AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Oklahoma on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
CIV-23-316-JD	4/13/2023	Western District of Oklahoma

PLAINTIFF	DEFENDANT
Flex-Chem Holding Company Llc	Pharaoh Energy Services Llc

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US 10,697,282 B2	6/30/2020	Flex - Chem Holding Company, LLC
2	US 10,633,575 B2	4/28/2020	Flex - Chem Holding Company , LLC
3	US 9,944,843 B2	4/17/2018	Flex - Chem Holding Company, LLC
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
	R. Rosson	4/13/2023

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

PHARAOH, EX. 1002

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 10,697,282 B2
APPLICATION NO. : 16/226464
DATED : June 30, 2020
INVENTOR(S) : Andrew Bryce Conway and Robert Easterly

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

In the Claims

Claim 4, Column 15, Line 25, N,N"-disuccinic acid should read --N,N'-disuccinic acid--

Signed and Sealed this
Third Day of November, 2020

Andrei Iancu
Director of the United States Patent and Trademark Office

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent No.:	10,697,282	Docket:	04697.0003USC1
Issue Date:	June 30, 2020	Applicant:	Flex-Chem Holding Company, LLC Cimarex Energy Co.
Title:	Method for Remediation of Subterranean-Formed Metal-Polymer Complexes Using a Metal-Complexing Agent		

REQUEST FOR CERTIFICATE OF CORRECTION

Certificate of Correction Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

23552
PATENT TRADEMARK OFFICE

Attention: Commissioner for Patents

It is requested that a Certificate of Correction under 37 C.F.R. §1.322 be issued to correct an obvious error appearing in the above-identified United States patent.

Issuance of the Certificate of Correction would neither expand nor contract the scope of the claims, and re-examination is not required.

No fee is submitted herewith as the error was made by the Patent Office. However, if deemed necessary, please charge any deficiency in fees to Deposit Account No. 13-2725 (Docket No. 04697.0003USC1).

Respectfully submitted,

/Melissa M. Hayworth/
Melissa M. Hayworth
Reg. No.: 45,774

September 30, 2020

Merchant & Gould P.C.
P.O. Box 2903
Minneapolis, Minnesota 55402
Telephone: 703.684.2522
Facsimile: 703.684.2501

PTO/SB/44 (09-07)
Approved for use through 01/31/2020. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.
(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 10,697,282B2

APPLICATION NO.: 16/226,464

ISSUE DATE : June 30, 2020

INVENTOR(S) : Andrew Bryce Conway and Robert Easterly

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

Claim 4, Col. 15, line 25, N,N''-disuccinic acid should read --N,N'-disuccinic acid--

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

Melissa M. Hayworth
Merchant & Gould
1900 Duke Street, Suite 600

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. 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 1.0 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: Attention Certificate of Corrections Branch, 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.

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.

Electronic Acknowledgement Receipt

EFS ID:	40728270
Application Number:	16226464
International Application Number:	
Confirmation Number:	3907
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Customer Number:	23552
Filer:	Melissa M. Hayworth/Lisa Kenney
Filer Authorized By:	Melissa M. Hayworth
Attorney Docket Number:	04697.0003USC1
Receipt Date:	30-SEP-2020
Filing Date:	19-DEC-2018
Time Stamp:	20:35:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Certificate of Correction	04697-0003USC1-Request_Cert_of_Correction.PDF	70760 bda8f90c6cd9a362cec689a98e63785f4f98cf40	no	1

Warnings:

Information:					
2	Request for Certificate of Correction	04697-0003USC1_Certificate_of_Correction.PDF	164326 2b3265f80f1cc22e6163bf6c2c485326261a0ec8	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	235086		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/226,464	06/30/2020	10697282	04697.0003USC1	3907

23552 7590 06/10/2020

MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

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):

Flex-Chem Holding Company, LLC, Weatherford, OK;
Andrew Bryce Conway, Weatherford, OK;
Robert Easterly, Tulsa, OK;
Cimarex Energy Co., Denver, CO;

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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	
Attorney Docket Number	04697.0003USC1

	20	8567503		2013-10-29	Welton et al.	
	21	8567504		2013-10-29	Welton et al.	
	22	8584757		2013-11-19	Reyes	
	23	6527051		2003-03-04	Reddy et al.	
Change(s) applied to document, /C.L./ 5/20/2020	24	6225262		2001-05-01	Irwin	
	25	6162766		2000-12-19	Muir	
	26	5497830		1996-03-12	Boles	
	27	3700280		1972-10-24	Papadopolous et al.	
	28	4089787		1978-05-16	Lybarger et al.	
	29	5944446		1999-08-31	Hocking	
	30	7906463	B2	2011-03-15	Starkey, II et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.D.L./

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

23552 7590 04/29/2020

MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

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.

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1	3907

TITLE OF INVENTION: METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	07/29/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
LEFF, ANGELA MARIE DITRAN	3674	166-308200

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

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 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 Merchant & Gould
2
3

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE	(B) RESIDENCE: (CITY and STATE OR COUNTRY)
Flex-Chem Holding Company, LLC	Weatherford, Oklahoma
Cimarex Energy Co	Denver, Colorado

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

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 132725

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 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 /Melissa M. Hayworth/ Date 15 May 2020

Typed or printed name Melissa M. Hayworth Registration No. 45774

Electronic Patent Application Fee Transmittal

Application Number:	16226464
Filing Date:	19-Dec-2018
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Filer:	Melissa M. Hayworth/Lisa Kenney
Attorney Docket Number:	04697.0003USC1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1000**

Electronic Acknowledgement Receipt

EFS ID:	39453557
Application Number:	16226464
International Application Number:	
Confirmation Number:	3907
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Customer Number:	23552
Filer:	Melissa M. Hayworth/Lisa Kenney
Filer Authorized By:	Melissa M. Hayworth
Attorney Docket Number:	04697.0003USC1
Receipt Date:	15-MAY-2020
Filing Date:	19-DEC-2018
Time Stamp:	14:06:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1000
RAM confirmation Number	E20205EE07308603
Deposit Account	
Authorized User	

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	04697-0003USC1-Issue_Fee_Transmittal.PDF	1241299 e02d9e67f54d5807de9beb84b1e5ffc7ad280953	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30487 b1f66bd5c261a6a019138fd284e2135a39032ae8	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1271786		

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

23552 7590 04/29/2020
MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

EXAMINER
LEFF, ANGELA MARIE DITRAN

ART UNIT	PAPER NUMBER
3674	

DATE MAILED: 04/29/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1	3907

TITLE OF INVENTION: METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	07/29/2020

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: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

23552 7590 04/29/2020

MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

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.

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1	3907

TITLE OF INVENTION: METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	07/29/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
LEFF, ANGELA MARIE DITRAN	3674	166-308200

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

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

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

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

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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 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 _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1	3907

23552 7590 04/29/2020

MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

EXAMINER	
LEFF, ANGELA MARIE DITRAN	
ART UNIT	PAPER NUMBER
3674	

DATE MAILED: 04/29/2020

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 30 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.

Notice of Allowability	Application No. 16/226,464	Applicant(s) Conway et al.	
	Examiner Angela M DiTrani Leff	Art Unit 3674	AIA (FITF) Status 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 the RCE filed 04/16/20.
   ☐ 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 21-42 . 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** or send an inquiry to **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. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/Angela M DiTrani Leff/
Primary Examiner, Art Unit 3674

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/226,464	Conway et al.
	Examiner	Art Unit
	Angela M DiTrani Leff	3674

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
updated search from parent application 14525038	06/18/2019	ADL
review of previous east search	12/16/2019	ADL
updated east search	04/24/2020	ADL

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	see east search history	04/24/2020	ADL

	/Angela M DiTrani Leff/ Primary Examiner, Art Unit 3674

PHARAOH, EX. 1002
P. 20

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/226,464	Conway et al.
	Examiner	**Art Unit**
	Angela M DiTrani Leff	3674

CPC						
Symbol					**Type**	**Version**
E21B	/	43	/	26	F	2013-01-01
C09K	/	8	/	52	I	2013-01-01
E21B	/	47	/	06	I	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	22	
/Angela M DiTrani Leff/ Primary Examiner, Art Unit 3674	24 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20200424

PHARAOH, EX. 1002
P. 21

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/226,464	Conway et al.
	Examiner	**Art Unit**
	Angela M DiTrani Leff	3674

INTERNATIONAL CLASSIFICATION				
CLAIMED				
E21B	/	43	/	26

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	22	
/Angela M DiTrani Leff/ Primary Examiner, Art Unit 3674	24 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office

Part of Paper No.: 20200424

PHARAOH, EX. 1002
P. 22

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/226,464	Conway et al.
	Examiner	**Art Unit**
	Angela M DiTrani Leff	3674

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

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		10		19		28		37						
	2		11		20		29		38						
	3		12		21		30		39						
	4		13		22		31		40						
	5		14		23		32		41						
	6		15		24		33		42						
	7		16		25		34								
	8		17		26		35								
	9		18		27		36								

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	22	
/Angela M DiTrani Leff/ Primary Examiner, Art Unit 3674	24 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office

Part of Paper No.: 20200424

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	Angela M. Ditrani Leff
Attorney Docket Number	04697.0003USC1

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	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. Add

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	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 Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
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NON-PATENT LITERATURE DOCUMENTS Remove

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[5]

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.D.L./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	Angela M. Ditrani Leff
Attorney Docket Number	04697.0003USC1

	1	Examination report No. 1 issued in corresponding Australian Application No. 2018219970 on 28 May 2019; pages 1-3
	2	Submission in response to first examination report in corresponding Australian Application dated 16 January 2020; pages 1-29
	3	Notice of acceptance for patent application issued in corresponding Australian Application No. 2018219970 on 23 January 2020; pages 1-3

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/Angela M DiTrani Leff/	Date Considered	04/24/2020

*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.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] 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	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	Angela M. Ditrani Leff
Attorney Docket Number	04697.0003USC1

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	/Melissa M. Hayworth/	Date (YYYY-MM-DD)	2020-04-16
Name/Print	Melissa M. Hayworth	Registration Number	45,774

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.**

Privacy Act Statement

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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 the Freedom of Information Act requires disclosure of these record s.

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 inspections 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.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	("10202834").PN.	USPAT; USOCR	OR	OFF	2020/04/24 15:01
L2	6	(("6265355") or ("4986356") or ("5678632") or ("5038864") or ("4609475") or ("20110053811")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/04/24 15:05
L3	7	(("6265355") or ("4986356") or ("5678632") or ("5038864") or ("4609475") or ("20110053811") or ("8071511")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/04/24 15:05

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L4	12	((subterranean welL$1bore$1 bore$1hole$1 down$1hole$1 oil$1well$1 oil$1field$1) and (metal$4 and $2polymer$2) and (chelat$4 complex$5) and shale$1).clm.	US-PGPUB; USPAT	OR	OFF	2020/04/24 15:16

4/24/2020 3:18:41 PM
C:\Users\aditrani\Documents\EAST\Workspaces\14525038recovered.wsp

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1

CONFIRMATION NO. 3907

23552
MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

POA ACCEPTANCE LETTER

OC000000116330299

Date Mailed: 04/22/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/15/2020.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/cnguyen/

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
* 16/226,464 *	16/226,464	Conway et al.	
	Examiner	**Art Unit**	
	LEFF, ANGELA MARIE DITRAN	3674	

Document Code - DISQ	**Internal Document - DO NOT MAIL**

TERMINAL DISCLAIMER	☑ APPROVED	☐ DISAPPROVED
Date Filed: 16 April 2020	**This patent is subject to a Terminal Disclaimer**	

Approved/Disapproved by:

/CHARRISSA S BROWN/

Technology Center: PLRC

Telephone: (571)272-1558

PTO/AIA/26 (04-14)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	Docket Number (Optional) 04697-0003USC1

In re Application of: Conway et al.

Application No.: 16/226,464

Filed: December 19, 2018

For: METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT

The applicant, FlexChem Holding Co LLC & Cimerex Energy Co , owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** No. 10,202,834 B2 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

expires for failure to pay a maintenance fee;
is held unenforceable;
is found invalid by a court of competent jurisdiction;
is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
has all claims canceled by a reexamination certificate;
is reissued; or
is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☑ The undersigned is an attorney or agent of record. Reg. No. 45774

/Melissa M. Hayworth/ — Signature
April 16, 2020 — Date

Melissa M. Hayworth — Typed or printed name

Title
703-684-2522 — Telephone Number

☑ Terminal disclaimer fee under 37 CFR 1.20(d) included.

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.

This collection of information is required by 37 CFR 1.321. 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.

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.

PTO/AIA/22 (03-13)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number (Optional): 04697.0003USC1

Application Number: 16/226,464

Filed: December 19, 2018

For: Method for Remediation of Subterranean-Formed Metal-Polymer Complexes Using a Metal Complexing Agent

Art Unit: 3674

Examiner: Angela M. Ditrani Leff

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	Micro Entity Fee	
☑	One month (37 CFR 1.17(a)(1))	$200	$100	$50	$ 200
☐	Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☐	Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐	Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐	Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 132725.

☑ Payment made via EFS-Web.

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.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 45774.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Melissa M. Hayworth/ — Signature

April 16, 2020 — Date

Melissa M. Hayworth — Typed or printed name

703-684-2522 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). 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 6 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.

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.
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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.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	Angela M. Ditrani Leff
Attorney Docket Number	04697.0003USC1

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	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 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[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16226464
	Filing Date	2018-12-19
	First Named Inventor	Andrew Bryce Conway
	Art Unit	3672
	Examiner Name	Angela M. Ditrani Leff
	Attorney Docket Number	04697.0003USC1

	1	Examination report No. 1 issued in corresponding Australian Application No. 2018219970 on 28 May 2019; pages 1-3
	2	Submission in response to first examination report in corresponding Australian Application dated 16 January 2020; pages 1-29
	3	Notice of acceptance for patent application issued in corresponding Australian Application No. 2018219970 on 23 January 2020; pages 1-3

If you wish to add additional non-patent literature document citation information please click the Add button Add

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.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] 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	16226464
	Filing Date	2018-12-19
	First Named Inventor	Andrew Bryce Conway
	Art Unit	3672
	Examiner Name	Angela M. Ditrani Leff
	Attorney Docket Number	04697.0003USC1

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	/Melissa M. Hayworth/	Date (YYYY-MM-DD)	2020-04-16
Name/Print	Melissa M. Hayworth	Registration Number	45,774

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.**

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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.

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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.

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Electronic Patent Application Fee Transmittal

Application Number:	16226464
Filing Date:	19-Dec-2018
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Filer:	Melissa M. Hayworth/Lisa Kenney
Attorney Docket Number:	04697.0003USC1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

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

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	1251	1	200	200
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1300	1300
STATUTORY OR TERMINAL DISCLAIMER	1814	1	160	160
		Total in USD ($)		**1660**

Electronic Acknowledgement Receipt

EFS ID:	39183197
Application Number:	16226464
International Application Number:	
Confirmation Number:	3907
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Customer Number:	23552
Filer:	Melissa M. Hayworth/Lisa Kenney
Filer Authorized By:	Melissa M. Hayworth
Attorney Docket Number:	04697.0003USC1
Receipt Date:	16-APR-2020
Filing Date:	19-DEC-2018
Time Stamp:	17:46:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1660
RAM confirmation Number	E20204FH49366604
Deposit Account	
Authorized User	

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	04697-0003USC1_RCE.PDF	1349994 959f664334ae38720127ff62ef01e2e60a2738f0	no	3
Warnings:					
Information:					
2	Amendment Submitted/Entered with Filing of CPA/RCE	04697-0003USC1-RCE_RESPONSE-.PDF	209448 7b6c84bc922d4909ce777337c3af2cf11a33eccd	no	21
Warnings:					
Information:					
3	Terminal Disclaimer Filed	04697-0003USUC1-Terminal_Disclaimer.PDF	155495 01d7eb3eb5249bb4543194f386977d551365a984	no	2
Warnings:					
Information:					
4	Extension of Time	04697-0003USC1_EOT-aia0022.PDF	159233 f268e0e74a22c0300f458f9bf83136759a31bb88	no	2
Warnings:					
Information:					
5	Information Disclosure Statement (IDS) Form (SB08)	04697-0003USC1_IDS-3.PDF	612228 3486f09040e9c37c64e1f5892924395f259ebbd8	no	4
Warnings:					
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6	Non Patent Literature	AU_Examination_1st_Report.PDF	222277 cdf3a49a0ebc84f286dde6591990d4c1fcedeb8a	no	3
Warnings:					
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7	Non Patent Literature	AU_Acceptance_Notice.PDF	203878 321e78c9239f2f75391b33e189d185f23080098d	no	3
Warnings:					
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8	Non Patent Literature	AU_Response_Submission-.PDF	4652268 4b6a606a4f1c9623d9a50dcf900384083874edcd	no	29
Warnings:					
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9	Fee Worksheet (SB06)	fee-info.pdf	34158 07e70c14b2feff8500d256d755625727d7ffbe5a	no	2
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Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	16/226,464	Filing Date	2018-12-19	Docket Number (if applicable)	04697.0003USC1	Art Unit	3674
First Named Inventor	Andrew Bryce Conway			Examiner Name	Angela M. Ditrani Leff		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

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- ☒ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☒ Other One month extension of time; Terminal Disclaimer

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 132725

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (02-18)
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Signature of Registered U.S. Patent Practitioner			
Signature	/Melissa M. Hayworth/	Date (YYYY-MM-DD)	2020-04-16
Name	Melissa M. Hayworth	Registration Number	45774

This collection of information is required by 37 CFR 1.114. 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.

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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 inspections or an issued patent.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Conway et al.	Examiner:	Leff, Angela M. Ditrani
Serial No.:	16/226,464	Group Art Unit:	3674
Filed:	December 19, 2018	Docket No.:	04697.0003USC1
Customer No.:	23552	Confirmation No.:	3907
Title:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT		

AMENDMENT & RESPONSE UNDER 37 C.F.R. § 1.114

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Attention Commissioner:

In complete response to the Final Office Action mailed December 23, 2019, Applicants submit herewith a Request for Continued Examination (RCE), the following Response, an IDS, and a one month extension of time.

Amendments to the Abstract are reflected on page 2 of this response.

Amendments to the Claims are reflected in the Listing of Claims, which begin on page 3 of this response.

Remarks begin on page 9 of this response.

Amendments to the Abstract:

Please replace the Abstract with the following:

Formulations and methods for remediating subterranean-formed metal-polymer complexes in wells in subterranean formations are described. In one embodiment, the method includes injecting a metal-polymer complex remediation mixture containing a metal complexing agent into a subterranean formation adjacent to a well at a pressure below the fracture pressure of the formation. A sufficient contact time is allowed and then the metal-polymer complex remediation mixture is pumped from the subsurface. This has been shown to remediate polymer-containing, subterranean-formed metal-polymer complexes in shale formations. Without being held to a particular theory, it appears that the metal complexing agent is forming metal complexes with the metals in the complexes, and particularly divalent metal ions. This removal of naturally occurring metals may be un-crosslinking and causing the metal-polymer complexes to go into solution, thereby removing the blockages caused by the metal-polymer complexes.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. – 20. (Cancelled)

21. (Currently Amended) A method for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a ~~low permeability~~ subterranean shale formation, the method comprising:

providing a metal-polymer complex remediation mixture comprising between 0.1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes ~~including~~ metal naturally present within the subterranean formation;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal and thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving hydrocarbon production of the well.

22. (Previously Presented) The method of claim 21, wherein the metal complexing agent is citric acid, formic acid, or mixtures thereof.

23. (Previously Presented) The method of claim 21, wherein the metal complexing agent is selected from the group consisting of ethylenediaminetetraacetic acid (EDTA), propylenediaminetetraacetic acid (PDTA), nitrilotriacetic acid (NTA), N-(2-hydroxyethyl)ethylenediaminetriacetic acid (HEDTA), diethylenetriaminepentaacetic acid (DTPA), hydroxyethyliminodiacetic acid (HEIDA), cyclohexylenediaminetetraacetic acid (CDTA), diphenylaminesulfonic acid (DPAS), ethylenediaminedi(o-hydroxyphenylacetic) acid (EDDHA), glucoheptonic acid, gluconic acid, oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, suberic acid, azelaic acid, sebacic acid, phthalic acid, terephthalic acid, aconitic acid, carballylic acid, trimesic acid, isocitric acid, citric acid, salts thereof, and mixtures thereof.

24. (Previously Presented) The method of claim 21, further wherein the metal complexing agent is selected from the group consisting of glutamic acid diacetic acid (GLDA), methylglycine diacetic acid (MGDA), β-alanine diacetic acid (β-ADA), ethylenediaminedisuccinic acid, S,S- ethylenediaminedisuccinic acid (EDDS), iminodisuccinic acid (IDS), hydroxyiminodisuccinic acid (HIDS), polyamino disuccinic acids, N-bis[2-(l,2-dicarboxyethoxy)ethyl]glycine (BCA6), N-bis[2-(l,2- dicarboxyethoxy)ethyl]aspartic acid (BCA5), N-bis[2-(l,2- dicarboxyethoxy)ethyl]methylglycine (MCBA5), N-tris[(l,2-dicarboxyethoxy)ethyl]amine (TCA6), N-methyliminodiacetic acid (MIDA), iminodiacetic acid (IDA), N-(2-acetamido)iminodiacetic acid (ADA), hydroxymethyl-iminodiacetic acid, 2-(2-carboxyethylamino) succinic acid (CEAA), 2-(2-carboxymethylamino) succinic acid (CMAA), diethylenetriamine- N,N"-disuccinic acid, triethylenetetramine-N,N"'-disuccinic acid, 1,6-hexamethylenediamine-N,N'-disuccinic acid, tetraethylenepentamine-N,N""- disuccinic acid, 2-hydroxypropylene-l,3-diamine-N,N'-disuccinic acid, 1,2- propylenediamine-N,N'-disuccinic acid, l,3-propylenediamine-N,N'-disuccinic acid, cis-cyclohexanediamine-N,N'-disuccinic acid, trans-cyclohexanediamine- N,N'-disuccinic acid, ethylenebis(oxyethylenenitrilo)-N,N'-disuccinic acid, glucoheptanoic acid, cysteic acid-N,N-diacetic acid, cysteic acid-N-monoacetic acid, alanine-N-monoacetic acid, N-(3-hydroxysuccinyl) aspartic acid, N-[2-(3- hydroxysuccinyl)]-L-serine, aspartic acid-N,N-diacetic acid, aspartic acid-N- monoacetic acid, salts thereof, and mixtures thereof.

25. (Previously Presented) The method of claim 21, further wherein the metal complexing agent is selected from acetic acid, acrylates, dihydroxymaleic acid, salts of dihydroxymaleic acid, ethylenediamine tetraacetic acid (EDTA), salts of EDTA, erythorbic acid, erythroboric acid, formic acid, gluconodeltalactone, glutamic acid N,N-diacetic acid (GLDA), salts of GLDA, hydroxyethylenediamine triacetic acid (HEDTA), salts of HEDTA, disodium ethanoldiglycine (HEIDA), salts of HEIDA, methylglycine N,N-diacetic acid (MGDA), salts of MGDA, nitriolotriacetic acid (NTA), and mixtures thereof.

26. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises between 10% and 80% by weight metal complexing agent, one or more additives, and mutual solvent.

27. (Previously Presented) The method of claim 26, wherein the metal complexing agent comprises between 10% and 80% by weight citric acid, formic acid, or mixtures thereof, between 0.1 and 30% of one or more acids as a pH modifier, and mutual solvent.

28. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises between 0.1% and about 60% by weight metal complexing agent.

29. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture further comprises a mutual solvent and an additive selected from the group consisting of acid inhibitor, corrosion inhibitor, scale inhibitor, clay control additive, surfactant, biocide, and mixtures thereof.

30. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises:

between 1% and 95% by weight metal complexing agent;

between 1 and 10,000 parts per million (ppm) of a corrosion inhibitor;

between 1 and 10,000 ppm of a biocide;

between 1 and 10,000 ppm of-a colloidal silica deposition inhibitor; and

between 1 and 500 gallons mutual solvent per thousand gallons (gpt) of water.

31. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture further comprises a pH modifier.

32. (Previously Presented) The method of claim 31, wherein the metal-polymer complex remediation mixture further comprises between 0.1 and 30% of one or more acids as a pH modifier.

33. (Previously Presented) The method of claim 32, wherein the acid is selected from the group consisting of hydrochloric acid, aqua regia, arsenic acid, boric acid, carbonic acid, chloric acid, chromic acid, fluoroantimonic acid, fluoroboric acid, fluorosulfuric acid, fulminic acid, hexafluorophosphoric acid, hexafluorosilicic acid, hydrobromic acid, hydrofluoric acid, hydrogen iodide, hypochlorous acid, hypofluorous acid, hypophosphoric acid, iodic acid, nitric acid, nitrosyl-O-hydroxide, nitrous acid, orthocarbonic acid, perchloric acid, permanganic acid, perrhenic acid, pertechnetic acid, phosphoric acid, silicic acid, sulfuric acid, thiocyanic acid, titanic acid, tungstic acid, xenic acid, and mixtures thereof.

34. (Previously Presented) The method of claim 32, wherein the acid is hydrochloric acid.

35. (Previously Presented) The method of claim 21, wherein the injecting operation further comprises:

alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well.

36. (Previously Presented) The method of claim 21, wherein the injecting operation further comprises:

injecting the metal-polymer complex remediation mixture until pressure within the well reaches a predetermined target that does not cause substantial fracturing of the formation.

37. (Previously Presented) The method of claim 21, wherein the injecting operation further comprises:

injecting the metal-polymer complex remediation mixture until the pressure within the well reaches a predetermined target pressure calculated based on the fracture pressure of the subterranean formation; and

upon reaching the target pressure, shutting in the well.

38. (Previously Presented) The method of claim 21 further comprising:

monitoring at least one of pH and well pressure during the maintaining operation; and

initiating the removing operation based on results of the monitoring operation.

39. (Previously Presented) The method of claim 21, wherein the contact time is between about 4 hours and about 4 days.

40. (Previously Presented) The method of claim 39, wherein the contact time is between 1 to 4 days.

41. (Currently Amended) A method for remediating a subterranean-formed metal-polymer complex in an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation, comprising:

observing a well production decrease;

providing a metal-polymer complex remediation mixture containing between 1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean shale formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes ~~including~~ metal naturally present within the subterranean formation;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

42. (Previously Presented) The method of claim 41, wherein the injecting operation further comprises:

alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well.

REMARKS

Claims 21-42 are currently pending, with claims 21 and 41 being independent. In the present response, claims 21 and 41 have been amended for additional clarity, and the Abstract has been amended to address an informality. Support for the amendments can be found throughout the specification, including in the original claims. Therefore, no new matter has been added.

Applicants thank the Examiner for the helpful telephonic interview conducted with Applicants' representative on April 2, 2020. The claim amendments presented herein are consistent with the discussion during the interview.

Applicants respectfully request the Examiner to reconsider and withdraw the outstanding rejections in view of the foregoing amendments and the following remarks.

Interview Summary

Applicants thank Examiner Leff for the telephonic interview conducted on April 2, 2020 with Applicants' representative Melissa M. Hayworth. The substance of the Examiner's Summary is an accurate record of the interview, including the proposed amendments.

Specifically, cited prior art document Lockhart was discussed and proposed claim amendments to claims 21 and 41 to further distinguish Lockhart and address the 112 rejection also were discussed. As noted above, claims 21 and 41 are amended herein consistent with those discussions. Further, Applicants' representative and the Examiner discussed the abstract and an amendment to address the outstanding rejection. Finally, Applicants' representative agreed that a terminal disclaimer would be submitted to overcome the obviousness type double patent rejection.

Applicants appreciate that the Examiner indicated that she would reach out to Applicants' representative to resolve any minor matters should that be necessary after filing the present response.

Objections to the Specification

The Abstract of the Disclosure has been objected to for improper language. To address this objection, Applicants submit an amended Abstract herein as discussed with the Examiner during the interview. In light of the amended Abstract, Applicants respectfully request that the objection be withdrawn.

Claim Rejections Under 35 U.S.C. § 112

Claims 21-40 are rejected under 35 U.S.C. § 112(b) as allegedly being indefinite for recitation of the term "low" with regard to a "low permeability subterranean formation". Without conceding the propriety of the rejection and to expedite allowance, claim 21 has been amended herein to specify a subterranean shale formation. In view of the amendment to claim 21, Applicants respectfully request that this rejection be withdrawn.

Claim Rejections Under 35 U.S.C. § 103

Claims 21-25, 28, and 36-40 are rejected under 35 U.S.C. § 103 as allegedly being obvious over Lockhart (US 4,986,356) in view of Moses (US 5,678,632) and Dunleavy (U.S. 5,038,864). Applicants respectfully traverse the rejection and the characterization of the claims and references.

Claim 21 is directed to a method for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a subterranean shale formation. The method comprises:

providing a metal-polymer complex remediation mixture comprising between 0.1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation***;

maintaining the metal-polymer complex remediation mixture ***in contact with the subterranean-formed metal-polymer complex*** for a contact time of between about 1 minute and

about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal and thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving hydrocarbon production of the well.

As explained in the specification, the present application and claims relate to methods for remediating subterranean-formed metal-polymer complexes, such as polyacrylamide or other gellable polymers that crosslink with ***metal ions, naturally present within wells in subterranean formations***. Following the introduction of a hydraulic fracturing fluid, including slickwater, where high volumes of polymers such as polyacrylamide are used as friction reducers, into a well bore, over time the well production can decrease. The presently claimed methods ***restore or enhance the productivity*** of these wells.

In contrast, Lockhart relates to a method for removing ***purposely placed water soluble gels*** from a petroleum reservoir. Lockhart discusses improving recovery of petroleum in zones of lesser permeability by partially or completely occluding the higher permeability zones. (Col. 1, ll 19-33). Lockhart discloses that the occlusion can be carried out using polymer gels and the gels most widely used are those obtained from water-soluble polymers crosslinked with polyvalent metal ions. (Col. 1, ll. 39-54).

Lockhart then goes on to describe that a problem connected with the use of polymer gels, which has not been solved, is that of removing the gelled polymers when they have performed their tasks or for incorrect positioning. (Col. 2, ll. 16-32). Accordingly, Lockhart is focused on solving this problem – of ***removing purposefully-placed polymer gels*** and thus, re-opening ***purposefully occluded zones.*** Lockhart describes ***forming the gels crosslinked with polyvalent metal ions used in crosslinking the polymers and injecting into the well to create an occlusion.***

As such, Lockhart discloses using a complexing agent to remove these ***purposefully-placed polymer gels*** designed and crosslinked with ***known amount of crosslinker***. The gels are formed from water-soluble polymers crosslinked with polyvalent metal ions used in crosslinking the polymers and injected into the well to create an occlusion. Accordingly, the method of Lockhart is implemented by injecting a quantity of complexing agent at a ***molar ratio*** to the

known crosslinking ion. ***Lockhart knows exactly how much polymer gel will go into the fluid.*** As such, Lockhart is able to provide a particular molar ratio of complexing agent to crosslinking metal ions. (see Col. 3, ll. 60-65), and this molar ratio readily can be calculated. It is not possible to calculate a quantity of complexing agent without knowing the amount of crosslinking ion. Molar ratios are determined by calculation. To calculate the quantity of one, it is absolutely required to know the quantity of the other.

In contrast, in accordance with the presently claimed method, the treatment addresses complexes formed from a previously injected fracturing fluid and metal ions naturally present within the formation. One of ordinary skill in the art would understand that a molar ratio ***cannot*** be derived from mere suspected, but unquantified, crosslinking by heterogeneous amounts and types of metal ions naturally present in the subterranean formation.

Accordingly as discussed during the interview, Lockhart does **not** disclose or suggest – at least – injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation.***

Thus, Lockhart cannot disclose or suggest the presently claimed methods.

Moses as cited and its full disclosure fails to address the many above-noted deficiencies of Lockhart.

Moses relates to a method of acidizing an underground reservoir comprising injecting a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme, and then allowing the enzyme to catalyze the conversion of the substrate into the acid. Moses is specific to dissolving acid-soluble rock structures by acid dissolution (i.e., $CaCO_3$).

In contrast to Moses, in the presently claimed methods the particularly recited metal complexing agents are **not** a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme.

Further, Moses teaches that acids react quickly with minerals, particularly carbonates, and are consumed by the reaction, and penetration of acid into the formation is limited by the rapid rate at which the acid is consumed by the reaction. (Col. 1, ll. 45-65). Thus, the invention of Moses focuses on utilizing a substrate for an enzyme, which substrate is capable of being converted into an organic acid by the enzyme, and the enzyme – this is the premise of Moses' claimed inventive step. As such, Moses clearly teaches away from injecting the presently claimed metal complexing agents including ***acids*** because Moses cautions that acids rapidly are consumed by reaction with rock minerals and the invention of Moses focuses on a solution for this problem.

Moreover, one of ordinary skill in the art also readily would understand that Lockhart works by a different mechanism than Moses; thus, it would be inappropriate to combine any features of Moses with Lockhart. As described above, Moses discloses a method of acidizing reservoir minerals using in-situ produced acid to dissolve acid-soluble rock structures (i.e., $CaCO_3$). In contrast, Lockhart addresses purposefully-placed polymer gels designed and crosslinked with a known amount of crosslinker.

Neither Lockhart nor Moses disclose or suggest providing complexing agent to remove subterranean-formed metal polymer complex, ***wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation***

Dunleavy as cited and its full disclosure fails to address the many above-noted deficiencies of Lockhart and Moses.

Dunleavy relates to a process for increasing the permeability of a subterranean formation which is at least partially plugged with a polymer accumulation using an aqueous treating fluid comprising hydrogen peroxide. Dunleavy discloses that the process is suitable for the ***near well bore environment***. As such, the process of Dunleavy is only suitable for degrading and dispersing polymer accumulation in the near well bore environment. Dunleavy teaches that hydrogen peroxide reacts with and degrades the polymer without any reliance on presence or quantity of crosslinking ions. (Col. 6, ll. 16-29)

Accordingly, one of ordinary skill in the art would not combine Lockhart, Moses, and Dunleavy. Lockhart is addressing purposefully-placed polymer gels, which were designed and crosslinked with known amount of crosslinker and which were purposefully-placed to create occlusions. Moses relates to a method of acidizing an underground reservoir comprising injecting a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme, and then allowing the enzyme to catalyze the conversion of the substrate into the acid. Dunleavy focuses on a process of injecting hydrogen peroxide into the near well bore environment to degrade and disperse the polymer accumulation. Importantly, neither Moses nor Dunleavy discloses or suggests addressing purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker (as is the focus of Lockhart).

Moreover, even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a subterranean formation.

Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest – at least – injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation.***

Applicant further notes that it is improper to use the claims "as a frame," and take the "naked parts of separate prior art references [ ] as a mosaic to recreate a facsimile of the claimed invention" without a finding of why ordinary artisans would have found that mosaic obvious, improperly employs hindsight bias. See W.L. Gore & Assocs., Inc. v. Garlock, Inc. 721 F.2d 1540, 1552-53 (Fed. Cir. 1983).

For at least these reasons, claims 21-25, 28, and 36-40 are not obvious over Lockhart in view of Moses and Dunleavy. Accordingly, Applicants respectfully request that the Examiner withdraw this outstanding rejection under 35 U.S.C. §103(a).

Claims 31-34 are rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart (US 4,986,356), in view of Moses (US 5,678,632) and Dunleavey (U.S. 5,038,864), as applied to claim 21, above, and further in view of Hanlon (U.S. 4,609,475). Applicants respectfully traverse the rejection and the characterization of the claims and references.

As described above with regard to claim 21, even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest – at least – injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation.***

Hanlon is cited merely as disclosing carboxylic acids as pH modifiers. The method of Hanlon requires both ***an oxidizing agent*** **and** a carboxylic acid and the oxidizing agent provides free radicals. Accordingly, as cited and in its full disclosure, Hanlon fails to address the many above-noted deficiencies of Lockhart, Moses, and Dunleavy. Even if combined Lockhart in view of Moses, Dunleavy, and Hanlon do not disclose or suggest the presently claimed methods.

For at least these reasons, Applicants respectfully request that the Examiner withdraw this outstanding rejection under 35 U.S.C. §103(a).

Claims 26, 29, and 30 are rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart (US 4,986,356), in view of Moses (US 5,678,632) and Dunleavey (U.S. 5,038,864), as applied to claim 21, respectively, above, and further in view of Nasr-El-Din (U.S. 2014/0116710). Claim 27 is rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart (US 4,986,356), in view of Moses (US 5,678,632), Dunleavey (U.S. 5,038,864 and Nasr-El-Din (U.S. 2014/0116710), as applied to claim 26, respectively, above, and, further, in view of Hanlon et al. Applicants respectfully traverse the rejection and the characterization of the claims and references.

As described above with regard to claim 21, even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest – at least – injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation.***

Nasr-El-Din is cited merely as disclosing additives. Nasr-El-Din focuses on dissolving soluble and partially soluble rock (i.e., $CaCO_3$ and other soluble inorganic components). Accordingly, as cited and in its full disclosure, Nasr-El-Din fails to address the many above-noted deficiencies of Lockhart, Moses, and Dunleavy. Even if combined, Lockhart in view of Moses, Dunleavy, and Nasr-El-Din do not disclose or suggest the presently claimed methods.

