in section a. above.

[Page 1 of 2]

This collection of information is required by 35 U.S.C. 119, 37 CFR 1.55, and 37 CFR 1.102(d). 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 1.11 and 1.14. This collection is estimated to take 2 hours 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.



## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	19331447
<b>Application Number:</b>	14366219
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	3312
<b>Title of Invention:</b>	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS
<b>First Named Inventor/Applicant Name:</b>	Larry Steven Eoff
<b>Customer Number:</b>	99633
<b>Filer:</b>	Iona Niven Kaiser/Debbie Allen
<b>Filer Authorized By:</b>	Iona Niven Kaiser
<b>Attorney Docket Number:</b>	2013-IP-072509 U1 US
<b>Receipt Date:</b>	17-JUN-2014
<b>Filing Date:</b>	
<b>Time Stamp:</b>	16:55:01
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition to make Special under PCT- Patent Pros Hwy	0876380891PPHReq.pdf	153620 <small>0c4903fa6554ba3bf08135c2754a03dd5b0234d1</small>	no	2

### Warnings:

### Information:

**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.**

# PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1  
Stylesheet Version v1.2

EPAS ID: PAT2902049

<b>SUBMISSION TYPE:</b>	NEW ASSIGNMENT										
<b>NATURE OF CONVEYANCE:</b>	ASSIGNMENT										
<b>CONVEYING PARTY DATA</b>											
<table border="1"><thead><tr><th>Name</th><th>Execution Date</th></tr></thead><tbody><tr><td>LARRY STEVEN EOFF</td><td>08/01/2013</td></tr><tr><td>B. RAGHAVA REDDY</td><td>08/01/2013</td></tr><tr><td>ERIC DAVIDSON</td><td>08/13/2013</td></tr><tr><td>ALEXANDRA CLARE MORRISON</td><td>08/21/2013</td></tr></tbody></table>	Name	Execution Date	LARRY STEVEN EOFF	08/01/2013	B. RAGHAVA REDDY	08/01/2013	ERIC DAVIDSON	08/13/2013	ALEXANDRA CLARE MORRISON	08/21/2013	
Name	Execution Date										
LARRY STEVEN EOFF	08/01/2013										
B. RAGHAVA REDDY	08/01/2013										
ERIC DAVIDSON	08/13/2013										
ALEXANDRA CLARE MORRISON	08/21/2013										
<b>RECEIVING PARTY DATA</b>											
<b>Name:</b>	HALLIBURTON ENERGY SERVICES, INC.										
<b>Street Address:</b>	10200 BELLAIRE BOULEVARD										
<b>City:</b>	HOUSTON										
<b>State/Country:</b>	TEXAS										
<b>Postal Code:</b>	77072										
<b>PROPERTY NUMBERS Total: 1</b>											
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<b>Application Number:</b>	14366219										
<b>CORRESPONDENCE DATA</b>											
<b>Fax Number:</b>	(202)756-8087										
<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.</i>											
<b>Phone:</b>	202 756 8000										
<b>Email:</b>	mweipdocket@mwe.com										
<b>Correspondent Name:</b>	MCDERMOTT WILL & EMERY LLP										
<b>Address Line 1:</b>	THE MCDERMOTT BUILDING										
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<b>Address Line 4:</b>	WASHINGTON, D.C. 20001										
<b>ATTORNEY DOCKET NUMBER:</b>	087638-0891										
<b>NAME OF SUBMITTER:</b>	DEBBIE ALLEN										
<b>SIGNATURE:</b>	/Debbie Allen/										
<b>DATE SIGNED:</b>	06/17/2014										
	This document serves as an Oath/Declaration (37 CFR 1.63).										
<b>Total Attachments: 8</b>											
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### DECLARATION AND ASSIGNMENT

As the below named inventor, I hereby declare that:

This declaration is directed to:

The attached application to be filed as a United States application or PCT international application, or

United States application or PCT international application number \_\_\_\_\_ filed on \_\_\_\_\_; and,

entitled "ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS." Regarding that application, I declare the following:

- The above-identified application was made, or authorized to be made, by me.
- I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.
- I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.
- I have reviewed and understand the subject matter of the above-identified application, including the claims.
- I am aware of and acknowledge my duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability under 37 CFR 1.56; including, for continuation-in-part applications, material information that became available between the filing of the prior application and the filing of the continuation-in-part application.

Moreover, Whereas, HALLIBURTON ENERGY SERVICES, INC., a Delaware Corporation, having a place of business at 10200 Bellaire Boulevard, Houston, TX 77072 (hereinafter "Assignee") is desirous of acquiring an interest therein;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, We, by these presents do sell, assign and transfer and convey unto Assignee, its successors and assigns, the full and exclusive right, for the United States of America and its territorial possessions and for any and all foreign countries, in and to the said invention, described in the Patent Application identified above, and any divisional, continuing or reissue application based on the present application preparatory to obtaining Letters Patent

of the United States therefore; said invention, application and any and all Letters Patent issuing there from to be held and enjoyed by Assignee, for its own use and benefit, and for its legal representatives, successors and assigns, to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held by me and had this assignment and sale not been made.

And I do further agree to sign all papers, make all rightful oaths and do all requisite acts for the filing of any disclaimer or for the filing and assignment of any divisional, continuing or reissue application or applications for patent based on the present application, as well as for any other U.S. or foreign application for patent which relates to the said invention.

And I do further agree to communicate to Assignee, its successors, assign or other legal representatives, such facts relating to the invention disclosed in the present application or Letters Patent issuing thereon as may be known to me, and to testify as to such facts in any interference or other litigation.

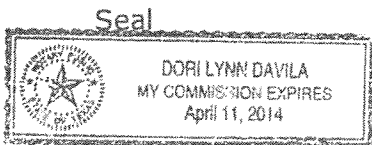
Executed this 1<sup>st</sup> day of August, 2013

Larry Steven Eoff  
LARRY STEVEN EOFF

STATE OF TEXAS )  
  )  
COUNTY OF HARRIS )

Before me personally appeared said LARRY STEVEN EOFF and acknowledged the foregoing instrument to be a free act and deed this 1 day of August, 2013.

[Signature]  
(Notary)



## DECLARATION AND ASSIGNMENT

As the below named inventor, I hereby declare that:

This declaration is directed to:

- The attached application to be filed as a United States application or PCT international application, or
- United States application or PCT international application number \_\_\_\_\_ filed on \_\_\_\_\_; and,

entitled "ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS." Regarding that application, I declare the following:

- The above-identified application was made, or authorized to be made, by me.
- I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.
- I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.
- I have reviewed and understand the subject matter of the above-identified application, including the claims.
- I am aware of and acknowledge my duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability under 37 CFR 1.56; including, for continuation-in-part applications, material information that became available between the filing of the prior application and the filing of the continuation-in-part application.

Moreover, Whereas, HALLIBURTON ENERGY SERVICES, INC., a Delaware Corporation, having a place of business at 10200 Bellaire Boulevard, Houston, TX 77072 (hereinafter "Assignee") is desirous of acquiring an interest therein;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, We, by these presents do sell, assign and transfer and convey unto Assignee, its successors and assigns, the full and exclusive right, for the United States of America and its territorial possessions and for any and all foreign countries, in and to the said invention, described in the Patent Application identified above, and any divisional, continuing or reissue application based on the present application preparatory to obtaining Letters Patent



**DECLARATION AND ASSIGNMENT**

As the below named inventor, I hereby declare that:

This declaration is directed to:

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of the United States therefore; said invention, application and any and all Letters Patent issuing there from to be held and enjoyed by Assignee, for its own use and benefit, and for its legal representatives, successors and assigns, to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held by me and had this assignment and sale not been made.

And I do further agree to sign all papers, make all rightful oaths and do all requisite acts for the filing of any disclaimer or for the filing and assignment of any divisional, continuing or reissue application or applications for patent based on the present application, as well as for any other U.S. or foreign application for patent which relates to the said invention.

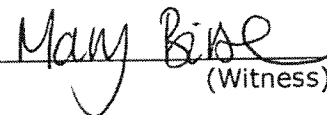
And I do further agree to communicate to Assignee, its successors, assign or other legal representatives, such facts relating to the invention disclosed in the present application or Letters Patent issuing thereon as may be known to me, and to testify as to such facts in any interference or other litigation.

Executed this 13<sup>th</sup> day of August, 2013

  
ERIC DAVIDSON

Before me personally appeared said ERIC DAVIDSON and acknowledged the foregoing instrument to be a free act and deed this 13<sup>th</sup> day of August, 2013.

Seal

  
(Witness)

### DECLARATION AND ASSIGNMENT

As the below named inventor, I hereby declare that:

This declaration is directed to:

The attached application to be filed as a United States application or PCT international application, or

United States application or PCT international application number \_\_\_\_\_ filed on \_\_\_\_\_; and,

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2013/056726**A. CLASSIFICATION OF SUBJECT MATTER**

E21B 33/13(2006.01)i, E21B 29/10(2006.01)i, E21B 33/138(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

E21B 33/13; E21B 43/295; C09K 8/68; E21B 43/00; E21B 43/25; E21B 43/16; E21B 43/27; C09K 8/60; E21B 29/10; E21B 33/138

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Korean utility models and applications for utility models  
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
eKOMPASS(KIPO internal) & keywords: treatment fluid, acid, permeability modifier, permeability modifier deactivator and injection well**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7727936 B2 (PAULS et al.) 01 June 2010 See abstract and claims 1,7.	1-20
A	US 2010-0230106 A1 (MILNE et al.) 16 September 2010 See abstract and claims 1-4.	1-20
A	US 2012-0168166 A1 (DALRYMPLE et al.) 05 July 2012 See abstract and claim 24.	1-20
A	US 7552771 B2 (EOFF et al.) 30 June 2009 See abstract and claims 1-3.	1-20
A	US 7114568 B2 (EOFF et al.) 03 October 2006 See abstract and claim 1.	1-20

 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family


Date of the actual completion of the international search

23 May 2014 (23.05.2014)

Date of mailing of the international search report

23 May 2014 (23.05.2014)

Name and mailing address of the ISA/KR



International Application Division  
Korean Intellectual Property Office  
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701,  
Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

JEONG, A Ram

Telephone No. +82-42-481-3388



## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/056726

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7727936 B2	01/06/2010	AU 2008-288334 A1	19/02/2009
		CA 2694151 A1	19/02/2009
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US 2010-0230106 A1	16/09/2010	CO 6420317 A2	16/04/2012
		EA 201171117 A1	30/07/2012
		GB 201112947 D0	14/09/2011
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		US 8413719 B2	09/04/2013
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US 2012-0168166 A1	05/07/2012	US 2005-0194140 A1	08/09/2005
		US 8278250 B2	02/10/2012
		US 8592353 B2	26/11/2013
US 7552771 B2	30/06/2009	AU 2008-322776 A1	22/05/2009
		AU 2008-322776 B2	25/07/2013
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		EP 2195400 B1	01/08/2012
		MX 2010004280 A	05/05/2010
		US 2009-0120642 A1	14/05/2009
		WO 2009-063161 A2	22/05/2009
WO 2009-063161 A3	26/11/2009		
US 7114568 B2	03/10/2006	AU 2003-251320 A1	29/03/2004
		AU 2006-231096 A1	12/10/2006
		AU 2006-231096 B2	17/11/2011
		CA 2525629 A1	25/11/2004

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/056726

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP 1644458 A1	12/04/2006
		EP 2009076 A1	31/12/2008
		US 2004-0045712 A1	11/03/2004
		US 2004-0220058 A1	04/11/2004
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		US 2006-0283592 A1	21/12/2006
		US 2009-0291863 A1	26/11/2009
		US 7091159 B2	15/08/2006
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		US 7741251 B2	22/06/2010
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		US 8008235 B2	30/08/2011
		US 8091638 B2	10/01/2012
		US 8181703 B2	22/05/2012
		US 8251141 B2	28/08/2012
		US 8278250 B2	02/10/2012
		US 8631869 B2	21/01/2014
		WO 2004-022667 A1	18/03/2004
		WO 2004-101706 A1	25/11/2004
		WO 2005-003515 A1	13/01/2005
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		WO 2005-071219 A3	06/04/2006
		WO 2005-119003 A1	15/12/2005
		WO 2006-106287 A1	12/10/2006
		WO 2008-007110 A1	17/01/2008

**Box No. VIII (ii) DECLARATION: ENTITLEMENT TO APPLY FOR AND BE GRANTED A PATENT**

*The declaration must conform to the standardized wording provided for in Section 212; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (ii). If this Box is not used, this sheet should not be included in the request.*

Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51 bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate:

in relation to this international application

HALLIBURTON ENERGY SERVICES, INC., is entitled to apply for and be granted a patent by virtue of the following:

an assignment from:

EOFF, Larry Steven, REDDY, B. Raghava, DAVIDSON, Eric and MORRISON, Alexandra Clare, dated August 1, 2013, August 1, 2013, August 13, 2013 and August 21, 2013, respectively, to HALLIBURTON ENERGY SERVICES, INC.

This declaration is continued on the following sheet, "Continuation of Box No. VIII (ii)".

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 2013IP072509U1PC	<b>FOR FURTHER ACTION</b>	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. <b>PCT/US2013/056726</b>	International filing date ( <i>day/month/year</i> ) <b>27 August 2013 (27.08.2013)</b>	(Earliest) Priority Date ( <i>day/month/year</i> )
Applicant <b>HALLIBURTON ENERGY SERVICES, INC.</b>		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of :

the international application in the language in which it was filed

a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b.  This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c.  With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2.  Certain claims were found unsearchable (See Box No. II)

3.  Unity of invention is lacking (See Box No. III)

4. With regard to the title,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

5. With regard to the abstract,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

a. the figure of the drawings to be published with the abstract is Figure No. 1

as suggested by the applicant.

as selected by this Authority, because the applicant failed to suggest a figure.

as selected by this Authority, because this figure better characterizes the invention.

b.  none of the figures is to be published with the abstract.

## INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/US2013/056726****A. CLASSIFICATION OF SUBJECT MATTER****E21B 33/13(2006.01)i, E21B 29/10(2006.01)i, E21B 33/138(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

E21B 33/13; E21B 43/295; C09K 8/68; E21B 43/00; E21B 43/25; E21B 43/16; E21B 43/27; C09K 8/60; E21B 29/10; E21B 33/138

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Korean utility models and applications for utility models  
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
eKOMPASS(KIPO internal) & keywords: treatment fluid, acid, permeability modifier, permeability modifier deactivator and injection well**C. DOCUMENTS CONSIDERED TO BE RELEVANT**


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A	US 2012-0168166 A1 (DALRYMPLE et al.) 05 July 2012 See abstract and claim 24.	1-20
A	US 7552771 B2 (EOFF et al.) 30 June 2009 See abstract and claims 1-3.	1-20
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 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:  
 "A" document defining the general state of the art which is not considered to be of particular relevance  
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 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  
 "O" document referring to an oral disclosure, use, exhibition or other means  
 "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art  
 "&" document member of the same patent family

Date of the actual completion of the international search  
23 May 2014 (23.05.2014)Date of mailing of the international search report  
**23 May 2014 (23.05.2014)**

Name and mailing address of the ISA/KR  
 International Application Division  
 Korean Intellectual Property Office  
 189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 302-701,  
 Republic of Korea  
 Facsimile No. +82-42-472-7140

Authorized officer

JEONG, A Ram

Telephone No. +82-42-481-3388



## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/056726

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		US 8592353 B2	26/11/2013
US 7552771 B2	30/06/2009	AU 2008-322776 A1	22/05/2009
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		EP 2195400 B1	01/08/2012
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		WO 2009-063161 A3	26/11/2009
US 7114568 B2	03/10/2006	AU 2003-251320 A1	29/03/2004
		AU 2006-231096 A1	12/10/2006
		AU 2006-231096 B2	17/11/2011
		CA 2525629 A1	25/11/2004

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/056726

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP 1644458 A1	12/04/2006
		EP 2009076 A1	31/12/2008
		US 2004-0045712 A1	11/03/2004
		US 2004-0220058 A1	04/11/2004
		US 2004-0229756 A1	18/11/2004
		US 2004-0229757 A1	18/11/2004
		US 2005-0000694 A1	06/01/2005
		US 2005-0155796 A1	21/07/2005
		US 2005-0194140 A1	08/09/2005
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		US 2005-0284632 A1	29/12/2005
		US 2006-0137875 A1	29/06/2006
		US 2006-0234874 A1	19/10/2006
		US 2006-0240994 A1	26/10/2006
		US 2006-0266522 A1	30/11/2006
		US 2006-0283592 A1	21/12/2006
		US 2009-0291863 A1	26/11/2009
		US 7091159 B2	15/08/2006
		US 7117942 B2	10/10/2006
		US 7182136 B2	27/02/2007
		US 7207387 B2	24/04/2007
		US 7589048 B2	15/09/2009
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		US 7741251 B2	22/06/2010
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		US 8278250 B2	02/10/2012
		US 8631869 B2	21/01/2014
		WO 2004-022667 A1	18/03/2004
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		WO 2008-007110 A1	17/01/2008



From the INTERNATIONAL BUREAU

**PCT**

FIRST NOTICE INFORMING THE APPLICANT OF  
THE COMMUNICATION OF THE INTERNATIONAL  
APPLICATION (TO DESIGNATED OFFICES WHICH  
DO NOT APPLY THE 30 MONTH TIME LIMIT  
UNDER ARTICLE 22(1))

(PCT Rule 47.1(c))

To:

JORDAN, Carey, C.  
Mcdermott Will & Emery LLP  
500 North Capitol Street, N.W.  
Washington, DC 20001  
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 02 April 2015 (02.04.2015)		<b>IMPORTANT NOTICE</b>	
Applicant's or agent's file reference 2013IP072509U1PC			
International application No. PCT/US2013/056726	International filing date (day/month/year) 27 August 2013 (27.08.2013)	Priority date (day/month/year)	
Applicant HALLIBURTON ENERGY SERVICES, INC.			

- ATTENTION:** For any designated Office(s), for which the time limit under Article 22(1), as in force from 1 April 2002 (30 months from the priority date), **does apply**, please see Form PCT/IB/308(Second and Supplementary Notice) (to be issued promptly after the expiration of 28 months from the priority date).
- Notice is hereby given that the following designated Office(s), for which the time limit under Article 22(1), as in force from 1 April 2002, **does not apply**, has/have requested that the communication of the international application, as provided for in Article 20, be effected under Rule 93bis.1. The International Bureau has effected that communication on the date indicated below:  
05 March 2015 (05.03.2015)

**None**

In accordance with Rule 47.1(c-bis)(i), those Offices will accept the present notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

- The following designated Offices, for which the time limit under Article 22(1), as in force from 1 April 2002, **does not apply**, have not requested, as at the time of mailing of the present notice, that the communication of the international application be effected under Rule 93bis.1 :

**LU, TZ, UG**

In accordance with Rule 47.1(c-bis)(ii), those Offices accept the present notice as conclusive evidence that the Contracting State for which that Office acts as a designated Office does not require the furnishing, under Article 22, by the applicant of a copy of the international application.

**4. TIME LIMITS for entry into the national phase**

For the designated Office(s) listed above, and unless a demand for international preliminary examination has been filed before the expiration of **19 months** from the priority date (see Article 39(1)), the applicable time limit for entering the national phase will, **subject to what is said in the following paragraph**, be **20 MONTHS** from the priority date.

In practice, **time limits other than the 20-month time limit** will continue to apply, for various periods of time, in respect of certain of the designated Offices listed above. For **regular updates on the applicable time limits** (20 or 21 months, or other time limit), Office by Office, refer to the *PCT Gazette*, the *PCT Newsletter* and the *PCT Applicant's Guide*, Volume II, National Chapters, all available from WIPO's Internet site, at <http://www.wipo.int/pct/en/index.html>.

It is the applicant's **sole responsibility** to monitor all these time limits.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  <b>Nora Lindner</b>
Facsimile No. +41 22 338 82 70	e-mail: <a href="mailto:pt05.pct@wipo.int">pt05.pct@wipo.int</a>

## PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: KAISER, IONA N.  MCDERMOTT WILL & EMERY LLP 500 NORTH CAPITOL STREET, N.W. WASHINGTON, D.C. 20001 USA
---

**PCT****NOTIFICATION OF RECEIPT  
OF SEARCH COPY**

(PCT Rule 25.1)

Date of mailing  
(day/month/year) 11 September 2013 (11.09.2013)Applicant's or agent's file reference  
2013IP072509U1PC**IMPORTANT NOTIFICATION**

International application No.

**PCT/US2013/056726**

International filing date (day/month/year)

**27 August 2013 (27.08.2013)**

Priority date (day/month/year)

Applicant

**HALLIBURTON ENERGY SERVICES, INC.**


1. **Where the International Searching Authority and the receiving Office are not the same Office:**  
The applicant is hereby notified that the search copy of the international application was received by this International Searching Authority on the date indicated below.

**Where the International Searching Authority and the receiving Office are the same Office:**  
The applicant is hereby notified that the search copy of the international application was received on the date indicated below.

**10 September 2013 (10.09.2013)** (date of receipt).

2.  The search copy was accompanied by a nucleotide and/or amino acid sequence listing or tables related thereto in electronic form.
3.  The search copy contained a nucleotide and/or amino acid sequence listing or tables related thereto in electronic form.
4. **Time limit for establishment of international search report and written opinion of the International Searching Authority**  
The applicant is informed that the time limit for establishing the international search report and the written opinion of the International Searching Authority is three months from the date of receipt indicated above or nine months from the priority date, whichever time limit expires later (Rules 42.1 and 43bis.1(a)).

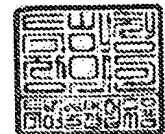
A copy of this Notification has been sent to the International Bureau and, where the first sentence of paragraph 1 applies, to the receiving Office.

Name and mailing address of the ISA/KR  
Korean Intellectual Property Office  
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan  
City, 302-701, Republic of Korea  
  
Facsimile No. 82-42-472-7140

Authorized officer

COMMISSIONER

Telephone No. 82-42-481-5207



From the INTERNATIONAL BUREAU

**PCT**

INVITATION TO CORRECT  
DECLARATIONS MADE IN THE REQUEST  
UNDER PCT RULE 4.17

(PCT Rules 4.17 and 26ter.2(a))

To:  
  
JORDAN, Carey, C.  
Mcdermott Will & Emery LLP  
500 North Capitol Street, N.W.  
Washington, DC 20001  
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 16 September 2013 (16.09.2013)	REPLY DUE	See below
Applicant's or agent's file reference 2013IP072509U1PC		
International application No. PCT/US2013/056726	International filing date (day/month/year) 27 August 2013 (27.08.2013)	
Applicant HALLIBURTON ENERGY SERVICES, INC.		

- The applicant is hereby invited to submit to the International Bureau a corrected declaration within the time limit indicated below and as explained in the Annex. The applicant's attention is drawn to the fact that the declaration has **not been examined** for compliance with national law requirements of the designated State(s) for which that declaration is made.
  - When?** Within 16 months from the priority date, provided that any corrected declaration which is received by the International Bureau after the expiration of that time limit shall be considered to have been received on the last day of that time limit if it reaches it before the technical preparations for international publication have been completed (Rule 26ter.1).
  - How?** By submitting a replacement sheet containing a corrected declaration accompanied by a letter explaining the correction (see Section 216). See Sections 211 to 215 for the applicable standardized wording.
  - Where?** Directly to the International Bureau at the address indicated below.  
If the corrected declaration is submitted to the receiving Office, that Office shall mark the date of receipt on it and transmit it promptly to the International Bureau. The declaration shall be considered to have been submitted to the International Bureau on the date marked (see Section 317).
- Failure to correct the declaration within the time limit** will result in the declaration, as originally filed, being published as part of the international application (Rule 48.2(a)(x)).  
Any declaration received after the expiration of the time limit under Rule 26ter.1 will have to be submitted by the applicant directly to the designated Offices concerned; it is only in the case of a signed declaration of inventorship for the purposes of the designation of the United States of America (Rule 4.17(iv)) that the original declaration will be returned to the applicant (see Section 419(d)).
- In respect of national phase processing**, the applicant's attention is drawn to Rule 51bis.2 which provides that the designated Office shall not, unless it may reasonably doubt the veracity of the declaration concerned, require any document or evidence relating to the subject matter of any declaration complying with Rule 4.17(i) to (iv) which is contained in the request or submitted to the International Bureau or directly to the designated Office. Note, however, that Rule 51bis.2 may not apply in respect of certain States. For further information, see Notes to the request form, Box No. VIII.
- A copy of this Invitation is being sent to the receiving Office.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  <b>Campin Helene</b> e-mail pt03.pct@wipo.int Telephone No. +41 22 338 74 03
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The International Bureau has found the following defect(s) in the declaration(s) listed below:

1.  declaration as to the identity of the inventor (Rules 4.17(i) and 51bis.1(a)(i) and Section 211), in respect of:
2.  declaration as to the applicant's entitlement, as at the international filing date, to apply for or be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii) and Section 212), in respect of:
3.  declaration as to the applicant's entitlement, as at the international filing date, to claim priority of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii) and Section 213), in respect of:
4.  declaration of inventorship (only for the purposes of the designation of the United States of America) (Rules 4.17(iv) and 51bis.1(a)(iv) and Section 214), in respect of:
  - a. *(name(s) included in the declaration)*:
    - is not in the prescribed wording
    - is not signed by all inventors named in the declaration
    - other (*specify*): As of 16 September 2012, a new form should be filled, please see website:  
[http://www.wipo.int/export/sites/www/pct/en/forms/request/ed\\_request.pdf](http://www.wipo.int/export/sites/www/pct/en/forms/request/ed_request.pdf)
5.  declaration as to non-prejudicial disclosures or exceptions to lack of novelty (Rules 4.17(v) and 51bis.1(a)(v) and Section 215), in respect of:

**PATENT COOPERATION TREATY**

From the RECEIVING OFFICE

**PCT**

To:  
 IONA N. KAISER  
 MCDERMOTT WILL & EMERY LLP  
 500 NORTH CAPITOL STREET, N.W.  
 WASHINGTON, DISTRICT OF COLUMBIA 20001

NOTIFICATION CONCERNING PAYMENT  
 OF PRESCRIBED FEES

(PCT Rules 12*bis*.1(c), 14, 15 and 16  
 and Administrative Instructions,  
 Sections 102*bis*(c), 304, 323(b) and 707)

Date of mailing (day/month/year)		09 Sep 2013
Applicant's or agent's file reference 2013IP072509U1PC		<b>PAYMENT DUE</b> see item 3 for time limits
International application No. PCT/US2013/056726	International filing date/Date of receipt (day/month/year) 27 Aug 2013	Priority date (day/month/year)
Applicant HALLIBURTON ENERGY SERVICES, INC.		

1. The applicant is hereby notified that this receiving Office has received:

- the payment of all the prescribed fees, and  an overpayment, which will be refunded in due course.  
 no or insufficient payment of the prescribed fees and the applicant is hereby invited to pay the balance due, as summarized under item 2, within the time limit(s) indicated under item 3.

2. Fees and payment calculation:

2,831.00	-	2,831.00	=	0.00
Total fees payable		Amount paid		Balance

The details of the calculation are given in the Annex.

3. Time limit(s) for payment and amount(s) payable (Rules 14.1, 15.3 and 16.1(f)):

- within ONE MONTH from the date of receipt of the international application (for the transmittal fee (if any), the search fee and the international filing fee). The amount payable for each fee is the amount applicable on the date of receipt of the international application.  
 within 16 MONTHS from the priority date (only for the fee for priority document). The applicant's attention is drawn to the fact that the request made by the applicant under Rule 17.1(b) will be considered not to have been made unless the fee is paid within that time limit.

4. Additional observations (if necessary):

- The search copy will not be transmitted to the International Searching Authority until the search fee is paid (therefore the start of the international search will be delayed) (Rule 23.1(a) and (b)).

