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.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

27683 7590 11/05/2024

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

EXAMINER	
STEPHENSON, DANIEL P	

ART UNIT	PAPER NUMBER
3676	

NOTIFICATION DATE	DELIVERY MODE
11/05/2024	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):

ipdocketing@haynesboone.com

APPLICATION NO.	ISSUE DATE	PATENT NO.
18/158,122	05-Nov-2024	12134952

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Dallas, TX 75201

EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at https://patentcenter.uspto.gov

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit https://www.uspto.gov/electronicgrants

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.
18/158,122	11/05/2024	12134952	57959.12US03	1469

27683 7590 10/16/2024

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at https://patentcenter.uspto.gov/. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at https://certifiedcopycenter.uspto.gov/index.html. The Certified Copy Center may be reached at (800)972-6382.

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 Center (https://patentcenter.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 Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional inventors):

Jordan Kuehn, Forest Park, IL;
Austin Johnson, Edmond, OK;
Ronnie B. Beason, Lexington, OK;
Nicholas J. Cannon, Washington, OK;

APPLICANT(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional applicants):

Downing Wellhead Equipment, LLC, Oklahoma City, OK;

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.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

☐ 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	1	23	12	8	23	29	34	50	45	38	56	64	67	75	78
2	2	24	13	9	24	30	35	51	46	54	57	65	68	76	79
3	3	25	14	10	25	31	36	52	47	55	58	66	69	77	80
	4	39	15	11	26	32	37	53	48	56	59	67	70	78	81
4	5	40	16	12	27	33	38	16	49	57	60	68	71		
5	6	~~41~~ 41	17	13	28	34	39	17	50	58	61	69	72		
6	7		18	14	29	45	40	18	51	59	62	70	73		
20	8	42	19	15	30	46	41	19	52	60	63	71	74		
21	9	43	20	26	31	47	42	35	53	61	64	72	75		
22	10	44	21	27	32	48	43	36	54	62	65	73	76		
	11	7	22	28	33	49	44	37	55	63	66	74	77		

Change(s) applied
to document,
/J.H/
9/27/2024

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	78	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	10 August 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20240810

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ISSUE FEE TRANSMITTAL FORM

APPLICATION #	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET #
18158122	01/23/2023	Jordan Kuehn	57959.12US03

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Nonprovisional Application under 35 USC 111(a)	DATE DUE	11/21/2024
CONFIRMATION #	1469	ISSUE FEE DUE	$ 480
EXAMINER	DANIEL STEPHENSON	PUBLICATION DUE	$ 0
GROUP ART UNIT	3676	TOTAL FEES DUE	$480
CLASS - SUBCLASS	166/373000	PREV. PAID FEE	$ 0
ENTITY STATUS	Small		

1. CHANGE OF CORRESPONDENCE ADDRESS AND/OR INDICATION OF FEE ADDRESS (37 CFR 1.33 & 1.363)

Correspondence Address

CURRENT ADDRESS

Maintenance Fee Address

CURRENT ADDRESS

☐ Change of correspondence address requested,system generated AIA/122-PC form attached

☐ Fee address indication requested, system generatedSB/47-PC form attached

2. ENTITY STATUS

Change in Entity Status

NEW STATUS

3. THE FOLLOWING FEES ARE SUBMITTED

☑ Issue Fee

☑ Publication Fee

4. FEE AUTHORIZATION

☐ I authorize USPTO to apply my previously paid issue fee to the current fees due

☐ The Director is herby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number:

☑ If in addition to the payment of the issue fee amount submitted with this form, there are any discrepencies in any amount(s) due, the Director is authorized to charge any deficiency, or credit any overpayment, to Deposit Account Number: 81394

5. FIRM AND/OR ATTORNEY NAMES TO BE PRINTED

NOTE: If no name is listed, no name will be printed
For printing on the patent front page, list to be displayed as entered

HAYNES AND BOONE, LLP

6. ASSIGNEE NAME(S) AND RESIDENCE DATA TO BE PRINTED

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

Downing Wellhead Equipment, LLC	OKLAHOMA CITY, OK UNITED STATES	Corporation

Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via Patent Center on the date indicated below.

Signature	Name	Registration #	Date
/Alan Herda/	Alan Herda	50426	08/29/2024

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	**08/29/2024 01:12:25 PM Z ET**	**57959.12US03**

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Alan Herda
PATENT CENTER #	66973732	FILING DATE	01/23/2023
CUSTOMER #	27683	FIRST NAMED INVENTOR	Jordan Kuehn
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	-

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
web85b.pdf	3	Issue Fee Payment (PTO-85B)	58 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
web85b.pdf	252D9E9572038E7F6DE15E68CB13DC11DCB1345EB201804C637EA4F5E335E5971102E7CCFEA849040620A8F492A706919D3229F7337D70898B80F18052CE1822

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 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

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	**08/29/2024 01:12:25 PM Z ET**	**57959.12US03**