Hanlon is cited merely as disclosing carboxylic acids as pH modifiers. The method of Hanlon requires both ***an oxidizing agent*** **and** a carboxylic acid and the oxidizing agent provides free radicals. Accordingly, as cited and in its full disclosure, Hanlon fails to address the many above-noted deficiencies of Lockhart, Moses, Dunleavy, and Nasr-El-Din.

For at least these reasons, Applicants respectfully request that the Examiner withdraw these outstanding rejections under 35 U.S.C. §103(a).

Claim 35 is rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart et al. (US 4,986,356), in view of Moses (US 5,678,632) and Dunleavey et al. (U.S. 5,038,864), as applied to claim 21, above, and further in view of Lai et al. (U.S. 6,265,355). Applicants respectfully traverse the rejection and the characterization of the claims and references.

As described above with regard to claim 21, even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest – at least – injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***wherein the subterranean-formed metal polymer***

complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation.

Lai is cited merely as disclosing alternatively injecting the mixture and a second amount of a diverting mixture. Lai does not relate to methods for remediating pre-existing wells or treatments of wells from which hydrocarbons have been produced. Moreover, Lai relates to breaking a gel that is formed by a crosslinkable polymer and a crosslinking agent. Thus, the amount of gel is known in Lai is known, in contrast to gellable polymers that crosslink with ***metal ions, naturally present within wells in subterranean formations*** as presently claimed.

Accordingly, as cited and in its full disclosure, Lai fails to address the many above-noted deficiencies of Lockhart, Moses, and Dunleavy. Even if combined Lockhart in view of Moses, Dunleavy, and Lai do not disclose or suggest the presently claimed methods.

For at least these reasons, Applicants respectfully request that the Examiner withdraw this outstanding rejection under 35 U.S.C. §103(a).

Claim 41 is rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart (US 4,986,356), in view of Moses (US 5,678,632), Dunleavey (U.S. 5,038,864 and Nasr-El-Din (U.S. 2014/0116710). Applicants respectfully traverse the rejection and the characterization of the claims and references.

Claim 41 is directed to a method for remediating a subterranean-formed metal-polymer complex in an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation. The method comprises:

observing a well production decrease;

providing a metal-polymer complex remediation mixture containing between 1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean shale formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***wherein the subterranean-formed metal polymer complex forms from a previously***

injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

As described above with regard to claim 21, even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest – at least – injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation.***

Nasr-El-Din focuses on dissolving soluble and partially soluble rock (i.e., $CaCO_3$ and other soluble inorganic components). Moreover, Nasr-El-Din does **not** relate to methods for remediating an ***existing, low-producing well*** in a hydrocarbon-bearing subterranean formation.

Accordingly, one of ordinary skill in the art would not combine Lockhart, Moses, Dunleavy, and Nasr-El-Din. Lockhart is addressing purposefully-placed polymer gels, which were designed and crosslinked with known amount of crosslinker and which were purposefully-placed to create occlusions. Moses relates to a method of acidizing an underground reservoir comprising injecting a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme, and then allowing the enzyme to catalyze the conversion of the substrate into the acid. And Moses focuses on carbonate rock structures and dissolve carbonates (i.e., $CaCO_3$) by acid dissolution. Dunleavy focuses on a process of

injecting hydrogen peroxide into the near well bore environment to degrade and disperse the polymer accumulation. Nasr-El-Din focuses on dissolving soluble and partially soluble rock (i.e., $CaCO_3$ and other soluble inorganic components). As such, Nasr-El-Din focuses dissolving carbonates. Moreover, Nasr-El-Din does not relate to methods for remediating an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation. Importantly, none of Moses, Dunleavy, and Nasr-El-Din discloses or suggests addressing purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker (as is the focus of Lockhart).

Moreover, even if combined, Lockhart, Moses, Dunleavy, and Nasr-El-Din do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex in a pre-existing, low-producing well in a low permeability subterranean shale formation. Even if combined, Moses, Dunleavy, and Nasr-El-Din do not address or cure the many above-noted deficiencies of Lockhart.

Applicant further notes that it is improper to use the claims "as a frame," and take the "naked parts of separate prior art references [ ] as a mosaic to recreate a facsimile of the claimed invention" without a finding of why ordinary artisans would have found that mosaic obvious, improperly employs hindsight bias. See *W.L. Gore & Assocs., Inc. v. Garlock, Inc.* 721 F.2d 1540, 1552-53 (Fed. Cir. 1983).

For at least these reasons, claim 41 is not obvious over Lockhart in view of Moses, Dunleavy, and Nasr-El-Din. Accordingly, Applicants respectfully request that the Examiner withdraw this outstanding rejection under 35 U.S.C. §103(a).

Claim 42 is rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart (US 4,986,356), in view of Moses (US 5,678,632), Dunleavey (U.S. 5,038,864) and Nasr-El-Din (U.S. 2014/0116710), as applied to claim 41, above, and, further, in view of Lai et al. (U.S. 6,265,355). Applicants respectfully traverse the rejection and the characterization of the claims and references.

As described above with regard to claim 21, even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest – at least – injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean

formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation.***

Also as described above for claim 41, one of ordinary skill in the art would not combine Lockhart, Moses, Dunleavy, and Nasr-El-Din, and even if combined, Lockhart, Moses, Dunleavy, and Nasr-El-Din do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex in an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation.

Lai is cited merely as disclosing alternatively injecting the mixture and a second amount of a diverting mixture. Lai does not relate to methods for remediating existing, low-producing wells or treatments of wells from which hydrocarbons have been produced. Moreover, Lai relates to breaking a gel that is formed by a crosslinkable polymer and a crosslinking agent. Thus, the amount of gel is known in Lai is known, in contrast to gellable polymers that crosslink with ***metal ions, naturally present within wells in subterranean shale formations*** as presently claimed. Accordingly, as cited and in its full disclosure, Lai fails to address the many above-noted deficiencies of Lockhart, Moses, and Dunleavy.

Even if combined Lockhart in view of Moses, Dunleavy, Nasr-El-Din, and Lai do not disclose or suggest the presently claimed methods. Even if combined, Lockhart, Moses, Dunleavy, Nasr-El-Din, and Lai do not disclose or suggest – at least – injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***wherein the subterranean-formed metal polymer complex forms from a previously injected fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation.***

For at least these reasons, Applicants respectfully request that the Examiner withdraw this outstanding rejection under 35 U.S.C. §103(a).

Double Patenting

Claims 21-42 are rejected on the ground of nonstatutory obviousness type double patenting over claims 1-15 of U.S. Patent 10,202,834 (the '834 patent). Without conceding the propriety of the rejection, Applicants submit herewith a terminal disclaimer to address the double patenting rejection. Applicants note that the filing of a terminal disclaimer is not to be construed as an admission of the propriety of the rejection on obviousness double patenting. *The Quad Environmental Technologies Corp. v. the Union Sanitary District*, 946 F.2d 870, 20 USPQ2d 1392 (Fed. Cir. 1991).

Conclusion

For the reasons noted above, the art of record does not disclose or suggest the inventive concept of the present invention as defined by the claims. In view of the foregoing amendments and remarks, reconsideration of the claims and allowance of the subject application are earnestly solicited. If there are any questions relating to this response or the application, Applicants request that the Examiner telephone the undersigned attorney.

Please charge any additional fees or credit any overpayment to Deposit Account No. 13-2725 (04697.0003USC1).

Respectfully submitted,

16 April 2020

/Melissa M. Hayworth/
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23552
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/226,464	Filing Date 12/19/2018	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ 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 $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ 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))					
* 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)			
AMENDMENT	04/16/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 22	Minus	** 20	= 2		x $100 =	200
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	200

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ 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.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/MONICA D FRANCIS/
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
16/226,464	December 19, 2018

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I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Flex-Chem Holding Company, LLC

☐ Inventor or Joint Inventor (title not required below)
☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	/Andrew Bryce Conway/	Date (Optional)	04-07-2020
Name	Andrew Bryce Conway		
Title	President		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 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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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.
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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 inspections or an issued patent.
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Flex-Chem Holding Company, LLC

Application No./Patent No.: 16/226,464 Filed/Issue Date: December 19, 2018

Titled: Method for Remediation of Subterranean-Formed Metal-Polymer Complexes Using a Metal Complexing Agent

Flex-Chem Holding Company, LLC, 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:

   Cimarex Energy Co.

   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 034135, Frame 0979, 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.

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: _____

The document was recorded in the United States Patent and Trademark Office at

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

Reel _____, Frame _____, or for which a copy thereof is attached.

6. 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.

☐ 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.

/Melissa M. Hayworth/	2020-04-15
Signature	Date
Melissa M. Hayworth	45774
Printed or Typed Name	Title or Registration 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.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
16/226,464	December 19, 2018

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 23552

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Cimarex Energy Co.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	
Name	Francis B. Barron		
Title	Senior Vice President General Counsel		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 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.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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 the Freedom of Information Act requires disclosure of these records.
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.
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Cimarex Energy Co.

Application No./Patent No.: 16/226,464 Filed/Issue Date: December 19, 2018

Titled: Method for Remediation of Subterranean-Formed Metal-Polymer Complexes Using a Metal Complexing Agent

Cimarex Energy Co., 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:

   Flex-Chem Holding Company, LLC

   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 034133, Frame 0595, 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.

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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: _____

The document was recorded in the United States Patent and Trademark Office at

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

Reel _____, Frame _____, or for which a copy thereof is attached.

6. 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.

☐ 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.

/Melissa M. Hayworth/	2020-04-15
Signature	Date
Melissa M. Hayworth	45774
Printed or Typed Name	Title or Registration Number

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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.
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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)).
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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.

Electronic Acknowledgement Receipt

EFS ID:	39165393
Application Number:	16226464
International Application Number:	
Confirmation Number:	3907
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Customer Number:	23552
Filer:	Melissa M. Hayworth/Lisa Kenney
Filer Authorized By:	Melissa M. Hayworth
Attorney Docket Number:	04697.0003USC1
Receipt Date:	15-APR-2020
Filing Date:	19-DEC-2018
Time Stamp:	13:43:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	FlexChem-POA_04697-0003USC1.PDF	1346869 336ce6158e500b21f56890e0c5eb4f84b0243c33	no	2

Warnings:

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	Flexchem-373Stmt--04697-0003USC1.PDF	119658 9279cd49d83b147b27a0085f9faf0eca45119b42	no	3
Warnings:					
Information:					
3	Power of Attorney	Cimarex-POA-04697-0003USC1.PDF	1391091 0ac7cd2f56a89c67ad723c34ad3e68428fb1a1fe	no	2
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73	Cimarex-373Stmt--04697-0003USC1.PDF	119626 9fe21a3875912964bfeb736a00ec396db4296b45	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	2977244		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1	3907

23552 7590 04/07/2020

MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

EXAMINER	
LEFF, ANGELA MARIE DITRAN	

ART UNIT	PAPER NUMBER
3674	

NOTIFICATION DATE	DELIVERY MODE
04/07/2020	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):

USPTO23552@merchantgould.com

Applicant-Initiated Interview Summary	Application No. 16/226,464	Applicant(s) Conway et al.		
	Examiner Angela M DiTrani Leff	Art Unit 3674	AIA (First Inventor to File) Status Yes	Page 1 of 2

All participants (applicant, applicants representative, PTO personnel):

1. Angela M DiTrani Leff (Primary Examiner); Telephonic

2. Melissa Hayworth (Attorney); Telephonic

Date of Interview: 02 April 2020

Claims Discussed: 21, 41

Prior Art Discussed: Lockhart

Amendment proposed: Applicant's amendments, as proposed, are attached hereto.

Issues Discussed:

Proposed Amendments:
The proposed amendments were discussed. The Examiner suggested to add the phrase -previously injected- prior to "a fracturing fluid" for clarification, and agreed such amendments would overcome the rejections of record.
Applicant proposed filing the proposed amendments in an RCE for further consideration. The Examiner will reach out to Applicant to resolve any minor matters should such be necessary.

Formalities:
Applicant agreed to amend the abstract to overcome the objection thereto.

Double Patenting:
Applicant agreed to file a terminal disclaimer to overcome the double patenting rejection.

Attachment(s): Proposed Amendments,

	/Angela M DiTrani Leff/ Primary Examiner, Art Unit 3674

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Conway et al.	Examiner:	Leff, Angela M. Ditrani
Serial No.:	16/226,464	Group Art Unit:	3674
Filed:	December 19, 2018	Docket No.:	04697.0003USC1
Customer No.:	23552	Confirmation No.:	3907
Title:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT		

PROPOSED CLAIM AMENDMENTS

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Attention Commissioner:

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. – 20. (Cancelled)

21. (Previously Presented) A method for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a ~~low permeability~~ subterranean shale formation, the method comprising:

providing a metal-polymer complex remediation mixture comprising between 0.1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, wherein the subterranean-formed metal polymer complex forms from a fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes ~~including~~ metal naturally present within the subterranean formation;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal and thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving hydrocarbon production of the well.

22. (Previously Presented) The method of claim 21, wherein the metal complexing agent is citric acid, formic acid, or mixtures thereof.

23. (Previously Presented) The method of claim 21, wherein the metal complexing agent is selected from the group consisting of ethylenediaminetetraacetic acid (EDTA), propylenediaminetetraacetic acid (PDTA), nitrilotriacetic acid (NTA), N-(2-hydroxyethyl)ethylenediaminetriacetic acid (HEDTA), diethylenetriaminepentaacetic acid (DTPA), hydroxyethyliminodiacetic acid (HEIDA), cyclohexylenediaminetetraacetic acid (CDTA), diphenylaminesulfonic acid (DPAS), ethylenediaminedi(o-hydroxyphenylacetic) acid (EDDHA), glucoheptonic acid, gluconic acid, oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, suberic acid, azelaic acid, sebacic acid, phthalic acid, terephthalic acid, aconitic acid, carballylic acid, trimesic acid, isocitric acid, citric acid, salts thereof, and mixtures thereof.

24. (Previously Presented) The method of claim 21, further wherein the metal complexing agent is selected from the group consisting of glutamic acid diacetic acid (GLDA), methylglycine diacetic acid (MGDA), β-alanine diacetic acid (β-ADA), ethylenediaminedisuccinic acid, S,S- ethylenediaminedisuccinic acid (EDDS), iminodisuccinic acid (IDS), hydroxyiminodisuccinic acid (HIDS), polyamino disuccinic acids, N-bis[2-(l,2-dicarboxyethoxy)ethyl]glycine (BCA6), N-bis[2-(l,2- dicarboxyethoxy)ethyl]aspartic acid (BCA5), N-bis[2-(l,2- dicarboxyethoxy)ethyl]methylglycine (MCBA5), N-tris[(l,2-dicarboxyethoxy)ethyl]amine (TCA6), N-methyliminodiacetic acid (MIDA), iminodiacetic acid (IDA), N-(2-acetamido)iminodiacetic acid (ADA), hydroxymethyl-iminodiacetic acid, 2-(2-carboxyethylamino) succinic acid (CEAA), 2-(2-carboxymethylamino) succinic acid (CMAA), diethylenetriamine- N,N"-disuccinic acid, triethylenetetramine-N,N"'-disuccinic acid, 1,6-hexamethylenediamine-N,N'-disuccinic acid, tetraethylenepentamine-N,N""- disuccinic acid, 2-hydroxypropylene-l,3-diamine-N,N'-disuccinic acid, 1,2- propylenediamine-N,N'-disuccinic acid, l,3-propylenediamine-N,N'-disuccinic acid, cis-cyclohexanediamine-N,N'-disuccinic acid, trans-cyclohexanediamine- N,N'-disuccinic acid, ethylenebis(oxyethylenenitrilo)-N,N'-disuccinic acid, glucoheptanoic acid, cysteic acid-N,N-diacetic acid, cysteic acid-N-monoacetic acid,

alanine-N-monoacetic acid, N-(3-hydroxysuccinyl) aspartic acid, N-[2-(3- hydroxysuccinyl)]-L-serine, aspartic acid-N,N-diacetic acid, aspartic acid-N- monoacetic acid, salts thereof, and mixtures thereof.

25. (Previously Presented) The method of claim 21, further wherein the metal complexing agent is selected from acetic acid, acrylates, dihydroxymaleic acid, salts of dihydroxymaleic acid, ethylenediamine tetraacetic acid (EDTA), salts of EDTA, erythorbic acid, erythroboric acid, formic acid, gluconodeltalactone, glutamic acid N,N-diacetic acid (GLDA), salts of GLDA, hydroxyethylenediamine triacetic acid (HEDTA), salts of HEDTA, disodium ethanoldiglycine (HEIDA), salts of HEIDA, methylglycine N,N-diacetic acid (MGDA), salts of MGDA, nitriolotriacetic acid (NTA), and mixtures thereof.

26. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises between 10% and 80% by weight metal complexing agent, one or more additives, and mutual solvent.

27. (Previously Presented) The method of claim 26, wherein the metal complexing agent comprises between 10% and 80% by weight citric acid, formic acid, or mixtures thereof, between 0.1 and 30% of one or more acids as a pH modifier, and mutual solvent.

28. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises between 0.1% and about 60% by weight metal complexing agent.

29. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture further comprises a mutual solvent and an additive selected from the group consisting of acid inhibitor, corrosion inhibitor, scale inhibitor, clay control additive, surfactant, biocide, and mixtures thereof.

30. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises:

between 1% and 95% by weight metal complexing agent;

between 1 and 10,000 parts per million (ppm) of a corrosion inhibitor;

between 1 and 10,000 ppm of a biocide;

between 1 and 10,000 ppm of-a colloidal silica deposition inhibitor; and

between 1 and 500 gallons mutual solvent per thousand gallons (gpt) of water.

31. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture further comprises a pH modifier.

32. (Previously Presented) The method of claim 31, wherein the metal-polymer complex remediation mixture further comprises between 0.1 and 30% of one or more acids as a pH modifier.

33. (Previously Presented) The method of claim 32, wherein the acid is selected from the group consisting of hydrochloric acid, aqua regia, arsenic acid, boric acid, carbonic acid, chloric acid, chromic acid, fluoroantimonic acid, fluoroboric acid, fluorosulfuric acid, fulminic acid, hexafluorophosphoric acid, hexafluorosilicic acid, hydrobromic acid, hydrofluoric acid, hydrogen iodide, hypochlorous acid, hypofluorous acid, hypophosphoric acid, iodic acid, nitric acid, nitrosyl-O-hydroxide, nitrous acid, orthocarbonic acid, perchloric acid, permanganic acid, perrhenic acid, pertechnetic acid, phosphoric acid, silicic acid, sulfuric acid, thiocyanic acid, titanic acid, tungstic acid, xenic acid, and mixtures thereof.

34. (Previously Presented) The method of claim 32, wherein the acid is hydrochloric acid.

35. (Previously Presented) The method of claim 21, wherein the injecting operation further comprises:

alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well.

36. (Previously Presented) The method of claim 21, wherein the injecting operation further comprises:

injecting the metal-polymer complex remediation mixture until pressure within the well reaches a predetermined target that does not cause substantial fracturing of the formation.

37. (Previously Presented) The method of claim 21, wherein the injecting operation further comprises:

injecting the metal-polymer complex remediation mixture until the pressure within the well reaches a predetermined target pressure calculated based on the fracture pressure of the subterranean formation; and

upon reaching the target pressure, shutting in the well.

38. (Previously Presented) The method of claim 21 further comprising:

monitoring at least one of pH and well pressure during the maintaining operation; and

initiating the removing operation based on results of the monitoring operation.

39. (Previously Presented) The method of claim 21, wherein the contact time is between about 4 hours and about 4 days.

40. (Previously Presented) The method of claim 39, wherein the contact time is between 1 to 4 days.

41. (Previously Presented) A method for remediating a subterranean-formed metal-polymer complex in an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation, comprising:

observing a well production decrease;

providing a metal-polymer complex remediation mixture containing between 1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean shale formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, wherein the subterranean-formed metal polymer complex forms from a fracturing fluid and the metal of the subterranean-formed metal-polymer complex includes ~~including~~ metal naturally present within the subterranean formation;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

42. (Previously Presented) The method of claim 41, wherein the injecting operation further comprises:

alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1	3907

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EXAMINER	
LEFF, ANGELA MARIE DITRAN	

ART UNIT	PAPER NUMBER
3674	

NOTIFICATION DATE	DELIVERY MODE
12/23/2019	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):

USPTO23552@merchantgould.com

Office Action Summary	Application No. 16/226,464	Applicant(s) Conway et al.	
	Examiner Angela M DiTrani Leff	Art Unit 3674	AIA (FITF) 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 11/22/19.

☐ 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) 21-42 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) 21-42 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 or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☑ The specification is objected to by the Examiner.

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

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

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

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 _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

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

Specification

2. The abstract of the disclosure is objected to because it begins with the phrase "Described herein are," i.e., a phrase that can be implied. Correction is required. See MPEP § 608.01(b).

Applicant is advised to delete the phrase "Described herein are" and begin the abstract with "Formulations and methods for remediating subterranean-formed metal-polymer complexes in wells in subterranean formations."

3. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words in length. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc. In addition, the form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided.

Claim Rejections - 35 USC § 112

4. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

> The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 21-40 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention. The term "low" in independent claim 21 is a relative term which renders the claim indefinite. The term "low" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The term “low” within the preamble phrase of “low permeability subterranean formation” renders the scope of the claim indefinite since it is unclear as to the particular permeability/permeability range Applicant intends to limit the claim, and, thus, type of formation in which the method is practiced.

Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 21-25, 28 and 36-40 are rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. (US 4,986,356 – cited previoulsy) in view of Moses et al. (US 5,678,632 – cited previously) and Dunleavy et al. (US 5,038,864 – cited previously).

With respect to independent claim 21, Lockhart et al. discloses a method for remediating a subterranean-formed metal polymer complex (col. 1, l. 60- col. 2, l. 8, wherein the complex is formed in situ) in a pre-existing well in a low permeability subterranean formation (col. 2, l. 16-32, wherein the polymer gel is disclosed as being removed after it has performed it’s task, thereby providing for remediation of a polymer complex in a *pre-existing* well), the method comprising:

providing a metal-polymer complex remediation mixture containing between 0.1% and 95% by weight metal complexing agent (col. 3, l. 59-65; col. 4, l. 4-15);

injecting the metal-polymer complex remediation mixture into the well until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex (col. 7, l. 45-51);

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days (col. 4, l. 10-13), thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components (col. 4, l. 13-15); and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well (col. 4, l. 13-15).

Lockhart et al. discloses wherein the metal-polymer complex remediation mixture is injected into the well until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex (col. 7, l. 45-51); the reference, however, fails to specify the injection pressure, and, therefore, fails to disclose injection of the mixture at a pressure less than a fracture pressure of the subterranean formation as claimed. Moses et al. teaches wherein acid containing fluids used to remove scale and/or damage present within a rock are injected at a pressure below fracture pressure to dissolve the scale/damage therein (col. 1, l. 25-30). Since Lockhart et al. discloses the use of a complexing agent chosen from a group that includes acids to remediate scale, it would have been obvious to one having ordinary skill in the art to inject the remediation mixture of Lockhart et al. at a pressure below

the fracture pressure in order to dissolve and remove any damage caused by the subterranean formed metal polymer complex present in the wellbore.

Lockhart et al. further discloses wherein the metal of the subterranean formed metal polymer complex includes various metals capable of crosslinking the polymer (col. 3, l. 60-65), and, further, wherein the method can be used to remove *all gels* which have been formed from natural or synthetic water soluble polymers by crosslinking with a polyvalent metal ion (col. 3, l. 46-50). The reference, however, fails to specify specifically wherein the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation. Dunleavy et al. teaches methods of restoring injectivity of a well in a subterranean formation that is plugged with an accumulated polymer (abstract; col. 1, l. 5-20), wherein it is further taught that it is suspected that crosslinking of injected polymers by ions, such as calcium and magnesium, present in injection water, well tubulars and *formation rock* results in polymer accumulation (col. 2, l. 20-27). Therefore, although Lockhart et al. fails to explicitly disclose wherein the metal of the subterranean formed metal polymer complex includes metal naturally present within the subterranean formation, since Dunleavy et al. teaches wherein polymers accumulate in a wellbore and formation as a result of crosslinking with metal ions found in the formation rock, and Lockhart et al. discloses wherein the method can be used to remove *all gels* that form between polymers crosslinked by a polyvalent metal ion, it would have been obvious to one having ordinary skill in the art to use the method of Lockhart et al. to not only remove gels formed by polymers with injected metal crosslinkers, but also those formed by crosslinking with metal ions naturally present within the formation. Furthermore, since Dunleavy et al. teaches that the presence of polyvalent metal ions in situ crosslinks polymers and results in polymer accumulation in situ, it is likely the polymers of Lockhart et al. would also

naturally crosslink in the presence of metal ions from the formation rock, thereby providing for a metal polymer complex that *includes* metal naturally present within the subterranean formation as claimed.

With respect to depending claims 22, 23, 24 and 25, Lockhart et al. discloses the metal complexing agent as claimed (col. 3, l. 10-39).

With respect to depending claim 28, Lockhart et al. discloses the metal complexing agent presence as claimed (col. 3, l. 55- col. 4, l. 8).

With respect to claims 36 and 37, as provided above within the rejection of claim 21, Moses et al. suggests the injection of the remediation mixture of Lockhart et al. at a pressure below fracturing pressure (see rejection of claim 21, above). Moses et al. further teaches wherein pressure is a function of depth (col. 3, l. 35-38). As such, when conducting the method of Lockhart et al. in view of Moses et al., wherein the remediation mixture is injected below the fracturing pressure, it would have been obvious to one having ordinary skill in the art to inject the mixture until pressure reaches a predetermined target pressure that does not cause substantial fracturing of the formation, and upon reaching such a pressure, shutting in the well, in order to ensure the remediation mixture does not cause fracturing of the reservoir and to allow the remediation mixture to begin reacting with the polymer gels in the formation upon shut in at the target pressure.

With respect to depending claim 38, Lockhart et al. discloses wherein the gel can completely break in a time period varying from 1 to 15 days so as to form a flowable liquid that can be easily removed from the previously occluded zone (col. 4, l. 10-15). The reference, however, is silent to wherein either the pH or well pressure is monitored during the maintaining operation and the removal of the flowable liquid is initiated based on the results of such

monitoring as claimed. Dunleavy et al. teaches wherein accumulations of polymer can be large and visually detectable or smaller and invisible to the eye, but still responsible for reducing permeability near the wellbore (col. 2, l. 20-33). It is well established in the art wherein the pressure of a well is dependent upon the injectivity thereof, and, hence, a change in pressure would occur as the well becomes less occluded and the polymer begins to dissolve. Therefore, it would have been obvious to one having ordinary skill in the art to monitor the pressure during the maintaining operation in the method of Lockhart et al. in order to determine the how much polymer remains gelled and occluding the well so as to determine the optimal time to re-open the well and remove the low viscosity flow back fluid therefrom.

With respect to depending claims 39 and 40, Lockhart et al. discloses the contact time as claimed (col. 4, l. 10-13).

8. Claims 31-34 are rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al. and Dunleavy et al., as applied to claim 21, above, and, further, in view of Hanlon et al. (US 4,609,475).

With respect to claims 31-34, Lockhart et al. in view of Moses et al. and Dunleavy et al. teaches the method as set forth above with respect to claim 21, but fails to explicitly disclose wherein the mixture includes an amount of acid as a pH modifier as claimed. Hanlon et al. teaches methods for removing polymer gels from a subterranean formation (col. 1, l. 10-15), wherein suitable complexing agents include carboxylic acids including those disclosed by Lockhart et al., wherein the remediation mixture employed therein further includes an acid, such as hydrochloric acid, as a pH modifier having a presence within the range as claimed in order to provide a pH suitable for reaction of the remediation mixture with the polymeric material in the formation, noting the rate of solubilization of the polymeric material can be adjusted by adjusting

the pH (col. 3, l. 33-39; col. 4, l. 11-16). As such, it would have been obvious to one having ordinary skill in the art to include an acid pH modifier in an amount encompassing the range claimed as suggested by Hanlon et al. in order to provide a desired rate for solubilizing the polymeric material in the method of Lockhart et al..

9. Claims 26, 29 and 30 are rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al. and Dunleavy et al., as applied to claim 21, above, and, further, in view of Nasr-El-Din et al. (US 2014/0116710 – cited previously).

Lockhart et al. discloses wherein the metal-polymer complex remediation mixture comprises the metal complexing agent in an amount as claimed (col. 4, l. 5-8). The reference, however, fails to disclose the additional components claimed as part of the remediation mixture, and, further, a presence thereof within the ranges as claimed.

Nasr-El-Din et al. teaches methods of using various complexing agents (abstract), including some disclosed by Lockhart et al., for the purpose of removing various scales from a shale formation so as to increase the production of oil or gas from the formation ([0016]) wherein additional additives may be included with the complexing agent in lower amounts, including corrosion inhibitors having a presence within the instantly claimed range ([0027]; [0054]), biocides in an amount encompassing the instantly claimed range ([0103]), as well as a mutual solvent, having a presence within the range as claimed ([0035]-[0036]).

Therefore, it would have been obvious to one having ordinary skill in the art to try a combination of additives as taught by Nasr-El-Din et al. with the complexing agent of Lockhart et al. in order to enhance production from the subterranean formation treated therewith. With regard to the colloidal silica deposition inhibitor, the Examiner notes, the presence thereof within the claimed range may be extremely minor, for example, in the instance of 1ppm, and, therefore,

one of ordinary skill would recognize whether the inclusion thereof is required as based on the conditions in the formation being treated therewith.

10. Claim 27 is rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al., Dunleavy et al. and Nasr-El-Din et al. as applied to claim 26, above, and, further, in view of Hanlon et al. (cited previously).

Lockhart et al. in view of Moses et al., Dunleavy et al. and Nasr-El-Din et al. teaches the method as set forth above with respect to claim 26, but fails to explicitly disclose wherein the mixture includes an amount of acid as a pH modifier as claimed. Hanlon et al. teaches methods for removing polymer gels from a subterranean formation (col. 1, l. 10-15), wherein suitable complexing agents include carboxylic acids including those disclosed by Lockhart et al., wherein the remediation mixture employed therein further includes an acid, such as hydrochloric acid, as a pH modifier having a presence within the range as claimed in order to provide a pH suitable for reaction of the remediation mixture with the polymeric material in the formation, noting the rate of solubilization of the polymeric material can be adjusted by adjusting the pH (col. 3, l. 33-39; col. 4, l. 11-16). As such, it would have been obvious to one having ordinary skill in the art to include an acid pH modifier in an amount encompassing the range claimed as suggested by Hanlon et al. in order to provide a desired rate for solubilizing the polymeric material.

11. Claim 35 is rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al. and Dunleavy et al., as applied to claim 21, above, and, further, in view of Lai et al. (US 6,265,355 – cited previously).

With respect to depending claim 35, Lockhart et al. discloses the injection of the metal polymer complex remediation mixture as noted above in the rejection of claim 21. The reference, however, fails to disclose alternately injecting the mixture and a second amount of a

diverting mixture into the well, as claimed. Lai et al. teaches a method wherein a metal polymer complex formed from a polymer and injected source of ions can be contacted with a chelating agent (col. 3, l. 50-65) for the purpose of dissociating the complex and breaking the gel plug formed therefrom (col. 4, l. 20-38); the reference further teaches alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well for the purpose of diverting the remediation mixture to a desired zone (col. 5, l. 20-col. 6, l. 3, wherein an amount of polymer gel is injected into the well, subsequent to which a first amount of remediation mixture is injected, and subsequent to which a polymer diverting material is injecting so as to divert the remediation mixture to the oil-bearing zone). It would have been obvious to one having ordinary skill in the art to try an injection pattern as taught by Lai et al. in the method of Lockhart et al. in order to emplace the metal complexing agent in a desired additional zones wherein remediation is required.

12. Claim 41 is rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al., Dunleavy et al. and Nasr-El-Din et al..

With respect to independent claim 41, Lockhart et al. discloses a method for remediating an existing, low producing well in a hydrocarbon bearing subterranean formation (col. 2, l. 16-32, wherein the polymer gel is disclosed as being removed after it has performed it's task, thereby providing for remediation of a polymer complex in an existing low producing well), the method comprising:

observing a well production decrease (col. 2, l. 16-32);

providing a metal-polymer complex remediation mixture containing between 0.1% and 95% by weight metal complexing agent (col. 3, l. 59-65; col. 4, l. 4-15);

injecting the metal-polymer complex remediation mixture into the well until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex (col. 7, l. 45-51);

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days (col. 4, l. 10-13), thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components (col. 4, l. 13-15); and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method (col. 4, l. 13-15).

Lockhart et al. discloses wherein the method is used to reopen occluded zones in a simple manner (col. 4, l. 16-24), wherein further, the method can be used to remove all gels formed from water soluble polymers by crosslinking with a polyvalent metal ion (col. 3, l. 46-49). Furthermore, the method can be used for clean up after the injection of a gellable composition into the reservoir (col. 2, l. 33-36). The reference, however, fails to explicitly provide for having initially fractured the formation, monitoring the production of the well of the well, and, after observing a well production decrease, and before injecting any remediation mixtures into the well, determining that a subterranean formed metal polymer complex has formed in the reservoir. Dunleavy et al. teaches a method of restoring permeability of a subterranean reservoir having a fracture network therein (col. 6, l. 30-33, thereby providing for "fracturing"), wherein production of the well is monitored in a manner that enables one of ordinary skill to determine a

subterranean formed metal polymer complex has formed after a well production decrease is observed (col. 2, l. 11-29), subsequent to which, injectivity is restored by injecting a remediation mixture (col. 2, l. 60-66). Since Lockhart et al. discloses wherein the remediation mixture may be injected after the injection of a gellable composition, it would have been obvious to one having ordinary skill to provide for a fracture network in the reservoir, as taught by Dunleavy et al., and monitor the well production so as to determine the time at which it is necessary to inject the remediation mixture of Lockhart et al. and thereby restore injectivity to the reservoir.

Lockhart et al. discloses wherein the metal-polymer complex remediation mixture is injected into the well until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex (col. 7, l. 45-51); the reference, however, fails to specify the injection pressure, and, therefore, fails to disclose injection of the mixture at a pressure less than a fracture pressure of the subterranean formation as claimed.

Moses et al. teaches wherein acid containing fluids used to remove scale and/or damage present within a rock are injected at a pressure below fracture pressure to dissolve the scale/damage therein (col. 1, l. 25-30). Since Lockhart et al. discloses the use of a complexing agent chosen from a group that includes acids to remediate scale, it would have been obvious to one having ordinary skill in the art to inject the remediation mixture of Lockhart et al. at a pressure below the fracture pressure in order to dissolve and remove any damage caused by the subterranean formed metal polymer complex present in the wellbore.

Lockhart et al. further discloses wherein the metal of the subterranean formed metal polymer complex includes various metals capable of crosslinking the polymer (col. 3, l. 60-65), and, further, wherein the method can be used to remove *all gels* which have been formed from natural or synthetic water soluble polymers by crosslinking with a polyvalent metal ion (col. 3, l.

46-50). The reference, however, fails to specify specifically wherein the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation. Dunleavy et al. teaches methods of restoring injectivity of a well in a subterranean formation that is plugged with an accumulated polymer (abstract; col. 1, l. 5-20), wherein it is further taught that it is suspected that crosslinking of injected polymers by ions, such as calcium and magnesium, present in injection water, well tubulars and *formation rock* results in polymer accumulation (col. 2, l. 20-27). Therefore, although Lockhart et al. fails to explicitly disclose wherein the metal of the subterranean formed metal polymer complex includes metal naturally present within the subterranean formation, since Dunleavy et al. teaches wherein polymers accumulate in a wellbore and formation as a result of crosslinking with metal ions found in the formation rock, and Lockhart et al. discloses wherein the method can be used to remove *all gels* that form between polymers crosslinked by a polyvalent metal ion, it would have been obvious to one having ordinary skill in the art to use the method of Lockhart et al. to not only remove gels formed by polymers with injected metal crosslinkers, but also those formed by crosslinking with metal ions naturally present within the formation. Furthermore, since Dunleavy et al. teaches that the presence of polyvalent metal ions in situ crosslinks polymers and results in polymer accumulation in situ, it is likely the polymers of Lockhart et al. would also naturally crosslink in the presence of metal ions from the formation rock, thereby providing for a metal polymer complex that *includes* metal naturally present within the subterranean formation as claimed.

Lockhart et al. fails to specify the subterranean formation as a shale formation. Nasr-El-Din et al. teaches methods of treating shale formations with various complexing agents (abstract), including some disclosed by Lockhart et al., for the purpose of removing various

scales from a shale formation so as to increase the production of oil or gas from the formation ([0016]). As such, it would have been obvious to one having ordinary skill in the art to try the method of Lockhart et al. within a shale formation in order to enhance the removal of scales, including polymer scale formed from a metal polymer complex therein, therefrom.