Name and mailing address of the receiving Office Mail Stop PCT, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-3201	Authorized officer <b>Wendy Trice</b> Telephone No. 571-272-7338
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**ANNEX TO FORM PCT/RO/102  
CALCULATION OF THE PRESCRIBED FEES**

International application No.  
PCT/US2013/056726

**T Transmittal Fee**

Prescribed amount:	240.00 <b>T</b>	<input checked="" type="checkbox"/> correct amount
Amount paid:	240.00	<input type="checkbox"/> overpayment
Balance:	0.00	<input type="checkbox"/> balance due

**S Search Fee**

Prescribed amount:	1,167.00 <b>S</b>	<input checked="" type="checkbox"/> correct amount
Amount paid:	1,167.00	<input type="checkbox"/> overpayment
Balance:	0.00	<input type="checkbox"/> balance due

**I International Filing Fee**

Fixed amount for first 30 sheets:	1,312.00 <b>i1</b>	
$\frac{7}{\text{Number of sheets in excess of 30}}$ x $\frac{16.00}{\text{Fee per sheet}}$	= 112.00 <b>i2</b>	

*(excluding pages referred to in Section 707(a-bis))*

Reduction where the international application is filed  
(See PCT Applicant's Guide, International Phase for details on the availability of this reduction):

on paper together with a copy in electronic form, in character coded format, of the request and the abstract . . . . . 0.00 **r**

or

in electronic form, the request not being in character coded format . . . . . 0.00 **r**

or

in electronic form, the request being in character coded format . . . . . 0.00 **r**

or

in electronic form, the request, description, claims and abstract being in character coded format . . . . . 0.00 **r**

Sub-total: . . . . . 1,424.00 **i1+i2-r**

*Applicants from certain States are entitled to a reduction of 90% of the international filing fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 10% of the sub-total entered at (i1+i2-r); (see Notes to the Fee Calculation Sheet as annexed to the Request Form, PCT/RO/101, for details):*

	1,424.00 <b>r</b>	<input checked="" type="checkbox"/> correct amount
Amount paid:	1,424.00	<input type="checkbox"/> overpayment
Balance:	0.00	<input type="checkbox"/> balance due

**P Fee for Priority Document**

Prescribed amount:	0.00 <b>P</b>	<input checked="" type="checkbox"/> correct amount
Amount paid:	0.00	<input type="checkbox"/> overpayment
Balance:	0.00	<input type="checkbox"/> balance due

**ES Fee for Earlier Search Documents**

Prescribed amount:	0.00 <b>ES</b>	<input type="checkbox"/> correct amount
Amount paid:	0.00	<input type="checkbox"/> overpayment
Balance:	0.00	<input type="checkbox"/> balance due

# PCT

## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only	
PCT/US13/56726	
International Application No.	27 AUG 2013 (27.08.13)
International Filing Date	PCTINTERNATIONAL RO/USAPPLICATION
Name of receiving Office and "PCT International Application"	
Applicant's or agent's file reference (if desired) (12 characters maximum)	2013IP072509U1PC

<b>Box No. I</b>	<b>TITLE OF INVENTION</b>
ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS	
<b>Box No. II</b>	<b>APPLICANT</b>
<input type="checkbox"/> This person is also inventor	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) HALLIBURTON ENERGY SERVICES, INC. 10200 Bellaire Boulevard Houston, TX 77072 UNITED STATES OF AMERICA	
Telephone No.	
Facsimile No.	
Applicant's registration No. with the Office	
E-mail authorization: Marking one of the check-boxes below authorizes the receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority to use the e-mail address indicated in this Box to send, notifications issued in respect of this international application to that e-mail address if those offices are willing to do so. <input type="checkbox"/> as advance copies followed by paper notifications; or <input type="checkbox"/> exclusively in electronic form (no paper notifications will be sent).	
E-mail address:	
State (that is, country) of nationality: US	State (that is, country) of residence: US
This person is applicant for the purposes of: <input checked="" type="checkbox"/> all designated States <input type="checkbox"/> the States indicated in the Supplemental Box	
<b>Box No. III</b>	<b>FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)</b>
<input checked="" type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.	
<b>Box No. IV</b>	<b>AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE</b>
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: <input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) KAISER, Iona N. (Reg. No. 53,086) JORDAN, Carey C. (Reg. No. 47,646) McDermott Will & Emery LLP 500 North Capitol Street, N.W. Washington, D.C. 20001 UNITED STATES OF AMERICA	
Telephone No. 202-756-8000	
Facsimile No. 202-756-8087	
Agent's registration No. with the Office 53,086	
E-mail authorization: Marking one of the check-boxes below authorizes the receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority to use the e-mail address indicated in this Box to send, notifications issued in respect of this international application to that e-mail address if those offices are willing to do so. <input type="checkbox"/> as advance copies followed by paper notifications; or <input checked="" type="checkbox"/> exclusively in electronic form (no paper notifications will be sent).	
E-mail address: mweipdocket@mwe.com	
<input type="checkbox"/> Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

**Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)**

*If none of the following sub-boxes is used, this sheet should not be included in the request.*

Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i> <b>EOFF, Larry Steven</b> 2201 Cedar Duncan, OK 73533 UNITED STATES OF AMERICA	This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input checked="" type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i>
Applicant's registration No. with the Office	

State (that is, country) of nationality:	State (that is, country) of residence:
--	--

This person is applicant for the purposes of:  all designated States  the States indicated in the Supplemental Box

Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i> <b>REDDY, B. Raghava</b> 72 Laughing Brook Court The Woodlands, TX 77380 UNITED STATES OF AMERICA	This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input checked="" type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i>
Applicant's registration No. with the Office	

State (that is, country) of nationality:	State (that is, country) of residence:
--	--

This person is applicant for the purposes of:  all designated States  the States indicated in the Supplemental Box

Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i> <b>DAVIDSON, Eric</b> 26 Ashfield Road, Cults Aberdeen, UK AB15 9NQ UNITED KINGDOM	This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input checked="" type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i>
Applicant's registration No. with the Office	

State (that is, country) of nationality:	State (that is, country) of residence:
--	--

This person is applicant for the purposes of:  all designated States  the States indicated in the Supplemental Box

Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i> <b>MORRISON, Alexandra Clare</b> Mains of Blackhall Cottage Inverurie AB 51 5JJ SOUTH AFRICA	This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input checked="" type="checkbox"/> inventor only <i>(If this check-box is marked, do not fill in below.)</i>
Applicant's registration No. with the Office	

State (that is, country) of nationality:	State (that is, country) of residence:
--	--

This person is applicant for the purposes of:  all designated States  the States indicated in the Supplemental Box

Further applicants and/or (further) inventors are indicated on another continuation sheet.



**Box No. V DESIGNATIONS**

The filing of this request constitutes under Rule 4.9(a) the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.

However,

- DE Germany is not designated for any kind of national protection
- JP Japan is not designated for any kind of national protection
- KR Republic of Korea is not designated for any kind of national protection

*(The check-boxes above may only be used to exclude (irrevocably) the designations concerned if, at the time of filing or subsequently under Rule 26bis.1, the international application contains in Box No. VI a priority claim to an earlier national application filed in the particular State concerned, in order to avoid the ceasing of the effect, under the national law, of this earlier national application.)*

**Box No. VI PRIORITY CLAIM AND DOCUMENT**

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application: regional Office	international application: receiving Office
item (1)				
item (2)				
item (3)				

Further priority claims are indicated in the Supplemental Box.

**Furnishing the priority document(s):**

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application(s) was filed with the receiving Office which, for the purposes of this international application, is the receiving Office) identified above as:

- all items     item (1)     item (2)     item (3)     other, see Supplemental Box

The International Bureau is requested to obtain from a digital library a certified copy of the earlier application(s) identified above, using, where applicable, the access code(s) indicated below (if the earlier application(s) is available to it from a digital library):

- item (1) access code \_\_\_\_\_     item (2) access code \_\_\_\_\_     item (3) access code \_\_\_\_\_     other, see Supplemental Box

**Restore the right of priority:** the receiving Office is requested to restore the right of priority for the earlier application(s) identified above or in the Supplemental Box as item(s) (\_\_\_\_\_). (See also the Notes to Box No. VI; further information must be provided to support a request to restore the right of priority.)

**Incorporation by reference:** where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.

**Box No. VII INTERNATIONAL SEARCHING AUTHORITY**

**Choice of International Searching Authority (ISA)** (if more than one International Searching Authority is competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA/ KR



**Box No. IX CHECK LIST for EFS-Web filings - this sheet is only to be used when filing an international application with RO/US via EFS-Web**

This international application contains the following:	Number of sheets	This international application is accompanied by the following item(s) (mark the applicable check-boxes below and indicate in right column the number of each item):	Number of items
(a) request form PCT/RO/101 (including any declarations and supplemental sheets) . . . . .	6	1. <input checked="" type="checkbox"/> fee calculation sheet . . . . .	1
(b) description (excluding any sequence listing part of the description, see (f), below) . . . . .	24	2. <input type="checkbox"/> original separate power of attorney . . . . .	
(c) claims . . . . .	4	3. <input type="checkbox"/> original general power of attorney . . . . .	
(d) abstract . . . . .	1	4. <input type="checkbox"/> copy of general power of attorney; reference number: . . . . .	
(e) drawings (if any) . . . . .	2	5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s) . . . . .	
(f) sequence listing part of the description in the form of an image file (e.g. PDF) . . . . .		6. <input type="checkbox"/> Translation of international application into (language): . . . . .	
<b>Total number of sheets (including the sequence listing part of the description if filed as an image file) . . . . .</b>	<b>37</b>	7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material . . . . .	
(g) sequence listing part of the description		8. <input type="checkbox"/> (only where item (f) is marked in the left column) copy of the sequence listing in electronic form (Annex C/ST.25 text file) not forming part of the international application but furnished only for the purposes of international search under Rule 13ter. . . . .	
<input type="checkbox"/> filed in the form of an Annex C/ST.25 text file		9. <input type="checkbox"/> (only where item (f) is marked in the left column) a statement confirming that "the information recorded in electronic form submitted under Rule 13ter is identical to the sequence listing as contained in the international application" as filed via EFS-Web: . . . . .	
<input type="checkbox"/> WILL BE filed separately on physical data carrier(s), on the same day and in the form of an Annex C/ST.25 text file		10. <input type="checkbox"/> copy of results of earlier search(es) (Rule 12bis.1(a)) . . . . .	
Indicate type and number of physical data carrier(s) . . . . .		11. <input checked="" type="checkbox"/> other (specify): PCT Transmittal . . . . .	1

Figure of the drawings which should accompany the abstract: \_\_\_\_\_ Language of filing of the international application: English

**Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE**  
*Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).*

/Iona N. Kaiser/  
 Iona N. Kaiser, Reg. No. 53,086

For receiving Office use only	
1. Date of actual receipt of the purported international application: 27 AUG 2013 (27.08.13)	2. Drawings: <input type="checkbox"/> received:  <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority (if two or more are competent): ISA / KR	
6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid	

For International Bureau use only  
 Date of receipt of the record copy by the International Bureau:

**PATENT COOPERATION TREATY**

From the RECEIVING OFFICE

**PCT**

To:  
 IONA N. KAISER  
 MCDERMOTT WILL & EMERY LLP  
 500 NORTH CAPITOL STREET, N.W.  
 WASHINGTON, DISTRICT OF COLUMBIA 20001

Confirmation No: 9430

NOTIFICATION OF THE INTERNATIONAL  
 APPLICATION NUMBER AND OF THE  
 INTERNATIONAL FILING DATE

(PCT Rule 20.2(c))

Date of mailing (day/month/year)	09 Sep 2013
-------------------------------------	-------------

Applicant's or agent's file reference 2013IP072509U1PC	<b>IMPORTANT NOTIFICATION</b>
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International application No. PCT/US2013/056726	International filing date (day/month/year) 27 Aug 2013	Priority date (day/month/year)
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Applicant  
 HALLIBURTON ENERGY SERVICES, INC.

Title of the invention  
 ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS

1. The applicant is hereby notified that the international application has been accorded the international application number and the international filing date indicated above.

2. The applicant is further notified that the record copy of the international application:

09 Sep 2013

was transmitted to the International Bureau on \_\_\_\_\_

has not yet been transmitted to the International Bureau for the reason indicated below and a copy of this notification has been sent to the International Bureau\*:

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3. FOREIGN TRANSMITTAL LICENSE INFORMATION Completed by: WT

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37 CFR 5.15(a)  37 CFR 5.15(b)

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From the INTERNATIONAL BUREAU

# PCT

NOTIFICATION CONCERNING  
AVAILABILITY OF THE PUBLICATION  
OF THE INTERNATIONAL APPLICATION

To:

JORDAN, Carey, C.  
Mcdermott Will & Emery LLP  
500 North Capitol Street, N.W.  
Washington, DC 20001  
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 05 March 2015 (05.03.2015)		<b>IMPORTANT NOTICE</b>	
Applicant's or agent's file reference 2013IP072509U1PC			
International application No. PCT/US2013/056726	International filing date (day/month/year) 27 August 2013 (27.08.2013)	Priority date (day/month/year)	
Applicant HALLIBURTON ENERGY SERVICES, INC.			

The applicant is hereby **notified** that the International Bureau:

- has **published** the above-indicated international application on 05 March 2015 (05.03.2015) under No. WO 2015/030721
- has **republished** the above-indicated international application on under No. WO  
For an explanation as to the reason for this republication of the international application, reference is made to INID codes (15), (48) or (88) (as the case may be) on the front page of the published international application.

A copy of the international application is available for viewing and downloading on WIPO's website at the following address: [www.wipo.int/pctdb](http://www.wipo.int/pctdb) (in the appropriate field of the structured search, enter the PCT or WO number).

The applicant may also obtain a paper copy of the published international application from the International Bureau by sending an e-mail to [patentscope@wipo.int](mailto:patentscope@wipo.int) or by submitting a written request to the contact details provided below.

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From the INTERNATIONAL BUREAU

**PCT**

NOTIFICATION OF RECEIPT OF  
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To:

JORDAN, Carey, C.  
Mcdermott Will & Emery LLP  
500 North Capitol Street, N.W.  
Washington, DC 20001  
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 16 September 2013 (16.09.2013)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 2013IP072509U1PC	International application No. PCT/US2013/056726

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

HALLIBURTON ENERGY SERVICES, INC. (all designated States)

International filing date: 27 August 2013 (27.08.2013)  
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Date of receipt of the record copy by the International Bureau: 09 September 2013 (09.09.2013)  
List of designated Offices:

**AP:** BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW  
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**ATTENTION:** The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau. In addition, the applicant's attention is drawn to:

- time limits for entry into the national phase (see [www.wipo.int/pct/en/texts/time\\_limits.html](http://www.wipo.int/pct/en/texts/time_limits.html) and *PCT Applicant's Guide*, National Phase, especially Chapters 3 and 4)
- requirements regarding priority documents (if applicable) (see *PCT Applicant's Guide*, International Phase, paragraph 5.070)

A copy of this notification is being sent to the receiving Office and to the International Searching Authority.

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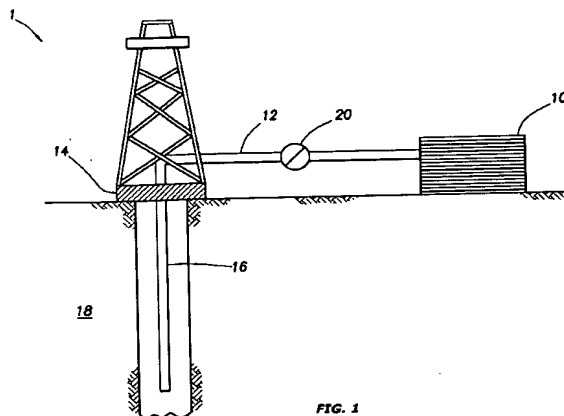


FIG. 1

(57) Abstract: Some embodiments herein comprise providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator; providing an injection well having a first treatment zone comprising a first aqueous formation permeability, wherein the first treatment zone comprises formation damage; introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone; reacting the acid with the first treatment zone so as to repair a portion of the formation damage; reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability to adopt a second, lesser aqueous formation permeability; and contacting the permeability modifier deactivator with the permeability modifier so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability.