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Alan Herda
PATENT CENTER #	66973732	AUTHORIZED BY	-
CUSTOMER #	27683	FILING DATE	01/23/2023
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Jordan Kuehn

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 1103	**E20248SD13009202**	**Alan Herda**

PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY
081394	**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 1.20 (Post Issuance fees); 37 CFR 1.21 (Miscellaneous fees and charges)**

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2501	UTILITY ISSUE FEE	480.00	1	480.00
			TOTAL AMOUNT:	**$480.00**

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 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

27683 7590 08/21/2024

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

EXAMINER	
STEPHENSON, DANIEL P	
ART UNIT	PAPER NUMBER
3676	

DATE MAILED: 08/21/2024

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

TITLE OF INVENTION: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	11/21/2024

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 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted 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. 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.

PTOL-85 (Rev. 11/23)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

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 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. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

27683 7590 08/21/2024

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

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 the USPTO patent electronic filing system 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.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

TITLE OF INVENTION: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	11/21/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
STEPHENSON, DANIEL P	3676	166-373000

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/AIA/122 or PTO/SB/122) attached.

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

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

1_____
2_____
3_____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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)

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

❑ Electronic Payment via the USPTO patent electronic filing system ❑ 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

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.

❑ Applicant asserting small entity status. See 37 CFR 1.27

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.

❑ Applicant changing to regular undiscounted fee 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. _____

IWS EXHIBIT 1003 EX_1003_014

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.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

27683 7590 08/21/2024

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

EXAMINER	
STEPHENSON, DANIEL P	
ART UNIT	**PAPER NUMBER**
3676	

DATE MAILED: 08/21/2024

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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/ owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).
https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf

Routine uses of the information in this record may include disclosure to:

1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
2) a federal, state, local, or international agency, in response to its request;
3) a contractor of the USPTO having need for the information in order to perform a contract;
4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
8) 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));
9) the Office of Personnel Management (OPM) for personnel research purposes; and
10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	**Application No.** 18/158,122	**Applicant(s)** Kuehn et al.	
	Examiner DANIEL P STEPHENSON	**Art Unit** 3676	**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 6/25/24.
   ☐ 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 See Continuation Sheet . 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 _____.

/DANIEL P STEPHENSON/
Primary Examiner, Art Unit 3676

Continuation of 3. The allowed claim(s) is/are: 1-3,5-10,12-17 and 19-81

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.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance: the closest prior art of record is Carr et al. (2019/0233275) and Tolman et al. (US 8490685), as discussed in the PTAB decision of 6/10/24 (USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Decision Granting Institution of Inter Partes Review, dated June 10, 2024, citation D1 on the IDS submitted 6/25/24).

3. The prior art of record fails to disclose, alone or in combination, the key features of "the first valve is associated with both the first well and the manifold so that the first valve is in fluid communication with the manifold; and fluidically positioned between the first well and the one or more pumps", "the second valve is associated with both the second well and the manifold so that the second valve is in fluid communication with the manifold; and fluidically positioned between the second well and the one or more pumps from which fluid is communicated to the first well via the manifold and the first valve", "opening the second valve causes fluid to be communicated from the one or more pumps to the second well via the manifold and the second valve, and wherein the second valve is opened in response to at least a portion of fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of the fluid communicated via the manifold" and "while fluid is communicated from the one or more pumps to the second well via the second valve and the manifold; wherein, during the CP swap, fluid is continuously communicated from the one or more pumps via the manifold" in combination with the other limitations currently presented in the combination of claim 1, 8 and 15.

4. The prior art of record fails to disclose, alone or in combination, the key features of "the first valve is in fluid communication with the manifold; and fluidically positioned between the first well and the one or more pumps", "the second valve is associated with both the second well and the manifold so that the second valve is in fluid communication with the manifold; and fluidically positioned between the second well and the one or more pumps from which fluid is communicated to the first well via the manifold and the first valve", and "opening the second valve while fluid is communicated from the one or more pumps to the first well via the first valve and the manifold, wherein opening the second valve causes fluid to be communicated from the one or more pumps to the second well via the manifold and the second valve, and wherein the second valve is opened in response to at least a portion of fluid communicated via the manifold satisfying one or more conditions; and closing the first valve after the at least a portion of fluid communicated via the manifold has satisfied the one or more conditions; wherein the display of the dashboard visually communicates the respective states of the first and second valves; and wherein fluid is continuously communicated from the one or more pumps via the manifold during the CP swap" in combination with the other limitations currently presented in the combination of claim 61 and 68.