13. Claim 42 is rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al., Dunleavy et al. and Nasr-El-Din et al., as applied to claim 41, above, and, further, in view of Lai et al..

With respect to depending claim 42, Lockhart et al. discloses the injection of the metal polymer complex remediation mixture as noted above in the rejection of claim 41. The reference, however, fails to disclose alternately injecting the mixture and a second amount of a diverting mixture into the well, as claimed. Lai et al. teaches a method wherein a metal polymer complex formed from a polymer and injected source of ions can be contacted with a chelating agent (col. 3, l. 50-65) for the purpose of dissociating the complex and breaking the gel plug formed therefrom (col. 4, l. 20-38); the reference further teaches alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well for the purpose of diverting the remediation mixture to a desired zone (col. 5, l. 20-col. 6, l. 3, wherein an amount of polymer gel is injected into the well, subsequent to which a first amount of remediation mixture is injected, and subsequent to which a polymer diverting material is injecting so as to divert the remediation mixture to the oil-bearing zone). It would have been obvious to one having ordinary skill in the art to try an injection pattern as taught by Lai et al. in the method of Lockhart et al. in order to emplace the metal complexing agent in a desired additional zones wherein remediation is required.

Double Patenting

14. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(l)(1) - 706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the

form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

15. Claims 21-42 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-15 of U.S. Patent No. 10,202,834 ('834 herein – cited previously). Although the claims at issue are not identical, they are not patentably distinct from each other because the instant claims broadly encompass the subject matter previously patented in '834.

Response to Arguments

16. Applicant's arguments with respect to the abstract objection as set forth in the previous office action have been fully considered but they are not persuasive; the Examiner notes the new objection presented above with regard to the use of language that can be implied, along with the suggestion for beginning any newly submitted abstract in the future.

17. Applicant's arguments with respect to the 35 USC 112(b) rejections of claims 21-40 for use of the term "low" have been fully considered but they are not persuasive. Applicant asserts one of ordinary skill in the art would recognize the meaning of the claim with regard to what type of formations in which the method may be practiced and cites reference to several non-patent literature documents. Although these documents may discuss "low" permeability formations, it is unclear if such permeabilities are what is intended to be encompassed by the instant disclosure. The specification defines the darcy as a unit of permeability for fluids in a porous material, and mentions "nano-darcy" shale formations, without explicitly defining the highest value thereof that is considered to provide for a "low" permeability formation, and,

further, the specification states wherein embodiments of the method may be usable with any fractured well regardless of the permeability of the formation ([0055] of the specification as filed). As such, it is unclear as to whether the term "low" is intended to define any specific value of permeability onto the claims. Additionally, the Examiner cites evidence to "Unconventional Well Testing," wherein it is stated "Defining low permeability is difficult as it has different meanings to different people." Therefore, the rejection is maintained.

18. Applicant's amendments with respect to the rejection of claim 28 under 35 USC 112(d) are sufficient to overcome the rejection thereof. The rejection is withdrawn.

19. Applicant's arguments with respect to the rejections of claims as obvious over Lockhart, in view of Moses and Dunleavy have been fully considered but they are not persuasive.

Applicant notes the present application relates to methods that remediate subterranean formed metal polymer complexes that form from crosslinked metal ions naturally present within wells in a subterranean formation following introduction of a fracturing fluid, and not merely within a wellbore, while Lockhart contrastingly relates to methods for removing purposely placed water soluble gels from a petroleum reservoir. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., wherein the metal polymer complexes form from a fracturing fluid) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant asserts Lockhart discloses using the complexing agent to remove purposely placed polymer gels that are crosslinked by a known amount of crosslinker and does not suggest metal naturally present within the subterranean formation complexing polymers in fracturing

fluids. It is noted that the features upon which applicant relies (i.e., wherein the metal naturally present within the subterranean formation complexes polymers in *fracturing fluids*) are not recited in the rejected claim(s).

Additionally, the Examiner notes, Lockhart explicitly states "If the reservoir is *particularly rich in metal ions, as is the case with* Ca^{+2}*, could cause precipitation of certain complexing agents from their aqueous solutions, it is convenient to use a larger quantity of the complexing agent, in order to ensure that the quantity necessary for degelling the polymer remains in solution* (col. 3, l. 66- col. 4, l. 3). Therefore, Lockhart acknowledges and suggests metal ions within the subterranean formation interact with the injected complexing agent, and the amount of complexing agent injected considers the presence of metal ions present in the formation in order to ensure the polymer is degelled. Furthermore, the Examiner acknowledges Lockhart does not explicitly disclose wherein the metal ions naturally present within the formation are complexed with the polymers, but references the teachings of Dunleavy for this feature, based on Lockhart's suggestion that metal ions are present within a formation into which a polymer is injected.

With reference to Dunleavy, Applicant asserts Dunleavy relates to a process suitable for the near well bore environment and is only suitable for degrading and dispersing polymer accumulation in the near well bore environment. The Examiner directs Applicant's attention to the grounds of rejection presented above with respect to Dunleavy et al., wherein it is cited that polymers injected can crosslink ions such as calcium, i.e., the same ions noted as present in the method of Lockhart, that are present in formation rock, resulting in polymer accumulation (col. 2, l. 20-27). Therefore, it is the position of the Office, since Lockhart and Dunleavy teach

wherein polymers are injected into formation rock that includes naturally present calcium ions, the polymer will crosslink such calcium ions and result in an accumulation/plug.

With respect to Moses, Applicant summarizes the teachings of Moses as injecting a substrate for an enzyme into an acid-soluble rock and asserts the presently claimed methods are not for a substrate for an enzyme.

The Examiner acknowledges Applicant's summarization, but further points to the citations presented in the rejection above for the combination of Moses with Lockhart.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

With regard to the remaining combinations of references with Lockhart, Moses and Dunleavy, Applicant maintains the positions responded to above, and, as such, the Examiner maintains the response thereto with the responses set forth herein.

Should Applicant wish to expedite prosecution with the filing of an AFCP 2.0 amendment, Applicant is invited to add a specific step of fracturing the formation with a polymer containing fluid and/or a step of forming the metal polymer complex at a specific distance within the subterranean formation/from the wellbore, assuming support for such is found within the specification as filed, in order to distinguish the types of gels that may be formed within/on a subterranean formation at/near the wellbore from those Applicant is asserting is provided by the specification as filed.

20. Applicant's arguments, with respect to the rejections of claims as unpatentable over Horton, along with the references applied in combination therewith have been fully considered.

With regard to Applicant's second assertion of "Horton does not disclose or suggest treatment within subterranean formations (adjacent to the well) as presently claimed," the Examiner respectfully disagrees. Horton explicitly recites in claim 10 wherein the polyvalent metal cations may be derived from *at least one of* a group that includes the downhole formation.

Applicant further asserts xanthan is used to prevent penetration into the formation and the xanthan scale forms in the wellbore on equipment and potentially earth formation within the wellbore, and, therefore Horton does not disclose or suggest remediating subterranean-formed metal-polymer complexes that crosslink with metal ions naturally present within wells in subterranean formations, as claimed. The Examiner respectfully disagrees; Horton specifically states wherein polymers interact with polyvalent ions found downhole, causing crosslinking or some type of gelation of the polymer ([0019]). The reference further states wherein the invention uses a fluid to remove polymer scale from earthen formations ([0016]). As such, polyvalent ions found downhole in earthen formations appear to provide for the instantly claimed "subterranean formed metal polymer complex."

The Examiner notes Applicant's recitation of "adjacent to the well" in parentheses when asserting the reference fails to provide for the polymer "...to be within the subterranean formation (adjacent to the well) as presently claimed;" the instant claims do not recite the requirement for being "adjacent to the well" and by putting the phrase in parentheses, it is unclear if Applicant is equating "adjacent to the well" as "within the subterranean formation." Horton clearly discloses *at least* formation of the gels on earthen formations.

The Examiner notes, however, upon further consideration of the amount of metal complexing agent, the rejection has been withdrawn.

Conclusion

21. **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 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.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angela M DiTrani Leff whose telephone number is (571)272-2182. The examiner can normally be reached on Monday-Friday, 9AM-5PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doug Hutton can be reached on 5712724137. 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 Leff/
Primary Examiner, Art Unit 3674

ADL
06/19/19

Notice of References Cited	Application/Control No. 16/226,464	Applicant(s)/Patent Under Reexamination Conway et al.	
	Examiner Angela M DiTrani Leff	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
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Unconventional Well Testing, Halliburton, retrieved 12/16/19 from https://www.halliburton.com/en-US/ps/testing-subsea/reservoir-testing-analysis/data-acquisition/spidr/low-permeability-wells.html (Year: 2019)
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/226,464	Conway et al.
	Examiner	Art Unit
	Angela M DiTrani Leff	3674

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
updated search from parent application 14525038	06/18/2019	ADL
review of previous east search	12/16/2019	ADL

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

	/Angela M DiTrani Leff/ Primary Examiner, Art Unit 3674

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	Angela M. Ditrani Leff
Attorney Docket Number	04697.0003USC1

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.D.L./

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	1	Deglint, H.J., et al., "Live Imaging of Micro-Wettability Experiments Performed for Low-Permeability Oil Reservoirs", Scientific Reports, www.nature.com/scientificreports, 7:3247; DOI:10.1038/s41598-017-04239-x; pp 1-13 28, June 2017
	2	Solomon, S. and T. Tlach, "Carbon dioxide (CO2) injection processes and technology", Abstract from Chapter 14.5.1 Permeability in Developments and Innovation in Carbon Dioxide (CO2) Capture and Storage, 2010
	3	Kuuskraa, V., "Unconventional Natural Gas" Abstract from Advances in Energy Systems and Technology, V. 3, 1982
	4	Zendehboudi, S., and Alireza Bahadori, "Shale Gas Production Technologies", Abstract from Chapter 4.1 Artificial Well Stimulation, Shale Oil and Gas Handbook, 2017
	5	Surdam, R.C., et al., "Reducing Risk in Low-Permeability Gas Formations: Understanding the Rock/Fluid Characteristics of Rocky Mountain Laramide Basins", Final Technical Progress Report D.O.E. Award No. DE-FC26-01NT41325 Sept 20, 2003

If you wish to add additional non-patent literature document citation information please click the Add button [Add]

EXAMINER SIGNATURE

Examiner Signature	/Angela M DiTrani Leff/	Date Considered	12/16/2019

*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.

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Examiner Name	Angela M. Ditrani Leff
Attorney Docket Number	04697.0003USC1

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	/Melissa M. Hayworth/	Date (YYYY-MM-DD)	2019-11-22
Name/Print	Melissa M. Hayworth	Registration Number	45,774

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.**

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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 the Freedom of Information Act requires disclosure of these record s.

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.

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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 inspections 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.

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S121	3	(("4986356") or ("5678632") or ("5038864")).PN.	USPAT; USOCR	OR	OFF	2019/06/18 13:23
S122	3	(("20110053811") or ("5678632") or ("6265355")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/18 13:24
S123	4	(("20110053811") or ("5678632") or ("6265355") or ("8071511")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/18 13:29
S124	1	("4609475").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/19 12:10
S125	1	("20150114653").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/19 12:12
S126	1	("20140116710").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/19 12:30
S127	1	("10202834").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/19 12:41
S128	1	S127 and low.clm.	USPAT	OR	OFF	2019/06/19 12:41
S129	2	(("5678632") or ("5038864")).PN.	USPAT; USOCR	OR	OFF	2019/12/16 17:49
S130	1	("20190120037").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/12/16 17:49
S131	1	("10202834").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/12/16 17:56

EAST Search History (Interference)

< This search history is empty>

12/16/2019 7:50:09 PM
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	Angela M. Ditrani Leff
Attorney Docket Number	04697.0003USC1

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	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 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[5]

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	Filing Date	2018-12-19
	First Named Inventor	Andrew Bryce Conway
	Art Unit	3672
	Examiner Name	Angela M. Ditrani Leff
	Attorney Docket Number	04697.0003USC1

	1	Deglint, H.J., et al., "Live Imaging of Micro-Wettability Experiments Performed for Low-Permeability Oil Reservoirs", Scientific Reports, www.nature.com/scientificreports, 7:3247; DOI:10.1038/s41598-017-04239-x; pp 1-13 28, June 2017
	2	Solomon, S. and T. Tlach, "Carbon dioxide (CO2) injection processes and technology", Abstract from Chapter 14.5.1 Permeability in Developments and Innovation in Carbon Dioxide (CO2) Capture and Storage, 2010
	3	Kuuskraa, V., "Unconventional Natural Gas" Abstract from Advances in Energy Systems and Technology, V. 3, 1982
	4	Zendehboudi, S., and Alireza Bahadori, "Shale Gas Production Technologies", Abstract from Chapter 4.1 Artificial Well Stimulation, Shale Oil and Gas Handbook, 2017
	5	Surdam, R.C., et al., "Reducing Risk in Low-Permeability Gas Formations: Understanding the Rock/Fluid Characteristics of Rocky Mountain Laramide Basins", Final Technical Progress Report D.O.E. Award No. DE-FC26-01NT41325 Sept 20, 2003

If you wish to add additional non-patent literature document citation information please click the Add button Add

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.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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(Not for submission under 37 CFR 1.99)

Application Number	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	Angela M. Ditrani Leff
Attorney Docket Number	04697.0003USC1

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	/Melissa M. Hayworth/	Date (YYYY-MM-DD)	2019-11-22
Name/Print	Melissa M. Hayworth	Registration Number	45,774

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.**

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Electronic Patent Application Fee Transmittal

Application Number:	16226464
Filing Date:	19-Dec-2018
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Filer:	Erich Gess/Lisa Amos
Attorney Docket Number:	04697.0003USC1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

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

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 2 months with $0 paid	1252	1	600	600
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
		Total in USD ($)		**840**

Electronic Acknowledgement Receipt

EFS ID:	37835205
Application Number:	16226464
International Application Number:	
Confirmation Number:	3907
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Customer Number:	23552
Filer:	Erich Gess/Lisa Amos
Filer Authorized By:	Erich Gess
Attorney Docket Number:	04697.0003USC1
Receipt Date:	22-NOV-2019
Filing Date:	19-DEC-2018
Time Stamp:	15:33:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$840
RAM confirmation Number	E2019ALF34260435
Deposit Account	132725
Authorized User	Lisa Amos

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

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 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	Extension of Time	2019-11-22_04697-0003USC1_EOT.PDF	159581 379ea2e69f0a6b9254997c7f5770b874465f6d9d	no	2
Warnings:					
Information:					
2	Letter Requesting Interview with Examiner	2019-11-22_04697-0003USC1_Request-for-Interview.PDF	75240 086ac2ec5a2f610425822f6c299caa8cab684f10	no	1
Warnings:					
Information:					
3		2019-11-22_04697-0003USC1_NF-Response.PDF	262846 ebad26db0fb4a401a5a061978ae0db50e5228e40	yes	38

Multipart Description/PDF files in .zip description

Document Description	Start	End
Applicant Arguments/Remarks Made in an Amendment	9	38
Claims	3	8
Abstract	2	2
Amendment/Req. Reconsideration-After Non-Final Reject	1	1

Warnings:					
Information:					
4	Information Disclosure Statement (IDS) Form (SB08)	2019-10-17_04697-0003USC1_IDS-2.PDF	612688 e258d6d12d32fe4bf5ea99f2ce4f14c17467cb2e	no	4
Warnings:					
Information:					

A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and made available

within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.

5	Non Patent Literature	Deglint.PDF	18567704 741e790cfb2b0d363c2b28a79358055dfdea2bf4	no	13
Warnings:					
Information:					
6	Non Patent Literature	Solomon_Formation-Permeability.PDF	303023 26457e081056695e2570a67d9c3e3f1fa0c59a56	no	13
Warnings:					
Information:					
7	Non Patent Literature	Kuuskraa.PDF	842109 78ed4ab90105f0dc7bbc0a9967ac6c58903cff64	no	3
Warnings:					
Information:					
8	Non Patent Literature	Zendehboudi.PDF	887604 66dc0a02d984c11782812d274d64983e4cc69afb	no	2
Warnings:					
Information:					
9	Non Patent Literature	Surdam_Reducing_Risk.PDF	9463758 331dadaa662c0058ee0ee23f4fdb2fb84ac0f195	no	49
Warnings:					
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Information:					
10	Fee Worksheet (SB06)	fee-info.pdf	32667 0d57c772519546697 35ca6942fb5a36686be99bf	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	31207220	

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.

PTO/AIA/22 (03-13)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number (Optional): 04697.0003USC1

Application Number: 16/226,464

Filed: December 19, 2018

For: METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT

Art Unit: 3674

Examiner: Angela Marie Ditran Leff

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
☐ One month (37 CFR 1.17(a)(1))	$200	$100	$50	$
☑ Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$ 600
☐ Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐ Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐ Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 132725.

☑ Payment made via EFS-Web.

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.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 45774.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Melissa M. Hayworth/ — Signature

November 22, 2019 — Date

Melissa M. Hayworth — Typed or printed name

703.684.2522 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). 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 6 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.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Conway et al.	Examiner:	Leff, Angela M. Ditrani
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Title:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT		

REQUEST FOR INTERVIEW

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

Dear Commissioner:

The Applicant's representative respectfully requests a formal Interview with the Examiner to help advance prosecution of the subject application.

Respectfully submitted,

22 November 2019

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REMARKS

Claims 21-42 are currently pending, with claims 21 and 41 being independent. In the present response, claim 28 has been amended for additional clarity, and the Abstract has been amended to address an informality. Support for the amendments can be found throughout the specification, including in the original claims. Therefore, no new matter has been added.

Applicants respectfully request the Examiner to reconsider and withdraw the outstanding rejections in view of the foregoing amendments and the following remarks. If the present response is not deemed persuasive, Applicants' representative requests an opportunity to discuss any outstanding rejections with the Examiner and submits herewith a formal Request for Interview.

Objections to the Specification

The Abstract of the Disclosure has been objected to for improper language. To expedite prosecution, Applicants submit an amended Abstract herein removing the objected to phrase. Thus, Applicants respectfully request that the rejection be withdrawn.

Claim Rejections Under 35 U.S.C. § 112

Claims 21-40 are rejected under 35 U.S.C. § 112(b) as allegedly being indefinite for recitation of the term "low" with regard to a "low permeability subterranean formation". Applicants respectfully traverse this rejection.

Applicants submit that the claim term "low permeability formation" is a term that is well understood to those of skill in this art and has a recognized meaning. The term "low permeability" with regard to formations is commonly used in this art and a search of literature relating to formations and formation permeability readily demonstrates the acceptance of this description in the industry. Since those of skill in the art so readily utilize this description in describing formations, one of skill in the art readily would understand the meaning of this claim term with regard to formations and one of skill in the art would not view it as unclear. Moreover, one of ordinary skill in the art would understand the type of formations in which the method is to be practiced.

As evidence of the widespread use and understanding in the industry, Applicants submit herewith copies of several references utilizing this phrase:

Solomon, S. and T. Tlach, "Carbon dioxide (CO2) injection processes and technology", Abstract from Chapter 14.5.1 Permeability in Developments and Innovation in Carbon Dioxide (CO2) Capture and Storage, 2010;

Zendehboudi, S., and Alireza Bahadori, "Shale Gas Production Technologies", Abstract from Chapter 4.1 Artificial Well Stimulation, Shale Oil and Gas Handbook, 2017;

Kuuskraa, V., "Unconventional Natural Gas" Abstract from Advances in Energy Systems and Technology, V. 3, 1982;

Surdam, R.C., et al., "Reducing Risk in Low-Permeability Gas Formations: Understanding the Rock/Fluid Characteristics of Rocky Mountain Laramide Basins", Final Technical Progress Report D.O.E. Award No. DE-FC26-01NT41325 Sept 20, 2003; and

Deglint, H.J., et al., "Live Imaging of Micro-Wettability Experiments Performed for Low-Permeability Oil Reservoirs", Scientific Reports, www.nature.com/scientificreports, 7:3247; DOI:10.1038/s41598-017-04239-x; pp 1-13 28, June 2017.

Applicant notes that these references are merely exemplary and again, a search of the literature relating to formations demonstrates the widely accepted use and understanding of this description to those of skill in the art.

Accordingly, Applicants respectfully request that this rejection be withdrawn.

Claim 28 is rejected under 35 U.S.C. § 112(d) as allegedly being improper dependent. To expedite prosecution, claim 28 has been to remove "about" from the claim phrase "between about 0.1 %". Accordingly, Applicants respectfully request that the rejection be withdrawn.

Claim Rejections Under 35 U.S.C. § 103

Claims 21-25, 28, and 36-40 are rejected under 35 U.S.C. § 103 as allegedly being obvious over Lockhart (US 4,986,356) in view of Moses (US 5,678,632) and Dunleavy (U.S. 5,038,864). Applicants respectfully traverse the rejection and the characterization of the claims and references.

Claim 21 is directed to a method for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a low permeability subterranean formation. The method comprises:

providing a metal-polymer complex remediation mixture comprising between 0.1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well ***at a pressure less than a fracture pressure of the subterranean formation*** until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation***;

maintaining the metal-polymer complex remediation mixture ***in contact with the subterranean-formed metal-polymer complex*** for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal and thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving hydrocarbon production of the well.

As explained in the specification, the present application and claims relate to methods for remediating subterranean-formed metal-polymer complexes, such as polyacrylamide or other gellable polymers that crosslink with ***metal ions, naturally present within wells in subterranean formations***. As such, the presently claimed method acts ***within the subterranean formation***, not merely within a wellbore. Following the introduction of a hydraulic fracturing fluid, including slickwater, where high volumes of polymers such as polyacrylamide are used as friction

reducers, into a well bore, over time the well production can decrease. The presently claimed methods ***restore or enhance the productivity*** of these wells.

In contrast, Lockhart relates to a method for removing ***purposely placed water soluble gels*** from a petroleum reservoir. Lockhart discusses improving recovery of petroleum in zones of lesser permeability by partially or completely occluding the higher permeability zones. (Col. 1, ll 19-33). Lockhart discloses that the occlusion can be carried out using polymer gels and the gels most widely used are those obtained from water-soluble polymers crosslinked with polyvalent metal ions. (Col. 1, ll. 39-54).

Lockhart then goes on to describe that a problem connected with the use of polymer gels, which has not been solved, is that of removing the gelled polymers when they have performed their tasks or for incorrect positioning. (Col. 2, ll. 16-32). Accordingly, Lockhart is focused on solving this problem – of ***removing purposefully-placed polymer gels*** and thus, re-opening ***purposefully occluded zones.*** Lockhart describes ***forming the gels crosslinked with polyvalent metal ions used in crosslinking the polymers and injecting into the well to create an occlusion.***

As such, Lockhart discloses using a complexing agent to remove these ***purposefully-placed polymer gels*** designed and crosslinked with ***known amount of crosslinker***. The gels are formed from water-soluble polymers crosslinked with polyvalent metal ions used in crosslinking the polymers and injected into the well to create an occlusion. Accordingly, the method of Lockhart is implemented by injecting a quantity of complexing agent at a molar ratio to the known crosslinking ion, and this molar ratio readily can be calculated.

As such, Lockhart does **not** disclose or suggest ***metal naturally present within the subterranean formation complexing with polymers in fracturing fluids***. Lockhart describes forming the gels crosslinked with polyvalent metal ions and injecting into the well to create an occlusion, as such purposefully placing the gels and purposefully creating an occlusion.

Accordingly, Lockhardt cannot disclose or suggest at least the presently claimed steps of injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation***; and maintaining the metal-polymer complex remediation mixture ***in***

contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal and thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components.

It is critical that Lockhart fails to disclose or suggest the presently claimed method of treatment that addresses complexes formed by crosslinking with ***metal ions naturally present within the formation***. In contrast, Lockhart treats gels formed with known formulated crosslinking metal ions. **Importantly, Lockhart fails to address, or even contemplate, that polymers would react with metals in the formation.**

Since Lockhart is addressing ***purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker, Lockhart knows exactly how much polymer gel will go into the fluid.*** As such, Lockhart is able to provide a particular molar ratio of complexing agent to crosslinking metal ions. (see Col. 3, ll. 60-65). In contrast, in accordance with the presently claimed method, the treatment addresses complexes formed by crosslinking with metal ions naturally present within the formation. One of ordinary skill in the art would understand that a molar ratio ***cannot*** be derived from mere suspected, but unquantified, crosslinking by heterogeneous amounts and types of metal ions naturally present in the subterranean formation.

Lockhart further fails to disclose or suggest an injection pressure, and as such, Lockhart cannot disclose or suggest injection of the treatment mixture at a pressure less than the fracture pressure.

Moses as cited and its full disclosure fails to address the many above-noted deficiencies of Lockhart.

Moses relates to a method of acidizing an underground reservoir comprising injecting a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme, and then allowing the enzyme to catalyze the conversion of the substrate into the acid. Moses is specific to dissolving acid-soluble rock structures by acid dissolution (i.e., $CaCO_3$).

In contrast to Moses, in the presently claimed methods the particularly recited metal complexing agents are **not** a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme.

Further, Moses teaches that acids react quickly with minerals, particularly carbonates, and are consumed by the reaction, and penetration of acid into the formation is limited by the rapid rate at which the acid is consumed by the reaction. (Col. 1, ll. 45-65). Thus, the invention of Moses focuses on utilizing a substrate for an enzyme, which substrate is capable of being converted into an organic acid by the enzyme, and the enzyme – this is the premise of Moses' claimed inventive step. As such, Moses clearly teaches away from injecting the presently claimed metal complexing agents including ***acids*** because Moses cautions that acids rapidly are consumed by reaction with rock minerals and the invention of Moses focuses on a solution for this problem.

Moreover, one of ordinary skill in the art also readily would understand that Lockhart works by a different mechanism than Moses; thus, it would be inappropriate to combine any features of Moses with Lockhart. As described above, Moses discloses a method of acidizing reservoir minerals using in-situ produced acid to dissolve acid-soluble rock structures (i.e., $CaCO_3$). In contrast, Lockhart addresses purposefully-placed polymer gels designed and crosslinked with a known amount of crosslinker.

Neither Lockhart nor Moses disclose or suggest providing complexing agent to remove metal ions from metal-polymer complexes formed by crosslinking with metal ions ***naturally present within the formation***.

Dunleavy as cited and its full disclosure fails to address the many above-noted deficiencies of Lockhart and Moses.

Dunleavy relates to a process for increasing the permeability of a subterranean formation which is at least partially plugged with a polymer accumulation using an aqueous treating fluid comprising hydrogen peroxide. Dunleavy discloses that the process is suitable for the ***near well bore environment***. As such, the process of Dunleavy is only suitable for degrading and dispersing polymer accumulation in the near well bore environment. Dunleavy teaches that hydrogen peroxide reacts with and degrades the polymer without any reliance on presence or quantity of crosslinking ions. (Col. 6, ll. 16-29)

Accordingly, one of ordinary skill in the art would not combine Lockhart, Moses, and Dunleavy. Lockhart is addressing purposefully-placed polymer gels, which were designed and crosslinked with known amount of crosslinker and which were purposefully-placed to create occlusions. Moses relates to a method of acidizing an underground reservoir comprising injecting a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme, and then allowing the enzyme to catalyze the conversion of the substrate into the acid. Dunleavy focuses on a process of injecting hydrogen peroxide into the near well bore environment to degrade and disperse the polymer accumulation. Importantly, neither Moses nor Dunleavy discloses or suggests addressing purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker (as is the focus of Lockhart).

Moreover, even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a low permeability subterranean formation.

Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest injecting the metal-polymer complex remediation mixture into the well ***at a pressure less than a fracture pressure of the subterranean formation*** until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation***.

Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest maintaining the metal-polymer complex remediation mixture ***in contact with the subterranean-formed metal-polymer complex*** for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause ***the subterranean-formed metal-polymer complex*** to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components.

Applicant further notes that it is improper to use the claims "as a frame," and take the "naked parts of separate prior art references [ ] as a mosaic to recreate a facsimile of the claimed invention" without a finding of why ordinary artisans would have found that mosaic obvious,

improperly employs hindsight bias. See W.L. Gore & Assocs., Inc. v. Garlock, Inc. 721 F.2d 1540, 1552-53 (Fed. Cir. 1983).

For at least these reasons, claims 21-25, 28, and 36-40 are not obvious over Lockhart in view of Moses and Dunleavy. Accordingly, Applicants respectfully request that the Examiner withdraw this outstanding rejection under 35 U.S.C. §103(a).

Claims 31-34 are rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart (US 4,986,356), in view of Moses (US 5,678,632) and Dunleavey (U.S. 5,038,864), as applied to claim 21, above, and further in view of Hanlon (U.S. 4,609,475). Applicants respectfully traverse the rejection and the characterization of the claims and references.

Lockhart is focused on solving the problem of ***removing purposefully-placed polymer gels*** and thus, re-opening ***purposefully occluded zones.*** Lockhart describes ***forming gels crosslinked with polyvalent metal ions used in crosslinking the polymers and injecting into the well to create an occlusion.*** As such, Lockhart is addressing ***purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker***, and Lockhart knows exactly how much polymer gel will go into the fluid. **Lockhart fails to address or even contemplate that polymers would react with metals in the formation.**

As described above with regard to claim 21, one of ordinary skill in the art would not combine Lockhart, Moses, and Dunleavy. Moreover, even if combined, Moses and Dunleavy do not address or cure the many above-noted deficiencies of Lockhart. Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a low permeability subterranean formation.

Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest injecting the metal-polymer complex remediation mixture into the well ***at a pressure less than a fracture pressure of the subterranean formation*** until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation***.

Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest maintaining the metal-polymer complex remediation mixture ***in contact with the subterranean-formed metal-polymer complex*** for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the ***subterranean-formed metal-polymer complex*** to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components.

Hanlon is cited merely as disclosing carboxylic acids as pH modifiers. The method of Hanlon requires both ***an oxidizing agent*** **and** a carboxylic acid and the oxidizing agent provides free radicals. Accordingly, as cited and in its full disclosure, Hanlon fails to address the many above-noted deficiencies of Lockhart, Moses, and Dunleavy. Even if combined Lockhart in view of Moses, Dunleavy, and Hanlon do not disclose or suggest the presently claimed methods.

For at least these reasons, Applicants respectfully request that the Examiner withdraw this outstanding rejection under 35 U.S.C. §103(a).

Claims 26, 29, and 30 are rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart (US 4,986,356), in view of Moses (US 5,678,632) and Dunleavey (U.S. 5,038,864), as applied to claim 21, respectively, above, and further in view of Nasr-El-Din (U.S. 2014/0116710). Claim 27 is rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart (US 4,986,356), in view of Moses (US 5,678,632), Dunleavey (U.S. 5,038,864 and Nasr-El-Din (U.S. 2014/0116710), as applied to claim 26, respectively, above, and, further, in view of Hanlon et al. Applicants respectfully traverse the rejection and the characterization of the claims and references.

Lockhart is focused on solving the problem of ***removing purposefully-placed polymer gels*** and thus, re-opening ***purposefully occluded zones.*** Lockhart describes ***forming gels crosslinked with polyvalent metal ions used in crosslinking the polymers and injecting into the well to create an occlusion.*** As such, Lockhart is addressing ***purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker***, and Lockhart knows exactly how much polymer gel will go into the fluid. **Lockhart fails to address or even contemplate that polymers would react with metals in the formation.**

As described above with regard to claim 21, one of ordinary skill in the art would not combine Lockhart, Moses, and Dunleavy. Moreover, even if combined, Moses and Dunleavy do not address or cure the many above-noted deficiencies of Lockhart. Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a low permeability subterranean formation.

Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest injecting the metal-polymer complex remediation mixture into the well ***at a pressure less than a fracture pressure of the subterranean formation*** until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation***.

Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest maintaining the metal-polymer complex remediation mixture ***in contact with the subterranean-formed metal-polymer complex*** for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components.

Nasr-El-Din is cited merely as disclosing additives. Nasr-El-Din focuses on dissolving soluble and partially soluble rock (i.e., $CaCO_3$ and other soluble inorganic components). Accordingly, as cited and in its full disclosure, Nasr-El-Din fails to address the many above-noted deficiencies of Lockhart, Moses, and Dunleavy. Even if combined, Lockhart in view of Moses, Dunleavy, and Nasr-El-Din do not disclose or suggest the presently claimed methods.

Hanlon is cited merely as disclosing carboxylic acids as pH modifiers. The method of Hanlon requires both ***an oxidizing agent*** **and** a carboxylic acid and the oxidizing agent provides free radicals. Accordingly, as cited and in its full disclosure, Hanlon fails to address the many above-noted deficiencies of Lockhart, Moses, Dunleavy, and Nasr-El-Din.

For at least these reasons, Applicants respectfully request that the Examiner withdraw these outstanding rejections under 35 U.S.C. §103(a).

Claim 35 is rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart et al. (US 4,986,356), in view of Moses (US 5,678,632) and Dunleavey et al. (U.S. 5,038,864), as applied to claim 21, above, and further in view of Lai et al. (U.S. 6,265,355). Applicants respectfully traverse the rejection and the characterization of the claims and references.

Lockhart is focused on solving the problem of ***removing purposefully-placed polymer gels*** and thus, re-opening ***purposefully occluded zones.*** Lockhart describes ***forming gels crosslinked with polyvalent metal ions used in crosslinking the polymers and injecting into the well to create an occlusion.*** As such, Lockhart is addressing ***purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker***, and Lockhart knows exactly how much polymer gel will go into the fluid. **Lockhart fails to address or even contemplate that polymers would react with metals in the formation.**

As described above with regard to claim 21, one of ordinary skill in the art would not combine Lockhart, Moses, and Dunleavy. Moreover, even if combined, Moses and Dunleavy do not address or cure the many above-noted deficiencies of Lockhart. Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a low permeability subterranean formation.

Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest injecting the metal-polymer complex remediation mixture into the well ***at a pressure less than a fracture pressure of the subterranean formation*** until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation***.

Even if combined, Lockhart, Moses, and Dunleavy do not disclose or suggest maintaining the metal-polymer complex remediation mixture ***in contact with the subterranean-formed metal-polymer complex*** for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid

comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components.

Lai is cited merely as disclosing alternatively injecting the mixture and a second amount of a diverting mixture. Lai does not relate to methods for remediating pre-existing wells or treatments of wells from which hydrocarbons have been produced. Moreover, Lai relates to breaking a gel that is formed by a crosslinkable polymer and a crosslinking agent. Thus, the amount of gel is known in Lai is known, in contrast to gellable polymers that crosslink with ***metal ions, naturally present within wells in subterranean formations*** as presently claimed. Accordingly, as cited and in its full disclosure, Lai fails to address the many above-noted deficiencies of Lockhart, Moses, and Dunleavy. Even if combined Lockhart in view of Moses, Dunleavy, and Lai do not disclose or suggest the presently claimed methods.

For at least these reasons, Applicants respectfully request that the Examiner withdraw this outstanding rejection under 35 U.S.C. §103(a).

Claim 41 is rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart (US 4,986,356), in view of Moses (US 5,678,632), Dunleavey (U.S. 5,038,864 and Nasr-El-Din (U.S. 2014/0116710). Applicants respectfully traverse the rejection and the characterization of the claims and references.

Claim 41 is directed to a method for remediating a subterranean-formed metal-polymer complex in an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation. The method comprises:

observing a well production decrease;

providing a metal-polymer complex remediation mixture containing between 1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well ***at a pressure less than a fracture pressure of the subterranean shale formation*** until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation***;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

As explained in the specification, the present application and claims relate to methods for remediating subterranean-formed metal-polymer complexes, such as polyacrylamide or other gelable polymers that crosslink with ***metal ions, naturally present within wells in subterranean shale formations***. As such, the presently claimed method acts ***within the subterranean formation***, not merely within a wellbore. Following the introduction of a hydraulic fracturing fluid, including slickwater, where high volumes of polymers such as polyacrylamide are used as friction reducers, into a well bore, over time the well production can decrease. The presently claimed methods ***restore or enhance the productivity*** of these wells.

In contrast, Lockhart relates to a method for removing ***purposely placed water soluble gels*** from a petroleum reservoir. Lockhart discusses improving recovery of petroleum in zones of lesser permeability by partially or completely occluding the higher permeability zones. (Col. 1, ll 19-33). Lockhart discloses that the occlusion can be carried out using polymer gels and the gels most widely used are those obtained from water-soluble polymers crosslinked with polyvalent metal ions. (Col. 1, ll. 39-54).

Lockhart then goes on to describe that a problem connected with the use of polymer gels, which has not been solved, is that of removing the gelled polymers when they have performed their tasks or for incorrect positioning. (Col. 2, ll. 16-32). Accordingly, Lockhart is focused on solving this problem – of ***removing purposefully-placed polymer gels*** and thus, re-opening ***purposefully occluded zones.*** Lockhart describes ***forming the gels crosslinked with polyvalent metal ions used in crosslinking the polymers and injecting into the well to create an occlusion.***

As such, Lockhart discloses using a complexing agent to remove these ***purposefully-placed polymer gels*** designed and crosslinked with ***known amount of crosslinker***. The gels are formed from water-soluble polymers crosslinked with polyvalent metal ions used in crosslinking the polymers and injected into the well to create an occlusion. Accordingly, the method of Lockhart is implemented by injecting a quantity of complexing agent at a molar ratio to the known crosslinking ion, and this molar ratio readily can be calculated.