WO 2015/030721 A1

## ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS

### BACKGROUND

5           **[0001]**       The methods of the embodiments described herein relate to acid diversion treatments in injection wells using permeability modifiers.

**[0002]**       An injection well is a wellbore in subterranean formation used to pump fluids into a producing reservoir (e.g., a hydrocarbon producing reservoir). Injection wells are typically used for waterflood, pressure  
10 maintenance, and enhanced oil recovery purposes. Injection wells are often composed of multiple subterranean zonal portions that are not homogeneous in terms of permeability, porosity, and/or the degree of damage experienced in the particular zone compared to surrounding zones. These nonhomogeneous zones can impede fluid injectivity into producing wellbores and may require increased  
15 pressure to adequately inject fluids.

**[0003]**       It is common to perform acid diversion treatments in injection wells to combat the nonhomogeneous nature of the well. An aqueous acid treatment may be injected into an injection well, where the acid is expected to dissolve portions of the formation rock in the near wellbore region, thereby  
20 reducing the lack of zonal homogeneity in the injection well. Acids, however, follow the path of least resistance and tend to flow to high permeability zones. In order to uniformly treat an injection well with an acid, diversion techniques are typically employed. Diversion techniques encourage the acid to flow from high permeability zones to low permeability zones.

25           **[0004]**       Permeability modifiers have been effective acid diverters for hydrocarbon producing wells. They are capable of altering the relative permeability of a portion of a wellbore that they come into contact with, resulting in blockage of water production and/or diversion of aqueous fluids away from that portion of the wellbore. As such, they are particularly useful in  
30 hydrocarbon producing wells where they have no effect on hydrocarbon permeability and where there is no concern that the effects of the permeability modifier (e.g., reduction in water permeability) may remain in effect for a period longer than desired or permanently. Injection wells, on the other hand, typically involve injection of water rather than hydrocarbons and minimal pressure during  
35 fluid injection is desirable. Thus, the use of permeability modifiers, although



**2013-IP-072509U1 PCT**

effective acid diverters, in injection wells may result in undesirable or irreversible reduction in water permeability of the wellbore.

**[0005]** It is therefore desirable to provide an acid diversion treatment for use in an injection well comprising a permeability modifier, whose effects can be reversed after the treatment is complete.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**[0006]** The following figures are included to illustrate certain aspects of the embodiments herein, and should not be viewed as exclusive embodiments. The subject matter disclosed is capable of considerable modifications, alterations, combinations, and equivalents in form and function, as will occur to those skilled in the art and having the benefit of this disclosure.

**[0007]** FIG. 1 depicts an embodiment of a system configured for delivering the treatment fluids comprising the acid diversion compositions described in some embodiments herein to a downhole location.

**[0008]** FIG. 2 shows a graphical representation of a fluid loss control test demonstrating the ability of a surfactant to be used as a permeability modifier deactivator as disclosed in some embodiments herein.

**DETAILED DESCRIPTION**

**[0009]** The methods of the embodiments described herein relate to acid diversion treatments in injection wells using permeability modifiers.

**[0010]** Although the embodiments disclosed herein focus on providing treatment fluids for use in acid diversion treatments in injection wells, the treatment fluids may be effectively used in any other subterranean formation or subterranean formation treatment operation that may benefit from an acid diversion treatment with reversible permeability modification effects. Such formations may include, but are not limited to, hydrocarbon producing wells, gas producing wells, and the like. Such subterranean formation treatment operations may include acid-fracturing treatments, remedial treatments, completion treatments, and the like. Additionally, although the treatment fluids described herein relate to acid diversion treatments, they may also be used without the acid for other diverting subterranean treatment operations.

**2013-IP-072509U1 PCT**

**[0011]** One or more illustrative embodiments are presented below. Not all features of an actual implementation are described or shown in this application for the sake of clarity. It is understood that in the development of an actual embodiment, numerous implementation-specific decisions must be made  
5 to achieve the developer's goals, such as compliance with system-related, business-related, government-related and other constraints, which vary by implementation and from time to time. While a developer's efforts might be complex and time-consuming, such efforts would be, nevertheless, a routine undertaking for those of ordinary skill in the art having benefit of this disclosure.

10 **[0012]** It should be noted that when "about" is provided herein at the beginning of a numerical list, the term modifies each number of the numerical list. In some numerical listings of ranges, some lower limits listed may be greater than some upper limits listed. One skilled in the art will recognize that the selected subset will require the selection of an upper limit in excess of the  
15 selected lower limit. Unless otherwise indicated, all numbers expressing quantities of ingredients, properties such as molecular weight, reaction conditions, and so forth used in the present specification and associated claims are to be understood as being modified in all instances by the term "about." Accordingly, unless indicated to the contrary, the numerical parameters set forth  
20 in the following specification and attached claims are approximations that may vary depending upon the desired properties sought to be obtained by the exemplary embodiments described herein. At the very least, and not as an attempt to limit the application of the doctrine of equivalents to the scope of the claim, each numerical parameter should at least be construed in light of the  
25 number of reported significant digits and by applying ordinary rounding techniques.

**[0013]** While compositions and methods are described in terms of "comprising" various components or steps, the compositions and methods can also "consist essentially of" or "consist of" the various components and steps.  
30 When "comprising" is used in a claim, it is open-ended.

**[0014]** In some embodiments described herein, a method is provided comprising introducing a treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier into an injection well at a first treatment zone. In some embodiments, the treatment fluid may further  
35 comprise a permeability modifier deactivator, whereas in other embodiments the

**2013-IP-072509U1 PCT**

permeability modifier deactivator may be included in a later-placed fluid. The first treatment zone is characterized by a first aqueous formation permeability and comprises formation damage thereon (e.g., formation fines, other particulates, and the like). As used herein, the term "aqueous formation permeability" refers to the ability of a subterranean formation to transmit aqueous fluids, which may include aqueous fluids comprising acids for acid diversion treatments. As used herein, the term "formation damage" refers to undesirable deposits in a subterranean formation that may reduce its permeability (e.g., scale, skin, hydrates, geological deposits on the pore throats of the formation, and the like).

**[0015]** The acid in the treatment fluid is reacted with the formation at the first treatment zone so as to repair a portion of the formation damage in the first treatment zone, thereby increasing the overall permeability. The permeability modifier is reacted with the first treatment zone so as to cause the first aqueous formation permeability to decrease and adopt a second aqueous formation permeability. Thus, the permeability modifier is capable of reducing the water permeability of the first treatment zone. The permeability modifier deactivator and the permeability modifier are then contacted at the first treatment zone so as to deactivate the permeability modifier and restore first treatment zone to about the first aqueous formation permeability. After deactivation, the treatment fluid and any particulates formed as a result of repairing the formation damage may be removed from the injection well. In other embodiments, the acid and the permeability modifier are first introduced into the injection well in a first treatment fluid, so as to acidize and reduce the aqueous permeability of the first treatment zone, followed by introduction of a second treatment fluid comprising the permeability modifier deactivator. This provides methods wherein as a first treatment zone is exposed to an acid to remove formation damage (and thus increase the overall permeability that first treatment zone) the first treatment zone is simultaneously exposed to a permeability modifier that acts over time to reduce the aqueous permeability of the first treatment zone. In this way, as the treatment progresses, the first treatment zone will become gradually less permeable to the treatment fluid (which is itself aqueous based) and so may tend to self-divert the treatment fluid (containing the acid and the permeability modifier and the optional permeability

**2013-IP-072509U1 PCT**

modifier deactivator) to a second or subsequent treatment zone. The process of treating zonal portions of the injection well may be repeated in multiple zones.

**[0016]** The acid for use in the treatment fluids of the embodiments described herein may include any acid capable of removing formation damage from a subterranean formation, provided the acid does not adversely affect the function of the permeability modifier and permeability modifier deactivator in the treatment fluid. Examples of suitable acids include, but are not limited to, hydrochloric acid; hydrofluoric acid; acetic acid; formic acid; sulfuric acid; sulfamic acid; chloroacetic acid; nitric acid; phosphoric acid; tartaric acid; oxalic acid; lactic acid; glycolic acid; aminopolycarboxylic acid; polyaminopolycarboxylic acid; citric acid; ethylene diamine tetra acetic acid; and any combination thereof. In some embodiments, hydrochloric acid; acetic acid; and formic acid are preferred. In some embodiments, the acid may be present in the treatment fluid in the range of from about a lower amount in the range of from about 0.5%, 1%, 3%, 5%, 8%, 12%, and 15% to about an upper limit of 30%, 28%, 25%, 21%, 18%, and 15% by weight of the treatment fluid.

**[0017]** As used herein, the term "permeability modifier" refers to a material capable of reducing the permeability of a subterranean formation to aqueous fluids. In some embodiments, the permeability modifier preferably adsorbs to surfaces within the porosity of the subterranean formation, thereby resisting the flow of aqueous fluids thereon. The permeability modifier thus allows the aqueous treatment fluid described herein to be diverted past the first treatment zone after it has been acidized and to flow to a second treatment zone, if desired, for contact with the acid, permeability modifier, and permeability modifier deactivator. The process of treating zonal portions of the injection well may be repeated in multiple zones. Suitable permeability modifiers include, but are not limited to, an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

**[0018]** One of ordinary skill in the art will appreciate that a variety of different water-soluble polymers may be suitable for use as the permeability modifiers disclosed herein. In some embodiments, the water-soluble polymers may be formed by a polymerization reaction of water-soluble monomers. Suitable examples of water-soluble polymers include, but are not limited to, homo-, co-, and terpolymers of: acrylamide; alkyl acrylate; 2-acrylamido-2-

**2013-IP-072509U1 PCT**

methyl propane sulfonic acid; N,N-dimethylacrylamide; vinyl pyrrolidone; dimethylaminoethyl methacrylate; acrylic acid; dimethylaminopropyl methacrylamide; vinyl amine; vinyl alcohol; vinyl acetate; trimethylammoniummethyl methacrylate chloride; methacrylamide; hydroxyethyl acrylate; vinyl sulfonic acid; vinyl phosphonic acid; methacrylic acid; vinyl caprolactam; N-vinylformamide; N,N-diallylacetamide; dimethyldiallyl ammonium halide; itaconic acid; styrene sulfonic acid; methacrylamidoethyltrimethyl ammonium halide; quaternary ammonium salt derivatives of acrylamide; quaternary ammonium salt derivatives of acrylic acid; cellulose; chitosan; a polyamide; a polyetheramine; a polyethyleneimine; a polyhydroxyetheramine; a lysine; a polysulfone; a gum; a starch; any derivative thereof; and any combinations thereof. Any monomer used to synthesize these polymers may be used in synthesizing the water-soluble polymers disclosed herein. As used herein, the term "derivative" refers to any compound that is made from one of the listed compounds, for example, by replacing one atom in one of the listed compounds with another atom or group of atoms, ionizing one of the listed compounds, or creating a salt of one of the listed compounds. Where the water-soluble polymer is a starch, it may preferably be a cationic starch formed by reacting the starch (*e.g.*, corn, maize, waxy maize, potato, tapioca, and the like) with the reaction product of epichlorohydrin and trialkylamine.

**[0019]** Specific examples of water-soluble polymers for use as the permeability modifiers described in some embodiments herein include, but are not limited to, polyacrylamide; polyvinylamine; poly(vinylamine/vinyl alcohol) copolymer; polydimethylaminoethyl methacrylate; polydimethylaminopropyl methacrylamide; poly(acrylamide/dimethylaminoethyl methacrylate) copolymer; poly(methacrylic acid/dimethylaminoethyl methacrylate) copolymer; poly(2-acrylamido-2-methyl propane sulfonic acid/dimethylaminoethyl methacrylate) copolymer; poly(acrylamide/dimethylaminopropyl methacrylamide) copolymer; poly (acrylic acid/dimethylaminopropyl methacrylamide) copolymer; poly(methacrylic acid/dimethylaminopropyl methacrylamide); any derivative thereof; and any combinations thereof.

**[0020]** In some embodiments, water-soluble hydrophobically modified polymers may be suitable for use as the permeability modifier described herein. As described herein, the term "hydrophobically modified" in all

**2013-IP-072509U1 PCT**

of its variations (e.g., "hydrophobic modification") refers to the incorporation into a water-soluble polymer structure hydrophobic groups having an alkyl chain length of about 4 to about 22 carbons. Although hydrophobic groups are incorporated into the polymer structure, the water-soluble hydrophobic modified  
5 polymers remain soluble in aqueous fluids. In some embodiments, a mole ratio of a water-soluble monomer to the hydrophobic groups in the water-soluble hydrophobically modified polymer is in the range of from about 99.98:0.02 to about 90:10. In certain embodiments, the water-soluble hydrophobically modified polymer may comprise a polymer backbone that comprises polar  
10 heteroatoms. Generally, the polar heteroatoms present within the polymer backbone of the water-soluble hydrophobically modified polymers include, but are not limited to, oxygen, nitrogen, sulfur, or phosphorous.

**[0021]** Exemplary water-soluble hydrophobically modified polymers may contain a water-soluble polymer backbone and a hydrophobic group, such  
15 as a hydrophobic branched alkyl chain of about 4 to about 22 carbons. In certain exemplary embodiments, the hydrophobic branch may have an alkyl chain length of about 7 to about 22 carbons. In other exemplary embodiments, the hydrophobic branch may have an alkyl chain length of about 12 to about 18 carbons.

**[0022]** Suitable examples of water-soluble hydrophobically modified  
20 polymers that may be utilized in the embodiments disclosed herein include, but are not limited to, acrylamide/octadecyldimethylammoniummethyl methacrylate bromide copolymer; dimethylaminoethyl methacrylate/vinyl pyrrolidone/hexadecyldimethylammoniummethyl methacrylate bromide  
25 terpolymer; acrylamide/2-acrylamido-2-methyl propane sulfonic acid/2-ethylhexyl methacrylate terpolymer; alkylamino alkylene methacrylate/alkyl ammonium alkylene methacrylate copolymer (e.g., dimethylaminoethyl methacrylate/alkyl-dimethylammoniummethyl methacrylate copolymer and  
30 dimethylaminoethyl methacrylate/hexadecyldimethylammoniummethyl methacrylate copolymer); any derivative thereof; and any combinations thereof.