As such, Lockhart does **not** disclose or suggest ***metal naturally present within the subterranean shale formation complexing with polymers in fracturing fluids***. Lockhart describes forming the gels crosslinked with polyvalent metal ions and injecting into the well to create an occlusion, as such purposefully placing the gels and purposefully creating an occlusion.

Accordingly, Lockhardt cannot disclose or suggest at least the presently claimed steps of injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation***; and maintaining the metal-polymer complex remediation mixture ***in contact with the subterranean-formed metal-polymer complex*** for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal and thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components.

It is critical that Lockhart fails to disclose or suggest the presently claimed method of treatment that addresses complexes formed by crosslinking with ***metal ions naturally present within the formation***. In contrast, Lockhart treats gels formed with known formulated crosslinking metal ions. **Importantly, Lockhart fails to address or even contemplate that polymers would react with metals in the formation.**

Since Lockhart is addressing ***purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker, Lockhart knows exactly how much polymer gel will go into the fluid.*** As such, Lockhart is able to provide a particular molar ratio of complexing agent to crosslinking metal ions. (see Col. 3, ll. 60-65). In contrast, in accordance with the presently

claimed method, the treatment addresses complexes formed by crosslinking with metal ions naturally present within the formation. One of ordinary skill in the art would understand that a molar ratio ***cannot*** be derived from mere suspected, but unquantified, crosslinking by heterogeneous amounts and types of metal ions naturally present in the subterranean formation.

Lockhart further fails to disclose or suggest an injection pressure, and as such, Lockhart cannot disclose or suggest injection of the treatment mixture at a pressure less than the fracture pressure.

Moses as cited and its full disclosure fails to address the many above-noted deficiencies of Lockhart.

Moses relates to a method of acidizing an underground reservoir comprising injecting a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme, and then allowing the enzyme to catalyze the conversion of the substrate into the acid. Moses is specific to dissolving acid-soluble rock structures by acid dissolution (i.e., $CaCO_3$). As such, Moses focuses on carbonate rock structures.

In contrast to Moses, in the presently claimed methods the particularly recited metal complexing agents are **not** a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme.

Further, Moses teaches that acids react quickly with minerals, particularly carbonates, and are consumed by the reaction, and penetration of acid into the formation is limited by the rapid rate at which the acid is consumed by the reaction. (Col. 1, ll. 45-65). Thus, the invention of Moses focuses on utilizing a substrate for an enzyme, which substrate is capable of being converted into an organic acid by the enzyme, and the enzyme – this is the premise of Moses' claimed inventive step. As such, Moses clearly teaches away from injecting the presently claimed metal complexing agents including ***acids*** because Moses cautions that acids rapidly are consumed by reaction with rock minerals and the invention of Moses focuses on a solution for this problem.

Moreover, one of ordinary skill in the art also readily would understand that Lockhart works by a different mechanism than Moses; thus, it would be inappropriate to combine any features of Moses with Lockhart. As described above, Moses discloses a method of acidizing reservoir minerals using in-situ produced acid to dissolve acid-soluble rock structures (i.e.,

$CaCO_3$). In contrast, Lockhart addresses purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker.

Neither Lockhart nor Moses disclose or suggest providing complexing agent to remove metal ions from metal-polymer complexes formed by crosslinking with metal ions ***naturally present within the formation***.

Dunleavy as cited and its full disclosure fails to address the many above-noted deficiencies of Lockhart and Moses.

Dunleavy relates to a process for increasing the permeability of a subterranean formation which is at least partially plugged with a polymer accumulation using an aqueous treating fluid comprising hydrogen peroxide. Dunleavy discloses that the process is suitable for the ***near well bore environment***. As such, the process of Dunleavy is only suitable for degrading and dispersing polymer accumulation in the near well bore environment. Dunleavy teaches that hydrogen peroxide reacts with and degrades the polymer without any reliance on presence or quantity of crosslinking ions. (Col. 6, ll. 16-29).

As cited and in its full disclosure, Nasr-El-Din fails to address the many above-noted deficiencies of Lockhart, Moses, and Dunleavy.

Nasr-El-Din focuses on dissolving soluble and partially soluble rock (i.e., $CaCO_3$ and other soluble inorganic components). Moreover, Nasr-El-Din does **not** relate to methods for remediating an ***existing, low-producing well*** in a hydrocarbon-bearing subterranean formation.

Accordingly, one of ordinary skill in the art would not combine Lockhart, Moses, Dunleavy, and Nasr-El-Din. Lockhart is addressing purposefully-placed polymer gels, which were designed and crosslinked with known amount of crosslinker and which were purposefully-placed to create occlusions. Moses relates to a method of acidizing an underground reservoir comprising injecting a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme, and then allowing the enzyme to catalyze the conversion of the substrate into the acid. And Moses focuses on carbonate rock structures and dissolve carbonates (i.e., $CaCO_3$) by acid dissolution. Dunleavy focuses on a process of injecting hydrogen peroxide into the near well bore environment to degrade and disperse the polymer accumulation. Nasr-El-Din focuses on dissolving soluble and partially soluble rock (i.e., $CaCO_3$ and other soluble inorganic components). As such, Nasr-El-Din focuses dissolving

carbonates. Moreover, Nasr-El-Din does not relate to methods for remediating an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation. Importantly, none of Moses, Dunleavy, and Nasr-El-Din discloses or suggests addressing purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker (as is the focus of Lockhart).

Moreover, even if combined, Lockhart, Moses, Dunleavy, and Nasr-El-Din do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex in a pre-existing, low-producing well in a low permeability subterranean shale formation. Even if combined, Moses, Dunleavy, and Nasr-El-Din do not address or cure the many above-noted deficiencies of Lockhart.

Even if combined, Lockhart, Moses, Dunleavy, and Nasr-El-Din do not disclose or suggest injecting the metal-polymer complex remediation mixture into the well ***at a pressure less than a fracture pressure of the subterranean shale formation*** until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean shale formation***.

Even if combined, Lockhart, Moses, Dunleavy, and Nasr-El-Din do not disclose or suggest maintaining the metal-polymer complex remediation mixture ***in contact with the subterranean-formed metal-polymer complex*** for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components.

Applicant further notes that it is improper to use the claims "as a frame," and take the "naked parts of separate prior art references [ ] as a mosaic to recreate a facsimile of the claimed invention" without a finding of why ordinary artisans would have found that mosaic obvious, improperly employs hindsight bias. See *W.L. Gore & Assocs., Inc. v. Garlock, Inc.* 721 F.2d 1540, 1552-53 (Fed. Cir. 1983).

For at least these reasons, claim 41 is not obvious over Lockhart in view of Moses, Dunleavy, and Nasr-El-Din. Accordingly, Applicants respectfully request that the Examiner withdraw this outstanding rejection under 35 U.S.C. §103(a).

Claim 42 is rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Lockhart (US 4,986,356), in view of Moses (US 5,678,632), Dunleavey (U.S. 5,038,864) and Nasr-El-Din (U.S. 2014/0116710), as applied to claim 41, above, and, further, in view of Lai et al. (U.S. 6,265,355). Applicants respectfully traverse the rejection and the characterization of the claims and references.

As described above, one of ordinary skill in the art would not combine Lockhart, Moses, Dunleavy, and Nasr-El-Din. Lockhart is addressing purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker Moses relates to a method of acidizing an underground reservoir comprising injecting a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme, and then allowing the enzyme to catalyze the conversion of the substrate into the acid. And Moses focuses on carbonate rock structures and dissolve carbonates (i.e., $CaCO_3$) by acid dissolution. Dunleavy focuses on a process of injecting hydrogen peroxide into the near well bore environment to degrade and disperse the polymer accumulation. Nasr-El-Din focuses on dissolving soluble and partially soluble rock (i.e., $CaCO_3$ and other soluble inorganic components). As such, Nasr-El-Din focuses dissolving carbonates. Moreover, Nasr-El-Din does not relate to methods for remediating an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation. None of Moses, Dunleavy, and Nasr-El-Din discloses or suggests addressing purposefully-placed polymer gels designed and crosslinked with known amount of crosslinker (as is the focus of Lockhart).

In addition, Dunleavy injects hydrogen peroxide into the near well bore environment sufficient to degrade and disperse polymer accumulation. Lockhart does not allow any quantity of complexing agent to remove metal-polymer complexes formed by crosslinking with metal ions naturally present within the formation. Rather, Lockhart allocates enough complexing agent solely for the known quantity included above ground. Dunleavy teaches that hydrogen peroxide

reacts with and degrades the polymer without any reliance on presence or quantity of crosslinking ions and is only specific to the near well bore environment.

Moreover, even if combined, Lockhart, Moses, Dunleavy, and Nasr-El-Din do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex ***in an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation***.

Even if combined, Lockhart, Moses, Dunleavy, and Nasr-El-Din do not disclose or suggest observing a well production decrease; injecting the metal-polymer complex remediation mixture into the well ***at a pressure less than a fracture pressure of the subterranean shale formation*** until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean shale formation***. Even if combined, Lockhart, Moses, Dunleavy, and Nasr-El-Din do not disclose or suggest maintaining the metal-polymer complex remediation mixture ***in contact with the subterranean-formed metal-polymer complex*** for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components.

Lai is cited merely as disclosing alternatively injecting the mixture and a second amount of a diverting mixture. Lai does not relate to methods for remediating existing, low-producing wells or treatments of wells from which hydrocarbons have been produced. Moreover, Lai relates to breaking a gel that is formed by a crosslinkable polymer and a crosslinking agent. Thus, the amount of gel is known in Lai is known, in contrast to gellable polymers that crosslink with ***metal ions, naturally present within wells in subterranean shale formations*** as presently claimed. Accordingly, as cited and in its full disclosure, Lai fails to address the many above-noted deficiencies of Lockhart, Moses, and Dunleavy. Even if combined Lockhart in view of Moses, Dunleavy, Nasr-El-Din, and Lai do not disclose or suggest the presently claimed methods.

For at least these reasons, Applicants respectfully request that the Examiner withdraw this outstanding rejection under 35 U.S.C. §103(a).

Claims 21-40 are rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Horton (US 2011/0053811), in view of Moses (US 5,678,632) and Lai (U.S. 6,265,355). Applicants respectfully traverse the rejection and the characterization of the claims and references.

Claim 21 is directed to a method for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a low permeability subterranean formation. The method comprises:

providing a metal-polymer complex remediation mixture comprising between 0.1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well ***at a pressure less than a fracture pressure of the subterranean formation*** until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation***;

maintaining the metal-polymer complex remediation mixture ***in contact with the subterranean-formed metal-polymer complex*** for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal and thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving hydrocarbon production of the well.

As explained in the specification, the present application and claims relate to methods for remediating subterranean-formed metal-polymer complexes, such as polyacrylamide or other gelable polymers that crosslink with ***metal ions, naturally present within wells in subterranean formations***. As such, the presently claimed method acts ***within the subterranean formation***, not merely within a wellbore. Following the introduction of a hydraulic fracturing fluid, including

slickwater, where high volumes of polymers such as polyacrylamide are used as friction reducers, into a well bore, over time the well production can decrease. The presently claimed methods ***restore or enhance the productivity*** *of these wells.*

In contrast, Horton relates to methods for remediating and/or preventing polymer deposition on surfaces of drilling machinery and earth formations within the wellbore. Specifically, Horton focuses on ***methods of remediating xanthan deposition***. Horton discloses that xanthan is a good choice of a viscosifying additive and its use in wellbore fluids is well known. Horton teaches specifically that the mechanism of the chelating agent is toward the metal ions, rather than the polymer.

Horton is deficient in at least three ways.

First, Applicants assert that the arguments about scaling the amount of chelating agent to arrive at the present claims cannot be found in Horton and instead improperly rely on using Applicants' disclosure and claims as a guide.

Applicants strenuously disagree that since, in the example of Horton wherein the chelating agent has a presence which is half of that of the xanthan, it would have been obvious to one having ordinary skill in the art, when scaling up the disclosed example so as to provide remediation of a metal-xanthan complex in an actual wellbore setting, to try an amount of chelating agent in the remediation mixture that is about half of the amount of xanthan, i.e., 0.05 to 3.5 wt%. Applicants further disagree that one of ordinary skill in the art would do this to provide an amount of chelating agent capable of complexing the metal-xanthan complex formed in the wellbore since Horton illustrates that a presence of chelating agent that is half that of the polymer (which it is remediating) is capable of achieving the intended results.

Horton teaches specifically that the mechanism of the chelating agent is toward the metal ion, rather than the polymer. Horton provides that as used therein, "chelating agent" is a compound whose molecular structure can envelop and/or sequester a certain type of ion in a stable and soluble complex. When sequestered inside the complex, the cations have a limited ability to react with other ions, clays or polymers, for example." (paragraph [0016]). As further taught in Horton, one of ordinary skill in the art would recognize that selection of the chelating agent may depend on the metal scale to be dissolved. In particular, the selection of the chelating agent may be related to the specificity of the chelating agent to the particular scaling cation, the

log K value, the optimum pH for sequestering and the commercial availability of the chelating agent, as well as downhole conditions, etc. (paragraph [0037]).

Applicants note that the relationship between the chelating agent and xanthan taught by Horton is the relative stability the bond that each forms with the metal ion (i.e., stability of chelating agent-metal vs xanthan-metal bond). However, Horton makes no reference to quantity of xanthan to chelating agent.

Rather, Horton teaches at paragraphs [0039] and [0040] that as the wellbore fluid encounters polyvalent ions, the chelating agent may complex with the polyvalent ion to form a chelated complex. The bonds between the sequestered polyvalent ion and the chelating agent may be any combination of coordination or ionic bonds. The resultant chelated complex has enhanced stability through the chelant effect, relative to crosslinking with the reactive groups of the polymer, for example the carboxylic groups of the xanthan biopolymer.

Horton provides no teaching or guidance on scaling up. **It is improper to imply the scaling should be in relation to xanthan – which would be in contrast to Horton's teaching that the chelating agent is added relative to the metal ion.**

Moreover, Horton provides only a single example under one condition, which provides no logical basis for asserting that Horton illustrates a rule that in fact is contradictory to Horton's actual teaching regarding that the amount of chelating agent is in relation to the metal ion.

As such, Horton teaches a chelating agent concentration that is six orders of magnitude less than the chelating agent concentration recited in claim 21. As recited in claim 21, 0.1% by weight is 1,000 parts per million or 1,000,000 parts per billion (ppb). Thus, Horton's teaching of 1 part per billion is six orders of magnitude less than 1,000,000 parts per billion recited in claim 21. The rejection of claim 21 over Horton is improper for at least these reasons.

Second, Horton does not disclose or suggest treatment **within** subterranean formations (adjacent to the well) as presently claimed. Horton clearly describes well bore fluids and **preventing** penetration into the formation. Horton describes that xanthan is utilized **to prevent penetration** into the formation. (see [0009].) Horton focuses on remediating and/or preventing polymer deposition on **surfaces of drilling machinery and earth formations within the wellbore**.

Finally, Horton does not disclose of suggest improving production from the well by the methods disclosed therein. Horton is focused on removing scale from equipment, in particular removing xanthan deposition/scale on oilfield equipment in a wellbore. As noted above, the xanthan is used to **prevent** penetration into the formation and the xanthan scale forms in the wellbore on the equipment and potentially on earth formation **within the wellbore**.

It would be contrary to the purpose of the xanthan to be **within** subterranean formations (adjacent to the well) as presently claimed. Thus, Horton does not disclose or suggest methods for remediating subterranean-formed metal-polymer complexes, such as polyacrylamide or other gellable polymers that crosslink with ***metal ions, naturally present within wells in subterranean formations***, as presently claimed.

Moses as cited and its full disclosure fails to address the many above-noted deficiencies of Horton.

Moses relates to a method of acidizing an underground reservoir comprising injecting a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme, and then allowing the enzyme to catalyze the conversion of the substrate into the acid. Moses is specific to dissolving acid-soluble rock structures by acid dissolution (i.e., $CaCO_3$).

In contrast to Moses, in the presently claimed methods the particularly recited metal complexing agents are **not** a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme.

Further, Moses teaches that acids react quickly with minerals, particularly carbonates, and are consumed by the reaction, and penetration of acid into the formation is limited by the rapid rate at which the acid is consumed by the reaction. (col. 1, lines 45-65). Thus, the invention of Moses focuses on utilizing a substrate for an enzyme, which substrate is capable of being converted into an organic acid by the enzyme, and the enzyme – this is the premise of Moses' claimed inventive step. As such, Moses clearly teaches away from injecting the presently claimed metal complexing agents including ***acids*** because Moses cautions that acids rapidly are consumed by reaction with rock minerals and the invention of Moses focuses on a solution for this problem.

Moreover, with regard to Horton, Moses relates to a method of acidizing an underground reservoir. In contrast, as described above, Horton relates to using xanthan (which **prevents** penetration into the formation) and then removing xanthan scale **formed in the wellbore**. As such, there is nothing appropriate in Moses to combine with the method of Horton.

Lai as cited and its full disclosure fails to address the many above-noted deficiencies of Horton and Moses.

Lai does not relate to methods for remediating pre-existing wells or treatments of wells from which hydrocarbons have been produced. Moreover, Lai relates to breaking a gel that is formed by a crosslinkable polymer and a crosslinking agent. Thus, the amount of gel is known in Lai is known, in contrast to gellable polymers that crosslink with ***metal ions, naturally present within wells in subterranean formations*** as presently claimed.

Even if combined, Horton, Moses, and Lai do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a low permeability subterranean formation.

Applicant further notes that it is improper to use the claims "as a frame," and take the "naked parts of separate prior art references [ ] as a mosaic to recreate a facsimile of the claimed invention" without a finding of why ordinary artisans would have found that mosaic obvious, improperly employs hindsight bias. See W.L. Gore & Assocs., Inc. v. Garlock, Inc. 721 F.2d 1540, 1552-53 (Fed. Cir. 1983).

For at least these reasons, claims 21-40 are not obvious over Horton in view of Moses and Lai. Accordingly, Applicants respectfully request that the Examiner withdraw the outstanding rejection under 35 U.S.C. §103(a).

Claims 41 and 42 are rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Horton (US 2011/0053811), in view of Welton (US 8,071,511), Moses (US 5,678,632) and Lai (U.S. 6,265,355), and Nasr-El-Din et al. (U.S. 2014/0116710).

Applicants respectfully traverse the rejection and the characterization of the claims and references.

Claim 41 is directed to a method for remediating a subterranean-formed metal-polymer complex in an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation. The method comprises:

observing a well production decrease;

providing a metal-polymer complex remediation mixture containing between 1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well ***at a pressure less than a fracture pressure of the subterranean shale formation*** until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, ***the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation***;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

As explained in the specification, the present application and claims relate to methods for remediating subterranean-formed metal-polymer complexes, such as polyacrylamide or other gelable polymers that crosslink with ***metal ions, naturally present within wells in subterranean shale formations***. As such, the presently claimed method acts ***within the subterranean formation***, not merely within a wellbore. Following the introduction of a hydraulic fracturing fluid, including slickwater, where high volumes of polymers such as polyacrylamide are used as friction reducers, into a well bore, over time the well production can decrease. The presently claimed methods ***restore or enhance the productivity*** *of these wells.*

In contrast, Horton relates to methods for remediating and/or preventing polymer deposition on surfaces of drilling machinery and earth formations within the wellbore.

Specifically, Horton focuses on ***methods of remediating xanthan deposition***. Horton discloses that xanthan is a good choice of a viscosifying additive and its use in wellbore fluids is well known. Horton teaches specifically that the mechanism of the chelating agent is toward the metal ions, rather than the polymer.

Horton is deficient in at least three ways.

First, Applicants assert that the arguments about scaling the amount of chelating agent to arrive at the present claims cannot be found in Horton and instead improperly rely on using Applicants' disclosure and claims as a guide.

Applicants strenuously disagree that since, in the example of Horton wherein the chelating agent has a presence which is half of that of the xanthan, it would have been obvious to one having ordinary skill in the art, when scaling up the disclosed example so as to provide remediation of a metal-xanthan complex in an actual wellbore setting, to try an amount of chelating agent in the remediation mixture that is about half of the amount of xanthan, i.e., 0.05 to 3.5 wt%. Applicants further disagree that one of ordinary skill in the art would do this to provide an amount of chelating agent capable of complexing the metal-xanthan complex formed in the wellbore since Horton illustrates that a presence of chelating agent that is half that of the polymer (which it is remediating) is capable of achieving the intended results.

Horton teaches specifically that the mechanism of the chelating agent is toward the metal ion, rather than the polymer. Horton provides that as used therein, "chelating agent" is a compound whose molecular structure can envelop and/or sequester a certain type of ion in a stable and soluble complex. When sequestered inside the complex, the cations have a limited ability to react with other ions, clays or polymers, for example." (paragraph [0016]). As further taught in Horton, one of ordinary skill in the art would recognize that selection of the chelating agent may depend on the metal scale to be dissolved. In particular, the selection of the chelating agent may be related to the specificity of the chelating agent to the particular scaling cation, the log K value, the optimum pH for sequestering and the commercial availability of the chelating agent, as well as downhole conditions, etc. (paragraph [0037]).

Applicants note that the relationship between the chelating agent and xanthan taught by Horton is the relative stability the bond that each forms with the metal ion (i.e., stability of

chelating agent-metal vs xanthan-metal bond). However, Horton makes no reference to quantity of xanthan to chelating agent.

Rather, Horton teaches at paragraphs [0039] and [0040] that as the wellbore fluid encounters polyvalent ions, the chelating agent may complex with the polyvalent ion to form a chelated complex. The bonds between the sequestered polyvalent ion and the chelating agent may be any combination of coordination or ionic bonds. The resultant chelated complex has enhanced stability through the chelant effect, relative to crosslinking with the reactive groups of the polymer, for example the carboxylic groups of the xanthan biopolymer.

Horton provides no teaching or guidance on scaling up. **It is improper to imply the scaling should be in relation to xanthan – which would be in contrast to Horton's teaching that the chelating agent is added relative to the metal ion.**

Moreover, Horton provides only a single example under one condition, which provides no logical basis for asserting that Horton illustrates a rule that in fact is contradictory to Horton's actual teaching regarding that the amount of chelating agent is in relation to the metal ion.

As such, Horton teaches a chelating agent concentration that is six orders of magnitude less than the chelating agent concentration recited in claim 41. As recited in claim 41, 0.1% by weight is 1,000 parts per million or 1,000,000 parts per billion (ppb). Thus, Horton's teaching of 1 part per billion is six orders of magnitude less than 1,000,000 parts per billion recited in claim 41. The rejection of claim 41 over Horton is improper for at least these reasons.

Second, Horton does not disclose or suggest treatment **within** subterranean shale formations (adjacent to the well) as presently claimed. Horton clearly describes well bore fluids and **preventing** penetration into the formation. Horton describes that xanthan is utilized **to prevent penetration** into the formation. (see [0009].) Horton focuses on remediating and/or preventing polymer deposition on **surfaces of drilling machinery and earth formations within the wellbore**.

Finally, Horton does not disclose of suggest improving production from the well by the methods disclosed therein. Horton is focused on removing scale from equipment, in particular removing xanthan deposition/scale on oilfield equipment in a wellbore. As noted above, the xanthan is used to **prevent** penetration into the formation and the xanthan scale forms in the wellbore on the equipment and potentially on earth formation **within the wellbore**.

It would be contrary to the purpose of the xanthan to be **within** subterranean formations (adjacent to the well) as presently claimed. Thus, Horton does not disclose or suggest methods for remediating subterranean-formed metal-polymer complexes, such as polyacrylamide or other gellable polymers that crosslink with ***metal ions, naturally present within wells in subterranean shale formations***, as presently claimed.

Moses as cited and its full disclosure fails to address the many above-noted deficiencies of Horton.

Moses relates to a method of acidizing an underground reservoir comprising injecting a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme, and then allowing the enzyme to catalyze the conversion of the substrate into the acid. Moses is specific to dissolving acid-soluble rock structures by acid dissolution (i.e., $CaCO_3$), and Moses focuses on carbonate rock structures and dissolve carbonates (i.e., $CaCO_3$) by acid dissolution.

In contrast to Moses, the presently claimed method relates to methods for remediating a subterranean-formed metal-polymer complex in an ***existing, low producing well in a hydrocarbon-bearing subterranean shale formation*** and in the presently claimed methods the particularly recited metal complexing agents are **not** a substrate for an enzyme (which substrate is capable of being converted into an organic acid by the enzyme) and the enzyme.

Further, Moses teaches that acids react quickly with minerals, particularly carbonates, and are consumed by the reaction, and penetration of acid into the formation is limited by the rapid rate at which the acid is consumed by the reaction. (col. 1, lines 45-65). Thus, the invention of Moses focuses on utilizing a substrate for an enzyme, which substrate is capable of being converted into an organic acid by the enzyme, and the enzyme – this is the premise of Moses' claimed inventive step. As such, Moses clearly teaches away from injecting the presently claimed metal complexing agents including ***acids*** because Moses cautions that acids rapidly are consumed by reaction with rock minerals and the invention of Moses focuses on a solution for this problem.

Moreover, with regard to Horton, Moses relates to a method of acidizing an underground reservoir. In contrast, as described above, Horton relates to using xanthan (which **prevents**

penetration into the formation) and then removing xanthan scale **formed in the wellbore**. As such, there is nothing appropriate in Moses to combine with the method of Horton.

Lai as cited and its full disclosure fails to address the many above-noted deficiencies of Horton and Moses.

Lai does not relate to methods for remediating pre-existing wells or treatments of wells from which hydrocarbons have been produced. Moreover, Lai relates to breaking a gel that is formed by a crosslinkable polymer and a crosslinking agent. Thus, the amount of gel is known in Lai is known, in contrast to gellable polymers that crosslink with ***metal ions, naturally present within wells in subterranean shale formations*** as presently claimed.

Welton relates to carbonate scale formed on downhole wellbore tubulars or subsurface completion equipment. In contrast, the presently claimed methods relate to methods for remediating a subterranean-formed metal-polymer complex in an existing, low-producing well ***in a subterranean shale formation***. Welton relates to treating a portion of a downhole wellbore tubular or subsurface completion equipment. Welton is concerned with carbonate scale formed on the ***inner walls of downhole casing, production tubing, and completion equipment***. Welton does not disclose or suggest remediating a subterranean-formed metal-polymer complex ***within the subterranean formation***, the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean shale formation complexed with polymers from the fracturing fluids.

Even if combined, Horton, Moses, Lai, and Welton do not disclose or suggest the specifically claimed steps of the present methods for remediating a subterranean-formed metal-polymer complex in an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation.

Applicant further notes that it is improper to use the claims "as a frame," and take the "naked parts of separate prior art references [ ] as a mosaic to recreate a facsimile of the claimed invention" without a finding of why ordinary artisans would have found that mosaic obvious, improperly employs hindsight bias. See W.L. Gore & Assocs., Inc. v. Garlock, Inc. 721 F.2d 1540, 1552-53 (Fed. Cir. 1983).

For at least these reasons, claims 41-42 are not obvious over Horton in view of Moses, Lai, and Welton. Accordingly, Applicants respectfully request that the Examiner withdraw the outstanding rejection under 35 U.S.C. §103(a).

Double Patenting

Claims 21-42 are rejected on the ground of nonstatutory obviousness type double patenting over claims 1-15 of U.S. Patent 10,202,834 (the '834 patent). Without conceding the propriety of the rejection, Applicant will submit a terminal disclaimer to address the double patenting rejection, as appropriate, upon indication of allowable subject matter. However, the filing of a terminal disclaimer is not to be construed as an admission of the propriety of the rejection on obviousness double patenting. *The Quad Environmental Technologies Corp. v. the Union Sanitary District*, 946 F.2d 870, 20 USPQ2d 1392 (Fed. Cir. 1991).

Conclusion

For the reasons noted above, the art of record does not disclose or suggest the inventive concept of the present invention as defined by the claims. In view of the foregoing amendments and remarks, reconsideration of the claims and allowance of the subject application are earnestly solicited. If there are any questions relating to this response or the application, Applicants request that the Examiner telephone the undersigned attorney.

If the foregoing amendments and remarks are not deemed persuasive, Applicants' representative requests an opportunity to discuss the presently claimed invention with the Examiner. As such, Applicants include herewith a formal Request for Interview.

Please charge any additional fees or credit any overpayment to Deposit Account No. 13-2725 (04697.0003USC1).

Respectfully submitted,

22 November 2019

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Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. – 20. (Cancelled)

21. (Previously Presented) A method for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a low permeability subterranean formation, the method comprising:

providing a metal-polymer complex remediation mixture comprising between 0.1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal and thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving hydrocarbon production of the well.

22. (Previously Presented) The method of claim 21, wherein the metal complexing agent is citric acid, formic acid, or mixtures thereof.

23. (Previously Presented) The method of claim 21, wherein the metal complexing agent is selected from the group consisting of ethylenediaminetetraacetic acid (EDTA), propylenediaminetetraacetic acid (PDTA), nitrilotriacetic acid (NTA), N-(2-hydroxyethyl)ethylenediaminetriacetic acid (HEDTA), diethylenetriaminepentaacetic acid (DTPA), hydroxyethyliminodiacetic acid (HEIDA), cyclohexylenediaminetetraacetic acid (CDTA), diphenylaminesulfonic acid (DPAS), ethylenediaminedi(o-hydroxyphenylacetic) acid (EDDHA), glucoheptonic acid, gluconic acid, oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, suberic acid, azelaic acid, sebacic acid, phthalic acid, terephthalic acid, aconitic acid, carballylic acid, trimesic acid, isocitric acid, citric acid, salts thereof, and mixtures thereof.

24. (Previously Presented) The method of claim 21, further wherein the metal complexing agent is selected from the group consisting of glutamic acid diacetic acid (GLDA), methylglycine diacetic acid (MGDA), β-alanine diacetic acid (β-ADA), ethylenediaminedisuccinic acid, S,S- ethylenediaminedisuccinic acid (EDDS), iminodisuccinic acid (IDS), hydroxyiminodisuccinic acid (HIDS), polyamino disuccinic acids, N-bis[2-(l,2-dicarboxyethoxy)ethyl]glycine (BCA6), N-bis[2-(l,2- dicarboxyethoxy)ethyl]aspartic acid (BCA5), N-bis[2-(l,2- dicarboxyethoxy)ethyl]methylglycine (MCBA5), N-tris[(l,2-dicarboxyethoxy)ethyl]amine (TCA6), N-methyliminodiacetic acid (MIDA), iminodiacetic acid (IDA), N-(2-acetamido)iminodiacetic acid (ADA), hydroxymethyl-iminodiacetic acid, 2-(2-carboxyethylamino) succinic acid (CEAA), 2-(2-carboxymethylamino) succinic acid (CMAA), diethylenetriamine- N,N"-disuccinic acid, triethylenetetramine-N,N"'-disuccinic acid, 1,6-hexamethylenediamine-N,N'-disuccinic acid, tetraethylenepentamine-N,N""- disuccinic acid, 2-hydroxypropylene-l,3-diamine-N,N'-disuccinic acid, 1,2- propylenediamine-N,N'-disuccinic acid, l,3-propylenediamine-N,N'-disuccinic acid, cis-cyclohexanediamine-N,N'-disuccinic acid, trans-cyclohexanediamine- N,N'-disuccinic acid, ethylenebis(oxyethylenenitrilo)-N,N'-disuccinic acid, glucoheptanoic acid, cysteic acid-N,N-diacetic acid, cysteic acid-N-monoacetic acid, alanine-N-monoacetic acid, N-(3-hydroxysuccinyl) aspartic acid, N-[2-(3- hydroxysuccinyl)]-L-serine, aspartic acid-N,N-diacetic acid, aspartic acid-N- monoacetic acid, salts thereof, and mixtures thereof.

25. (Previously Presented) The method of claim 21, further wherein the metal complexing agent is selected from acetic acid, acrylates, dihydroxymaleic acid, salts of dihydroxymaleic acid, ethylenediamine tetraacetic acid (EDTA), salts of EDTA, erythorbic acid, erythroboric acid, formic acid, gluconodeltalactone, glutamic acid N,N-diacetic acid (GLDA), salts of GLDA, hydroxyethylenediamine triacetic acid (HEDTA), salts of HEDTA, disodium ethanoldiglycine (HEIDA), salts of HEIDA, methylglycine N,N-diacetic acid (MGDA), salts of MGDA, nitriolotriacetic acid (NTA), and mixtures thereof.

26. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises between 10% and 80% by weight metal complexing agent, one or more additives, and mutual solvent.

27. (Previously Presented) The method of claim 26, wherein the metal complexing agent comprises between 10% and 80% by weight citric acid, formic acid, or mixtures thereof, between 0.1 and 30% of one or more acids as a pH modifier, and mutual solvent.

28. (Currently Amended) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises between ~~about~~ 0.1% and about 60% by weight metal complexing agent.

29. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture further comprises a mutual solvent and an additive selected from the group consisting of acid inhibitor, corrosion inhibitor, scale inhibitor, clay control additive, surfactant, biocide, and mixtures thereof.

30. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises:

between 1% and 95% by weight metal complexing agent;

between 1 and 10,000 parts per million (ppm) of a corrosion inhibitor;

between 1 and 10,000 ppm of a biocide;

between 1 and 10,000 ppm of-a colloidal silica deposition inhibitor; and

between 1 and 500 gallons mutual solvent per thousand gallons (gpt) of water.

31. (Previously Presented) The method of claim 21, wherein the metal-polymer complex remediation mixture further comprises a pH modifier.

32. (Previously Presented) The method of claim 31, wherein the metal-polymer complex remediation mixture further comprises between 0.1 and 30% of one or more acids as a pH modifier.

33. (Previously Presented) The method of claim 32, wherein the acid is selected from the group consisting of hydrochloric acid, aqua regia, arsenic acid, boric acid, carbonic acid, chloric acid, chromic acid, fluoroantimonic acid, fluoroboric acid, fluorosulfuric acid, fulminic acid, hexafluorophosphoric acid, hexafluorosilicic acid, hydrobromic acid, hydrofluoric acid, hydrogen iodide, hypochlorous acid, hypofluorous acid, hypophosphoric acid, iodic acid, nitric acid, nitrosyl-O-hydroxide, nitrous acid, orthocarbonic acid, perchloric acid, permanganic acid, perrhenic acid, pertechnetic acid, phosphoric acid, silicic acid, sulfuric acid, thiocyanic acid, titanic acid, tungstic acid, xenic acid, and mixtures thereof.

34. (Previously Presented) The method of claim 32, wherein the acid is hydrochloric acid.

35. (Previously Presented) The method of claim 21, wherein the injecting operation further comprises:

alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well.

36. (Previously Presented) The method of claim 21, wherein the injecting operation further comprises:

injecting the metal-polymer complex remediation mixture until pressure within the well reaches a predetermined target that does not cause substantial fracturing of the formation.

37. (Previously Presented) The method of claim 21, wherein the injecting operation further comprises:

injecting the metal-polymer complex remediation mixture until the pressure within the well reaches a predetermined target pressure calculated based on the fracture pressure of the subterranean formation; and

upon reaching the target pressure, shutting in the well.

38. (Previously Presented) The method of claim 21 further comprising:

monitoring at least one of pH and well pressure during the maintaining operation; and

initiating the removing operation based on results of the monitoring operation.

39. (Previously Presented) The method of claim 21, wherein the contact time is between about 4 hours and about 4 days.

40. (Previously Presented) The method of claim 39, wherein the contact time is between 1 to 4 days.

41. (Previously Presented) A method for remediating a subterranean-formed metal-polymer complex in an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation, comprising:

observing a well production decrease;

providing a metal-polymer complex remediation mixture containing between 1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean shale formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

42. (Previously Presented) The method of claim 41, wherein the injecting operation further comprises:

alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well.

Amendments to the Abstract:

Please replace the Abstract with the following:

Described herein are formulations and methods for remediating subterranean-formed metal-polymer complexes in wells in subterranean formations. In one embodiment, the method includes injecting a metal-polymer complex remediation mixture containing a metal complexing agent into a subterranean formation adjacent to a well at a pressure below the fracture pressure of the formation. A sufficient contact time is allowed and then the metal-polymer complex remediation mixture is pumped from the subsurface. This has been shown to remediate polymer-containing, subterranean-formed metal-polymer complexes in shale formations. Without being held to a particular theory, it appears that the metal complexing agent is forming metal complexes with the metals in the complexes, and particularly divalent metal ions. This removal of naturally occurring metals may be un-crosslinking and causing the metal-polymer complexes to go into solution, thereby removing the blockages caused by the metal-polymer complexes.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Conway et al.	Examiner:	Leff, Angela M. Ditrani
Serial No.:	16/226,464	Group Art Unit:	3674
Filed:	December 19, 2018	Docket No.:	04697.0003USC1
Customer No.:	23552	Confirmation No.:	3907
Title:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT		

AMENDMENT & RESPONSE UNDER 37 C.F.R. § 1.111

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Attention Commissioner:

In complete reply to the Office Action mailed June 24, 2019, Applicants submit the following Response, a Request for Interview, and two month extension of time.

Amendments to the Abstract are reflected on page 2 of this response.

Amendments to the Claims are reflected in the Listing of Claims, which begin on page 3 of this response.

Remarks begin on page 9 of this response.

PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/226,464	Filing Date 12/19/2018	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ 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 $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ 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))					
* 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)			
AMENDMENT	11/22/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 22	Minus	** 22	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ 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.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/TRACEY M YOUNG/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1	3907

23552 7590 06/24/2019

MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

EXAMINER	
LEFF, ANGELA MARIE DITRAN	

ART UNIT	PAPER NUMBER
3674	

NOTIFICATION DATE	DELIVERY MODE
06/24/2019	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):

USPTO23552@merchantgould.com

Office Action Summary	Application No. 16/226,464	Applicant(s) Conway et al.	
	Examiner Angela M DiTrani Leff	Art Unit 3674	AIA (FITF) 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 _____.

☐ 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) 21-42 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) 21-42 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 or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☑ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 12/19/18 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 _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

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

Specification

2. The abstract of the disclosure is objected to because it begins with the phrase "This disclosure describes," i.e., a phrase that can be implied. Correction is required. See MPEP § 608.01(b).

3. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words in length. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc. In addition, the form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided.

Claim Rejections - 35 USC § 112

4. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

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

5. Claims 21-40 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention. The term "low" in independent claim 21 is a relative term which renders the claim indefinite. The term "low" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The term “low” within the preamble phrase of “low permeability subterranean formation” renders the scope of the claim indefinite since it is unclear as to the particular permeability/permeability range Applicant intends to limit the claim, and, thus, type of formation in which the method is practiced.

6. The following is a quotation of 35 U.S.C. 112(d):

> (d) REFERENCE IN DEPENDENT FORMS.—Subject to subsection (e), a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

The following is a quotation of pre-AIA 35 U.S.C. 112, fourth paragraph:

> Subject to the following paragraph [i.e., the fifth paragraph of pre-AIA 35 U.S.C. 112], a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

7. Claim 28 is rejected under 35 U.S.C. 112(d) or pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends. Claim 28 recites a percentage of metal complexing agent within the metal-polymer complex remediation mixture as comprising “between *about* 0.1%.” Independent claim 21, however, upon which claim 28 depends, recites a range for the metal complexing agent presence that begins with “0.1%.” As such, the term “about” in dependent claim 28 appears to attempt to

broaden the range previously claimed, and, hence, fail to further limit the previously claimed range. Applicant may cancel the claim(s), amend the claim(s) to place the claim(s) in proper dependent form, rewrite the claim(s) in independent form, or present a sufficient showing that the dependent claim(s) complies with the statutory requirements.

Claim Rejections - 35 USC § 103

8. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

9. Claims 21-25, 28 and 36-40 are rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. (US 4,986,356) in view of Moses et al. (US 5,678,632) and Dunleavy et al. (US 5,038,864).

With respect to independent claim 21, Lockhart et al. discloses a method for remediating a subterranean-formed metal polymer complex (col. 1, l. 60- col. 2, l. 8, wherein the complex is formed in situ) in a pre-existing well in a low permeability subterranean formation (col. 2, l. 16-32, wherein the polymer gel is disclosed as being removed after it has performed it's task, thereby providing for remediation of a polymer complex in a *pre-existing* well), the method comprising:

providing a metal-polymer complex remediation mixture containing between 0.1% and 95% by weight metal complexing agent (col. 3, l. 59-65; col. 4, l. 4-15);

injecting the metal-polymer complex remediation mixture into the well until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex (col. 7, l. 45-51);

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and

about 100 days (col. 4, l. 10-13), thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components (col. 4, l. 13-15); and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well (col. 4, l. 13-15).

Lockhart et al. discloses wherein the metal-polymer complex remediation mixture is injected into the well until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex (col. 7, l. 45-51); the reference, however, fails to specify the injection pressure, and, therefore, fails to disclose injection of the mixture at a pressure less than a fracture pressure of the subterranean formation as claimed. Moses et al. teaches wherein acid containing fluids used to remove scale and/or damage present within a rock are injected at a pressure below fracture pressure to dissolve the scale/damage therein (col. 1, l. 25-30). Since Lockhart et al. discloses the use of a complexing agent chosen from a group that includes acids to remediate scale, it would have been obvious to one having ordinary skill in the art to inject the remediation mixture of Lockhart et al. at a pressure below the fracture pressure in order to dissolve and remove any damage caused by the subterranean formed metal polymer complex present in the wellbore.

Lockhart et al. further discloses wherein the metal of the subterranean formed metal polymer complex includes various metals capable of crosslinking the polymer (col. 3, l. 60-65), and, further, wherein the method can be used to remove *all gels* which have been formed from natural or synthetic water soluble polymers by crosslinking with a polyvalent metal ion (col. 3, l. 46-50). The reference, however, fails to specify specifically wherein the metal of the

subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation. Dunleavy et al. teaches methods of restoring injectivity of a well in a subterranean formation that is plugged with an accumulated polymer (abstract; col. 1, l. 5-20), wherein it is further taught that it is suspected that crosslinking of injected polymers by ions, such as calcium and magnesium, present in injection water, well tubulars and *formation rock* results in polymer accumulation (col. 2, l. 20-27). Therefore, although Lockhart et al. fails to explicitly disclose wherein the metal of the subterranean formed metal polymer complex includes metal naturally present within the subterranean formation, since Dunleavy et al. teaches wherein polymers accumulate in a wellbore and formation as a result of crosslinking with metal ions found in the formation rock, and Lockhart et al. discloses wherein the method can be used to remove *all gels* that form between polymers crosslinked by a polyvalent metal ion, it would have been obvious to one having ordinary skill in the art to use the method of Lockhart et al. to not only remove gels formed by polymers with injected metal crosslinkers, but also those formed by crosslinking with metal ions naturally present within the formation. Furthermore, since Dunleavy et al. teaches that the presence of polyvalent metal ions in situ crosslinks polymers and results in polymer accumulation in situ, it is likely the polymers of Lockhart et al. would also naturally crosslink in the presence of metal ions from the formation rock, thereby providing for a metal polymer complex that *includes* metal naturally present within the subterranean formation as claimed.

With respect to depending claims 22, 23, 24 and 25, Lockhart et al. discloses the metal complexing agent as claimed (col. 3, l. 10-39).

With respect to depending claim 28, Lockhart et al. discloses the metal complexing agent presence as claimed (col. 3, l. 55- col. 4, l. 8).

With respect to claims 36 and 37, as provided above within the rejection of claim 21, Moses et al. suggests the injection of the remediation mixture of Lockhart et al. at a pressure below fracturing pressure (see rejection of claim 21, above). Moses et al. further teaches wherein pressure is a function of depth (col. 3, l. 35-38). As such, when conducting the method of Lockhart et al. in view of Moses et al., wherein the remediation mixture is injected below the fracturing pressure, it would have been obvious to one having ordinary skill in the art to inject the mixture until pressure reaches a predetermined target pressure that does not cause substantial fracturing of the formation, and upon reaching such a pressure, shutting in the well, in order to ensure the remediation mixture does not cause fracturing of the reservoir and to allow the remediation mixture to begin reacting with the polymer gels in the formation upon shut in at the target pressure.

With respect to depending claim 38, Lockhart et al. discloses wherein the gel can completely break in a time period varying from 1 to 15 days so as to form a flowable liquid that can be easily removed from the previously occluded zone (col. 4, l. 10-15). The reference, however, is silent to wherein either the pH or well pressure is monitored during the maintaining operation and the removal of the flowable liquid is initiated based on the results of such monitoring as claimed. Dunleavy et al. teaches wherein accumulations of polymer can be large and visually detectable or smaller and invisible to the eye, but still responsible for reducing permeability near the wellbore (col. 2, l. 20-33). It is well established in the art wherein the pressure of a well is dependent upon the injectivity thereof, and, hence, a change in pressure would occur as the well becomes less occluded and the polymer begins to dissolve. Therefore, it would have been obvious to one having ordinary skill in the art to monitor the pressure during the maintaining operation in the method of Lockhart et al. in order to determine the how much

polymer remains gelled and occluding the well so as to determine the optimal time to re-open the well and remove the low viscosity flow back fluid therefrom.

With respect to depending claims 39 and 40, Lockhart et al. discloses the contact time as claimed (col. 4, l. 10-13).

10. Claims 31-34 are rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al. and Dunleavy et al., as applied to claim 21, above, and, further, in view of Hanlon et al. (US 4,609,475).

With respect to claims 31-34, Lockhart et al. in view of Moses et al. and Dunleavy et al. teaches the method as set forth above with respect to claim 21, but fails to explicitly disclose wherein the mixture includes an amount of acid as a pH modifier as claimed. Hanlon et al. teaches methods for removing polymer gels from a subterranean formation (col. 1, l. 10-15), wherein suitable complexing agents include carboxylic acids including those disclosed by Lockhart et al., wherein the remediation mixture employed therein further includes an acid, such as hydrochloric acid, as a pH modifier having a presence within the range as claimed in order to provide a pH suitable for reaction of the remediation mixture with the polymeric material in the formation, noting the rate of solubilization of the polymeric material can be adjusted by adjusting the pH (col. 3, l. 33-39; col. 4, l. 11-16). As such, it would have been obvious to one having ordinary skill in the art to include an acid pH modifier in an amount encompassing the range claimed as suggested by Hanlon et al. in order to provide a desired rate for solubilizing the polymeric material in the method of Lockhart et al..

11. Claims 26, 29 and 30 are rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al. and Dunleavy et al., as applied to claim 21, above, and, further, in view of Nasr-El-Din et al. (US 2014/0116710).

Lockhart et al. discloses wherein the metal-polymer complex remediation mixture comprises the metal complexing agent in an amount as claimed (col. 4, l. 5-8). The reference, however, fails to disclose the additional components claimed as part of the remediation mixture, and, further, a presence thereof within the ranges as claimed.

Nasr-El-Din et al. teaches methods of using various complexing agents (abstract), including some disclosed by Lockhart et al., for the purpose of removing various scales from a shale formation so as to increase the production of oil or gas from the formation ([0016]) wherein additional additives may be included with the complexing agent in lower amounts, including corrosion inhibitors having a presence within the instantly claimed range ([0027]; [0054]), biocides in an amount encompassing the instantly claimed range ([0103]), as well as a mutual solvent, having a presence within the range as claimed ([0035]-[0036]).

Therefore, it would have been obvious to one having ordinary skill in the art to try a combination of additives as taught by Nasr-El-Din et al. with the complexing agent of Lockhart et al. in order to enhance production from the subterranean formation treated therewith. With regard to the colloidal silica deposition inhibitor, the Examiner notes, the presence thereof within the claimed range may be extremely minor, for example, in the instance of 1ppm, and, therefore, one of ordinary skill would recognize whether the inclusion thereof is required as based on the conditions in the formation being treated therewith.

12. Claim 27 is rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al., Dunleavy et al. and Nasr-El-Din et al. as applied to claim 26, above, and, further, in view of Hanlon et al..

Lockhart et al. in view of Moses et al., Dunleavy et al. and Hanlon et al. teaches the method as set forth above with respect to claim 26, but fails to explicitly disclose wherein the

mixture includes an amount of acid as a pH modifier as claimed. Hanlon et al. teaches methods for removing polymer gels from a subterranean formation (col. 1, l. 10-15), wherein suitable complexing agents include carboxylic acids including those disclosed by Lockhart et al., wherein the remediation mixture employed therein further includes an acid, such as hydrochloric acid, as a pH modifier having a presence within the range as claimed in order to provide a pH suitable for reaction of the remediation mixture with the polymeric material in the formation, noting the rate of solubilization of the polymeric material can be adjusted by adjusting the pH (col. 3, l. 33-39; col. 4, l. 11-16). As such, it would have been obvious to one having ordinary skill in the art to include an acid pH modifier in an amount encompassing the range claimed as suggested by Hanlon et al. in order to provide a desired rate for solubilizing the polymeric material.

13. Claim 35 is rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al. and Dunleavy et al., as applied to claim 21, above, and, further, in view of Lai et al. (US 6,265,355 – cited previously).

With respect to depending claim 35, Lockhart et al. discloses the injection of the metal polymer complex remediation mixture as noted above in the rejection of claim 21. The reference, however, fails to disclose alternately injecting the mixture and a second amount of a diverting mixture into the well, as claimed. Lai et al. teaches a method wherein a metal polymer complex formed from a polymer and injected source of ions can be contacted with a chelating agent (col. 3, l. 50-65) for the purpose of dissociating the complex and breaking the gel plug formed therefrom (col. 4, l. 20-38); the reference further teaches alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well for the purpose of diverting the remediation mixture to a desired zone (col. 5, l. 20-col. 6, l. 3, wherein an amount of polymer gel is injected into the well, subsequent to

which a first amount of remediation mixture is injected, and subsequent to which a polymer diverting material is injecting so as to divert the remediation mixture to the oil-bearing zone). It would have been obvious to one having ordinary skill in the art to try an injection pattern as taught by Lai et al. in the method of Lockhart et al. in order to emplace the metal complexing agent in a desired additional zones wherein remediation is required.

14. Claim 41 is rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al., Dunleavy et al. and Nasr-El-Din et al..

With respect to independent claim 41, Lockhart et al. discloses a method for remediating an existing, low producing well in a hydrocarbon bearing subterranean formation (col. 2, l. 16-32, wherein the polymer gel is disclosed as being removed after it has performed it's task, thereby providing for remediation of a polymer complex in an existing low producing well), the method comprising:

observing a well production decrease (col. 2, l. 16-32);

providing a metal-polymer complex remediation mixture containing between 0.1% and 95% by weight metal complexing agent (col. 3, l. 59-65; col. 4, l. 4-15);

injecting the metal-polymer complex remediation mixture into the well until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex (col. 7, l. 45-51);

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days (col. 4, l. 10-13), thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low

viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components (col. 4, l. 13-15); and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method (col. 4, l. 13-15).

Lockhart et al. discloses wherein the method is used to reopen occluded zones in a simple manner (col. 4, l. 16-24), wherein further, the method can be used to remove all gels formed from water soluble polymers by crosslinking with a polyvalent metal ion (col. 3, l. 46-49). Furthermore, the method can be used for clean up after the injection of a gellable composition into the reservoir (col. 2, l. 33-36). The reference, however, fails to explicitly provide for having initially fractured the formation, monitoring the production of the well of the well, and, after observing a well production decrease, and before injecting any remediation mixtures into the well, determining that a subterranean formed metal polymer complex has formed in the reservoir. Dunleavy et al. teaches a method of restoring permeability of a subterranean reservoir having a fracture network therein (col. 6, l. 30-33, thereby providing for "fracturing"), wherein production of the well is monitored in a manner that enables one of ordinary skill to determine a subterranean formed metal polymer complex has formed after a well production decrease is observed (col. 2, l. 11-29), subsequent to which, injectivity is restored by injecting a remediation mixture (col. 2, l. 60-66). Since Lockhart et al. discloses wherein the remediation mixture may be injected after the injection of a gellable composition, it would have been obvious to one having ordinary skill to provide for a fracture network in the reservoir, as taught by Dunleavy et al., and monitor the well production so as to determine the time at which it is necessary to inject the remediation mixture of Lockhart et al. and thereby restore injectivity to the reservoir.

Lockhart et al. discloses wherein the metal-polymer complex remediation mixture is injected into the well until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex (col. 7, l. 45-51); the reference, however, fails to specify the injection pressure, and, therefore, fails to disclose injection of the mixture at a pressure less than a fracture pressure of the subterranean formation as claimed.

Moses et al. teaches wherein acid containing fluids used to remove scale and/or damage present within a rock are injected at a pressure below fracture pressure to dissolve the scale/damage therein (col. 1, l. 25-30). Since Lockhart et al. discloses the use of a complexing agent chosen from a group that includes acids to remediate scale, it would have been obvious to one having ordinary skill in the art to inject the remediation mixture of Lockhart et al. at a pressure below the fracture pressure in order to dissolve and remove any damage caused by the subterranean formed metal polymer complex present in the wellbore.

Lockhart et al. further discloses wherein the metal of the subterranean formed metal polymer complex includes various metals capable of crosslinking the polymer (col. 3, l. 60-65), and, further, wherein the method can be used to remove *all gels* which have been formed from natural or synthetic water soluble polymers by crosslinking with a polyvalent metal ion (col. 3, l. 46-50). The reference, however, fails to specify specifically wherein the metal of the subterranean-formed metal-polymer complex includes metal naturally present within the subterranean formation. Dunleavy et al. teaches methods of restoring injectivity of a well in a subterranean formation that is plugged with an accumulated polymer (abstract; col. 1, l. 5-20), wherein it is further taught that it is suspected that crosslinking of injected polymers by ions, such as calcium and magnesium, present in injection water, well tubulars and *formation rock* results in polymer accumulation (col. 2, l. 20-27). Therefore, although Lockhart et al. fails to

explicitly disclose wherein the metal of the subterranean formed metal polymer complex includes metal naturally present within the subterranean formation, since Dunleavy et al. teaches wherein polymers accumulate in a wellbore and formation as a result of crosslinking with metal ions found in the formation rock, and Lockhart et al. discloses wherein the method can be used to remove *all gels* that form between polymers crosslinked by a polyvalent metal ion, it would have been obvious to one having ordinary skill in the art to use the method of Lockhart et al. to not only remove gels formed by polymers with injected metal crosslinkers, but also those formed by crosslinking with metal ions naturally present within the formation. Furthermore, since Dunleavy et al. teaches that the presence of polyvalent metal ions in situ crosslinks polymers and results in polymer accumulation in situ, it is likely the polymers of Lockhart et al. would also naturally crosslink in the presence of metal ions from the formation rock, thereby providing for a metal polymer complex that *includes* metal naturally present within the subterranean formation as claimed.

Lockhart et al. fails to specify the subterranean formation as a shale formation. Nasr-El-Din et al. teaches methods of treating shale formations with various complexing agents (abstract), including some disclosed by Lockhart et al., for the purpose of removing various scales from a shale formation so as to increase the production of oil or gas from the formation ([0016]). As such, it would have been obvious to one having ordinary skill in the art to try the method of Lockhart et al. within a shale formation in order to enhance the removal of scales, including polymer scale formed from a metal polymer complex therein, therefrom.

15. Claim 42 is rejected under 35 U.S.C. 103 as being unpatentable over Lockhart et al. in view of Moses et al., Dunleavy et al. and Nasr-El-Din et al., as applied to claim 41, above, and, further, in view of Lai et al..

With respect to depending claim 42, Lockhart et al. discloses the injection of the metal polymer complex remediation mixture as noted above in the rejection of claim 41. The reference, however, fails to disclose alternately injecting the mixture and a second amount of a diverting mixture into the well, as claimed. Lai et al. teaches a method wherein a metal polymer complex formed from a polymer and injected source of ions can be contacted with a chelating agent (col. 3, l. 50-65) for the purpose of dissociating the complex and breaking the gel plug formed therefrom (col. 4, l. 20-38); the reference further teaches alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well for the purpose of diverting the remediation mixture to a desired zone (col. 5, l. 20-col. 6, l. 3, wherein an amount of polymer gel is injected into the well, subsequent to which a first amount of remediation mixture is injected, and subsequent to which a polymer diverting material is injecting so as to divert the remediation mixture to the oil-bearing zone). It would have been obvious to one having ordinary skill in the art to try an injection pattern as taught by Lai et al. in the method of Lockhart et al. in order to emplace the metal complexing agent in a desired additional zones wherein remediation is required.

16. Claims 21-40 are rejected under 35 U.S.C. 103 as being unpatentable over Horton et al. (US 2011/0053811) in view of Moses et al. and Lai et al..

With respect to independent claim 21, Horton et al. discloses a method for remediating a subterranean-formed metal-polymer complex in a pre-existing well ([0039], wherein the remediation fluid is injected to remediate a particular interval of the wellbore) in a low permeability subterranean formation, the method comprising:

providing a metal-polymer complex remediation mixture ([0042]);

injecting the metal-polymer complex remediation mixture into the well until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation ([0018]; [0025]-[0027]; claim 10):

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time ([0045]), thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal and thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components ([0018]; [0042]; [0048]); and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well ([0018]; [0041]; [0042]; [0048]) .

With regard to the amount of metal complexing agent, Horton et al. provides a *laboratory* example wherein 1 ppb of chelating agent is used to dissolve the metal-polymer complex formed from 2 ppb of aqueous xanthan gum ([0045]). Horton et al. further discloses wherein the amount of xanthan used in the *actual* well treatment fluids is between 0.1 to 7.0 wt% of the wellbore fluid. Although failing to explicitly disclose the amount of complexing agent used in the remediation mixture to complex such a presence of xanthan, since Horton et al. shows in the example wherein the chelating agent has a presence which is half of that of the xanthan, it would have been obvious to one having ordinary skill in the art, when scaling up the disclosed example so as to provide remediation of a metal-xanthan complex in an actual wellbore setting, to try an amount of chelating agent in the remediation mixture that is about half of the amount of xanthan, i.e., 0.05 to 3.5 wt%, i.e., an amount that partially overlaps the instantly

claimed range, in order to provide an amount of chelating agent capable of complexing the metal-xanthan complex formed in the wellbore since Horton et al. clearly illustrates that a presence of chelating agent that is half that of the polymer it is remediating is capable of achieving the intended results.

With regard to the injection of the metal polymer complex remediation mixture, Horton et al. discloses wherein the mixture may be used to remediate scale that results from the complexing of polyvalent metal ions with a polymer downhole (abstract). The reference, however, fails to specify an injection pressure thereof, and, thus, fails to disclose wherein the mixture is injected at a pressure less than a fracture pressure of the subterranean formation. Moses et al. teaches wherein acid containing fluids used to remove scale and/or damage present within a rock are injected at a pressure below fracture pressure to dissolve the scale/damage therein (col. 1, l. 25-30). Since Horton et al. discloses the use of a chelating agent chosen from a group of acids to remediate scale, it would have been obvious to one having ordinary skill in the art to inject the remediation mixture of Horton et al. at a pressure below the fracture pressure in order to dissolve and remove any scale and damage present in the wellbore.

Horton et al. discloses wherein the chelating agent contacts the metal-polymer complex for a time sufficient to dissolve the precipitants ([0045]). Horton et al., however, fails to explicitly disclose wherein the contact time is between about 1 minute and about 100 days. The Examiner notes, it would appear the mere contact of the EDTA and precipitant within the example of Horton et al. would suffice for *at least* a contact time of "about" 1 minute since a provision of contact that brings about near immediate dissolving of the precipitants would seem to meet such a limitation as claimed. Furthermore, given the vastness of time within the range, one of ordinary skill would recognize the optimal contact time by mere experimentation and trial

and error since 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). Furthermore, Horton et al. discloses wherein the precipitants of the invention are formed by interaction of the polymer and polyvalent metal ions, *regardless* of the source of the metal ions ([0017]). Lai et al. teaches a method wherein a metal polymer complex formed from a polymer and injected source of ions can be contacted with a chelating agent, including some of the same chelating agents disclosed by Horton et al. (col. 3, l. 50-65), wherein the complex is contacted with the chelating agent for at least about 24 hours for the purpose of dissociating the complex and breaking the gel plug formed therefrom (col. 4, l. 20-38). Since Horton et al. discloses wherein the ions that complex the polymer are either injected with the polymer or found naturally in the downhole environment, and Lai et al. teaches the alternative form of injecting the ions with the polymer as requiring a contact time of at least about 24 hours to disassociate the complex of the polymer and ions, it would have been obvious to one having ordinary skill in the art to try a contact time of at least about 24 hours, and, hence a time explicitly falling within the range as claimed in order to dissociate the metal-polymer complex formed by the polymer with metal ions found naturally downhole.

With respect to depending claim 22, Horton et al. teaches the method as provided above, in view of the teachings of Moses et al. and Lai et al., wherein Horton et al. discloses metal complexing agents such as EDTA, DTPA, EGTA, etc, and, further notes wherein the selection of the chelating agent depends upon the metal scale to be dissolved, as well as the specificity of the chelating agent to the particular scaling cation, the log K value, the optimum pH for sequestering and the commercial availability of the chelating agent, as well as downhole conditions ([0036]-

[0037]). The reference, however, fails to disclose wherein the metal complexing agent is citric or formic acid as claimed. Lai et al. teaches methods of dissociating a metal-polymer complex, as noted above in the rejection of claim 21, wherein it is further taught wherein the metal complexing agent is an aminocarboxylic acid that can include EDTA or NTA (col. 3, l. 61-65). The reference further teaches wherein known chelating agents used in the art include EDTA, NTA and citric acid (Table 1; col. 6, l. 60-67). Since Lai et al. teaches citric acid as an alternative to EDTA, it would have been obvious to one having ordinary skill in the art to try citric acid as an alternative to the metal complexing agents disclosed by Horton et al. in order to dissociate the metal-polymer complex formed within the method disclosed therein.

With respect to claims 23-25, Horton et al. discloses wherein the metal complexing agent is selected from the groups as claimed ([0036]-[0038]; [0045]).

With respect to claim 26, Horton et al. discloses wherein the metal-polymer remediation mixture comprises one or more additives and mutual solvent ([0024]). With regard to the amount of chelating agent, Horton et al. provides an example wherein 1ppb of chelating agent is used to dissolve the metal-polymer complex ([0045]). With regard to an amount encompassing the full extent of the range as instantly claimed, Horton et al. further teaches wherein the selection of the chelating agent is based upon a variety of factors, including the specificity of the chelating agent to the particular scaling cation and the optimum pH for sequestering ([0037]). Therefore, one of ordinary skill would recognize an optimal amount of chelating agent to employ within the invention of Horton et al. as based on the conditions encountered in the subterranean formation and desired scaling cation to remove therefrom.

With respect to further depending claim 27, Horton et al. discloses metal complexing agents such as EDTA, DTPA, EGTA, etc, and, further notes wherein the selection of the

chelating agent depends upon the metal scale to be dissolved, as well as the specificity of the chelating agent to the particular scaling cation, the log K value, the optimum pH for sequestering and the commercial availability of the chelating agent, as well as downhole conditions ([0036]-[0037]). The reference, however, fails to disclose wherein the metal complexing agent is citric or formic acid as claimed. Lai et al. teaches methods of dissociating a metal-polymer complex, as noted above in the rejection of claim 21, wherein it is further taught wherein the metal complexing agent is an aminocarboxylic acid that can include EDTA or NTA (col. 3, l. 61-65). The reference further teaches wherein known chelating agents used in the art include EDTA, NTA and citric acid (Table 1; col. 6, l. 60-67). Since Lai et al. teaches citric acid as an alternative to EDTA, it would have been obvious to one having ordinary skill in the art to try citric acid as an alternative to the metal complexing agents disclosed by Horton et al. in order to dissociate the metal-polymer complex formed within the method disclosed therein Horton et al. discloses wherein, in an example, after the complexing agent dissolves the precipitants, it is disclosed that the solution may be acidified with HCl to a pH of between 0 and 1 for the purpose of further breaking up the viscosity of the solution ([0045]). Although silent to the amount of HCl, i.e., the pH modifier, employed, it would have been obvious to one having ordinary skill in the art to add an amount of HCl within the range as instantly claimed as based on the pH of the solution prior to the addition thereof and desired final pH to break up the viscosity of the solution 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).

With respect to claim 28, Horton et al. provides an example wherein 1ppb of chelating agent is used to dissolve the metal-polymer complex ([0045]). As such, Horton et al. provides

for an amount of *about* 0.1% by weight metal complexing agent. With regard to an amount encompassing the full extent of the range as instantly claimed, Horton et al. further teaches wherein the selection of the chelating agent is based upon a variety of factors, including the specificity of the chelating agent to the particular scaling cation and the optimum pH for sequestering ([0037]). Therefore, one of ordinary skill would recognize an optimal amount of chelating agent to employ within the invention of Horton et al. as based on the conditions encountered in the subterranean formation and desired scaling cation to remove therefrom.

With respect to depending claim 29, Horton et al. discloses the remediation mixture comprising a mutual solvent and ad additive selected from the group as claimed ([0024]).

With respect to depending claim 30, Horton et al. discloses the metal complexing agent presence as noted above in the rejection of claim 21; the reference further discloses wherein various additives may be added to the wellbore fluids which the metal complexing agent contacts, including corrosion inhibitors, biocides and mutual solvents ([0024]). Although silent to the amount thereof, as well as of a colloidal silica deposition inhibitor, since Horton et al. merely offers the noted additives as exemplary, one of ordinary skill would recognize the appropriateness of further including therewith a colloidal silica deposition inhibitor as based on the conditions encountered in the formation treated therewith. With regard to the particular amounts of each, due to the absence of evidence of the criticality of the use of each of these components as used within the amounts as claimed, as well as the small amounts thereof that may be included in order to fall within the ranges as claimed, it would have been obvious to one having ordinary skill in the art before the effective filing date of the claimed invention to include an amount of biocide, corrosion inhibitor, mutual solvent and colloidal silica deposition inhibitor as desired and when needed in order to prevent any corrosion, bacterial or colloidal silica build-

ups within the well and/or formation as based on the actual conditions encountered in the formation and desired treatment to provide thereto.

With respect to depending claims 31-34, Horton et al. discloses wherein, in an example, after the complexing agent dissolves the precipitants, it is disclosed that the solution may be acidified with HCl to a pH of between 0 and 1 for the purpose of further breaking up the viscosity of the solution ([0045]). Although silent to the amount of HCl, i.e., the pH modifier, employed, it would have been obvious to one having ordinary skill in the art to add an amount of HCl within the range as instantly claimed as based on the pH of the solution prior to the addition thereof and desired final pH to break up the viscosity of the solution 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).

With respect to depending claim 35, Horton et al. teaches the method as provided above with respect to claim 21, in view of Moses et al. and Lai et al., wherein it is taught individual intervals, as well as additional intervals, may be treated with the remediation fluid so as to remove the polymer metal complex therefrom ([0039]). The reference, however, fails to explicitly provide for the alternate injection of a first amount of metal-polymer complex and second amount of diverting agent as claimed. Lai et al. teaches the method as noted above in the rejection of claim 21, and, further, alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well for the purpose of diverting the remediation mixture to a desired zone (col. 5, l. 20-col. 6, l. 3, wherein an amount of polymer gel is injected into the well, subsequent to which a first amount of remediation mixture is injected, and subsequent to which a polymer diverting material is injecting so as to

divert the remediation mixture to the oil-bearing zone). Since Horton et al. discloses and suggests wherein individual intervals may be treated with the remediation mixture, as well as additional intervals, and Lai et al. teaches alternate injection of a remediation mixture and diverting mixture so as to place the remediation mixture in an intended zone, it would have been obvious to one having ordinary skill in the art to treat a first zone requiring remediation in Horton et al. and alternately injecting a diverting mixture therewith in order to emplace the metal complexing agent in the desired additional zones wherein remediation is required.

With respect to claims 36 and 37, as provided above within the rejection of claim 21, Moses et al. suggests the injection of the remediation mixture of Horton et al. at a pressure below fracturing pressure (see rejection of claim 21, above). Moses et al. further teaches wherein pressure is a function of depth (col. 3, l. 35-38). As such, when conducting the method of Horton et al. in view of Moses et al., wherein the remediation mixture is injected below the fracturing pressure, it would have been obvious to one having ordinary skill in the art to inject the mixture until pressure reaches a predetermined target pressure that does not cause substantial fracturing of the formation, and upon reaching such a pressure, shutting in the well, in order to ensure the remediation mixture does not cause fracturing of the reservoir and to allow the remediation mixture to begin reacting with the polymer gels in the formation upon shut in at the target pressure.

With respect to claim 38, Horton et al. discloses wherein in an example, after the metal-polymer complex is dissolved, the solution is acidified to a pH between 0 and 1 to further break up the viscosity of the solution ([0045]). The reference further discloses wherein as the polymer releases the metal ions through contact by the metal complexing agent, the metal-polymer scale dissolves, enabling the polymer to return to a fluid state, so that it can be subjected to

reclamation techniques ([0043]). Since Horton et al. discloses wherein the pH is lowered to further break the viscosity of the polymer solution after the initial dissociation of the metal-polymer complex, it would have been obvious to one having ordinary skill in the art to monitor the pH so as to know the appropriate time upon which to lower the pH to, for example, between 0 and 1, so as to further break the viscosity of the fluid and allow the fluid to be reclaimed and recovered from the well.

With respect to claims 39 and 40, Horton et al. discloses wherein the chelating agent contacts the metal-polymer complex for a time sufficient to dissolve the precipitants ([0045]). Horton et al., however, fails to explicitly disclose wherein the contact time is between about 4 hours and about 4 days, and, further between 1 and 4 days. The Examiner notes, it would appear the mere contact of the EDTA and precipitant within the example of Horton et al. would suffice for *at least* a contact time of "about" 4 hours since a provision of contact that brings about near immediate dissolving of the precipitants would seem to meet such a limitation as claimed. Furthermore, given the vastness of time within the range, one of ordinary skill would recognize the optimal contact time by mere experimentation and trial and error since 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). Additionally, Horton et al. discloses wherein the precipitants of the invention are formed by interaction of the polymer and polyvalent metal ions, *regardless* of the source of the metal ions ([0017]). Lai et al. teaches a method wherein a metal polymer complex formed from a polymer and injected source of ions can be contacted with a chelating agent, including some of the same chelating agents disclosed by Horton et al. (col. 3, l. 50-65), wherein the complex is contacted with the chelating agent for at least about 24 hours for

the purpose of dissociating the complex and breaking the gel plug formed therefrom (col. 4, l. 20-38). Since Horton et al. discloses wherein the ions that complex the polymer are either injected with the polymer or found naturally in the downhole environment, and Lai et al. teaches the alternative form of injecting the ions with the polymer as requiring a contact time of at least about 24 hours to dissociate the complex of the polymer and ions, it would have been obvious to one having ordinary skill in the art to try a contact time of at least about 24 hours, and, hence a time explicitly falling within the range as claimed in order to dissociate the metal-polymer complex formed by the polymer with metal ions found naturally downhole.

17. Claims 41 and 42 are rejected under 35 U.S.C. 103 as being unpatentable over Horton et al. in view of Welton et al. (US 8,071,511), Moses et al., Lai et al. and Nasr-El-Din et al..

With respect to independent claim 41, Horton et al. discloses a method for remediating an existing ([0039]) low-producing well in a hydrocarbon-bearing formation, the method comprising:

observing formation of scale in the form of a subterranean formed metal-polymer complex, wherein the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation ([0018]; [0025]-[0027]; claim 10);

providing a metal-polymer complex remediation mixture containing ([0045]);

injecting the metal-polymer complex remediation mixture into the well until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex ([0018]; [0025]-[0027]; claim 10);

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time ([0045]), thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate

and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components ([0018]; [0042]; [0048]); and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method ([0018]; [0041]; [0042]; [0048]) .

Horton et al. discloses wherein scale formation in tubing is problematic in that the tubing has to be removed and replaced ([0030]-[0032]), or the scale removed therefrom, in order to promote well stability and productivity ([0041]). The reference, however, fails to disclose wherein a production decrease is observed. Welton et al. teaches methods for removing scale caused by downhole ions within wellbore tubulars (col. 2, l. 56-63), wherein the scale formation is noted by a decrease in well production that clogs the wellbore (col. 1, l. 60-61; col. 3, l. 15-38); sensors may be placed in the well to determine that the scale has indeed formed (col. 3, l. 50-59) and a remediation mixture comprising a chelating agent is injected so as to remove the scale once it has been determined that the scale has formed (col. 3, l. 11-15; abstract). Since Horton et al. discloses wherein the remediation mixture is injected into the tubular to remove and remediate scale formed downhole as a result of ions present in the formation, and Welton et al. teaches a method of monitoring the formation of scale wherein after a production decrease, sensors can be used to determine if scale has formed so that a chelating agent can be injected therein to remove the scale, it would have been obvious to one having ordinary skill in the art to monitor production of the well in the method of Horton et al., and upon noticing a decrease in production, determining that the subterranean metal-polymer complex disclosed therein has formed, after which, the remediation mixture is injected, in order to remove the metal-polymer

complex scale; in doing so, one of ordinary skill would be certain of the presence of the metal-polymer complex scale and thereby not waste any chelating agent by injecting the chelating agent when remediation is not yet necessary.