As discussed in more detail below, these water-soluble hydrophobically modified polymers may be formed, in exemplary embodiments, by reactions with a variety of alkyl halides. For example, in some exemplary embodiments, the water-soluble hydrophobically modified polymer may comprise a

**2013-IP-072509U1 PCT**

dimethylaminoethyl methacrylate/hexadecyldimethylammoniumethyl methacrylate bromide copolymer.

**[0023]** The water-soluble hydrophobically modified polymers described herein may be synthesized by any suitable technique known in the art.

5 In some embodiments, the water-soluble hydrophobically modified polymers may be formed by the reaction product of one or more water-soluble polymers and one or more hydrophobic groups. In other embodiments, the water-soluble hydrophobically modified polymers may be prepared from a polymerization reaction of water-soluble monomers, followed by hydrophobic modification of the

10 resultant polymer. In still other embodiments, hydrophobic groups may be reacted with water-soluble monomers that are then polymerized to form the water-soluble hydrophobically modified polymers disclosed herein. In yet other embodiments, the water-soluble hydrophobically modified polymers may be

15 formed by the polymerization reaction of hydrophobically modified water-soluble monomers and water-soluble monomers. One of skill in the art, with the benefit of this disclosure, will recognize what method of synthesis to choose based on a particular application. Factors that may influence the type of synthesis selected include, but are not limited to, reaction conditions, the type of starting material (e.g., water-soluble monomers v. water-soluble polymers) available, and the

20 like.

**[0024]** Water-soluble polymers that may be used for forming the water-soluble hydrophobically modified polymers disclosed herein may be any of the water-soluble polymers and their derivatives that may be alone used as permeability modifiers, as discussed above. In some embodiments, the water-

25 soluble polymer selected may preferably comprise reactive amino groups in the polymer backbone or as pendent groups, which may be capable of reacting with hydrophobic groups. In some exemplary embodiments, the amino groups are dialkyl amino pendent groups. In some exemplary embodiments, the water-soluble hydrophobically modified polymers are formed from monomers

30 comprising dimethylaminoethyl methacrylate or dimethylaminopropyl methacrylamide, with hydrophobic dimethyl amino pendant groups.

**[0025]** The hydrophobic groups that are capable of reacting with the water-soluble polymers to form the water-soluble hydrophobically modified polymers for use as permeability modifiers include, but are not limited to, an

35 alkyl halide; a sulfonate; a sulfate; a hydrophobic organic acid; any derivative

**2013-IP-072509U1 PCT**

thereof; and any combinations thereof. Suitable examples of hydrophobic organic acids and organic acid derivatives may include, but are not limited to, octenyl succinic acid; dodecenyl succinic acid; anhydrides, esters, imides, and amides thereof; and any combination thereof.

5           **[0026]** As discussed, in some embodiments, the water-soluble hydrophobically modified polymers may be prepared from the polymerization reaction of hydrophobically modified water-soluble monomers and water-soluble monomers. In such cases, the polymerization reactions may have estimated molecular weights in the range of from a lower limit of about 100,000; 250,000; 10 500,000; 750,000; 1,000,000; 1,250,000; 1,500,000; 1,750,000; 2,000,000; 2,250,000; 2,500,000; 2,750,000; 3,000,000; 3,250,000; 3,500,000; 3,750,000; 4,000,000; 4,250,000; 4,500,000; 4,750,000; and 5,000,000 to an upper limit of about 10,000,000; 9,750,000; 9,500,000; 9,250,000; 9,000,000; 15 8,750,000; 8,500,000; 8,250,000; 8,000,000; 7,750,000; 7,500,000; 7,250,000; 7,000,000; 6,750,000; 6,500,000; 6,250,000; 6,000,000; 5,750,000; 5,500,000; 5,250,000; and 5,000,000. In some embodiments, the mole ratios of the water-soluble monomer(s) to the hydrophobically modified water-soluble monomer(s) in the range of from about 99.98:0.02; 98.08:0.92; 98.18:1.82; 97.28:2.72; 96.38:3.62; 95.48:4.52; 94.58:5.42; 93.68:6.32; 20 92.78:7.22; 97.88:8.12; 90.98:9.02; to about 90:10. Suitable water-soluble monomers that may be used to synthesize the water-soluble hydrophobically modified polymers (*i.e.*, both the water-soluble non-hydrophobically modified monomers and the hydrophobically modified water-soluble monomers) include any of those listed for forming the water-soluble polymers, as discussed 25 previously. Examples of hydrophobically modified water-soluble polymers may include, but are not limited to, alkyl acrylates; alkyl methacrylates; alkyl acrylamides; alkyl methacrylamides alkyl dimethylammoniummethyl methacrylate halides;       alkyl       dimethylammoniumpropyl       methacrylamide halidesoctadecyldimethylammoniummethyl       methacrylate       bromide; 30 hexadecyldimethylammoniummethyl       methacrylate       bromide; hexadecyldimethylammoniumpropyl methacrylamide bromide; 2-ethylhexyl methacrylate; hexadecyl methacrylamide; and any combination thereof, wherein the alkyl groups have from about 4 to about 22 carbon atoms.

35           **[0027]** In some embodiments, water-soluble hydrophilically modified polymers may be used as the permeability modifiers described herein. As used



**2013-IP-072509U1 PCT**

herein, the term "hydrophilically modified" in all of its variations (e.g., "hydrophilic modification") refers to the incorporation of hydrophilic groups into a water-soluble polymer structure. In exemplary embodiments, the hydrophilic groups are branched to increase the degree of branching of the water-soluble polymer. The water-soluble hydrophilically modified polymers typically have molecular weights in the range of from about 100,000 to about 10,000,000 and may have weight ratios of the hydrophilic polymers to the polyethers in the range of from about 1:1; 1.5:1; 2:1; 2.5:1; 3:1; 3.5:1; 4:1; 4.5:1; 5:1; 5.5:1; 6:1; 6.5:1; 7:1; 7.5:1; 8:1; 8.5:1; 9:1; 9.5:1; to about 10:1. In certain  
5 10 15 20 25 30 35

**[0028]** Specific examples of suitable water-soluble hydrophilically modified polymers include, but are not limited to, the reaction product of polydimethylaminoethyl methacrylate and epichlorohydrin-terminated polyethyleneoxide methyl ether; the reaction product of polydimethylaminopropyl methacrylamide and epichlorohydrin-terminated polyethyleneoxide methyl ether; the reaction product of poly(acrylamide/dimethylaminopropyl methacrylamide) and epichlorohydrin-terminated polyethyleneoxide methyl ether; the reaction product of a polydimethylaminoethyl methacrylate and epichlorohydrin-terminated polyethyleneoxide methyl ether having a weight ratio of polydimethylaminoethyl methacrylate to epichlorohydrin-terminated polyethyleneoxide methyl ether of about 3:1; any derivative thereof; and any combinations thereof.

**[0029]** The water-soluble hydrophilically modified polymers described herein may be synthesized by any suitable technique known in the art. In some embodiments, the water-soluble hydrophilically modified polymers may be formed by the reaction product of one or more water-soluble polymers and compounds comprising one or more hydrophilic groups. In other embodiments, the water-soluble hydrophilically modified polymers may be prepared from a polymerization reaction of water-soluble monomers, followed by hydrophilic modification of the resultant polymer. In still other embodiments, compounds comprising hydrophilic groups may be reacted with water-soluble monomers that are then polymerized to form the water-soluble hydrophilically modified polymers disclosed herein. In yet other embodiments, the water-soluble

**2013-IP-072509U1 PCT**

hydrophilically modified polymers may be formed by the polymerization reaction of hydrophilically modified water-soluble monomers and water-soluble monomers. One of skill in the art, with the benefit of this disclosure, will recognize what method of synthesis to choose based on a particular application.

5 Factors that may influence the type of synthesis selected include, but are not limited to, reaction conditions, the type of starting material (e.g., water-soluble monomers v. water-soluble polymers) available, the desired degree of branching, and the like. In all cases, suitable water-soluble polymers and monomers for use in forming the water-soluble hydrophilically modified polymers  
10 described herein include any of the water-soluble polymers and monomers and their derivatives that may be alone used as permeability modifiers, as discussed above.

**[0030]** Suitable hydrophilic groups that may be present in a hydrophilic compound may include, but are not limited to, a hydroxyl group; a carbonyl  
15 group; a carboxyl group; a sulfhydryl group; an amino group; a phosphate group; a polyether group; any derivative thereof; and any combination thereof. Preferably, if a polyether group is used for hydrophilic modification, it also comprises a halogen; sulfonate; sulfate; organic acid; epichlorohydrin-terminated polyethylene oxide methyl ether; or a derivative thereof. Suitable  
20 polyether groups include, but are not limited to, polyethylene oxide; polypropylene oxide; polybutylene oxide; copolymers thereof; terpolymers thereof; and any combination thereof.

**[0031]** In some embodiments, the permeability modifier is present in the range of from a lower limit of from about 0.05%, 0.1%, 0.5%, 1%, 1.5%,  
25 and 2% to an upper limit of from about 5%, 4.5%, 4%, 3.5%, 3%, and 2.5% by weight of the treatment fluid. The permeability modifier disclosed in some embodiments may reduce the permeability of a subterranean formation in the range of from a lower limit of about 45%; 47.5%; 50%; 52.5%; 55%; 57.5%;  
30 60%; 62.5%; 65%; and 67.5% to an upper limit of about 90%; 87.5%; 85%; 82.5%; 80%; 77.5%; 75%; 72.5%; 70%; and 67.5% from a first aqueous formation permeability to a second aqueous formation permeability upon contact with the subterranean formation.

**[0032]** The permeability modifier deactivator in the exemplary embodiments herein is capable of deactivating the permeability modifier and  
35 reversing its effects. That is, the permeability modifier deactivator is able to

**2013-IP-072509U1 PCT**

restore a subterranean formation treated with the permeability modifier (*i.e.*, experiencing a reduced permeability to water due to contact with the permeability modifier) back to approximately the original untreated aqueous permeability (*i.e.*, before exposure to the permeability modifier. As such, the exemplary acid diverting qualities of the permeability modifier may be used in an injection well without the well experiencing substantial adverse permeability reduction. In some embodiments, the permeability modifier deactivator may be included in the same treatment fluid as the permeability modifier without effecting the action of the permeability modifier, at least during the acid diversion treatment operation. That is, the permeability modifier deactivator can be designed to deactivate the permeability modifier at varying degrees of degradation and at variable durations and rates, thereby allowing the acid and permeability modifier to perform their functions prior to deactivation and restoration of the formations permeability to water, according to the needs of the operator. Indeed, in some embodiments, it is possible to shut in the injection well after introducing the treatment fluids described herein comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator for a substantial period of time, such as over a week. Generally, however, shut-in times may be no more than about 24 hours. In other embodiments, the permeability modifier and permeability modifier deactivator may be introduced into the formation in separate treatment fluids.

**[0033]** In some embodiments, the permeability modifier deactivator may deactivate the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier (*e.g.*, blocking the hydrophobic functional groups from forming intermolecular or intramolecular hydrophobic associations); and any combination thereof. The permeability modifier deactivators that are capable of blocking hydrophobic functional groups may function by incorporating the hydrophobic functional groups on the permeability modifier into the micellar structures of the permeability modifier deactivator, thereby preventing the hydrophobic functional groups from association with similar groups on the permeability modifier or on other permeability modifiers. As used herein, the term "desorption" in all of its variants (*e.g.*, "desorbed," "desorbing," and the like) refers to the disassociation of an adsorbed substance from the substrate to

**2013-IP-072509U1 PCT**

which it was adsorbed. As used herein, the term "degradation" in all of its variants (*e.g.*, "degrade," "degradable," and the like) refers to lowering of a molecular weight to a less effective level. The term "deactivation" of the permeability modifier by the permeability modifier deactivator is not intended to  
5 imply 100% deactivation, but to a sufficient extent to return the original permeability (*e.g.*, to restore the first treatment zone to about the first aqueous formation permeability) within a range of, for example, from a lower limit of about 20%; 25%; 30%; 35%; 40%; 45%; and 50% to an upper limit of about 100%; 95%; 90%; 85%; 80%; 75%; 70%; 65%; 60%; 55%; and 50%.

10 **[0034]** The permeability modifier deactivator may include, but is not limited to, a free-radical generating compound (also referred to herein as "FRGC"); a mutual solvent; a surfactant; and any combination thereof. FRGCs may promote, among other things, the desorption and oxidation of the permeability modifiers disclosed herein (*e.g.*, promote the removal of the  
15 permeability modifier from the pores of the subterranean formation). Mutual solvents and surfactants may interfere with the hydrophobic functional groups that act to maintain the placement of the permeability modifier (*e.g.*, couple the hydrophobic groups with the aqueous base fluid), and at certain elevated concentrations, surfactants may desorb the permeability modifier itself.

20 **[0035]** Suitable examples of FRGC include, but are not limited to an inorganic oxidizer compound; an organic peroxide; an azo compound; and any combination thereof. Suitable examples of inorganic oxidizer compounds that may be used as the FRGCs of some embodiments disclosed herein may include, but are not limited to, a hydrogen peroxide; an alkali metal persulfate; an alkali  
25 metal perborate; an alkali metal chlorite; an alkali metal bromate; an alkali metal chlorate; an alkali metal hypochlorite; an alkali metal permanganate; an oxidation-reduction system employing a reducing agent (*e.g.*, a sulfite) in combination with an oxidizer; ammonium persulfate; potassium persulfate; sodium persulfate; and any combination thereof. An example of a suitable  
30 commercially available inorganic oxidizer compound includes, but is not limited to VICON NF™, available from Halliburton Energy Services, Inc. in Houston, Texas. Suitable examples of organic peroxides that may be used as the FRGCs of some embodiments disclosed herein may include, but are not limited to, a hydroperoxide; a dialkyl peroxide; benzoyl peroxide; 2,2-bis(tert-  
35 butylperoxy)butane; 2,4-pentanedione peroxide; 2,5-di(tert-butylperoxy)-2,5-

**2013-IP-072509U1 PCT**

dimethyl-3-hexyne; 2-butanone peroxide; cumene hydroperoxide; di-tert-amyl peroxide; dicumyl peroxide; lauroyl peroxide; tert-butyl hydroperoxide; tert-butyl peracetate; tert-butyl peroxide; tert-butyl peroxybenzoate; tert-butylperoxy-2-ethylhexyl carbonate; and any combination thereof. In some  
5 embodiments, the organic peroxide has a water solubility of greater than about 5%. Suitable examples of azo compounds that may be used as the FRGCs of some embodiments disclosed herein may include, but are not limited to, 2'-azobis-(2- methylbutyronitrile); 2,2'-azobis(isobutyramidine hydrochloride); 2,2'-azobis[2-(2-imidazolin- 2-yl)propane]dihydrochloride; 1,1 '-  
10 azobis(cyclohexanecarbonitrile); 2,2'-azobis(2- methylpropionamidine) dihydrochloride; 4,4 '-azobis(4-cyano valeric acid); 2,2'-azobis(2-methyl-N-(2-hydroxyethyl)propionamide; and any combination thereof. In some embodiments, the azo compounds are water-soluble with a minimum solubility of greater than about 5%. A suitable commercially available azo compound  
15 includes, but is not limited, to PERM C™ available from Halliburton Energy Services, Inc. in Houston, Texas.