With regard to the amount of metal complexing agent, Horton et al. provides a *laboratory* example wherein 1 ppb of chelating agent is used to dissolve the metal-polymer complex formed from 2 ppb of aqueous xanthan gum ([0045]). Horton et al. further discloses wherein the amount of xanthan used in the *actual* well treatment fluids is between 0.1 to 7.0 wt% of the wellbore fluid. Although failing to explicitly disclose the amount of complexing agent used in the remediation mixture to complex such a presence of xanthan, since Horton et al. shows in the example wherein the chelating agent has a presence which is half of that of the xanthan, it would have been obvious to one having ordinary skill in the art, when scaling up the disclosed example so as to provide remediation of a metal-xanthan complex in an actual wellbore setting, to try an amount of chelating agent in the remediation mixture that is about half of the amount of xanthan, i.e., 0.05 to 3.5 wt%, i.e., an amount that partially overlaps the instantly claimed range, in order to provide an amount of chelating agent capable of complexing the metal-xanthan complex formed in the wellbore since Horton et al. clearly illustrates that a presence of chelating agent that is half that of the polymer it is remediating is capable of achieving the intended results.

With regard to the injection of the metal polymer complex remediation mixture, Horton et al. discloses wherein the mixture may be used to remediate scale that results from the complexing of polyvalent metal ions with a polymer downhole (abstract). The reference, however, fails to specify an injection pressure thereof, and, thus, fails to disclose wherein the mixture is injected at a pressure less than a fracture pressure of the subterranean formation.

Moses et al. teaches wherein acid containing fluids used to remove scale and/or damage present within a rock are injected at a pressure below fracture pressure to dissolve the scale/damage therein (col. 1, l. 25-30). Since Horton et al. discloses the use of a chelating agent chosen from a group of acids to remediate scale, it would have been obvious to one having ordinary skill in the art to inject the remediation mixture of Horton et al. at a pressure below the fracture pressure in order to dissolve and remove any scale and damage present in the wellbore.

Horton et al. discloses wherein the chelating agent contacts the metal-polymer complex for a time sufficient to dissolve the precipitants ([0045]). Horton et al., however, fails to explicitly disclose wherein the contact time is between about 1 minute and about 100 days. The Examiner notes, it would appear the mere contact of the EDTA and precipitant within the example of Horton et al. would suffice for *at least* a contact time of "about" 1 minute since a provision of contact that brings about near immediate dissolving of the precipitants would seem to meet such a limitation as claimed. Furthermore, given the vastness of time within the range, one of ordinary skill would recognize the optimal contact time by mere experimentation and trial and error since 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). Furthermore, Horton et al. discloses wherein the precipitants of the invention are formed by interaction of the polymer and polyvalent metal ions, *regardless* of the source of the metal ions ([0017]). Lai et al. teaches a method wherein a metal polymer complex formed from a polymer and injected source of ions can be contacted with a chelating agent, including some of the same chelating agents disclosed by Horton et al. (col. 3, l. 50-65), wherein the complex is contacted with the chelating agent for at least about 24 hours for the purpose of dissociating the complex

and breaking the gel plug formed therefrom (col. 4, l. 20-38). Since Horton et al. discloses wherein the ions that complex the polymer are either injected with the polymer or found naturally in the downhole environment, and Lai et al. teaches the alternative form of injecting the ions with the polymer as requiring a contact time of at least about 24 hours to dissociate the complex of the polymer and ions, it would have been obvious to one having ordinary skill in the art to try a contact time of at least about 24 hours, and, hence a time explicitly falling within the range as claimed in order to dissociate the metal-polymer complex formed by the polymer with metal ions found naturally downhole.

Horton et al. fails to specify the subterranean formation as a shale formation. Nasr-El-Din et al. teaches methods of treating shale formations with various complexing agents (abstract), including some disclosed by Horton et al., for the purpose of removing various scales from a shale formation so as to increase the production of oil or gas from the formation ([0016]). As such, it would have been obvious to one having ordinary skill in the art to try the method of Horton et al. within a shale formation in order to enhance the removal of scales, including polymer scale formed from a metal polymer complex therein, therefrom.

With respect to depending claim 42, Horton et al. teaches the method as provided above with respect to claim 41, in view of Moses et al. and Lai et al., wherein it is taught individual intervals, as well as additional intervals, may be treated with the remediation fluid so as to remove the polymer metal complex therefrom ([0039]). The reference, however, fails to explicitly provide for the alternate injection of a first amount of metal-polymer complex and second amount of diverting agent as claimed. Lai et al. teaches the method as noted above in the rejection of claim 41, and, further, alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well for the purpose of

diverting the remediation mixture to a desired zone (col. 5, l. 20-col. 6, l. 3, wherein an amount of polymer gel is injected into the well, subsequent to which a first amount of remediation mixture is injected, and subsequent to which a polymer diverting material is injecting so as to divert the remediation mixture to the oil-bearing zone). Since Horton et al. discloses and suggests wherein individual intervals may be treated with the remediation mixture, as well as additional intervals, and Lai et al. teaches alternate injection of a remediation mixture and diverting mixture so as to place the remediation mixture in an intended zone, it would have been obvious to one having ordinary skill in the art to treat a first zone requiring remediation in Horton et al. and alternately injecting a diverting mixture therewith in order to emplace the metal complexing agent in the desired additional zones wherein remediation is required.

Double Patenting

18. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(l)(1) - 706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

19. Claims 21-42 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-15 of U.S. Patent No. 10,202,834 (‘834 herein). Although the claims at issue are not identical, they are not patentably distinct from each other because the instant claims broadly encompass the subject matter previously patented in ‘834.

Conclusion

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angela M DiTrani Leff whose telephone number is (571)272-2182. The examiner can normally be reached on Monday-Friday, 9AM-5PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doug Hutton can be reached on 5712724137. 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 Leff/
Primary Examiner, Art Unit 3674

ADL
06/19/19

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	Examiner Angela M DiTrani Leff	Art Unit 3674	Page 1 of 1

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/226,464	Conway et al.
	Examiner	Art Unit
	Angela M DiTrani Leff	3674

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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Interference Search			
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	/Angela M DiTrani Leff/ Primary Examiner, Art Unit 3674

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(Not for submission under 37 CFR 1.99)

Application Number	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	
Attorney Docket Number	04697.0003USC1

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(Not for submission under 37 CFR 1.99)

Application Number	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	
Attorney Docket Number	04697.0003USC1

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[5]
	1	RICK MCCURDY, High Rate Hydraulic Fracturing Additives in Non-Marcellus Unconventional Shales, May 2011, pages 17-21, Proceedings of the Technical Workshops for the Hydraulic Fracturing Study: Chemical & Analytical Methods http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/upload/proceedingsofhfchemanalmethodsfinalmay2011.pdf	
	2	JASON WEIDNER, Chemical Additive Selection in Matrix Acidizing, Thesis, May 2011, http://repository.tamu.edu/bitstream/handle/1969.1/150930/Weidner,%20Jason.pdf?sequence=1	
	3	AL-HARTHY, et al., Options for High Temperature Well Stimulation, December 1, 2008, Oilfield Review Winter 2008/2009; 20, no.4, http://www.slb.com/~/media/Files/resources/oilfield_review/ors08/win08/options_for_high_temperature_well_stimulation.pdf	
	4	PORTIER, et al., Review on Chemical Stimulation Techniques in Oil Industry and Applications to Geothermal Systems – Technical Report, Deep Heat Mining Association, Work Package 4, May 2007, http://engine.brgm.fr/Deliverables/Period2/ENGINE_D28_WP4_ChemicalStimulation_DHMA_052007.pdf	
	5	XU, et al., On modeling of chemical stimulation of enhanced geothermal system using high pH with chelating agent, Geofluids; Journal Volume: 9; Related Information: Journal Publication Date: May 1, 2009; http://www.osti.gov/scitech/servlets/purl/962720	
	6	Waterfront Product Information, Geogard SX – Amorphous Silica Control, 2014, http://www.wateradditives.com/components/com_jshopping/files/demo_products/Geogard_SX_GP_WF.pdf	
	7	EHSAAN NASIR, Thesis for Texas A&M, May 2012, Effect of acid additives on spent acid flowback, http://repository.tamu.edu/bitstream/handle/1969.1/ETD-TAMU-2012-05-10933/NASIR-THESIS.pdf?sequence=2&isAllowed=y	
	8	FRENIER, et al., Use of Highly Acid-Soluble Chelating Agents in Well Stimulation Services, SPE Annual Technical Conference and Exhibition, October 1-4, 2000, Dallas, Texas, https://www.onepetro.org/conference-paper/SPE-63242-MS	
	9	CIVAN et al., Rigorous Modeling of Gas Transport in Nano-darcy Shale Porous Media under Extreme Pore Proximity and Elevated Pressure Conditions, Proceedings of the International Conference on Heat Transfer and Fluid Flow, Prague, Czech Republic, August 11-12, 2014, Paper No 208, http://avestia.com/HTFF2014_Proceedings/papers/208.pdf	
	10	JAMES CAPUTO, AAPL 57th Annual Meeting, Boston, June 8-11, 2011, Shale Plays: Basic Geologic and Engineering Concepts, http://www.landman.org/docs/white-papers/03-caputo_aapl_shale_play_seminar_part1_final.pdf	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.D.L./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
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Filing Date	2018-12-19
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	11	TAN NGUYEN, New Mexico Tech, Well Design – Spring 2013 Power Point Presentation	
	12	International Search Report for Application No. PCT/US2015/25399 mailed July 8, 2015, 2pgs.	
	13	Written Opinion of the International Searching Authority for Application No. PCT/US2015/25399 mailed July 8, 2015, 5pgs.	
	14	Notification of Transmittal of the International Search Report and the Written Opinion of the International Searching Authority, or the Declaration for Application No. PCT/US2015/25399 mailed July 8, 2015, 1pg.	
	15	Written Opinion, PCT/US2015/048634 mailed December 7, 2015, 5pgs.	
	16	International Search Report, PCT/US2015/048634 mailed December 7, 2015, 2pgs.	
	17	Geiver, The Slickwater Story, The Bakken magazine, http://thebakken.com/articles/711/the-slickwater-story, July 14, 2014, 2pgs.	
	18	Huang R.Y.M.; Jarvis, N.R. 1973. Ionically crosslinked hydrophilic polymer membranes: Synthesis and measurement of transport properties, J Polym Sci 41: 117-127, 11 pgs.	
	19	Ahmed, E.M. 2015. Hydrogel: Preparation, characterization, and applications: A review, J Adv Res 6: 105-121, 17pgs.	
	20	Akin, H.; Hasirci, V.N.; Hasirci, N. 1990. Permeability properties of charged hydrogel-carrying membranes, Polymer 31 (2): 270-275, 6pgs.	
	21	European Search Report for European Patent Application No. 14856530.2 - 1354, June 23, 2017, 8pgs.	

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Application Number	16226464
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Art Unit	3672
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Attorney Docket Number	04697.0003USC1

	22	European Search Report dated August 31, 2017, Application No. EP15780712.4, 7pgs.	
	23	EPA, Proceedings of the Technical Workshops for the Hydraulic Fracturing Study: Chemical & Analytical Methods, EPA 600/R-11/066, May 2011, 122pgs.	
	24	Notification of Transmittal of The International Search Report and The Written Opinion of the International Searching Authority, or the Declaration, PCT/US2014/062440, February 13, 2015, 1pg.	
	25	Written Opinion of the International Searching Authority, PCT/US2014/062440, February 13, 2015, 6pgs.	
	26	International Search Report and Written Opinion for Application No. PCT/US2014/062440 mailed February 13, 2015	
	27	Australian Examination Report, Application No. 2015247994, dated February 8, 2018, 3 pgs.	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/Angela M DiTrani Leff/	Date Considered	06/19/2019

*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.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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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	/Melissa M. Hayworth/	Date (YYYY-MM-DD)	2019-03-21
Name/Print	Melissa M. Hayworth	Registration Number	45,774

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.**

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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 inspections 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.

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2367	(166/311,312).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/08/02 14:07
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S5	858	(e21b21/14).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/08/02 14:09
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S3	626	(e21b31/03).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/08/02 14:09
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S68	1	("20150114653").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/06/27 10:48
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		"20100089579" | "20110259592" | "20120067576" | "20120097392" | "20120115759" | "4698168" | "4888121" | "5685918" | "5744151" | "5762821" | "7781381").PN.	USPAT; USOCR			11:23
S76	20	("4537684" | "4633949" | "4683954" | "4888121" | "5073270").PN. OR ("5674817").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/06/28 11:08
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S83	68	S80 not (S81 S82)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/06/28 11:46
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S95	12	("3522844").URPN.	USPAT	OR	OFF	2017/06/29 09:40
S96	1	("3700280").PN.	USPAT; USOCR	OR	OFF	2018/03/29 10:10
S98	0	("0599474").PN.	EPO; DERWENT; IBM_TDB	OR	OFF	2018/03/29 10:11
S97	2	(("0599474") or ("2012171857")).PN.	EPO; DERWENT; IBM_TDB	OR	OFF	2018/03/29 10:11
S99	2	(("3700280") or ("5674817")).PN.	USPAT; USOCR	OR	OFF	2018/03/29 10:27
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			DERWENT; IBM_TDB			
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S105	22	("5038864").URPN.	USPAT	OR	OFF	2018/03/29 11:31
S106	1	("5038864").PN.	USPAT; USOCR	OR	OFF	2018/03/29 11:42
S107	1	("4986356").PN.	USPAT; USOCR	OR	OFF	2018/03/29 13:37
S108	1	("20140116710").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/29 14:36
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S110	1	("5678632").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/29 15:21
S111	1	("8236734").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/29 15:22
S112	1	("5038864").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/29 15:34
S113	2	(("9932516") or ("9944843")).PN.	USPAT; USOCR	OR	OFF	2018/09/14 13:14
S114	2	("0599474").PN.	USPAT; USOCR; EPO	OR	OFF	2018/09/14 13:24
S115	1	("3700280").PN.	USPAT; USOCR; EPO	OR	OFF	2018/09/14 13:25
S116	2	("2012171857").PN.	USPAT; USOCR; EPO; DERWENT; IBM_TDB	OR	OFF	2018/09/14 13:26
S117	1	("20110053811").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/14 14:01
S118	6	(("6265355") or ("20130210684") or ("20150005204") or ("20080110621") or	US-PGPUB; USPAT;	OR	OFF	2018/09/14 14:03

		("20110053811") or ("20130157905")).PN.	USOCR			
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S122	3	(("20110053811") or ("5678632") or ("6265355")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/18 13:24
S123	4	(("20110053811") or ("5678632") or ("6265355") or ("8071511")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/18 13:29
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L2	1	("20150114653").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/19 12:12
L3	1	("20140116710").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/19 12:30
L6	1	l5 and low.clm.	USPAT	OR	OFF	2019/06/19 12:41
L5	1	("10202834").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/19 12:41

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S120	10	((subterranean welL$1bore$1 bore$1hole$1 down$1hole$1 oil$1well$1 oil$1field$1) and (metal$4 and $2polymer$2) and (chelat$4 complex$5) and shale$1).clm.	US-PGPUB; USPAT	OR	OFF	2018/09/14 15:48

6/ 19/ 2019 1:43:00 PM
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1

CONFIRMATION NO. 3907

23552
MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

PUBLICATION NOTICE

OC000000107680659

Title:METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT

Publication No.US-2019-0120037-A1
Publication Date:04/25/2019

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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.

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PTO/SB/08a (01-10)
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(Not for submission under 37 CFR 1.99)

Application Number	16226464
Filing Date	2018-12-19
First Named Inventor	Andrew Bryce Conway
Art Unit	3672
Examiner Name	
Attorney Docket Number	04697.0003USC1

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	2	5223159		1993-06-29	Smith et al.	
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	4	5346010		1994-09-13	Adams et al.	
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	10	6638896		2003-10-28	Tibbles et al.	
	11	7013974		2006-03-21	Hanes, Jr.	
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	Attorney Docket Number	04697.0003USC1

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	22	8584757		2013-11-19	Reyes	
	23	6527051		2003-03-04	Reddy et al.	
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	Attorney Docket Number	04697.0003USC1

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	32	4609475		1986-09-02	Hanlon	
	33	5678632		1997-10-21	Moses	
	34	8236734		2012-08-07	Shen	
	35	4815537		1989-03-28	Jones	
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	Attorney Docket Number	04697.0003USC1

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	Attorney Docket Number	04697.0003USC1

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	Art Unit	3672
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	Attorney Docket Number	04697.0003USC1

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	5	XU, et al., On modeling of chemical stimulation of enhanced geothermal system using high pH with chelating agent, Geofluids; Journal Volume: 9; Related Information: Journal Publication Date: May 1, 2009; http://www.osti.gov/scitech/servlets/purl/962720	
	6	Waterfront Product Information, Geogard SX – Amorphous Silica Control, 2014, http://www.wateradditives.com/components/com_jshopping/files/demo_products/Geogard_SX_GP_WF.pdf	
	7	EHSAAN NASIR, Thesis for Texas A&M, May 2012, Effect of acid additives on spent acid flowback, http://repository.tamu.edu/bitstream/handle/1969.1/ETD-TAMU-2012-05-10933/NASIR-THESIS.pdf?sequence=2&isAllowed=y	
	8	FRENIER, et al., Use of Highly Acid-Soluble Chelating Agents in Well Stimulation Services, SPE Annual Technical Conference and Exhibition, October 1-4, 2000, Dallas, Texas, https://www.onepetro.org/conference-paper/SPE-63242-MS	
	9	CIVAN et al., Rigorous Modeling of Gas Transport in Nano-darcy Shale Porous Media under Extreme Pore Proximity and Elevated Pressure Conditions, Proceedings of the International Conference on Heat Transfer and Fluid Flow, Prague, Czech Republic, August 11-12, 2014, Paper No 208, http://avestia.com/HTFF2014_Proceedings/papers/208.pdf	
	10	JAMES CAPUTO, AAPL 57th Annual Meeting, Boston, June 8-11, 2011, Shale Plays: Basic Geologic and Engineering Concepts, http://www.landman.org/docs/white-papers/03-caputo_aapl_shale_play_seminar_part1_final.pdf	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16226464
	Filing Date	2018-12-19
	First Named Inventor	Andrew Bryce Conway
	Art Unit	3672
	Examiner Name	
	Attorney Docket Number	04697.0003USC1

	11	TAN NGUYEN, New Mexico Tech, Well Design – Spring 2013 Power Point Presentation	
	12	International Search Report for Application No. PCT/US2015/25399 mailed July 8, 2015, 2pgs.	
	13	Written Opinion of the International Searching Authority for Application No. PCT/US2015/25399 mailed July 8, 2015, 5pgs.	
	14	Notification of Transmittal of the International Search Report and the Written Opinion of the International Searching Authority, or the Declaration for Application No. PCT/US2015/25399 mailed July 8, 2015, 1pg.	
	15	Written Opinion, PCT/US2015/048634 mailed December 7, 2015, 5pgs.	
	16	International Search Report, PCT/US2015/048634 mailed December 7, 2015, 2pgs.	
	17	Geiver, The Slickwater Story, The Bakken magazine, http://thebakken.com/articles/711/the-slickwater-story, July 14, 2014, 2pgs.	
	18	Huang R.Y.M.; Jarvis, N.R. 1973. Ionically crosslinked hydrophilic polymer membranes: Synthesis and measurement of transport properties, J Polym Sci 41: 117-127, 11 pgs.	
	19	Ahmed, E.M. 2015. Hydrogel: Preparation, characterization, and applications: A review, J Adv Res 6: 105-121, 17pgs.	
	20	Akin, H.; Hasirci, V.N.; Hasirci, N. 1990. Permeability properties of charged hydrogel-carrying membranes, Polymer 31 (2): 270-275, 6pgs.	
	21	European Search Report for European Patent Application No. 14856530.2 - 1354, June 23, 2017, 8pgs.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16226464
	Filing Date	2018-12-19
	First Named Inventor	Andrew Bryce Conway
	Art Unit	3672
	Examiner Name	
	Attorney Docket Number	04697.0003USC1

	22	European Search Report dated August 31, 2017, Application No. EP15780712.4, 7pgs.	
	23	EPA, Proceedings of the Technical Workshops for the Hydraulic Fracturing Study: Chemical & Analytical Methods, EPA 600/R-11/066, May 2011, 122pgs.	
	24	Notification of Transmittal of The International Search Report and The Written Opinion of the International Searching Authority, or the Declaration, PCT/US2014/062440, February 13, 2015, 1pg.	
	25	Written Opinion of the International Searching Authority, PCT/US2014/062440, February 13, 2015, 6pgs.	
	26	International Search Report and Written Opinion for Application No. PCT/US2014/062440 mailed February 13, 2015	
	27	Australian Examination Report, Application No. 2015247994, dated February 8, 2018, 3 pgs.	

If you wish to add additional non-patent literature document citation information please click the Add button Add

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.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] 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	16226464
	Filing Date	2018-12-19
	First Named Inventor	Andrew Bryce Conway
	Art Unit	3672
	Examiner Name	
	Attorney Docket Number	04697.0003USC1

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	/Melissa M. Hayworth/	Date (YYYY-MM-DD)	2019-03-21
Name/Print	Melissa M. Hayworth	Registration Number	45,774

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.**

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 the Freedom of Information Act requires disclosure of these record s.

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).

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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 inspections 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.

Electronic Acknowledgement Receipt

EFS ID:	35496916
Application Number:	16226464
International Application Number:	
Confirmation Number:	3907
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Customer Number:	23552
Filer:	Melissa M. Hayworth/Lisa Kenney
Filer Authorized By:	Melissa M. Hayworth
Attorney Docket Number:	04697.0003USC1
Receipt Date:	21-MAR-2019
Filing Date:	19-DEC-2018
Time Stamp:	18:46:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	2019-03-21_04697-0003USC1_IDS_Transmittal.PDF	79596 b04e9f6dfeaaabafb888b2cb10f3b4b648dc8804	no	1

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	2019-03-21-04697-0003USC1_IDS-1.PDF	616612 918f9c3acd5c44aa0f5bc97e91e554a9fda434c2	no	13
Warnings:					
Information:					
		Total Files Size (in bytes):	696208		

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Conway et al.	Examiner:	
Serial No.:	16/226,464	Group Art Unit:	3672
Filed:	December 19, 2018	Docket No.:	04697.0003USC1
Customer No.:	23552	Confirmation No.:	3907
Title:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT		

INFORMATION DISCLOSURE STATEMENT (37 C.F.R. § 1.97(b))

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Attention: Commissioner for Patents

The items of information listed on the enclosed Form SB08 are brought to the attention of the Examiner as a formality in the above-referenced application. Applicant notes that all of the items listed on the submitted Form SB08 were cited in the parent application.

In accordance with 37 C.F.R. §1.98(d), copies of the documents listed on the enclosed Form SB08 are not provided because these documents were previously cited by or submitted to the U.S. Patent and Trademark Office in parent application U.S. Application No. 14/525,038 to which the present application claims priority.

Pursuant to the provisions of M.P.E.P. 609, it is requested that the Examiner return a copy of the attached Form SB08, marked as being considered and initialed by the Examiner, to the undersigned with the next official communication.

Respectfully submitted,

March 21, 2019

/Melissa M. Hayworth/

Melissa M. Hayworth
Registration No. 45,774

MERCHANT & GOULD PC
PO Box 2903
Minneapolis, MN 55402
Telephone No. 703.684.2522
Facsimile No. 612.332.9081

23552
PATENT TRADEMARK OFFICE

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/226,464

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	22 minus 20 =	* 2			OR	x 100 =	200
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 460 =	0.00
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).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1920

APPLICATION AS AMENDED - PART II

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

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/226,464	12/19/2018	3674	2080	04697.0003USC1	22	2

CONFIRMATION NO. 3907

UPDATED FILING RECEIPT

23552
MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

OC000000108878259

Date Mailed: 03/21/2019

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)

Andrew Bryce Conway, Weatherford, OK;
Robert Easterly, Tulsa, OK;

Applicant(s)

Flex-Chem Holding Company, LLC, Weatherford, OK;
Cimarex Energy Co., Denver, CO;

Assignment For Published Patent Application

Flex-Chem Holding Company, LLC, Weatherford, OK
Cimarex Energy Co., Denver, CO

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 14/525,038 10/27/2014 PAT 10202834
which claims benefit of 61/895,873 10/25/2013
and claims benefit of 61/898,107 10/31/2013

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 Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

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

If Required, Foreign Filing License Granted: 01/16/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/226,464**

Projected Publication Date: 04/25/2019

Non-Publication Request: No

Early Publication Request: No

Title

METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT

Preliminary Class

166

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 37, Code of Federal Regulations, 5.11 & 5.15

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

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

NOT GRANTED

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technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Conway et al.	Examiner:	
Serial No.:	16/226,464	Group Art Unit:	3672
Filed:	December 19, 2018	Docket No.:	04697.0003USC1
Customer No.:	23552	Confirmation No.:	3907
Title:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT		

RESPONSE TO MISSING PARTS

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

Attention: Commissioner

In response to the Notice to File Missing Parts mailed January 18, 2019, and the Notice of Incomplete Reply mailed February 22, 2019, submitted herewith please find the executed Declaration from Andrew Bryce Conway.

Payment of the outstanding fee balance in the amount of $100.00 is also being submitted herewith.

Please charge any additional fees or credit any overpayment to Deposit Account No. 13-2725 (Docket No. 04697.0003USC1).

March 15, 2019

/Melissa M. Hayworth/
Melissa M. Hayworth
Reg. No.: 45,774

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Tel. 703.684.2522

23552
PATENT TRADEMARK OFFICE

PTO/AIA/01 (06-12)
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN FORMATIONS USING A METAL COMPLEXING AGENT

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 16/226,464 filed on December 19, 2018.

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.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Andrew Bryce Conway Date (Optional): 3-10-19

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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.

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.

Electronic Patent Application Fee Transmittal

Application Number:	16226464
Filing Date:	19-Dec-2018
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Filer:	Melissa M. Hayworth/Lisa Kenney
Attorney Docket Number:	04697.0003USC1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	1	100	100
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**100**

Electronic Acknowledgement Receipt

EFS ID:	35440107
Application Number:	16226464
International Application Number:	
Confirmation Number:	3907
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Customer Number:	23552
Filer:	Melissa M. Hayworth/Lisa Kenney
Filer Authorized By:	Melissa M. Hayworth
Attorney Docket Number:	04697.0003USC1
Receipt Date:	15-MAR-2019
Filing Date:	19-DEC-2018
Time Stamp:	16:06:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$100
RAM confirmation Number	031819INTEFSW16081000
Deposit Account	
Authorized User	

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Response to Pre-Exam Formalities Notice	2019-03-15_04697-0003USC1_Response-Notice.PDF	76245 7888211208fee9a2521053470f8a6b6187e1bec0	no	1
Warnings:					
Information:					
2	Oath or Declaration filed	2019-03-15-04697-0003USC1_Declaration-Conway.PDF	1686897 e08ab130df5c0f9ac910f19532e153bfc0047e95	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30397 78d51177175894143deb4c593dd693f8b75ae160	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1793539		

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 APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/226,464

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	22 minus 20 =	* 2			OR	x 100 =	200
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 460 =	0.00
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).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1920

APPLICATION AS AMENDED - PART II

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

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1

CONFIRMATION NO. 3907

23552
MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

FORMALITIES LETTER

OC000000106052482

Date Mailed: 02/22/2019

NOTICE OF INCOMPLETE REPLY (NONPROVISIONAL)

Filing Date Granted

The U.S. Patent and Trademark Office has received your reply on 02/15/2019 to the Notice to File Missing Parts (Notice) mailed 01/18/2019 and it has been entered into the nonprovisional application. The reply, however, does not include the following items required in the Notice. A complete reply must be timely filed to prevent ABANDONMENT of the above-identified application. Replies should be mailed to: Mail Stop Missing Parts, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450.

Applicant is given **TWO MONTHS** from the date of the Notice to File Missing Parts (Notice) mailed 01/18/2019 within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

Items Required to Avoid Abandonment:

The required items noted below SHOULD be filed along with any items required above. The filing date of this nonprovisional application will be the date of receipt of the items required above.

- Additional claim fees of $ **100** as an undiscounted entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of the Notice to avoid abandonment is/are itemized below. No entity status discount is in effect. If applicant is qualified for small entity status, a written assertion of small entity status must be submitted to establish small entity status. (See 37 CFR 1.27). If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- $ **200** for **2** total claims over 20.
- $(**100**) previous unapplied payment amount.
- $ **100** TOTAL FEE BALANCE DUE.

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute

statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
  Andrew Bryce Conway

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice". https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sareebuddin/

Document code: WFEE

United States Patent and Trademark Office
Sales Receipt for Accounting Date: 02/21/2019

CVORACHA SALE #00000007 Mailroom Dt: 02/15/2019 132725 16226464
01 FC : 1051 160.00 DA

Electronic Patent Application Fee Transmittal

Application Number:	16226464
Filing Date:	19-Dec-2018
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Filer:	Melissa M. Hayworth/Lisa Kenney
Attorney Docket Number:	04697.0003USC1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	1	100	100
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**100**

Electronic Acknowledgement Receipt

EFS ID:	35166914
Application Number:	16226464
International Application Number:	
Confirmation Number:	3907
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Customer Number:	23552
Filer:	Melissa M. Hayworth/Lisa Kenney
Filer Authorized By:	Melissa M. Hayworth
Attorney Docket Number:	04697.0003USC1
Receipt Date:	15-FEB-2019
Filing Date:	19-DEC-2018
Time Stamp:	14:54:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$100
RAM confirmation Number	021919INTEFSW14554400
Deposit Account	
Authorized User	

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Preliminary Amendment	2019-02-15_04697-0003USC1_Preliminary_Amendment.PDF	99298 72d62d948731ea63abae6554f3822f80dc223883	no	7
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30396 b660a380061740151 0d94105125fe2a955962419	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	129694		

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Conway et al.	Examiner:	
Serial No.:	16/226,464	Group Art Unit:	3672
Filed:	December 19, 2018	Docket No.:	04697.0003USC1
Customer No.:	23552	Confirmation No.:	3907
Title:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT		

PRELIMINARY AMENDMENT

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

Attention: Commissioner

Prior to examination of the above-identified application, please enter the following amendments:

Amendments to the Claims are reflected in the Listing of the Claims, which begin on page 2 of this paper;

Remarks begin on page 7 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. – 20. (Cancelled)

21. (New) A method for remediating a subterranean-formed metal-polymer complex in a pre-existing well in a low permeability subterranean formation, the method comprising:

providing a metal-polymer complex remediation mixture comprising between 0.1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve but not precipitate the metal and thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving hydrocarbon production of the well.

22. (New) The method of claim 21, wherein the metal complexing agent is citric acid, formic acid, or mixtures thereof.

23. (New) The method of claim 21, wherein the metal complexing agent is selected from the group consisting of ethylenediaminetetraacetic acid (EDTA), propylenediaminetetraacetic acid (PDTA), nitrilotriacetic acid (NTA), N-(2- hydroxyethyl)ethylenediaminetriacetic acid (HEDTA), diethylenetriaminepentaacetic acid (DTPA), hydroxyethyliminodiacetic acid

(HEIDA), cyclohexylenediaminetetraacetic acid (CDTA), diphenylaminesulfonic acid (DPAS), ethylenediaminedi(o-hydroxyphenylacetic) acid (EDDHA), glucoheptonic acid, gluconic acid, oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, suberic acid, azelaic acid, sebacic acid, phthalic acid, terephthalic acid, aconitic acid, carballylic acid, trimesic acid, isocitric acid, citric acid, salts thereof, and mixtures thereof.

24. (New) The method of claim 21, further wherein the metal complexing agent is selected from the group consisting of glutamic acid diacetic acid (GLDA), methylglycine diacetic acid (MGDA), β-alanine diacetic acid (β-ADA), ethylenediaminedisuccinic acid, S,S-ethylenediaminedisuccinic acid (EDDS), iminodisuccinic acid (IDS), hydroxyiminodisuccinic acid (HIDS), polyamino disuccinic acids, N-bis[2-(l,2- dicarboxyethoxy)ethyl]glycine (BCA6), N-bis[2-(l,2- dicarboxyethoxy)ethyl]aspartic acid (BCA5), N-bis[2-(l,2-dicarboxyethoxy)ethyl]methylglycine (MCBA5), N-tris[(l,2- dicarboxyethoxy)ethyl]amine (TCA6), N-methyliminodiacetic acid (MIDA), iminodiacetic acid (IDA), N-(2-acetamido)iminodiacetic acid (ADA), hydroxymethyl-iminodiacetic acid, 2-(2-carboxyethylamino) succinic acid (CEAA), 2-(2-carboxymethylamino) succinic acid (CMAA), diethylenetriamine- N,N''-disuccinic acid, triethylenetetramine-N,N'''-disuccinic acid, 1,6-hexamethylenediamine-N,N'-disuccinic acid, tetraethylenepentamine-N,N''''- disuccinic acid, 2-hydroxypropylene-l,3-diamine-N,N'-disuccinic acid, 1,2- propylenediamine-N,N'-disuccinic acid, l,3-propylenediamine-N,N'-disuccinic acid, cis-cyclohexanediamine-N,N'-disuccinic acid, trans-cyclohexanediamine- N,N'-disuccinic acid, ethylenebis(oxyethylenenitrilo)-N,N'-disuccinic acid, glucoheptanoic acid, cysteic acid-N,N-diacetic acid, cysteic acid-N-monoacetic acid, alanine-N-monoacetic acid, N-(3-hydroxysuccinyl) aspartic acid, N-[2-(3- hydroxysuccinyl)]-L-serine, aspartic acid-N,N-diacetic acid, aspartic acid-N- monoacetic acid, salts thereof, and mixtures thereof.

25. (New) The method of claim 21, further wherein the metal complexing agent is selected from acetic acid, acrylates, dihydroxymaleic acid, salts of dihydroxymaleic acid, ethylenediamine tetraacetic acid (EDTA), salts of EDTA, erythorbic acid, erythroboric acid, formic acid, gluconodeltalactone, glutamic acid N,N-diacetic acid (GLDA), salts of GLDA, hydroxyethylenediamine triacetic acid (HEDTA), salts of HEDTA, disodium ethanoldiglycine

(HEIDA), salts of HEIDA, methylglycine N,N-diacetic acid (MGDA), salts of MGDA, nitriolotriacetic acid (NTA), and mixtures thereof.

26. (New) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises between 10% and 80% by weight metal complexing agent, one or more additives, and mutual solvent.

27. (New) The method of claim 26, wherein the metal complexing agent comprises between 10% and 80% by weight citric acid, formic acid, or mixtures thereof, between 0.1 and 30% of one or more acids as a pH modifier, and mutual solvent.

28. (New) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises between about 0.1% and about 60% by weight metal complexing agent.

29. (New) The method of claim 21, wherein the metal-polymer complex remediation mixture further comprises a mutual solvent and an additive selected from the group consisting of acid inhibitor, corrosion inhibitor, scale inhibitor, clay control additive, surfactant, biocide, and mixtures thereof.

30. (New) The method of claim 21, wherein the metal-polymer complex remediation mixture comprises:

between 1% and 95% by weight metal complexing agent;
between 1 and 10,000 parts per million (ppm) of a corrosion inhibitor;
between 1 and 10,000 ppm of a biocide;
between 1 and 10,000 ppm of-a colloidal silica deposition inhibitor; and
between 1 and 500 gallons mutual solvent per thousand gallons (gpt) of water.

31. (New) The method of claim 21, wherein the metal-polymer complex remediation mixture further comprises a pH modifier.

32. (New) The method of claim 31, wherein the metal-polymer complex remediation mixture further comprises between 0.1 and 30% of one or more acids as a pH modifier.

33. (New) The method of claim 32, wherein the acid is selected from the group consisting of hydrochloric acid, aqua regia, arsenic acid, boric acid, carbonic acid, chloric acid, chromic acid, fluoroantimonic acid, fluoroboric acid, fluorosulfuric acid, fulminic acid, hexafluorophosphoric acid, hexafluorosilicic acid, hydrobromic acid, hydrofluoric acid, hydrogen iodide, hypochlorous acid, hypofluorous acid, hypophosphoric acid, iodic acid, nitric acid, nitrosyl-O-hydroxide, nitrous acid, orthocarbonic acid, perchloric acid, permanganic acid, perrhenic acid, pertechnetic acid, phosphoric acid, silicic acid, sulfuric acid, thiocyanic acid, titanic acid, tungstic acid, xenic acid, and mixtures thereof.

34. (New) The method of claim 32, wherein the acid is hydrochloric acid.

35. (New) The method of claim 21, wherein the injecting operation further comprises:

alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well.

36. (New) The method of claim 21, wherein the injecting operation further comprises:

injecting the metal-polymer complex remediation mixture until pressure within the well reaches a predetermined target that does not cause substantial fracturing of the formation.

37. (New) The method of claim 21, wherein the injecting operation further comprises:

injecting the metal-polymer complex remediation mixture until the pressure within the well reaches a predetermined target pressure calculated based on the fracture pressure of the subterranean formation; and

upon reaching the target pressure, shutting in the well.

38. (New) The method of claim 21 further comprising:

monitoring at least one of pH and well pressure during the maintaining operation; and

initiating the removing operation based on results of the monitoring operation.

39. (New) The method of claim 21, wherein the contact time is between about 4 hours and about 4 days.

40. (New) The method of claim 39, wherein the contact time is between 1 to 4 days.

41. (New) A method for remediating a subterranean-formed metal-polymer complex in an existing, low-producing well in a hydrocarbon-bearing subterranean shale formation, comprising:

observing a well production decrease;

providing a metal-polymer complex remediation mixture containing between 1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean shale formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

42. (New) The method of claim 41, wherein the injecting operation further comprises:

alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well.

REMARKS

Claims 1-20 of the application were as originally filed in parent application US Application No. 14/525038. By way of this Preliminary Amendment, claims 1-20 have been cancelled and new claims 21-42 have been added. Support for the new claims can be found throughout the application as filed, including in the original claims.

Applicant respectfully requests that this Preliminary Amendment be entered into the record prior to examination and consideration of the above-identified application. If a telephone conference would be helpful in resolving any issues concerning this application, please contact the undersigned Applicant's attorney-of record.

Please charge any additional fees or credit any overpayment to Deposit Account No. 13-2725 (Docket No. 04697.0003USC1).

15 February 2019

/Melissa M. Hayworth/
Melissa M. Hayworth
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23552
PATENT TRADEMARK OFFICE

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/226,464

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 460 =	0.00
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).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1720

APPLICATION AS AMENDED - PART II

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

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/226,464	12/19/2018	3672	1720	04697.0003USC1	20	2

CONFIRMATION NO. 3907

FILING RECEIPT

23552
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MINNEAPOLIS, MN 55402-0903

OC000000105162335

Date Mailed: 01/18/2019

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)

Andrew Bryce Conway, Weatherford, OK;
Robert Easterly, Tulsa, OK;

Applicant(s)

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Cimarex Energy Co., Denver, CO;

Assignment For Published Patent Application

Flex-Chem Holding Company, LLC, Weatherford, OK
Cimarex Energy Co., Denver, CO

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 14/525,038 10/27/2014
which claims benefit of 61/895,873 10/25/2013
and claims benefit of 61/898,107 10/31/2013

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 Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

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

If Required, Foreign Filing License Granted: 01/16/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/226,464**

Projected Publication Date: 04/25/2019

Non-Publication Request: No

Early Publication Request: No

Title

METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT

Preliminary Class

166

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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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.

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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.

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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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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/226,464	12/19/2018	Andrew Bryce Conway	04697.0003USC1

CONFIRMATION NO. 3907

23552
MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

FORMALITIES LETTER

OC000000105162336

Date Mailed: 01/18/2019

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing.

Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- Surcharge as set forth in 37 CFR 1.16(f) must be submitted.
  The surcharge is due for any one of:
  - late submission of the basic filing fee, search fee, or examination fee,
  - late submission of inventor's oath or declaration,
  - filing an application that does not contain at least one claim on filing, or
  - submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. No entity status discount is in effect. If applicant is qualified for small entity status, a written assertion of small entity status must be submitted to establish small entity status. (See 37 CFR 1.27). If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- $ **160** surcharge.
- $(**0**) previous unapplied payment amount.
- $ **160** TOTAL FEE BALANCE DUE.

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

• A properly executed inventor's oath or declaration has not been received for the following inventor(s):
Andrew Bryce Conway

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice". https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/kung/

DocCode – SCORE

SCORE Placeholder Sheet for IFW Content

Application Number: 16226464 Document Date: 12/19/2018

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

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Form Revision Date: August 26, 2013

METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT

ABSTRACT OF THE DISCLOSURE

This disclosure describes formulations and methods for remediating subterranean-formed metal-polymer complexes in wells in subterranean formations. In one embodiment, the method includes injecting a metal-polymer complex remediation mixture containing a metal complexing agent into a subterranean formation adjacent to a well at a pressure below the fracture pressure of the formation. A sufficient contact time is allowed and then the metal-polymer complex remediation mixture is pumped from the subsurface. This has been shown to remediate polymer-containing, subterranean-formed metal-polymer complexes in shale formations. Without being held to a particular theory it appears that the metal complexing agent is forming metal complexes with the metals in the complexes, and particularly divalent metal ions. This removal of naturally occurring metals may be un-crosslinking and causing the metal-polymer complexes to go into solution, thereby removing the blockages caused by the metal-polymer complexes.

CLAIMS

What is claimed is:

1. A method for remediating a subterranean-formed metal-polymer complex in a well in a subterranean formation comprising:

providing a metal-polymer complex remediation mixture containing between about 0.1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex ;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

2. The method of claim 1 wherein the metal complexing agent is citric acid.

3. The method of claim 1 wherein the metal complexing agent is acetic acid.

4. The method of claim 1 wherein the metal complexing agent is ethylenediaminetetraacetic acid (EDTA).

5. The method of claim 1 wherein the metal complexing agent includes at least one of ethylenediaminetetraacetic acid (EDTA), propylenediaminetetraacetic acid (PDTA), nitrilotriacetic acid (NTA), N-(2- hydroxyethyl)ethylenediaminetriacetic acid (HEDTA), diethylenetriaminepentaacetic acid (DTPA), hydroxyethyliminodiacetic acid (HEIDA), cyclohexylenediaminetetraacetic acid (CDTA), diphenylaminesulfonic acid (DPAS), ethylenediaminedi(o-hydroxyphenylacetic) acid (EDDHA), glucoheptonic acid, gluconic acid,

oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, suberic acid, azelaic acid, sebacic acid, phthalic acid, terephthalic acid, aconitic acid, carballylic acid, trimesic acid, isocitric acid, citric acid, or any salt or derivative of any of the previously listed compounds.

6. The method of claim 1 wherein the metal-polymer complex remediation mixture comprises:

between about 1% and 95% by weight metal complexing agent;

between 1 and 10,000 parts per million (ppm) of a corrosion inhibitor;

between 1 and 10,000 ppm of a biocide;

between 1 and 10,000 ppm of a colloidal silica deposition inhibitor; and

between 1 and 500 gallons per thousand gallons (gpt) of a mutual solvent.

7. The method of claim 1 wherein the metal-polymer complex remediation mixture further comprises between 0.1 and 95% of acid(s) as pH modifier.

8. The method of claim 1 wherein the injecting operation further comprises:

alternately injecting a first amount of metal-polymer complex remediation mixture and a second amount of a diverting mixture into the well.

9. The method of claim 1 wherein the injecting operation further comprises:

injecting the metal-polymer complex remediation mixture to completion or until pressure within the well reaches a predetermined target that does not cause substantial fracturing of the formation.

10. The method of claim 1 wherein the injecting operation further comprises:

injecting the metal-polymer complex remediation mixture until the pressure within the well reaches a predetermined target pressure calculated based on the fracture pressure of the subterranean formation; and

upon reaching the target pressure, shutting in the well.

11. The method of claim 1 further comprising:

monitoring at least one of pH and well pressure during the maintaining operation; and

initiating the removing operation based on results of the monitoring operation.

12. The method of claim 1 further wherein the metal complexing agent is selected from glutamic acid diacetic acid (GLDA), methylglycine diacetic acid (MGDA), β-alanine diacetic acid (β-ADA), ethylenediaminedisuccinic acid, S,S- ethylenediaminedisuccinic acid (EDDS), iminodisuccinic acid (IDS), hydroxyiminodisuccinic acid (HIDS), polyamino disuccinic acids, N-bis[2-(l,2- dicarboxyethoxy)ethyl]glycine (BCA6), N-bis[2-(l,2-dicarboxyethoxy)ethyl]aspartic acid (BCA5), N-bis[2-(l,2- dicarboxyethoxy)ethyl]methylglycine (MCBA5), N-tris[(l,2- dicarboxyethoxy)ethyl]amine (TCA6), N-methyliminodiacetic acid (MIDA), iminodiacetic acid (IDA), N-(2-acetamido)iminodiacetic acid (ADA), hydroxymethyl-iminodiacetic acid, 2-(2-carboxyethylamino) succinic acid (CEAA), 2-(2-carboxymethylamino) succinic acid (CMAA), diethylenetriamine- N,N''-disuccinic acid, triethylenetetramine-N,N'''-disuccinic acid, 1,6- hexamethylenediamine-N,N'-disuccinic acid, tetraethylenepentamine-N,N''''-disuccinic acid, 2-hydroxypropylene-l,3-diamine-N,N'-disuccinic acid, 1,2- propylenediamine-N,N'-disuccinic acid, l,3-propylenediamine-N,N'-disuccinic acid, cis-cyclohexanediamine-N,N'-disuccinic acid, trans-cyclohexanediamine- N,N'-disuccinic acid, ethylenebis(oxyethylenenitrilo)-N,N'-disuccinic acid, glucoheptanoic acid, cysteic acid-N,N-diacetic acid, cysteic acid-N-monoacetic acid, alanine-N-monoacetic acid, N-(3-hydroxysuccinyl) aspartic acid, N-[2-(3-hydroxysuccinyl)]-L-serine, aspartic acid-N,N-diacetic acid, aspartic acid-N- monoacetic acid, any salt thereof, any derivative thereof, or any combination thereof.

13. The method of claim 1 further wherein the metal complexing agent is selected from acetic acid, acrylates, dihydroxymaleic acid, salts of dihydroxymaleic acid, EDTA (ethylenediamine tetraacetic acid), salts of EDTA, erythorbic acid, erythroboric acid, formic acid, gluconodeltalactone, GLDA (glutamic acid N,N-diacetic acid), salts of GLDA, HEDTA (hydroxyethylenediamine triacetic acid), salts of HEDTA, HEIDA (disodium ethanoldiglycine), salts of HEIDA, MGDA (methylglycine N,N-diacetic acid), salts of MGDA, NTA (nitriolotriacetic acid), organic metal complexers, ligands, porphyrins, pigments, peptides, saccharides, nucleic acids, phosphonic acid, polyacrylic acid and citric acid in an amount sufficient to sequester at least a portion of a metal compound.

14. The method of claim 1 wherein the metal-polymer complex remediation mixture comprises between about 0.1% and about 60% by weight metal complexing agent.

15. The method of claim 1 wherein the contact time is between about 4 hours and about 4 days.

16. A method for remediating a low-producing well in a hydrocarbon-bearing subterranean formation, comprising:

fracturing the hydrocarbon-bearing subterranean formation;

monitoring the production of the well; and

after observing a well production decrease, determining that a subterranean-formed metal-polymer complex has formed in the well;

providing a metal-polymer complex remediation mixture containing between about 0.1% and 95% by weight metal complexing agent;

injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the subterranean formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex ;

maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and

removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

17. The method of claim 16, wherein the metal complexing agent includes at least one of ethylenediaminetetraacetic acid (EDTA), propylenediaminetetraacetic acid (PDTA), nitrilotriacetic acid (NTA), N-(2- hydroxyethyl)ethylenediaminetriacetic acid (HEDTA), diethylenetriaminepentaacetic acid (DTPA), hydroxyethyliminodiacetic acid (HEIDA), cyclohexylenediaminetetraacetic acid (CDTA), diphenylaminesulfonic acid (DPAS), ethylenediaminedi(o-hydroxyphenylacetic) acid (EDDHA), glucoheptonic acid, gluconic acid, oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, suberic acid,

azelaic acid, sebacic acid, phthalic acid, terephthalic acid, aconitic acid, carballylic acid, trimesic acid, isocitric acid, citric acid, or any salt or derivative of any of the previously listed compounds.

18. The method of claim 17,wherein the remediation mixture comprises between about 0.1% and about 60% by weight metal complexing agent;

between about 1% and 95% by weight metal complexing agent;

between 1 and 10,000 parts per million (ppm) of a corrosion inhibitor;

between 1 and 10,000 ppm of a biocide;

between 1 and 10,000 ppm of a colloidal silica deposition inhibitor;

between 1 and 500 gallons per thousand gallons (gpt) of a mutual solvent; and

wherein the contact time is between about 1 minute and about 100 days.

19. The method of claim 16, wherein the injecting operation further comprises:

injecting the remediation mixture until the pressure within the well reaches a predetermined target pressure calculated based on the fracture pressure of the hydrocarbon-bearing subterranean formation; and

upon reaching the target pressure, shutting in the well.

20. The method of claim 19, further comprising:

monitoring at least one of pH and well pressure during the maintaining operation; and

initiating the removing operation based on results of the monitoring operation.

METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT

RELATED APPLICATIONS

[0001] This application is a continuation of U.S. Patent Application No. 14/525,038 filed October 27, 2014 entitled "Method for Remediation of Subterranean-Formed Metal-Polymer Complexes Using a Metal Complexing Agent", which claims the benefit of U.S. Provisional Application No. 61/895,873, filed October 25, 2013, and U.S. Provisional Application No. 61/898,107, filed October 31, 2013, the contents of all of which are hereby incorporated by reference in their entirety.

INTRODUCTION

[0002] The darcy is a unit of permeability for fluids in a porous material. Nano-darcy shale formations refer to those shale formations having an average permeability in at least one direction of less than 1 micro-darcy or less than $1x10^{-6}$ darcy. In nano-darcy shale formations, the range of average pore sizes within the shale spans the size of the hydrocarbons trapped in the shale, e.g., the natural gas molecules and the molecules of the various crude oil constituents. That is, the average pore size within the shale may be smaller, approximately the same size or larger than the size of the hydrocarbons. This differs from higher permeability shale formations in which the average pore sizes are substantially larger than the various hydrocarbon molecule sizes.

[0003] While permeability is a useful measurement, the determination of average pore size from a permeability measurement relies on assumptions about the shapes of the grains or pores in the subsurface. Shale formations are a mixture of clay minerals and larger particles. Clay minerals are not normally spherically shaped and also exhibit electro-static properties not found in non-clay materials. Thus, as nano-darcy shale formations are typically very high in clay content, they do not exhibit the same behaviors as more permeable formations, even more permeable shale formations.

[0004] Well stimulation refers to the treatment of an existing well to increase its recovery of hydrocarbons or other substances from the subsurface. Because of the different nature of nano-darcy shale formations, typical well stimulation techniques have been found to be ineffective or much less effective than in higher permeability formations.

[0005] An extreme form of well stimulation is referred to as hydraulic fracturing. Hydraulic fracturing of oil and gas wells is conducted by pumping fluids at high pressures and high velocities through a vertical and, usually, a horizontal section of a well. The well contains a well casing and, in some wells, tubing inside the casing. Perforations or ports in the casing are adjacent to targeted intervals of subterranean formations containing a hydrocarbon or target product. In hydraulic fracturing, the pressure exerted on the formation is greater than the pressure required to substantially fracture the formation, a pressure referred to as the fracture pressure of the formation which is a function of the formation' properties and the depth where the fractures are desired. One test for determining the fracture pressure is the Leak-off test. Applying a pressure equal to or greater than the fracture pressure causes the formation to fracture, creating an extensive fracture network.

[0006] After the fractures or cracks are initiated, pumping is continued, allowing the fractures to propagate. Once the fracture has gained sufficient fracture width, a proppant such as sand is added to the fluid and is transported into the fracture system, partially filling the fracture network. After the desired amount of proppant is placed in the fractures, additional water-based fluid is pumped to flush the casing of any proppant that may have settled in the casing. On completion of the fracturing process, the well is opened, allowing a portion of the fracturing fluids to be recovered. As the pressure is relieved, the fracture closes onto the proppant, creating a conductive pathway needed to accelerate oil and gas recovery from the formation. Hydraulic fracturing is expensive because of the large amounts of fluids and high pressures involved.

REMEDIATING SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES

[0007] This disclosure describes formulations and methods for remediating subterranean-formed metal-polymer complexes, such as polyacrylamide or other gelable polymers that crosslink with metal ions, from wells in subterranean formations, including wells in nano-darcy shale formations. In one embodiment, the method includes injecting a remediation mixture containing a metal complexing agent such as citric acid or EDTA into a subterranean formation adjacent to a well at a pressure below the fracture pressure of the formation. A sufficient contact time is allowed and then the remediation mixture is pumped from the subsurface. This has been shown to remediate subterranean-formed polyacrylamide metal-polymer complexes in subterranean formations. Without being held to a particular theory, based on an analysis of samples of polyacrylamide metal-polymer complexes, it appears that the metal complexing agent breaks the cross-links between the cations and the polymers used in the fracturing fluids. The

metal-polymer complexes plug the passages in the formations which prevents removal of hydrocarbons. Breaking the crosslinking in the metal-polymer complex causes the metal-polymer complex to go into a solution that can be pumped to the surface, which removes the blockages and thereby causes increased production.

[0008] In one aspect, a method for remediating a subterranean-formed metal-polymer complex in a well in a subterranean formation is disclosed. The method can include providing a metal-polymer complex remediation mixture containing between about 0.1% and 95% by weight metal complexing agent, injecting the metal-polymer complex remediation mixture into the well at a pressure less than a fracture pressure of the formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex, maintaining the metal-polymer complex remediation mixture in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components; and removing the low viscosity flow back fluid from the well after the contact time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

[0009] In another aspect, a method for remediating a low-producing well in a subterranean formation is disclosed. The example method can include fracturing the subterranean formation to produce a well, monitoring the production of the well, and after observing the well production decrease, after observing a well production decrease, determining that a subterranean-formed metal-polymer complex has formed in the well. A metal-polymer complex remediation mixture is provided containing between about 0.1% and 95% by weight metal complexing agent. The metal-polymer complex remediation mixture is injected into the well at a pressure less than a fracture pressure of the formation until at least some of the metal-polymer complex remediation mixture contacts the subterranean-formed metal-polymer complex. After injection, the metal-polymer complex remediation mixture is maintained in contact with the subterranean-formed metal-polymer complex for a contact time of between about 1 minute and about 100 days, thereby allowing the metal complexing agent to cause the subterranean-formed metal-polymer complex to dissociate and dissolve, thereby creating a low viscosity flow back fluid comprising the spent metal-polymer complex remediation mixture and the metal-polymer complex components. The low viscosity flow back fluid is then removed from the well after the contact

time, thereby improving the hydrocarbon production of the well relative to the hydrocarbon production immediately prior to performance of the method.

[0010] These and various other features as well as advantages which characterize the systems and methods described herein will be apparent from a reading of the following detailed description and a review of the associated drawings. Additional features are set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the technology. The benefits and features of the technology will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0011] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the disclosure as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The following drawing figures, which form a part of this application, are illustrative of described technology and are not meant to limit the scope of the disclosure as claimed in any manner, which scope shall be based on the claims appended hereto.

[0013] FIG. 1 is an embodiment of a method of remediating a subterranean-formed metal-polymer complex.

[0014] FIG. 2A illustrates a sample of a subterranean-formed metal-polymer complex.

[0015] FIG. 2B illustrates the sample of FIG. 2A in a beaker with an example remediation mixture.

[0016] FIGS. 2C and 2D illustrate the sample of FIG. 2B after contact with the example remediation mixture in FIG. 2B.

[0017] FIG. 3 illustrates a sample of a subterranean-formed metal-polymer complex after contact with an example remediation mixture.

[0018] FIGS. 4A and 4B illustrate a sample of a subterranean-formed metal-polymer complex after contact with an example remediation mixture.

[0019] FIG. 5A illustrates a sample of a subterranean-formed metal-polymer complex.

[0020] FIG. 5B illustrates the sample of 5A being filtered after contact with an example remediation mixture.

[0021] FIG. 6A illustrates a sample of a subterranean-formed metal-polymer complex.

[0022] FIG. 6B illustrates the sample of 6A being filtered after contact with an example remediation mixture.

[0023] FIG. 7A illustrates a sample of a subterranean-formed metal-polymer complex.

[0024] FIG. 7B illustrates the sample of 7A being filtered after contact with an example remediation mixture.

[0025] FIG. 8 is an embodiment of a method of remediating a low-producing well.

DETAILED DESCRIPTION

[0026] Although the techniques introduced above and discussed in detail below may be implemented for remediating subterranean-formed metal-polymer complexes from subterranean formations, the present disclosure will discuss the implementation of these techniques in an oil and gas well for the purpose of extracting hydrocarbons. The reader will understand that the technology described in the context of an oil and gas well could be adapted for use with other systems such as water well and solution mining wells.

[0027] This disclosure describes formulations and methods for remediating a subterranean-formed metal-polymer complexes with residual polymers such as polyacrylamide or other gelable polymer that forms crosslinks or complexes with metals or metal complexes such as ferric hydroxide. Following the introduction of a hydraulic fracturing fluid, including slickwater, where high volumes of polymers such as polyacrylamide are used as friction reducers, into a well bore, over time the well production can decrease. Previously, well operators assumed that the flow reduction was attributable to the diminishing reserve of hydrocarbons in the subterranean formation. In many instances, this is not the sole reason for the observed flow reduction. Without being bound to a particular theory, the observed flow reduction can be attributed to a build-up of metal-polymer complex in the well bore that was formed after the well was created. Again, without being bound to a particular theory, when fracturing fluid containing a polymer, such as polyacrylamide, is pumped into subterranean formations, the polymer can cross-link with metals present or introduced in the subterranean formations and form metal-polymer complexes. The metal-polymer complex may form a physical block in the subterranean formations, plugging up the conductive pathways formed during the fracturing process.

[0028] In one embodiment, the method includes injecting a remediation mixture containing a metal complexing agent such as citric acid or EDTA into a well at a pressure below the fracture pressure of the formation where a metal-polymer complex is presumed or known to have formed. A sufficient contact time is allowed and then the remediation mixture is pumped from the

subsurface. The remediation mixture has been shown to un-crosslink and remediate metal-polymer complexes obtained from nano-darcy shale formations, which can result in a liquid with similar viscosity and rheological properties as water. Without being held to a particular theory, based on an analysis of the extracted metal-polymer complex it appears that the metal complexing agent undergoes an ion exchange with the metal-polymer complex causing it to dissociate and dissolve. In other words, the metal complexing agent might be breaking the crosslinks with the cations in the metal-polymer complex.

[0029] The present disclosure relates to a process to cause the dissociation of metal cations and metal complexes from the metal-polymer complexes created in wells as a byproduct of the fracturing process. Whether the cations are present from natural sources in the reservoir rock prior to drilling into the formation or formed through interactions with drilling, completion, or reservoir stimulation (hydraulic fracturing or acid stimulation) fluids, the use of metal complexing substances to dissolve or disperse materials that are, or can, restrict flow into the well bore is presented as a commercial method to restore or enhance the productivity of well bores that are restricted with such materials. For example, the introduction of hydraulic fracturing fluids containing, for example, polymers and acrylates including polymers used as friction reducers, such as polyacrylamide, can form metal-polymer complexes between the polymer and the metal ions, such as aluminum, barium, calcium, magnesium, manganese, iron, strontium, boron and other metals or metalloids. These metal-polymer complexes do not exist naturally. Rather, they can form as a result of the fracturing process and the materials used in the fracturing process.

[0030] For the purposes of this disclosure, a metal-complexing agent may be any chemical that can bind with a metal regardless of the binding mechanism and includes sequestration agents, reducing agents, chelating agents, ligands, porphyrins, pigments, peptides, saccharides and/or nucleic acids. In some embodiments, the metal-complexing agent is a chelating agent, an alkali metal salt thereof, a non-alkali metal salt thereof, or any combination thereof may be included in the treatment fluids described herein. In some embodiments, the chelating agent may be biodegradable. Although use of a biodegradable chelating agent may be particularly advantageous in some embodiments of the present disclosure, there is no requirement to do so, and, in general, any suitable chelating agent may be used. As used herein, the term "biodegradable" refers to a substance that can be broken down by exposure to environmental conditions including native or non-native microbes, sunlight, air, heat, and the like. Use of the

term "biodegradable" does not imply a particular degree of biodegradability, mechanism of biodegradability, or a specified biodegradation half-life.

[0031] In some embodiments, a partially soluble or colloidal metal ion complex, such as, for example, calcium magnesium silicate, is solubilized using, for example, one or a combination of the following chelation chemicals (chelating agent): Acetic Acid, Acrylates, Dihydroxymaleic Acid, Salts of Dihydroxymaleic Acid, EDTA (ethylenediamine tetraacetic acid), Salts of EDTA, erythorbic acid, erythroboric acid, Formic Acid, Gluconodeltalactone, GLDA (glutamic acid N,N-diacetic acid), Salts of GLDA, HEDTA (hydroxyethylenediamine triacetic acid), Salts of HEDTA, HEIDA (disodium ethanoldiglycine), Salts of HEIDA, MGDA (methylglycine N,N-diacetic acid), Salts of MGDA, NTA (nitriolotriacetic acid), Organic Metal Complexers, Phosphonic Acid, Polyacrylic Acid and notably Citric Acid in an amount sufficient to sequester at least a portion of any metal compounds and thereby dissolve or disperse materials that can restrict the flow path to the well bore and the overall permeability of the well bore and reservoir rock system. It should be understood that although chelation chemical(s) (chelating agent(s), chelator(s)) have been provided herein by way of example, any chelation chemical may be utilized in accordance with the present process, so long as the chelation chemical functions in accordance with the present disclosure as described herein.

[0032] In some embodiments, suitable complexing agents may include common chelating agent compounds such as, for example, ethylenediaminetetraacetic acid (EDTA), propylenediaminetetraacetic acid (PDTA), nitrilotriacetic acid (NTA), N-(2-hydroxyethyl)ethylenediaminetriacetic acid (HEDTA), diethylenetriaminepentaacetic acid (DTPA), hydroxyethyliminodiacetic acid (HEIDA), cyclohexylenediaminetetraacetic acid (CDTA), diphenylaminesulfonic acid (DPAS), ethylenediaminedi(o-hydroxyphenylacetic) acid (EDDHA), glucoheptonic acid, gluconic acid, oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, suberic acid, azelaic acid, sebacic acid, phthalic acid, terephthalic acid, aconitic acid, carballylic acid, trimesic acid, isocitric acid, citric acid, any salt thereof, any derivative thereof, and the like. It is to be noted that NTA may be considered to be a biodegradable compound, but it may have undesirable toxicity issues.

[0033] In some embodiments, suitable complexing agents may include biodegradable chelating agents such as, for example, glutamic acid diacetic acid (GLDA), methylglycine diacetic acid (MGDA), β-alanine diacetic acid (β-ADA), ethylenediaminedisuccinic acid, S,S-ethylenediaminedisuccinic acid (EDDS), iminodisuccinic acid (IDS), hydroxyiminodisuccinic acid (HIDS), polyamino disuccinic acids, N-bis[2-(l,2- dicarboxyethoxy)ethyl]glycine (BCA6),

N-bis[2-(l,2- dicarboxyethoxy)ethyl]aspartic acid (BCA5), N-bis[2-(l,2-dicarboxyethoxy)ethyl]methylglycine (MCBA5), N-tris[(l,2- dicarboxyethoxy)ethyl]amine (TCA6), N-methyliminodiacetic acid (MIDA), iminodiacetic acid (IDA), N-(2-acetamido)iminodiacetic acid (ADA), hydroxymethyl-iminodiacetic acid, 2-(2-carboxyethylamino) succinic acid (CEAA), 2-(2-carboxymethylamino) succinic acid (CMAA), diethylenetriamine- N,N"-disuccinic acid, triethylenetetramine-N,N"'-disuccinic acid, 1,6-hexamethylenediamine-N,N'-disuccinic acid, tetraethylenepentamine-N,N""- disuccinic acid, 2-hydroxypropylene-l,3-diamine-N,N'-disuccinic acid, 1,2- propylenediamine-N,N'-disuccinic acid, l,3-propylenediamine-N,N'-disuccinic acid, cis-cyclohexanediamine-N,N'-disuccinic acid, trans-cyclohexanediamine- N,N'-disuccinic acid, ethylenebis(oxyethylenenitrilo)-N,N'-disuccinic acid, glucoheptanoic acid, cysteic acid-N,N-diacetic acid, cysteic acid-N-monoacetic acid, alanine-N-monoacetic acid, N-(3-hydroxysuccinyl) aspartic acid, N-[2-(3- hydroxysuccinyl)]-L-serine, aspartic acid-N,N-diacetic acid, aspartic acid-N- monoacetic acid, any salt thereof, any derivative thereof, or any combination thereof.

[0034] In an alternative embodiment, the metal-complexing agent may be a suitable sequestering agent such as polysuccinimide, polyaspartic acid, and polymers, oligomers, chains or block-copolymers of the twenty two essential amino acids containing metal complexing groups such as carboxylic acids, phosphonic acids, sulfonic acids and boronic acids.

[0035] In one embodiment, the metal complexing agent is provided between about 0.05% weight volume to about 60% weight volume. However, any suitable range may be used including from about 1% to about 40%; from about 2% and about 20%; from about 0.1% to about 95%; from about 0.05% to about 95%; from about 5% to about 50%; or from about 10% to about 80%. In some embodiments, the amount of metal complexing agent may be even higher as some metal complexing agents may be provided with additives as described in greater detail below.

[0036] The metal-polymer complex remediation mixture can contain the metal complexing agent as well as multiple chemical additives as desired. The additives may include biocide, scale inhibitor, clay control additive, oxygen scavenger and surfactant that assist fluid recovery. To keep the fracturing treatments affordable, only minimal amounts of these additives are used. Each additive is normally liquid-based and is metered separately into the treatment fluid and mixed with water and other additives in the blender. The blender includes a 5- to 15-barrel tub with agitation devices. The additive concentrations are commonly expressed in parts per million (ppm) or as gallons of additive per 1000 gallons of water (abbreviated as gallons per thousand or

gpt). The additives typically are composed of a chemical that provides the desired function such as scale inhibition and a solvent, commonly water, alcohol or oil.

[0037] Another additive that may be used is a corrosion inhibitor. Corrosion inhibitors reduce corrosion of the well components. In an embodiment, quaternary ammonium compounds typically referred to as quaternary amines are used as a corrosion inhibitor in trace amounts to 2,000 ppm. However, any suitable corrosion inhibitor may be used in any amount as desired. Other examples of possible corrosion inhibitors include quaternary amine compounds commonly used for protection of metal in the presence of high or low pH and/or dissolved oxygen bearing fluids, such as Flex-Chem FC-181 and many other similar formulations used in well maintenance activities. Quaternary ammonium compounds, acetylenic alcohols, amide and oxylalkylated alcohols, quinoline quaternary ammonium alkyl amine salts and surfactants, nonyl phenol surfactants, alkyl thioamides, oxyalkylated phenols, alkyl pyridine benzyl quaternary ammonium chloride, benzyl quaternary ammonium chloride, aliphatic amines, cocoamine diquaternary ammonium chloride, imadazoline, polyamide, modified amido polyamine, alkylamidomine, amido imadazoline, alkyl phosphate ester, potassium salt of a glycol phosphate ester, amine salt of poly-phosphate ester, tallow diamine ethoxylate, polyacid, amine salt of polyphosphonic acid, organic acid-amine salt, crude dimerized fatty acids or tall oil dimer-trimer acids.

[0038] Another additive that may be used is a surfactant. Surfactants such as sodium lauryl sulfate and many other surfactant materials that could be selected based on their compatibility with the other materials in the chelating solution and pH of the final solution can be used.

[0039] Another additive that may be used is a biocide. For example, in an embodiment trace amounts to 5,000 ppm tributyl tetradecyl phosphonium chloride (TTPC) may be used as a biocide. Any suitable biocide may be used in any amount as desired. Biocidal agents could include, glutaraldehyde, quaternary amine compounds such as alkyl dimethyl benzyl ammonium chloride (ADBAC), sodium chlorite (which would generate chlorine dioxide in-situ), TTPC, isothiazolin compounds, thione based compounds, and many other agents approved for use in the well maintenance activities. Other examples of possible biocides include chlorine dioxide, didecyldimethyl ammonium chloride (DDAC) and brominated propionamide.

[0040] Another additive that may be used is a dispersing agent. Dispersing agents such as Dow Acumer 5000 or Versaflex Si to enhance the removal of colloidal silicon bearing materials and many other dispersing agents that could assist with recovering colloidal material residue from the well bore.

[0041] Another additive that may be used is a colloidal silica deposition inhibitor. The use of a colloidal silica deposition inhibitor, sometimes also referred to as amorphous silica control compound, prevents silica scale precipitation within the wells during the treatment process. One example of a colloidal silica deposition inhibitor is an aqueous solution of organic additive based on phosphino carboxylic acid copolymer. Any suitable colloidal silica deposition inhibitor may be used. Other examples of possible colloidal silica deposition inhibitors include such materials as phosphate, phosphate ester, or phosphonate compounds; polymaleic, or acrylate compounds such as polyacrylic acid scale inhibitors commonly used for such applications in well maintenance activities.

[0042] Another additive that may be used is a mutual solvent. Mutual solvents are soluble in oil, water and acid-based mixtures and may be used in a range of applications, such as removing heavy hydrocarbon deposits, controlling the wettability of contact surfaces before, during or after a stimulation treatment, and preventing or breaking emulsions. A commonly used mutual solvent is ethylene glycol monobutyl ether, generally known as EGMBE or 2-butoxy ethanol. Any suitable mutual solvent may be used. Other examples of possible mutual solvents include compounds such as ethylene glycol monobutyl ether or FCS-280 or other compounds commonly used for such applications in well maintenance activities.

[0043] Acid may also be used as an additive in order to control the pH of the remediation mixture. In an embodiment hydrochloric acid may be used from trace amounts to about 30% by weight. Any suitable acid may be used as needed. Other examples of possible acids include aqua regia, arsenic acid, boric acid, carbonic acid, chloric acid, chromic acid, fluoroantimonic acid, fluoroboric acid, fluorosulfuric acid, fulminic acid, hexafluorophosphoric acid, hexafluorosilicic acid, hydrobromic acid, hydrofluoric acid, hydrogen iodide, hypochlorous acid, hypofluorous acid, hypophosphoric acid, iodic acid, nitric acid, nitrosyl-O-hydroxide, nitrous acid, orthocarbonic acid, perchloric acid, permanganic acid, perrhenic acid, pertechnetic acid, phosphoric acid, silicic acid, sulfuric acid, thiocyanic acid, titanic acid, tungstic acid or xenic acid.

[0044] In some wells, metal-polymer complex remediation using the novel remediation mixtures designed herein may be made more cost efficient by alternating the injection of the remediation mixture with the injection of a diverting material. Many wells have high volume sections within the well flow paths that are referred to as fluid thief zones in that they represent a volume that must be filled during the treatment process but the fluid in that zone is ineffective at its task (in this case complexing with metal cations in the subterranean formation). To address

this, a diverting material such as particles of polylactic acid in a brine mixture may be used. Diverting materials are designed to take up larger volumes without interfering with the delivery of treatment chemicals to the target zones. Diverting materials are relatively inert with respect to the treatment chemicals and are also designed to allow easy passage of the treatment chemicals around volumes that they occupy. In addition, many diverting materials are designed to breakdown and be easily recoverable after some period of time such as days or weeks.

[0045] Diverting materials and mixtures other than particles of polylactic acid in a brine mixture may also be used. Diverting agents such as benzoic acid flakes, polylactic acid, solid or water soluble ball sealers, rock salt, encapsulated solid chelators, etc., other diverting agents. For example, mixtures using products consisting of various polymers blended with waxes and other solid hydrocarbons polymers blended with waxes and other solid hydrocarbons have been used as diverting material. Diverting materials are designed to be relatively inert with respect to the treatment chemicals and are also designed to allow easy passage of the treatment chemicals.

[0046] In an embodiment, a metal-polymer complex remediation program may include alternating between injecting an amount of remediation mixture, followed by injecting an amount of a diverting mixture until such time as the well pressure achieves a target pressure, such as a pre-determined target pressure, the fracture pressure for the formation or a threshold amount above or below the pre-determined fracture pressure from the formation calculated based on the fracture pressure.

[0047] FIG. 1 illustrates one such metal-polymer complex remediation program. In the program 100, the remediation mixture is obtained in a provide remediation mixture operation 102. The remediation mixture may be made or completed on site in a batch process or an amount of remediation mixture may be brought to the site prior to the metal-polymer complex remediation of the well. Any of the embodiments of the remediation mixture described above may be used.

[0048] In embodiments, a provide diverting mixture operation 104 is also performed in which a diverting mixture is either generated at the site prior to use or a mixture is brought to the site pre-made. Any diverting mixture as described above may be used. This operation, 104, is optional and may not be needed if it is determined that there will be relatively little loses to thief zones of the remediation mixture during the treatment process.

[0049] Next, the remediation mixture and the diverting mixture (if any) are injected in an injection operation 106. In an embodiment, the two mixtures are alternately injected in alternating injection operation 106. As described above, predetermined amounts of the mixtures

may be alternately injected or the injection amounts may be varied. In an embodiment, for example, the injection operation alternately injects 150 barrels of remediation mixture and 150 barrels of diverting mixture.

[0050] In one embodiment, injection continues until such time as the well pressure achieves a target pressure. The target pressure may be a pre-determined target pressure based on knowledge of the operator. Alternatively, the target pressure may be the fracture pressure for the formation or a threshold amount above or below the fracture pressure from the formation. Any suitable technique such as the Leak-off test may be used to determine fracture pressure.

[0051] Upon reaching the target pressure, a well shut in operation 108 is performed. In the shut in operation 108, the well is closed and the remediation mixture is trapped in the well.