**[0036]** Suitable mutual solvents for use in the treatment fluids described herein include, but are not limited to, glycol ethers and alkoxylates of glycol ethers. Specific examples of suitable mutual solvents may include, but  
20 are not limited to, ethylene glycol monomethyl ether; ethylene glycol monoethyl ether; ethylene glycol monopropyl ether; ethylene glycol monoisopropyl ether; ethylene glycol monobutyl ether ("EGMBE"); ethylene glycol monophenyl ether; ethylene glycol monobenzyl ether; ethylene glycol monohexyl ether; propylene glycol monobutyl ether; diethylene glycol monomethyl ether; diethylene glycol  
25 monoethyl ether; diethylene glycol monobutyl ether; diethylene glycol monohexyl ether; diethylene glycol dimethyl ether; dipropylene glycol methyl ether; triethylene glycol monomethyl ether; triethylene glycol monoethyl ether; triethylene glycol monobutyl ether; any derivative thereof; and any combination thereof. Suitable commercially available mutual solvents include, but are not  
30 limited to, MUSOL® A Mutual Solvent and MUSOL® E Mutual Solvent, available from Halliburton Energy Services, Inc. in Houston, Texas.

**[0037]** Suitable surfactants for use as the permeability modifier deactivators in some embodiments described herein include, but are not limited to, nonionic, anionic, cationic, and zwitterionic surfactants. Specific examples  
35 may include, but are not limited to, an alkyl sulfonates; alkyl aryl sulfonate

**2013-IP-072509U1 PCT**

(*e.g.*, an alkyl benzyl sulfonate, such as a salt of dodecylbenzene sulfonic acid); alkyl trimethylammonium chloride; a branched alkyl ethoxylated alcohol; dioctyl sodium sulfosuccinate; linear alkyl ethoxylated alcohol; trialkyl benzylammonium chloride; a sulfated alkoxyate (*e.g.*, sodium dodecylsulfate); a sulfonated  
5 alkoxyate; an alkyl quarternary ammonium compound (*e.g.*, trimethyl hexadecyl ammonium bromide); an alkoxyated linear alcohol; C<sub>10</sub>-C<sub>20</sub> alkyldiphenyl ether sulfonate; polyethylene glycol; an ether of alkylated phenol; an alpha olefin sulfonate (*e.g.*, sodium dodecene sulfonate); any derivative thereof; and any combination thereof.

10       **[0038]**       In some embodiments, the permeability modifier deactivators may be present in the treatment fluid in the amount in the range of from a lower limit of about 0.0001%; .001%; .01%; .1%; 1%; 10%; 20%; 30%; 40%; 50%;  
15 60%; 70%; 80%; 90%; and 100% to an upper limit of about 200%; 190%; 180%; 170%; 160%; 150%; 140%; 130%; 120%; 110%; and 100% by weight of the permeability modifier. In other embodiments, the permeability modifier deactivators may be present in the range of from about 1% to about 150% by weight of the permeability modifier. In yet other embodiments, the permeability modifier deactivators may be present in the range of from about 10% to about  
20 100% by weight of the permeability modifier. One of ordinary skill in the art, with the benefit of this disclosure, will recognize and optimize the amount of permeability modifier deactivator to include in a particular treatment fluid. Factors that may affect the amount of permeability modifier deactivator to include in a treatment fluid may include, but are not limited to, the type of permeability modifier selected, the type of permeability modifier deactivator  
25 selected, the duration of time before deactivation of the permeability modifier is desired, and the like.

**[0039]** In various embodiments, systems configured for delivering the treatment fluids described herein to a downhole location are described. In various embodiments, the systems can comprise a pump fluidly coupled to a  
30 tubular, the tubular containing a treatment fluid comprising the permeability modifier and/or the permeability modifier deactivator.

**[0040]** The pump may be a high pressure pump in some embodiments. As used herein, the term "high pressure pump" will refer to a pump that is capable of delivering a fluid downhole at a pressure of about 1000 psi or greater.  
35 A high pressure pump may be used when it is desired to introduce the treatment

**2013-IP-072509U1 PCT**

fluid to a subterranean formation at or above a fracture gradient of the subterranean formation, but it may also be used in cases where fracturing is not desired. In some embodiments, the high pressure pump may be capable of fluidly conveying particulate matter, such as proppant particulates, into the subterranean formation. Suitable high pressure pumps will be known to one having ordinary skill in the art and may include, but are not limited to, floating piston pumps and positive displacement pumps.

**[0041]** In other embodiments, the pump may be a low pressure pump. As used herein, the term "low pressure pump" will refer to a pump that operates at a pressure of about 1000 psi or less. In some embodiments, a low pressure pump may be fluidly coupled to a high pressure pump that is fluidly coupled to the tubular. That is, in such embodiments, the low pressure pump may be configured to convey the treatment fluid to the high pressure pump. In such embodiments, the low pressure pump may "step up" the pressure of the treatment fluid before it reaches the high pressure pump.

**[0042]** In some embodiments, the systems described herein can further comprise a mixing tank that is upstream of the pump and in which the treatment fluid is formulated. In various embodiments, the pump (e.g., a low pressure pump, a high pressure pump, or a combination thereof) may convey the treatment fluid from the mixing tank or other source of the treatment fluid to the tubular. In other embodiments, however, the treatment fluid can be formulated offsite and transported to a worksite, in which case the treatment fluid may be introduced to the tubular via the pump directly from its shipping container (e.g., a truck, a railcar, a barge, or the like) or from a transport pipeline. In either case, the treatment fluid may be drawn into the pump, elevated to an appropriate pressure, and then introduced into the tubular for delivery downhole.

**[0043]** FIGURE 1 shows an illustrative schematic of a system that can deliver treatment fluids described herein to a downhole location, according to one or more embodiments. It should be noted that while FIGURE 1 generally depicts a land-based system, it is to be recognized that like systems may be operated in subsea locations as well. As depicted in FIGURE 1, system **1** may include mixing tank **10**, in which a treatment fluid disclosed in some embodiments herein may be formulated. The treatment fluid may be conveyed via line **12** to wellhead **14**, where the treatment fluid enters tubular **16**, tubular

**2013-IP-072509U1 PCT**

**16** extending from wellhead **14** into subterranean formation **18**. Upon being ejected from tubular **16**, the treatment fluid may subsequently penetrate into subterranean formation **18**. Pump **20** may be configured to raise the pressure of the treatment fluid to a desired degree before its introduction into tubular **16**.

5 It is to be recognized that system **1** is merely exemplary in nature and various additional components may be present that have not necessarily been depicted in FIGURE 1 in the interest of clarity. Non-limiting additional components that may be present include, but are not limited to, supply hoppers, valves, condensers, adapters, joints, gauges, sensors, compressors, pressure  
10 controllers, pressure sensors, flow rate controllers, flow rate sensors, temperature sensors, and the like.

[0044] Although not depicted in FIGURE 1, the treatment fluid may, in some embodiments, flow back to wellhead **14** and exit subterranean formation **18**. In some embodiments, the treatment fluid that has flowed back to wellhead  
15 **14** may subsequently be recovered and recirculated to subterranean formation **18**.

[0045] It is also to be recognized that the disclosed treatment fluids may also directly or indirectly affect the various downhole equipment and tools that may come into contact with the treatment fluids during operation. Such  
20 equipment and tools may include, but are not limited to, wellbore casing, wellbore liner, completion string, insert strings, drill string, coiled tubing, slickline, wireline, drill pipe, drill collars, mud motors, downhole motors and/or pumps, surface-mounted motors and/or pumps, centralizers, turbolizers, scratchers, floats (e.g., shoes, collars, valves, etc.), logging tools and related  
25 telemetry equipment, actuators (e.g., electromechanical devices, hydromechanical devices, etc.), sliding sleeves, production sleeves, plugs, screens, filters, flow control devices (e.g., inflow control devices, autonomous inflow control devices, outflow control devices, etc.), couplings (e.g., electro-hydraulic wet connect, dry connect, inductive coupler, etc.), control lines (e.g.,  
30 electrical, fiber optic, hydraulic, etc.), surveillance lines, drill bits and reamers, sensors or distributed sensors, downhole heat exchangers, valves and corresponding actuation devices, tool seals, packers, cement plugs, bridge plugs, and other wellbore isolation devices, or components, and the like. Any of these components may be included in the systems generally described above and  
35 depicted in FIGURE 1.



**2013-IP-072509U1 PCT**

**[0046]** Embodiments disclosed herein include:

**[0047]** A. A method comprising: (a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator; (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability, wherein first treatment zone comprises formation damage; (c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone; (d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage; (e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability; (f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability; and (g) removing the treatment fluid from the injection well.

**[0048]** B. method comprising: (a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier; (b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator; (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability, wherein the first treatment zone comprises formation damage; (c) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone; (d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage; (e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability; (f) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone; (g) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore first treatment zone to

**2013-IP-072509U1 PCT**

about the first aqueous formation permeability; and (g) removing the treatment fluid from the injection well.

**[0049]** Each of embodiments A and B may have one or more of the following additional elements in any combination:

5 **[0050]** Element 1: Wherein elements (a) through (f) are repeated at at least a second treatment zone in the injection well.

**[0051]** Element 2: Wherein elements (a) through (g) are repeated at at least a second treatment zone in the injection well.

10 **[0052]** Element 3: Wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

15 **[0053]** Element 4: Wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.

20 **[0054]** Element 5: Wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

**[0055]** Element 6: Wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.

25 **[0056]** Element 7: Wherein the acid is selected from the group consisting of hydrochloric acid; hydrofluoric acid; acetic acid; formic acid; sulfuric acid; sulfamic acid; chloroacetic acid; nitric acid; phosphoric acid; tartaric acid; oxalic acid; lactic acid; glycolic acid; aminopolycarboxylic acid; polyaminopolycarboxylic acid; citric acid; ethylene diamine tetra acetic acid; and any combination thereof.

30 **[0057]** Element 8: Wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.

**[0058]** Element 9: Wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.

**2013-IP-072509U1 PCT**

**[0059]** Element 10: Wherein the permeability modifier deactivator is present in an amount in the range of from about 0.0001% to about 200% by weight of the permeability modifier.

5 **[0060]** Element 11: Wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

10 **[0061]** By way of non-limiting example, exemplary combinations applicable to A, B, C include: A in combination with 3, 10, and 11; A in combination with 1, 3, 5, and 7; B in combination with 5, 6, 7, and 11; and B in combination with 2, 3, 8, 9, and 10.

15 **[0062]** To facilitate a better understanding of the embodiments described herein, the following examples of preferred or representative embodiments are given. In no way should the following examples be read to limit, or to define, the scope of the disclosure.

**EXAMPLE 1**

20 **[0063]** In one example, a core flow test was performed to evaluate the performance of the permeability modifier when it is present in a single treatment fluid with a permeability modifier deactivator. A treatment fluid was prepared according to some embodiments described herein using 6.7 mL of a 3% active solution of a hydrophobically modified dimethylaminoethyl methacrylate permeability modifier, 2.5 mL of a 10% active solution of a sodium chlorate permeability modifier deactivator, and 90.8 mL of 2% KCl. 56 mL of  
25 the treatment fluid was pumped into a 2.56 cm x 15.24 cm (1 in x 6 in) sandstone core, having an initial permeability to brine (9% NaCl/1% CaCl<sub>2</sub>) of about 4,700 millidarcy ("mD"). Pressure increases were observed by means of pressure transducers connected to the flow system. Immediately thereafter, the core was flushed with a brine solution (9% NaCl/1% CaCl<sub>2</sub>) and a reduction in  
30 brine permeability of about 98% was observed due to the action of the dimethylaminoethyl methacrylate permeability modifier, without hindrance from the sodium chlorate permeability modifier deactivator. This example illustrates that when the treatment fluid comprises a permeability modifier as well as a permeability modifier deactivator, sufficient time is available for the permeability

**2013-IP-072509U1 PCT**

modifier to reduce the permeability of a subterranean formation prior to the action of the permeability modifier deactivator.

**EXAMPLE 2**

5           **[0064]**     In this example, a core flow test was performed to evaluate the ability of a permeability modifier deactivator to remove the permeability reduction brought about by the permeability modifier. A treatment fluid was prepared according to some embodiments described herein using 6.7 mL of a 3% active solution of a hydrophobically modified dimethylaminoethyl  
10 methacrylate permeability modifier, 1.0 g of sodium persulfate free-radical generating compound, 0.6 g sodium carbonate pH control agent, and 93.7 mL of 2% KCl. 19 mL of the treatment fluid was pumped into a 2.56 cm x 15.24 cm (1 in x 6 in) sandstone core, having an initial permeability to brine (9% NaCl/1% CaCl<sub>2</sub>) of about 1650 mD. Pressure increases were observed by means of  
15 pressure transducers connected to the flow system. Immediately thereafter, the core was shut-in for 10 minutes. Following this shut-in period brine (9% NaCl/1% CaCl<sub>2</sub>) was again pumped through the core and reduction in permeability to brine of about 94% was seen, illustrating that the permeability modifier deactivator had not removed the effect of the permeability modifier.  
20 Following this, the treatment fluid was again pumped into the core, followed by a shut-in time of 1 hour. After the shut-in period, brine (9% NaCl/1% CaCl<sub>2</sub>) was again pumped into the core and reduction in permeability to brine of about 17% was seen, indicating that the permeability modifier deactivator was able to reverse the permeability reduction of the core by the permeability modifier. This  
25 example illustrates that with the proper combination selection of the permeability modifier and the permeability modifier deactivator and, in this example, an adequate shut-in period, the effect of the permeability modifier can be reduced significantly.

**EXAMPLE 3**

30           **[0065]**     In this example, a core flow test was performed to evaluate the performance of the permeability modifier deactivator described in some embodiments herein to restore permeability after treatment with the permeability modifier. A first treatment fluid was prepared using 6.7% of a  
35 hydrophobically modified dimethylaminoethyl methacrylate permeability modifier

**2013-IP-072509U1 PCT**

in 1.25 sg of NaBr brine solution buffered at approximately pH 5.2. The first treatment fluid was flowed at 100 psi through four separate 10 micron Aloxite discs, composed of aluminum oxide, until flow ceased. Thereafter, four treatment fluids comprising 1.25 sg NaBr brine buffered at approximately pH 5.2 alone or comprising the permeability modifier deactivators described herein were prepared. Each was flowed at 100 psi and 40°C (104°F) and timed until 200g of fluid was collected through the Aloxite disc. The treatment fluid composition and results are shown in Table 1 and demonstrate that the permeability modifier deactivators in some embodiments described herein are effective at restoring reduced permeability caused by the permeability modifiers disclosed herein. For comparison, a control sample was run on an untreated Aloxite disc and it took 6 seconds to collect 200g of the 1.25 sg NaBr brine buffered at approximately pH 5.2.

15

**TABLE 1**

<b>Treatment Fluid Composition</b>	<b>Time (sec) to reach 200g fluid flow collection</b>
Brine alone	1800
20% EGMBE in brine	24
2% betain at pH 8.6 in brine	480
2% betain at pH 2.1	2100

**EXAMPLE 4**

[0066] In this example, the ability of a surfactant for use as the permeability modifier deactivators to restore water permeability that has been reduced by the permeability modifiers in some embodiments described herein was evaluated by measuring the fluid loss control ability of a water-soluble hydrophobically modified permeability modifier in the presence of an anionic surfactant. A control experiment was initially performed to determine the water permeability reducing ability of a water-soluble hydrophobically modified dimethylaminoethyl methacrylate permeability modifier solution by contacting a silica flour bed with the permeability modifier and determining the fluid loss control. The permeability modifier solution was prepared using 67 gallons of the permeability modifier per thousand gallons of solution, corresponding to a 0.2% permeability modifier concentration in 2% KCl. The fluid loss control tests were performed by measuring the flow rates of the permeability modifier solution

**2013-IP-072509U1 PCT**

followed by 2% KCl solution through a silica flour filter cake prepared by deposition of 10 grams of silica flour mixed in water onto filter paper placed over the bottom lid in a Filter Press HPHT fluid loss cell with a capacity of 175 ml supplied by Fann Instruments in Houston, Texas. The 2% KCl or permeability  
5 modifier solution was then poured onto top of the filter cake, and the flow rate was measured over a 10 minute period by applying a pressure of 30 psi. 100 ml of the permeability modifier solution was poured on the filter bed, and the flow rate was measured. A flow rate reduction of about 50% or more is assumed to be indicative of the permeability modifier's ability to reduce water permeability  
10 and is given a "pass" rating.

**[0067]** When the flow rate of permeability modifier solution was reduced significantly, indicating reduced water permeability, the remaining permeability modifier solution was poured out, and replaced with 100 ml of the  
15 2% KCl solution. The apparatus was reassembled and the flow rates were measured. When the flow rate stabilized, the 2% KCl was replaced with 100 ml of 1.3% sodium dodecyl sulfate anionic surfactant (permeability modifier deactivator) solution. The apparatus was reassembled and the flow rate measurement was resumed. The flow rate increased quickly. After flowing the  
20 entire volume of the surfactant solution, the apparatus was recharged with 100 ml of the 2% KCl solution, and flow rate measurement was resumed. The flow rates were close to that measured for the 2% KCl solution prior to treatment with the permeability modifier, indicating that the permeability reduction effect of the permeability modifier was nullified by treatment with the surfactant solution, thereby restoring the original permeability of the silica flour bed.  
25 FIGURE 2 shows a graphic representation of the results.

**[0068]** Therefore, the embodiments herein are well adapted to attain the ends and advantages mentioned as well as those that are inherent therein. The particular embodiments disclosed above are illustrative only, as the  
30 embodiments herein may be modified and practiced in different but equivalent manners apparent to those skilled in the art having the benefit of the teachings herein. Furthermore, no limitations are intended to the details of construction or design herein shown, other than as described in the claims below. It is therefore evident that the particular illustrative embodiments disclosed above may be  
35 altered, combined, or modified and all such variations are considered within the scope and spirit of the disclosure. The embodiments herein illustratively

**2013-IP-072509U1 PCT**

disclosed herein suitably may be practiced in the absence of any element that is not specifically disclosed herein and/or any optional element disclosed herein. While compositions and methods are described in terms of "comprising," "containing," or "including" various components or steps, the compositions and methods can also "consist essentially of" or "consist of" the various components and steps. All numbers and ranges disclosed above may vary by some amount. Whenever a numerical range with a lower limit and an upper limit is disclosed, any number and any included range falling within the range is specifically disclosed. In particular, every range of values (of the form, "from about a to about b," or, equivalently, "from approximately a to b," or, equivalently, "from approximately a-b") disclosed herein is to be understood to set forth every number and range encompassed within the broader range of values. Also, the terms in the claims have their plain, ordinary meaning unless otherwise explicitly and clearly defined by the patentee. Moreover, the indefinite articles "a" or "an," as used in the claims, are defined herein to mean one or more than one of the element that it introduces. If there is any conflict in the usages of a word or term in this specification and one or more patent or other documents that may be incorporated herein by reference, the definitions that are consistent with this specification should be adopted.

20

**2013-IP-072509U1 PCT****CLAIMS**

The invention claimed is:

1. A method comprising:
  - (a) providing a treatment fluid comprising an aqueous base fluid, an acid, a permeability modifier, and a permeability modifier deactivator;
  - (b) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability, wherein first treatment zone comprises formation damage;
  - (c) introducing the treatment fluid into the injection well, so as to contact the acid, the permeability modifier, and the permeability modifier deactivator with the first treatment zone;
  - (d) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;
  - (e) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;
  - (f) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore the first treatment zone to about the first aqueous formation permeability; and
  - (g) removing the treatment fluid from the injection well.
2. The method of claim 1, wherein elements (a) through (f) are repeated at least at a second treatment zone in the injection well.
3. The method of claim 1, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.
4. The method of claim 1, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.



**2013-IP-072509U1 PCT**

5. The method of claim 1, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.
6. The method of claim 1, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.
7. The method of claim 1, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.
8. The method of claim 1, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.
9. The method of claim 1, wherein the permeability modifier deactivator is present in an amount in the range of from about 0.0001% to about 200% by weight of the permeability modifier.
10. The method of claim 1, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.
11. A method comprising:
  - (a) providing a first treatment fluid comprising an aqueous base fluid, an acid, and a permeability modifier;
  - (b) providing a second treatment fluid comprising an aqueous base fluid and a permeability modifier deactivator;
  - (c) providing an injection well in a subterranean formation having a first treatment zone comprising a first aqueous formation permeability,  
wherein the first treatment zone comprises formation damage;

**2013-IP-072509U1 PCT**

(d) introducing the first treatment fluid into the injection well, so as to contact the acid and the permeability modifier with the first treatment zone;

(e) reacting the acid with the first treatment zone so as to repair a portion of the formation damage;

(f) reacting the permeability modifier with the first treatment zone so as to cause the first aqueous formation permeability in the first treatment zone to adopt a second aqueous formation permeability that is less than the first aqueous formation permeability;

(g) introducing the second treatment fluid into the injection well, so as to contact the permeability modifier deactivator with the first treatment zone;

(h) contacting the permeability modifier deactivator with the permeability modifier at the first treatment zone so as to deactivate the permeability modifier and restore first treatment zone to about the first aqueous formation permeability; and

(g) removing the treatment fluid from the injection well.

12. The method of claim 11, wherein elements (a) through (h) are repeated at at least a second treatment zone in the injection well.

13. The method of claim 11, wherein the second aqueous formation permeability is in the range of about 50% to about 90% less than the first aqueous formation permeability.

14. The method of claim 11, wherein the permeability modifier deactivator deactivates the permeability modifier by a mechanism selected from the group consisting of desorption of the permeability modifier; degradation of the permeability modifier; blocking hydrophobic functional groups present on the permeability modifier; and any combination thereof.

15. The method of claim 11, wherein the permeability modifier is an unmodified water-soluble polymer; a water-soluble hydrophobically modified polymer; a water-soluble hydrophilically modified polymer; and any combination thereof.

**2013-IP-072509U1 PCT**

16. The method of claim 11, wherein the permeability modifier is present in an amount in the range of from about 0.05% to about 5% by weight of the treatment fluid.
17. The method of claim 11, wherein the acid is present in an amount in the range of from about 0.5% to about 8% by weight of the treatment fluid.
18. The method of claim 11, wherein the permeability modifier deactivator is selected from the group consisting of a free-radical generating compound; a mutual solvent; a surfactant; and any combination thereof.
19. The method of claim 11, wherein the permeability modifier deactivator is present in an amount in the range of from about 0.0001% to about 200% by weight of the permeability modifier.
20. The method of claim 11, wherein the permeability modifier deactivator that restores the first treatment zone to about the first aqueous formation permeability achieves a restoration of at least about 20% of the first aqueous formation permeability.

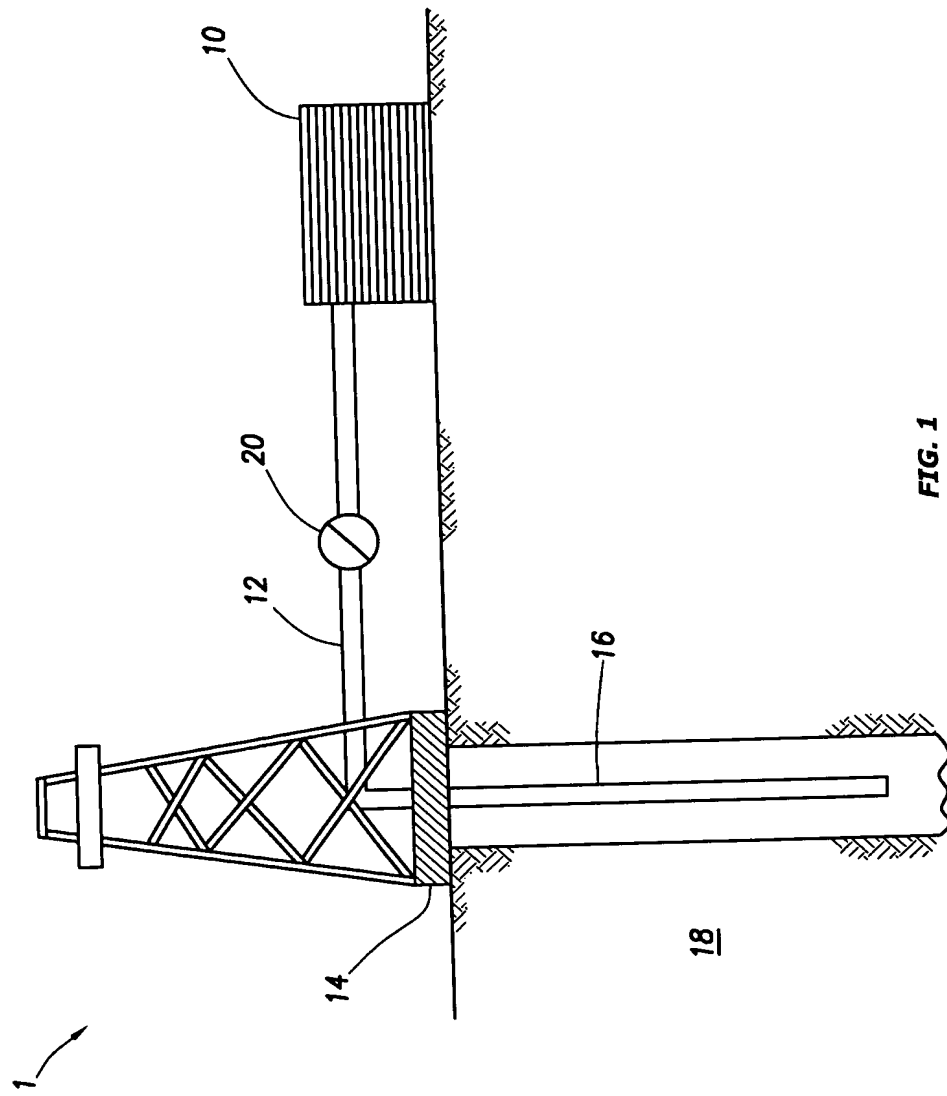


FIG. 1

2/2

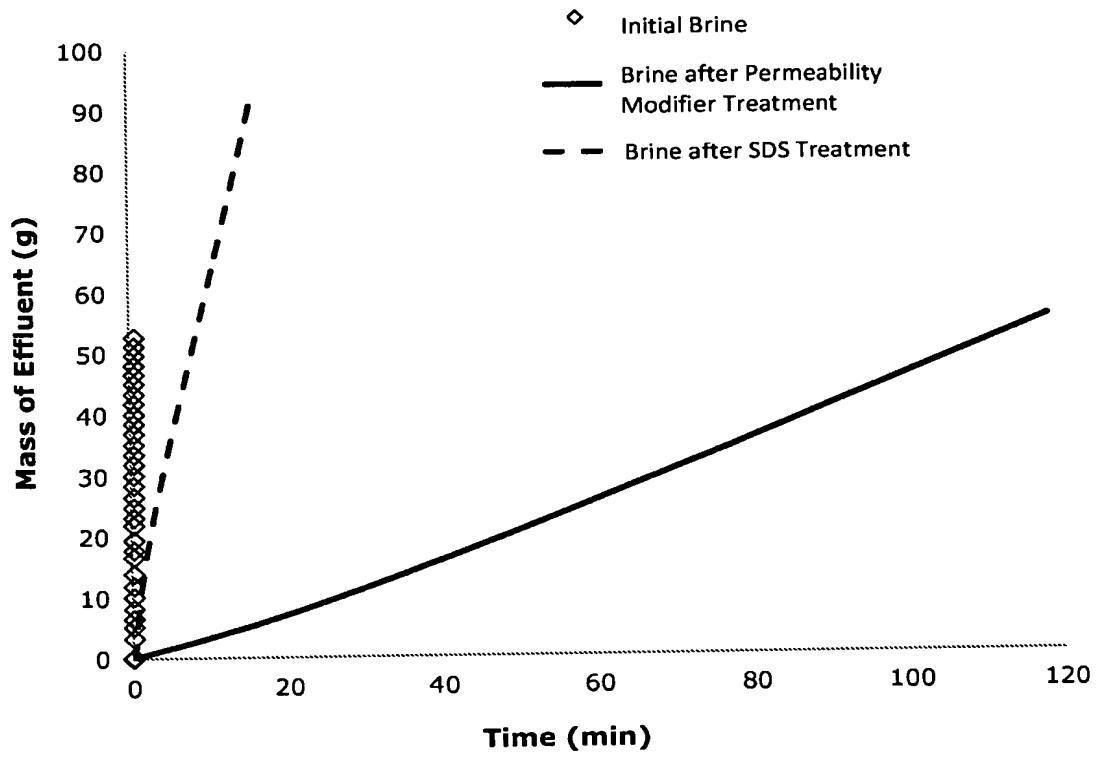


FIG. 2

# PCT

## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only	
PCT/US13/56726	
International Application No.	27 AUG 2013 (27.08.13)
International Filing Date	PCTINTERNATIONAL RO/USAPPLICATION
Name of receiving Office and "PCT International Application"	
Applicant's or agent's file reference (if desired) (12 characters maximum)	2013IP072509U1PC