[0052] The well is then maintained in the shut in state in a maintain shut in operation 110. This provides contact time for the remediation mixture allowing the treatment chemicals to react with the subterranean-formed metal-polymer complex, thereby allowing the metal-polymer complex to dissociate and dissolve into the treatment mixture. During this period, the pressure may slowly decrease and the pH may change due to reactions occurring in the subsurface. The contact time provided may be any amount from 1 minute to 100 days. However, it appears that 1 to 4 days may be preferable. Too long or short a contact time may result in lowered performance. Too short a time may not allow sufficient time for the remediation mixture to cause the dissociation of crosslinks and polymer connections in the metal-polymer complex. Too long a contact time may result in bound metals precipitating within the well or formation before they can be removed with the spent remediation mixture. It is anticipated that the optimum time may need to be determined empirically for each fracturing fluid chemistry and formation combination or even each depth or region of a formation.

[0053] The method ends with the extraction of the spent remediation mixture along with the dissociated and dissolved metal-polymer complex constituents in a mixture removal operation 112. In the removal operation 112, the well is opened and the liquid in the well is pumped out of the well. The constituents removed will include bound metals from the subsurface, constituents of the metal-polymer complex and spent treatment mixture. Without being held to a particular theory, the remediation mixture breaks up the metal-polymer complex and allows it to be pumped out of the well, whether it is by breaking the cross-links or complexing the metals.

[0054] Other embodiments of the method 100 are possible. In addition to changing any of the specific components of the mixtures as described above, changes to when and how the mixtures are produced and injected may be made without departing from the teaching of this disclosure.

[0055] FIG. 8 illustrates a low-producing well remediation program 800. In some instances, a well becomes low-producing as compared to the initial hydrocarbon production. Without actually testing the well to verify a metal-polymer complex is blocking hydrocarbon flow, there might be a presumption that metal-polymer complex was formed in the well. Nonetheless, remediation mixtures according to the instant disclosure can be employed to improve hydrocarbon production without confirmation that a subterranean-formed metal-polymer complex is the cause of the low hydrocarbon production. Embodiments of this method may be usable with any fractured well regardless of the permeability of the formation. However, such embodiment may be more suitable for low permeability formations such as nano-darcy formations as the development of a metal-polymer complex will have a greater impact in a low permeability formation than in a higher permeability formation.

[0056] In the example program 800, a well is fractured using fracturing fluid in a conduct fracturing process operation 802. This process is performed according to various methods known in the art. In embodiments, the well production output is monitored in operation 804. Monitoring output can include hourly, daily, weekly, monthly, and yearly hydrocarbon output from the well. It can be performed manually or automatically. If the well production decreases, then a remediation of the well can be performed using a remediation mixture. The monitoring operation 804 may include periodic sampling from the well to determine the existence of a subterranean-formed metal-polymer complex. Determination of a metal-polymer complex in this embodiment is direct observation of the metal-polymer complex such as by obtaining some amount of material from the well (e.g., via a bailer, by a downhole inspection technique, or from the flowback). If a decrease in well production is observed in tandem with the existence of a subterranean-formed metal-polymer complex or an increase in the amount of metal-polymer complex observed in the well, then it will be presumed that the metal-polymer complex is causing the production decrease. Alternatively, the monitoring operation 804 may only be a monitoring of the hydrocarbon production of the well, the flowback production of the well, the pressures needed to operate the well or some other indicator of well performance or of the hydraulic resistance within the well. In this embodiment, the observed decrease in performance in conjunction with the fact that a fracturing operation took place at the well is indirect evidence that a metal-polymer complex has formed and is causing the decrease in performance.

[0057] The remediation mixture is obtained in a provide remediation mixture operation 806. The remediation mixture may be made or completed on site in a batch process or an amount of

remediation mixture may be brought to the site prior to the metal-polymer complex remediation of the well. Any of the embodiments of the remediation mixture described above may be used.

[0058] In embodiments, a provide diverting mixture operation 808 is also performed in which a diverting mixture is either generated at the site prior to use or a mixture is brought to the site pre-made. Any diverting mixture as described above may be used. This operation, 808, is optional and may not be needed if it is determined that there will be relatively little loses to thief zones of the remediation mixture during the treatment process.

[0059] Next, the remediation mixture and the diverting mixture (if any) are injected in an injection operation 810. In an embodiment, the two mixtures are alternately injected in alternating injection operation 810. As described above, predetermined amounts of the mixtures may be alternately injected or the injection amounts may be varied. In an embodiment, for example, the injection operation alternately injects 150 barrels of remediation mixture and 150 barrels of diverting mixture.

[0060] In one embodiment, injection continues until such time as the well pressure achieves a target pressure. The target pressure may be a pre-determined target pressure based on knowledge of the operator. Alternatively, the target pressure may be the fracture pressure for the formation or a threshold amount above or below the fracture pressure from the formation. Any suitable technique such as the Leak-off test may be used to determine fracture pressure.

[0061] Upon reaching the target pressure, a well shut in operation 812 is performed. In the shut in operation 812, the well is closed and the remediation mixture is trapped in the well.

[0062] The well is then maintained in the shut in state in a maintain shut in operation 814. This provides contact time for the remediation mixture, allowing the treatment chemicals to react with the presumed subterranean-formed metal-polymer complex, thereby allowing the metal-polymer complex to dissociate and dissolve into the treatment mixture. During this period, the pressure may slowly decrease and the pH may change due to reactions occurring in the subsurface. The contact time provided may be any amount from 1 minute to 800 days. However, it appears that 1 to 4 days may be preferable. Too long or short a contact time may result in lowered performance. Too short a time may not allow sufficient time for the remediation mixture to cause the dissociation of crosslinks and polymer connections in the metal-polymer complex. Too long a contact time may result in bound metals precipitating within the well or formation before they can be removed with the spent remediation mixture. It is anticipated that the optimum time may need to be determined empirically for each fracturing fluid chemistry and formation combination or even each depth or region of a formation.

[0063] The method ends with the extraction of the spent remediation mixture along with the dissociated and dissolved metal-polymer complex constituents in a mixture removal operation 816. In the removal operation 816, the well is opened and the liquid in the well is pumped out of the well. The constituents removed may include bound metals, constituents of the metal-polymer complex and spent treatment mixture. Without being held to a particular theory, the remediation mixture breaks up the metal-polymer complex and allows it to be pumped out of the well, whether it is by breaking the cross-links or complexing the metals.

[0064] Other embodiments of the method 800 are possible. In addition to changing any of the specific components of the mixtures as described above, changes to when and how the mixtures are produced and injected may be made without departing from the teaching of this disclosure.

EXAMPLES

Example 1

[0065] A laboratory analysis was performed in which embodiments of the remediation mixture were mixed with a sample of subterranean-formed metal-complexed polyacrylamide metal-polymer complex. In the first test, 14.2 g of a sample was weighed (see FIG. 2A). The sample was placed into a 500 mL Griffin Beaker (FIG. 2B) with 8 mL d-limonene and 40 mL of 10% sodium chlorite. The sample was then placed in a 150°F water bath for 16 hours. After 16 hours, the sample was observed (FIGS. 2C and 2D).

[0066] The initial d-limonene treatment appeared to release a trace amount of hydrocarbon in the metal-polymer complex sample. After the sample soaked for 16 hours in 10% sodium chlorite at 150°F (FIGS. 2C and 2D), there was a change to the sample.

[0067] In the second test, 18.7 g of a sample of subterranean-formed metal-polymer complex was weighed. The sample was placed in a 300 mL Griffin Beaker with 40 mL of 10% tetrasodium EDTA. The sample was placed in a 150°F water bath for 16 hours. After 16 hours, the sample was observed (FIG. 3).

[0068] The addition of 10% tetrasodium EDTA to the sample put the sample completely into solution after 4 hours at 150°F (FIG. 3). Without being bound to a particular theory, it appears that the tetrasodium EDTA and the metal-polymer complex sample have an ion exchange that causes the metal-polymer complex sample to dissociate and dissolve.

[0069] In the third test, 14.4 g of a sample of subterranean-formed metal-polymer complex was weighed. The sample was placed in a 300 mL Griffin Beaker with 80 mL of 10% citric acid. The

sample was then placed in a 150°F water bath for 16 hours. After 16 hours, the sample was observed (FIGS. 4A and 4B).

[0070] The addition of 10% citric acid to the sample subterranean-formed metal-polymer complex moderately put the sample of subterranean-formed metal-polymer complex into solution after 16 hours at 150°F (FIGS. 4A and 4B).

Example 2

[0071] A laboratory analysis was performed in which embodiments of the remediation mixture were mixed with a sample subterranean-formed metal-complexed polyacrylamide metal-polymer complex. In the first test, 21.6 g of a sample subterranean-formed metal-polymer complex was weighed (FIG. 5A). Then the sample was placed in a 250 mL Griffin Beaker with 40 mL of 10% citric acid. The sample was then placed in a 178°F water bath for 18 hours. After 18 hours, the sample was filtered and observed (FIG. 5B).

[0072] Citric acid is a weak organic acid that is also a metal complexing agent. The addition of 10% citric acid to the sample moderately put the sample into solution after 18 hours at 178°F (FIG. 5B). The filtrate and the frac sand appeared to have no binding polymer residue.

[0073] In the second test, 21.6 g of a sample of subterranean-formed metal-polymer complex was weighed (FIG. 6A). The sample was placed in a 250 mL Griffin Beaker with 40 mL of 10% tetrasodium EDTA. Then the sample was placed in a 178°F water bath for 18 hours. After 18 hours, the sample was filtered and observed (FIG. 6B).

[0074] The addition of 10% tetrasodium EDTA to the metal-polymer complex sample moderately put the sample into solution after 16 hours at 178°F (FIG. 6B). Without wishing to be bound to a particular theory, it appears that after being bound by tetrasodium EDTA, the metal ions originally in the metal-polymer complex sample remain in solution but exhibit diminished reactivity. This could be attributed to the tetrasodium EDTA uncrosslinking the metal-polymer complex sample by undergoing ion exchange, resulting in dissociation and dissolution. The filtrate and remaining frac sand in the sample separated out but had a polymer binding sludge-coated appearance.

[0075] In the third test, 21.6 g of a sample of subterranean-formed metal-polymer complex was weighed (FIG. 7A). The sample was placed in a 250 mL Griffin Beaker with 40 mL of 5% citric acid/5% tetrasodium EDTA solution. Then the sample was placed in a 178°F water bath for 18 hours. After 18 hours, the sample was filtered and observed (FIG 7B).

[0076] The addition of 5% citric acid/5% tetrasodium EDTA solution to the metal-polymer complex sample moderately put the sample into solution after 18 hours at 178°F (FIG. 7B). The filtrate and remaining frac sand in the sample separated out.

[0077] Unless otherwise indicated, all numbers expressing quantities of ingredients, properties such as molecular weight, reaction conditions, and so forth used in the specification and 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 in the following specification and attached claims are approximations that may vary depending upon the desired properties sought to be obtained.

[0078] As used herein, "about" refers to a degree of deviation based on experimental error typical for the particular property identified. The latitude provided the term "about" will depend on the specific context and particular property and can be readily discerned by those skilled in the art. The term "about" is not intended to either expand or limit the degree of equivalents which may otherwise be afforded a particular value. Further, unless otherwise stated, the term "about" shall expressly include "exactly," consistent with the discussions regarding ranges and numerical data. Concentrations, amounts, and other numerical data may be expressed or presented herein in a range format. It is to be understood that such a range format is used merely for convenience and brevity and thus should be interpreted flexibly to include not only the numerical values explicitly recited as the limits of the range, but also to include all the individual numerical values or sub-ranges encompassed within that range as if each numerical value and sub-range is explicitly recited. As an illustration, a numerical range of "about 4 percent to about 7 percent" should be interpreted to include not only the explicitly recited values of about 4 percent to about 7 percent, but also include individual values and sub-ranges within the indicated range. Thus, included in this numerical range are individual values such as 4.5, 5.25 and 6 and sub-ranges such as from 4-5, from 5-7, and from 5.5-6.5; etc. This same principle applies to ranges reciting only one numerical value. Furthermore, such an interpretation should apply regardless of the breadth of the range or the characteristics being described.

[0079] Notwithstanding that the numerical ranges and parameters setting forth the broad scope of the disclosure are approximations, the numerical values set forth in the specific examples are reported as precisely as possible. Any numerical value, however, inherently contain certain errors necessarily resulting from the standard deviation found in their respective testing measurements.

[0080] It will be clear that the systems and methods described herein are well adapted to attain the ends and advantages mentioned as well as those inherent therein. Those skilled in the art will recognize that the methods and systems within this specification may be implemented in many manners and as such is not to be limited by the foregoing exemplified embodiments and examples. In other words, functional elements being performed by a single or multiple components, in various combinations of hardware and software, and individual functions can be distributed among software applications at either the client or server level. In this regard, any number of the features of the different embodiments described herein may be combined into one single embodiment and alternate embodiments having fewer than or more than all of the features herein described are possible.

[0081] It will be clear that the systems and methods described herein are well adapted to attain the ends and advantages mentioned as well as those inherent therein. Those skilled in the art will recognize that the methods and systems within this specification may be implemented in many manners and as such is not to be limited by the foregoing exemplified embodiments and examples. In this regard, any number of the features of the different embodiments described herein may be combined into one single embodiment and alternate embodiments having fewer than or more than all of the features herein described are possible.

[0082] While various embodiments have been described for purposes of this disclosure, various changes and modifications may be made which are well within the scope of the present disclosure. Numerous other changes may be made which will readily suggest themselves to those skilled in the art and which are encompassed in the spirit of the disclosure.

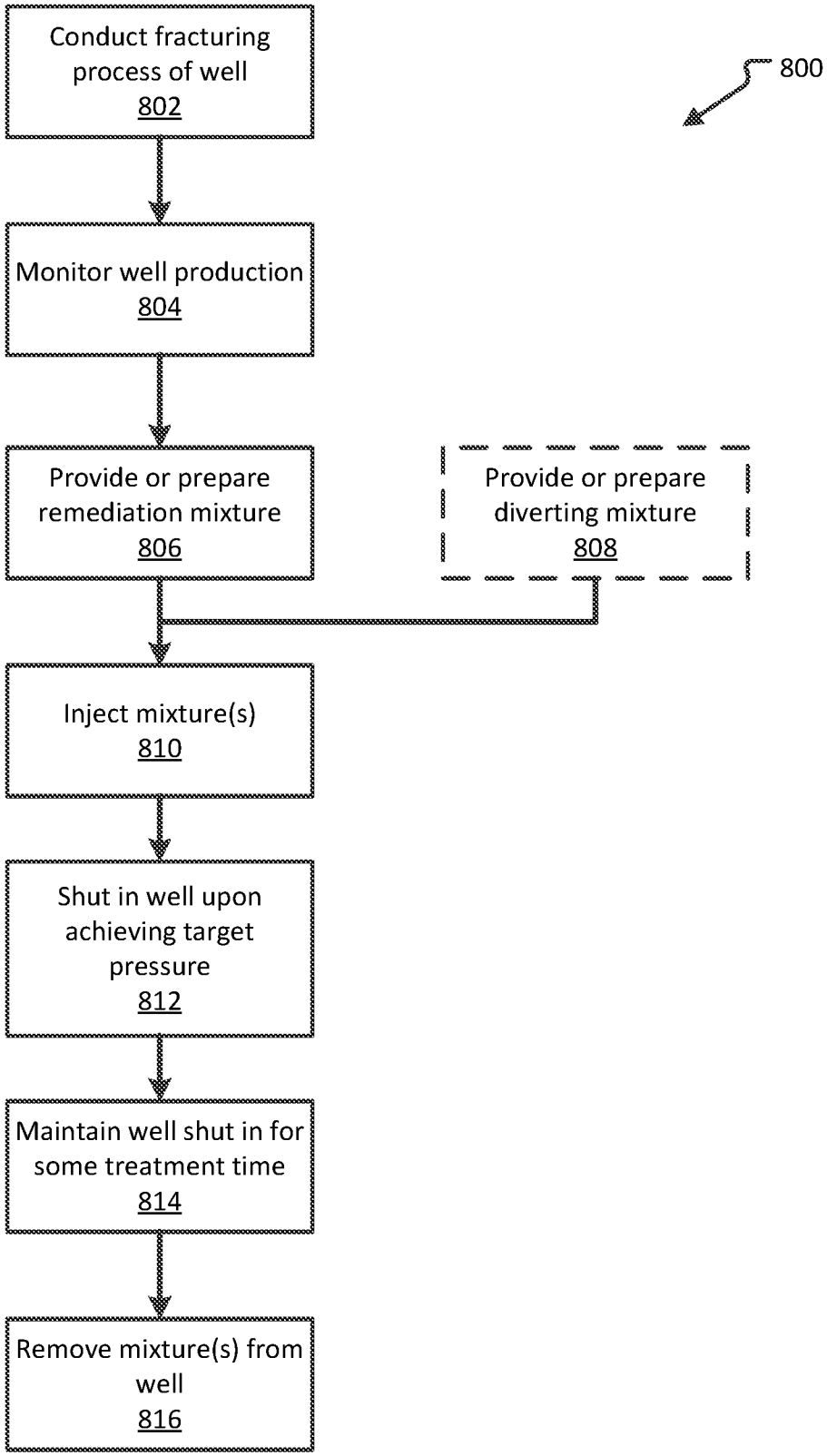

Conduct fracturing process of well
802
800
Monitor well production
804
Provide or prepare remediation mixture
806
Provide or prepare diverting mixture
808
Inject mixture(s)
810
Shut in well upon achieving target pressure
812
Maintain well shut in for some treatment time
814
Remove mixture(s) from well
816

FIG. 8

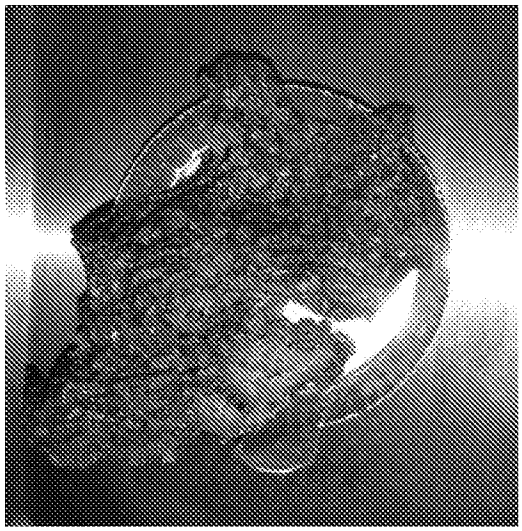


FIG. 2A

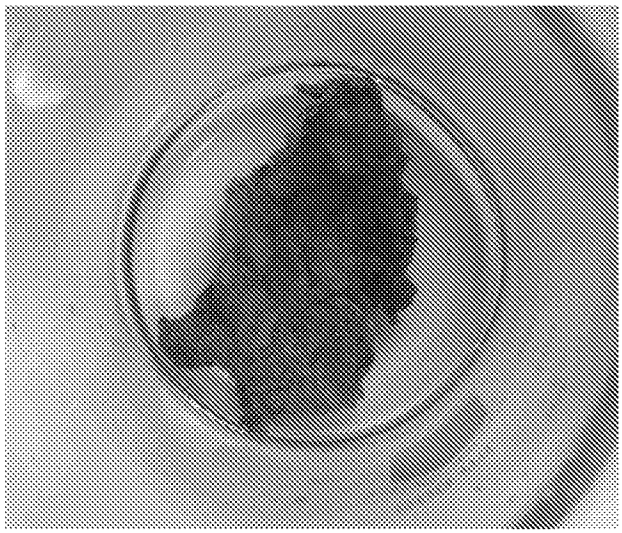


FIG. 2B

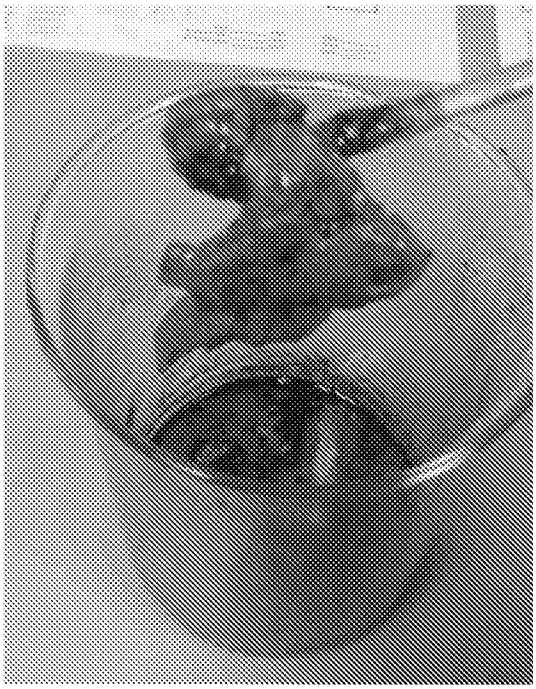


FIG. 2C

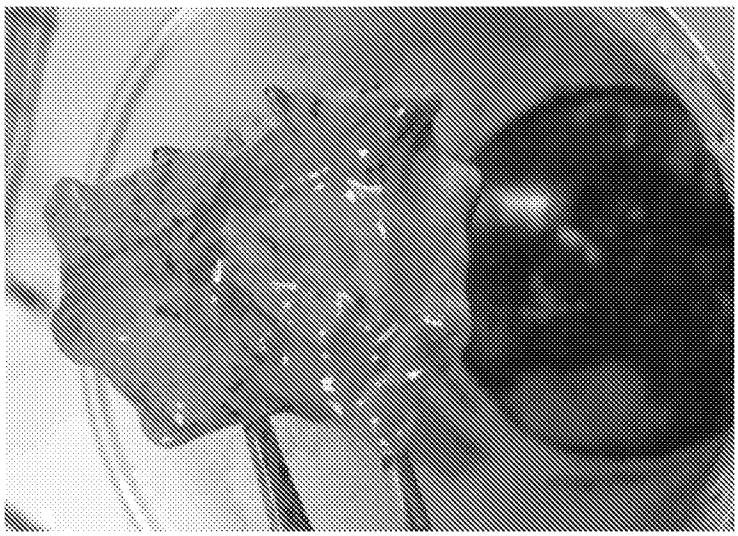


FIG. 2D

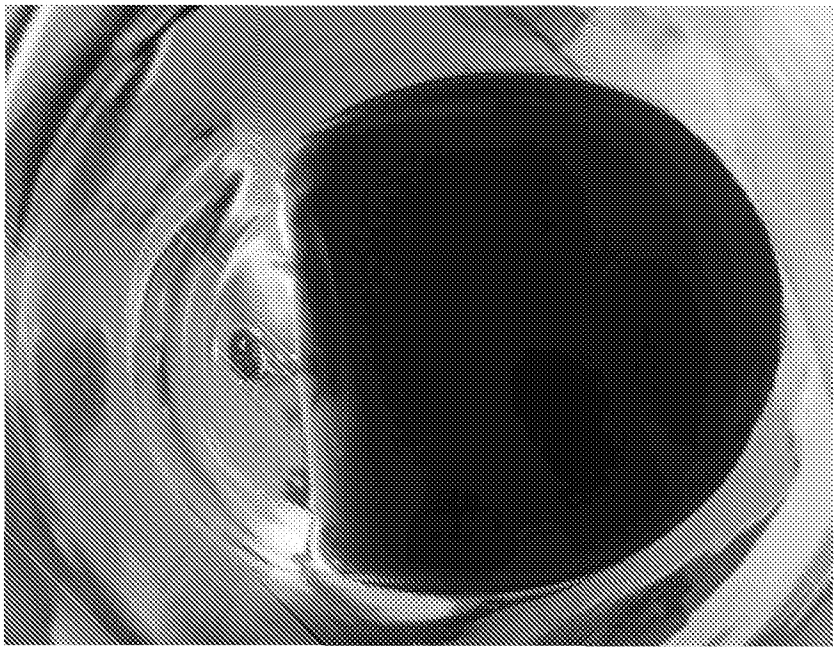


FIG. 3



FIG. 4A



FIG. 4B



FIG. 5A



FIG. 5B



FIG. 6A

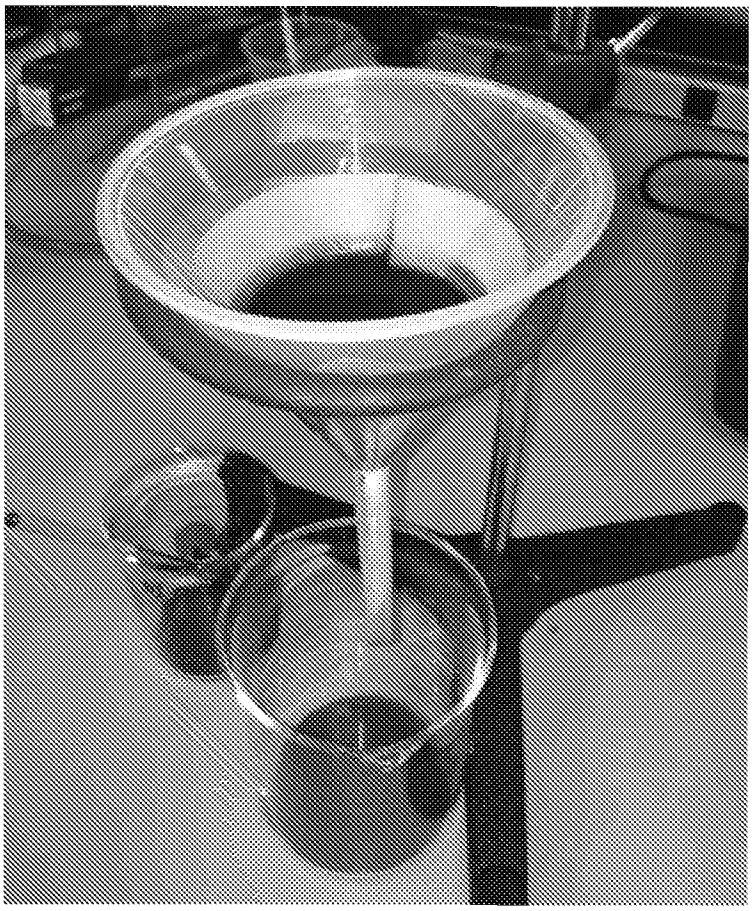


FIG. 6B



FIG. 7A

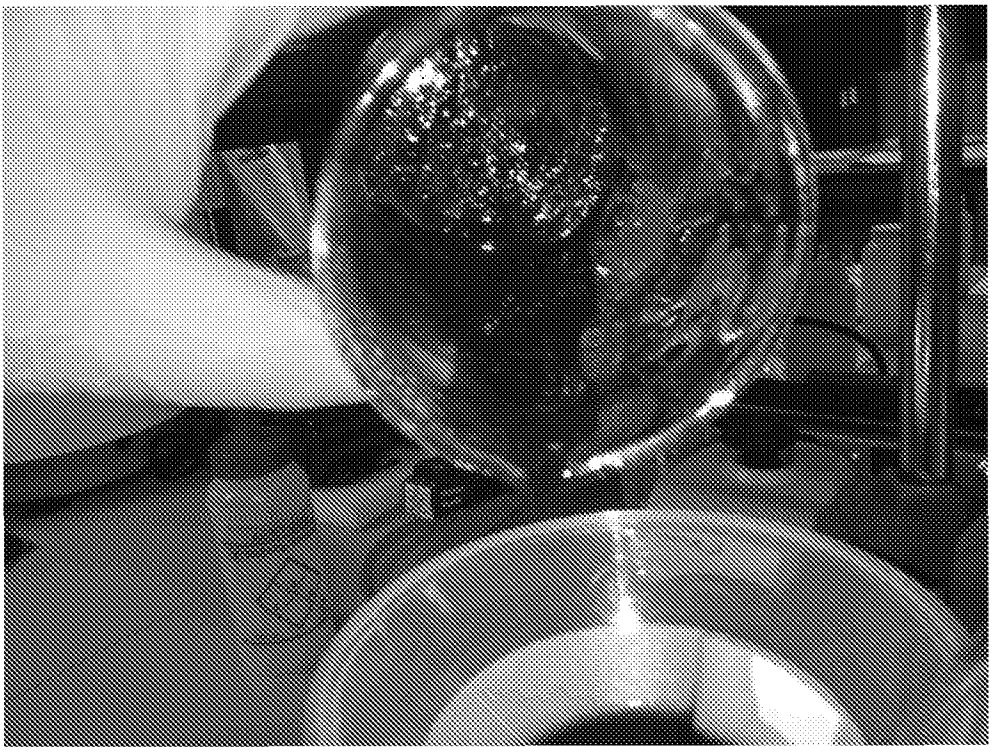


FIG. 7B

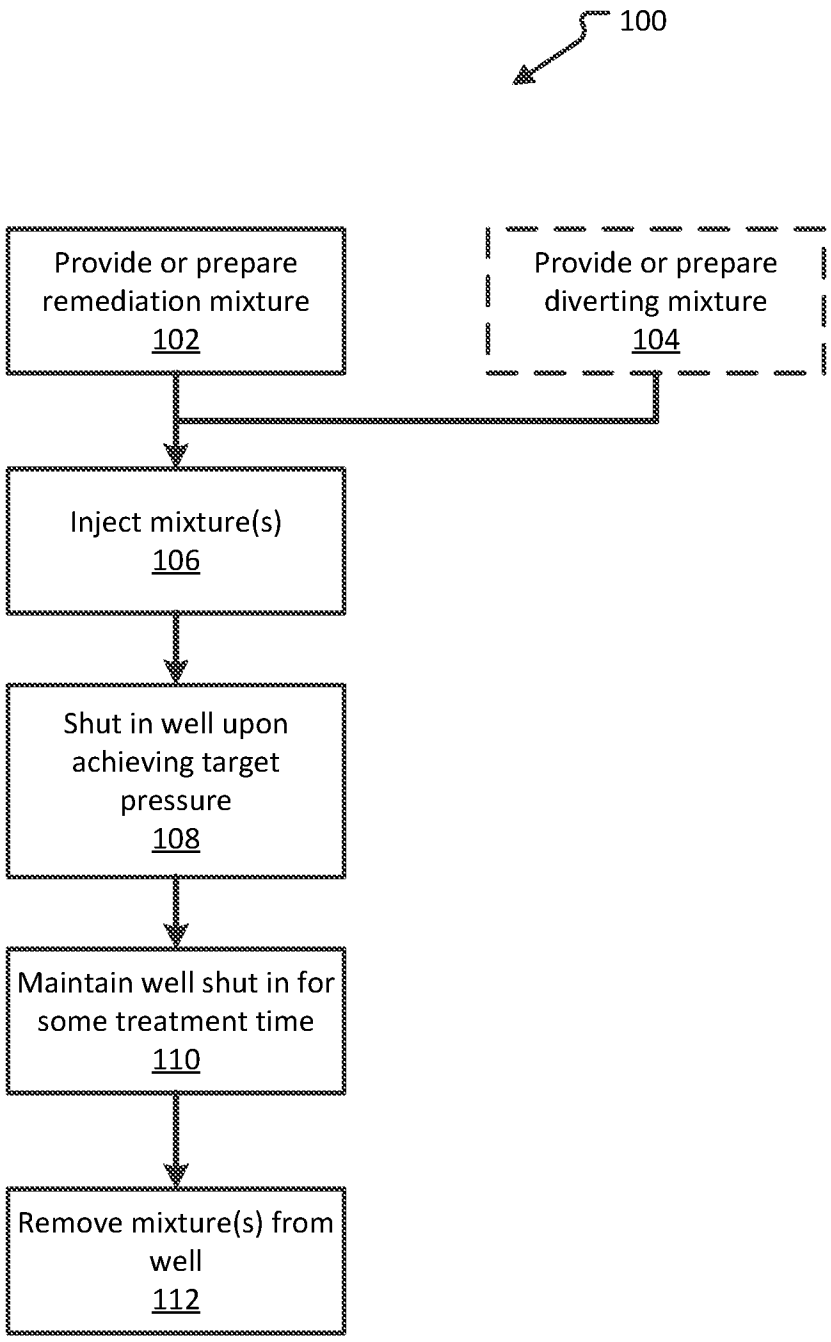

100
Provide or prepare remediation mixture 102
Provide or prepare diverting mixture 104
Inject mixture(s) 106
Shut in well upon achieving target pressure 108
Maintain well shut in for some treatment time 110
Remove mixture(s) from well 112

FIG. 1

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	04697.0003USC1
	Application Number	
Title of Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT	

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

Secrecy Order 37 CFR 5.2

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

Inventor Information:

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

Correspondence Information:

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	04697.0003USC1
	Application Number	
Title of Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT	

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

Customer Number	23552		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT		
Attorney Docket Number	04697.0003USC1	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	8	**Suggested Figure for Publication (if any)**	1

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).
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Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	23552		

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	04697.0003USC1
	Application Number	
Title of Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT	

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		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
Current	Continuation of	14/525038	2014-10-27
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14/525038	Claims benefit of provisional	61/895873	2013-10-25
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14/525038	Claims benefit of provisional	61/898107	2013-10-31

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

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(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).

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

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	04697.0003USC1
	Application Number	
Title of Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT	

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

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

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

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

Applicant Information:

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	04697.0003USC1
	Application Number	
Title of Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT	

Applicant 1 Remove

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

Clear

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

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

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. ☒

Organization Name	Flex-Chem Holding Company, LLC		
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Address 2			
City	Weatherford	**State/Province**	OK
Country	US	Postal Code	73096
Phone Number		Fax Number	
Email Address			

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

Applicant 2 Remove

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

Clear

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

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

Name of the Deceased or Legally Incapacitated Inventor :

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	04697.0003USC1
	Application Number	
Title of Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT	

If the Applicant is an Organization check here. ☒

Organization Name	Cimarex Energy Co.		
Mailing Address Information For Applicant:			
Address 1	1700 Lincoln Street		
Address 2	Suite 1800		
City	Denver	**State/Province**	CO
Country i	US	Postal Code	80203
Phone Number		Fax Number	
Email Address			

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

Assignee Information including Non-Applicant Assignee Information:

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

Assignee 1

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

Remove

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

Organization Name	Flex-Chem Holding Company, LLC		
Mailing Address Information For Assignee including Non-Applicant Assignee:			
Address 1	700 N. Wilson Road		
Address 2			
City	Weatherford	**State/Province**	OK
Country i	US	Postal Code	73096
Phone Number		Fax Number	
Email Address			

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	04697.0003USC1
	Application Number	
Title of Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT	

Assignee 2

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.

Remove

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

Organization Name	Cimarex Energy Co.

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	1700 Lincoln Street		
Address 2	Suite 1800		
City	Denver	**State/Province**	CO
Country i	US	Postal Code	80203
Phone Number		Fax Number	
Email Address			

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

Signature:

Remove

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

Signature	/Melissa M. Hayworth/			Date (YYYY-MM-DD)	2018-12-19
First Name	Melissa	Last Name	Hayworth	Registration Number	45774

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

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.**

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 the Freedom of Information Act requires disclosure of these records.

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 C o o p eration 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 inspections 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.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN FORMATIONS USING A METAL COMPLEXING AGENT

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

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.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Bryce Conway Date (Optional): 12-22-14

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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 this form, call 1-800-PTO-9199 and select option 2.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHOD FOR REMEDIATION OF SUBTERRANEAN FORMATIONS USING A METAL COMPLEXING AGENT

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____

  filed on _____.

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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LEGAL NAME OF INVENTOR

Inventor: Robert Easterly Date (Optional): October 28, 2014

Signature: Robert D Easterly

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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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)).
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Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Filer:	Melissa M. Hayworth/Lisa Kenney
Attorney Docket Number:	04697.0003USC1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1720**

Electronic Acknowledgement Receipt

EFS ID:	34646062
Application Number:	16226464
International Application Number:	
Confirmation Number:	3907
Title of Invention:	METHOD FOR REMEDIATION OF SUBTERRANEAN-FORMED METAL-POLYMER COMPLEXES USING A METAL COMPLEXING AGENT
First Named Inventor/Applicant Name:	Andrew Bryce Conway
Customer Number:	23552
Filer:	Melissa M. Hayworth/Lisa Kenney
Filer Authorized By:	Melissa M. Hayworth
Attorney Docket Number:	04697.0003USC1
Receipt Date:	19-DEC-2018
Filing Date:	
Time Stamp:	19:43:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1720
RAM confirmation Number	122018INTEFSW19455900
Deposit Account	
Authorized User	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2018-12-19_Continuation_Application_04697-0003USC1.PDF	199474 928c44d29dd7beb170cebcdfc587a094cb186247	yes	24

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Abstract	24	24
Claims	19	23
Specification	1	18

Warnings:

Information:

2		004697-0003USC1_Figures.PDF	834638 31c4d60cc99173b10f6d245f8a1492a867b79e89	yes	8

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Drawings-only black and white line drawings	8	8
Drawings-other than black and white line drawings	2	7
Drawings-only black and white line drawings	1	1

Warnings:

Information:

3	Application Data Sheet	2018-12-21-ADS--04697-0003USC1.PDF	1561612 ea84fba512c7805e77f638327d01824a815df332	no	8

Warnings:

Information:

4	Oath or Declaration filed	2018-12-19_04697_0003USC1_Declaration_all.PDF	1262034 ca1ee9ee439a7bae20014034524982632 9a426cb	no	4
Warnings:					
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					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	34854 ea0053e3549e87d154c0a9067959fc1926f6acb4	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	3892612	

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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.