<b>Box No. I</b>	<b>TITLE OF INVENTION</b>	
	ACID DIVERSION TREATMENTS IN INJECTION WELLS USING PERMEABILITY MODIFIERS	
<b>Box No. II</b>	<b>APPLICANT</b>	<input type="checkbox"/> This person is also inventor
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) HALLIBURTON ENERGY SERVICES, INC. 10200 Bellaire Boulevard Houston, TX 77072 UNITED STATES OF AMERICA		Telephone No.  Facsimile No.  Applicant's registration No. with the Office
<b>E-mail authorization:</b> Marking one of the check-boxes below authorizes the receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority to use the e-mail address indicated in this Box to send, notifications issued in respect of this international application to that e-mail address if those offices are willing to do so. <input type="checkbox"/> as advance copies followed by paper notifications; or <input type="checkbox"/> exclusively in electronic form (no paper notifications will be sent). E-mail address:		
State (that is, country) of nationality: US		State (that is, country) of residence: US
This person is applicant for the purposes of: <input checked="" type="checkbox"/> all designated States <input type="checkbox"/> the States indicated in the Supplemental Box		
<b>Box No. III</b>	<b>FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)</b>	
	<input checked="" type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.	
<b>Box No. IV</b>	<b>AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE</b>	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:		<input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) KAISER, Iona N. (Reg. No. 53,086) JORDAN, Carey C. (Reg. No. 47,646) McDermott Will & Emery LLP 500 North Capitol Street, N.W. Washington, D.C. 20001 UNITED STATES OF AMERICA		Telephone No. 202-756-8000 Facsimile No. 202-756-8087 Agent's registration No. with the Office 53,086
<b>E-mail authorization:</b> Marking one of the check-boxes below authorizes the receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority to use the e-mail address indicated in this Box to send, notifications issued in respect of this international application to that e-mail address if those offices are willing to do so. <input type="checkbox"/> as advance copies followed by paper notifications; or <input checked="" type="checkbox"/> exclusively in electronic form (no paper notifications will be sent). E-mail address: mweipdocket@mwe.com		
<input type="checkbox"/> <b>Address for correspondence:</b> Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.		

**Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)**

*If none of the following sub-boxes is used, this sheet should not be included in the request.*

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*  
**EOFF, Larry Steven**  
**2201 Cedar**  
**Duncan, OK 73533**  
**UNITED STATES OF AMERICA**

This person is:

applicant only

applicant and inventor

inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of:  all designated States  the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*  
**REDDY, B. Raghava**  
**72 Laughing Brook Court**  
**The Woodlands, TX 77380**  
**UNITED STATES OF AMERICA**

This person is:

applicant only

applicant and inventor

inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of:  all designated States  the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*  
**DAVIDSON, Eric**  
**26 Ashfield Road, Cults**  
**Aberdeen, UK AB15 9NQ**  
**UNITED KINGDOM**

This person is:

applicant only

applicant and inventor

inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of:  all designated States  the States indicated in the Supplemental Box

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*  
**MORRISON, Alexandra Clare**  
**Mains of Blackhall Cottage**  
**Inverurie AB 51 5JJ**  
**SOUTH AFRICA**

This person is:

applicant only

applicant and inventor

inventor only *(If this check-box is marked, do not fill in below.)*

Applicant's registration No. with the Office

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of:  all designated States  the States indicated in the Supplemental Box

Further applicants and/or (further) inventors are indicated on another continuation sheet.

<b>Box No. V DESIGNATIONS</b>				
<p>The filing of this request <b>constitutes under Rule 4.9(a) the designation</b> of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.</p> <p>However,</p> <p><input type="checkbox"/> DE Germany is <b>not designated</b> for any kind of national protection</p> <p><input type="checkbox"/> JP Japan is <b>not designated</b> for any kind of national protection</p> <p><input type="checkbox"/> KR Republic of Korea is <b>not designated</b> for any kind of national protection</p> <p><i>(The check-boxes above may only be used to exclude (irrevocably) the designations concerned if, at the time of filing or subsequently under Rule 26bis.1, the international application contains in Box No. VI a priority claim to an earlier national application filed in the particular State concerned, in order to avoid the ceasing of the effect, under the national law, of this earlier national application.)</i></p>				
<b>Box No. VI PRIORITY CLAIM AND DOCUMENT</b>				
<b>The priority of the following earlier application(s) is hereby claimed:</b>				
Filing date of earlier application <i>(day/month/year)</i>	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application: regional Office	international application: receiving Office
item (1)				
item (2)				
item (3)				
<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.				
<b>Furnishing the priority document(s):</b>				
<input type="checkbox"/> The <b>receiving Office</b> is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application(s) was filed with the receiving Office which, for the purposes of this international application, is the receiving Office) identified above as:				
<input type="checkbox"/> all items <input type="checkbox"/> item (1) <input type="checkbox"/> item (2) <input type="checkbox"/> item (3) <input type="checkbox"/> other, see Supplemental Box				
<input type="checkbox"/> The <b>International Bureau</b> is requested to obtain from a digital library a certified copy of the earlier application(s) identified above, using, where applicable, the access code(s) indicated below (if the earlier application(s) is available to it from a digital library):				
<input type="checkbox"/> item (1) access code _____ <input type="checkbox"/> item (2) access code _____ <input type="checkbox"/> item (3) access code _____ <input type="checkbox"/> other, see Supplemental Box				
<b>Restore the right of priority:</b> the receiving Office is requested to restore the right of priority for the earlier application(s) identified above or in the Supplemental Box as item(s) (_____). (See also the Notes to Box No. VI; further information <b>must</b> be provided to support a request to restore the right of priority.)				
<b>Incorporation by reference:</b> where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.				
<b>Box No. VII INTERNATIONAL SEARCHING AUTHORITY</b>				
<b>Choice of International Searching Authority (ISA)</b> (if more than one International Searching Authority is competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):				
ISA/ KR				



<b>Continuation of Box No. VII USE OF RESULTS OF EARLIER SEARCH, REFERENCE TO THAT SEARCH</b>		
<input type="checkbox"/> The ISA indicated in Box No. VII is requested to take into account the results of the earlier search(es) indicated below ( <i>see also Notes to Box VII; use of results of more than one earlier search</i> ).		
Filing date ( <i>day/month/year</i> )	Application Number	Country ( <i>or regional Office</i> )
<input type="checkbox"/> <b>Statement (Rule 4.12(ii)):</b> this international application is the same, or substantially the same, as the application in respect of which the earlier search was carried out except, where applicable, that it is filed in a different language.		
<input type="checkbox"/> <b>Availability of documents:</b> the following documents are available to the ISA in a form and manner acceptable to it and therefore do not need to be submitted by the applicant to the ISA (Rule 12bis.1(f)):		
<input type="checkbox"/> a copy of the results of the earlier search,*		
<input type="checkbox"/> a copy of the earlier application,		
<input type="checkbox"/> a translation of the earlier application into a language which is accepted by the ISA,		
<input type="checkbox"/> a translation of the results of the earlier search into a language which is accepted by the ISA,		
<input type="checkbox"/> a copy of any document cited in the results of the earlier search. ( <i>If known, please indicate below the document(s) available to the ISA</i> ):		
<input type="checkbox"/> <b>Transmit copy of results of earlier search and other documents</b> ( <i>where the earlier search was not carried out by the ISA indicated above but by the same Office as that which is acting as the receiving Office</i> ): the <b>receiving Office</b> is requested to prepare and transmit to the ISA (Rule 12bis.1(c)):		
<input type="checkbox"/> a copy of the results of the earlier search,*		
<input type="checkbox"/> a copy of the earlier application,		
<input type="checkbox"/> a copy of any document cited in the results of the earlier search.		
* Where the results of the earlier search are neither available from a digital library nor transmitted by the receiving Office, the applicant is required to submit them to the receiving Office (Rule 12bis.1(a)) ( <i>See item 11. in the check-list and also Notes to Box No. VII</i> ).		
Filing date ( <i>day/month/year</i> )	Application Number	Country ( <i>or regional Office</i> )
<input type="checkbox"/> <b>Statement (Rule 4.12(ii)):</b> this international application is the same, or substantially the same, as the application in respect of which the earlier search was carried out except, where applicable, that it is filed in a different language.		
<input type="checkbox"/> <b>Availability of documents:</b> the following documents are available to the ISA in a form and manner acceptable to it and therefore do not need to be submitted by the applicant to the ISA (Rule 12bis.1(f)):		
<input type="checkbox"/> a copy of the results of the earlier search,*		
<input type="checkbox"/> a copy of the earlier application,		
<input type="checkbox"/> a translation of the earlier application into a language which is accepted by the ISA,		
<input type="checkbox"/> a translation of the results of the earlier search into a language which is accepted by the ISA,		
<input type="checkbox"/> a copy of any document cited in the results of the earlier search. ( <i>If known, please indicate below the document(s) available to the ISA</i> ):		
<input type="checkbox"/> <b>Transmit copy of results of earlier search and other documents</b> ( <i>where the earlier search was not carried out by the ISA indicated above but by the same Office as that which is acting as the receiving Office</i> ): the <b>receiving Office</b> is requested to prepare and transmit to the ISA (Rule 12bis.1(c)):		
<input type="checkbox"/> a copy of the results of the earlier search,*		
<input type="checkbox"/> a copy of the earlier application,		
<input type="checkbox"/> a copy of any document cited in the results of the earlier search.		
* Where the results of the earlier search are neither available from a digital library nor transmitted by the receiving Office, the applicant is required to submit them to the receiving Office (Rule 12bis.1(a)) ( <i>See item 11. in the check-list and also Notes to Box No. VII</i> ).		
<input type="checkbox"/> Further earlier searches are indicated on a continuation sheet.		
<b>Box No. VIII DECLARATIONS</b>		
The following <b>declarations</b> are contained in Boxes Nos. VIII (i) to (v) ( <i>mark the applicable check-boxes below and indicate in the right column the number of each type of declaration</i> ):		Number of declarations
<input type="checkbox"/> Box No. VIII (i)	Declaration as to the identity of the inventor	:
<input checked="" type="checkbox"/> Box No. VIII (ii)	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	: 1
<input type="checkbox"/> Box No. VIII (iii)	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	:
<input type="checkbox"/> Box No. VIII (iv)	Declaration of inventorship (only for the purposes of the designation of the United States of America)	:
<input type="checkbox"/> Box No. VIII (v)	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	:

**Box No. IX CHECK LIST for EFS-Web filings** - this sheet is only to be used when filing an international application with RO/US via EFS-Web

This international application contains the following:	Number of sheets	This international application is <b>accompanied</b> by the following item(s) ( <i>mark the applicable check-boxes below and indicate in right column the number of each item</i> ):	Number of items
(a) request form PCT/RO/101 (including any declarations and supplemental sheets) . . . . . :	6	1. <input checked="" type="checkbox"/> fee calculation sheet . . . . . :	1
(b) description (excluding any sequence listing part of the description, see (f), below) . . . . . :	24	2. <input type="checkbox"/> original separate power of attorney . . . . . :	
(c) claims . . . . . :	4	3. <input type="checkbox"/> original general power of attorney . . . . . :	
(d) abstract . . . . . :	1	4. <input type="checkbox"/> copy of general power of attorney; reference number: . . . . . :	
(e) drawings (if any) . . . . . :	2	5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s) . . . . . :	
(f) sequence listing part of the description in the form of an <b>image file</b> (e.g. PDF) . . . . . :		6. <input type="checkbox"/> Translation of international application into ( <i>language</i> ): . . . . . :	
<b>Total number of sheets</b> (including the sequence listing part of the description if filed as an <b>image file</b> ) . . . . . :	37	7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material . . . . . :	
(g) sequence listing part of the description		8. <input type="checkbox"/> ( <i>only where item (f) is marked in the left column</i> ) copy of the sequence listing in electronic form (Annex C/ST.25 text file) not forming part of the international application but <b>furnished only for the purposes of international search</b> under Rule 13ter . . . . . :	
<input type="checkbox"/> filed in the form of an <b>Annex C/ST.25 text file</b>		9. <input type="checkbox"/> ( <i>only where item (f) is marked in the left column</i> ) a statement confirming that "the information recorded in electronic form submitted under Rule 13ter is identical to the sequence listing as contained in the international application" as filed via EFS-Web: . . . . . :	
<input type="checkbox"/> WILL BE filed separately on physical data carrier(s), on the same day and in the form of an <b>Annex C/ST.25 text file</b>		10. <input type="checkbox"/> copy of results of earlier search(es) (Rule 12bis.1(a)) . . . . . :	
Indicate type and number of physical data carrier(s) . . . . .		11. <input checked="" type="checkbox"/> other ( <i>specify</i> ): PCT Transmittal . . . . . :	1

Figure of the drawings which should accompany the abstract:	Language of filing of the international application: <b>English</b>
---	---

**Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE**  
*Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).*

/Iona N. Kaiser/  
 Iona N. Kaiser, Reg. No. 53,086

For receiving Office use only	
1. Date of actual receipt of the purported international application: <b>27 AUG 2013 (27.08.13)</b>	2. Drawings: <input type="checkbox"/> received:  <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority (if two or more are competent): <b>ISA / KR</b>	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

**Box No. VIII (ii) DECLARATION: ENTITLEMENT TO APPLY FOR AND BE GRANTED A PATENT**

*The declaration must conform to the standardized wording provided for in Section 212; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (ii). If this Box is not used, this sheet should not be included in the request.*

Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate:

in relation to this international application

HALLIBURTON ENERGY SERVICES, INC., is entitled to apply for and be granted a patent by virtue of the following:

an assignment from:

EOFF, Larry Steven, REDDY, B. Raghava, DAVIDSON, Eric and MORRISON, Alexandra Clare, dated August 1, 2013, August 1, 2013, August 13, 2013 and August 21, 2013, respectively, to HALLIBURTON ENERGY SERVICES, INC.

This declaration is continued on the following sheet, "Continuation of Box No. VIII (ii)".