5. The prior art of record fails to disclose, alone or in combination, the key features of "a first valve via which fluid is adapted to be communicated from the one or more pumps to the first well, the first valve being associated with both the first well and the manifold so that the first valve is in fluid communication with the manifold; and fluidically positioned between the first well and the one or more pumps ;a second valve via which fluid is adapted to be communicated from the one or more pumps to the second well, the second valve being associated with both the second well and the manifold so that the second valve is in fluid communication with the manifold; and fluidically positioned between the second well and the one or more pumps from which fluid is adapted to be communicated to the first well via the manifold and the first valve", and "to transition from hydraulically fracturing the first well to

hydraulically fracturing the second well, by opening the second valve: while fluid is communicated from the one or more pumps to the first well via the first valve and the manifold, in response to at least a portion of fluid communicated via the manifold satisfying one or more conditions, and to cause fluid to be communicated from the one or more pumps to the second well via the manifold and the second valve; and closing the first valve after the at least a portion of fluid communicated via the manifold has satisfied the one or more conditions" in combination with the other limitations currently presented in the combination of claim 75.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL P STEPHENSON whose telephone number is (571)272-7035. The examiner can normally be reached M-F 10am-6pm.

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, Tara Schimpf can be reached on 571-270-7741. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like

assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or

571-272-1000.

/DANIEL P STEPHENSON/
Primary Examiner, Art Unit 3676

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	Art Unit
	DANIEL P STEPHENSON	3676

CPC - Searched*		
Symbol	**Date**	**Examiner**
E21B33/068, E21B34/02, E21B41/00, E21B43/11, E21B43/26, E21B43/2607, F16K3/36, F16N11/00, F16N2210/00, F16N2210/02, F16N29/02, F16N39/00, F16N7/38, F16N7/40	10/07/2022	DPS
updated	11/19/2022	DPS
updated, E21B17/006	05/27/2023	DPS
updated	07/14/2023	DPS
updated	11/04/2023	DPS
updated	03/09/2024	DPS
updated	08/10/2024	DPS

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**
SEARCH text, Inventor name, Forward/Backward search	10/07/2022	DPS
IPR2024-00583 Reviewed Inter Partes Review of U.S. Patent No. 11,401,779 on 3/7/2024	03/07/2024	DPS
IPR2024-00300 Reviewed Inter Partes Review of U.S. Patent No. 11,560,770 on 3/7/2024	03/07/2024	DPS

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	Art Unit
	DANIEL P STEPHENSON	3676

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
see history		10/07/2022	DPS
updated		11/04/2023	DPS
updated		03/09/2024	DPS
updated		08/10/2024	DPS

IWS EXHIBIT 1003 EX_1003_024

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

CPC						
Symbol					**Type**	**Version**
E21B	/	34	/	02	F	2013-01-01
E21B	/	41	/	00	I	2013-01-01
E21B	/	43	/	2607	I	2020-05-01
E21B	/	33	/	068	I	2013-01-01
F16N	/	11	/	00	I	2013-01-01
F16N	/	29	/	02	I	2013-01-01
F16K	/	3	/	36	I	2013-01-01
E21B	/	43	/	11	I	2013-01-01
E21B	/	17	/	006	I	2013-01-01
E21B	/	43	/	26	I	2013-01-01
F16N	/	2210	/	00	A	2013-01-01

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	78	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	10 August 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20240810

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

INTERNATIONAL CLASSIFICATION				
CLAIMED				
E21B	/	43	/	26
E21B	/	33	/	068
E21B	/	34	/	02
E21B	/	41	/	00
E21B	/	43	/	11
F16K	/	3	/	36
F16N	/	11	/	00
F16N	/	29	/	02

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

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

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	78	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	10 August 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20240810

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

☐ 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	1	23	12	8	23	29	34	50	45	38	56	64	67	75	78
2	2	24	13	9	24	30	35	51	46	54	57	65	68	76	79
3	3	25	14	10	25	31	36	52	47	55	58	66	69	77	80
	4	39	15	11	26	32	37	53	48	56	59	67	70	78	81
4	5	40	16	12	27	33	38	16	49	57	60	68	71		
5	6	47	17	13	28	34	39	17	50	58	61	69	72		
6	7		18	14	29	45	40	18	51	59	62	70	73		
20	8	42	19	15	30	46	41	19	52	60	63	71	74		
21	9	43	20	26	31	47	42	35	53	61	64	72	75		
22	10	44	21	27	32	48	43	36	54	62	65	73	76		
	11	7	22	28	33	49	44	37	55	63	66	74	77		

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 78	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676 (Primary Examiner)	10 August 2024 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

U.S. Patent and Trademark Office Part of Paper No.: 20240810

In place of PTO-1449 Form	U. S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE			*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	18/158,122
				Filing Date	January 23, 2023
				First Inventor Name	Jordan Kuehn
				Art Unit	3676
				Examiner Name	Daniel P. Stephenson
SHEET	1	OF	4	Attorney Docket Number	57959.12US03

U. S. PATENTS

Examiner's Initials	Cite No.	Document Number	Issue Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	A1	8490685B2	07-23-2013	TOLMAN ET AL.
	A2			
	A3			
	A4			
	A5			
	A6			
	A7			
	A8			
	A9			
	A10			

U. S. PATENT APPLICATION PUBLICATIONS

Examiner's Initials	Cite No.	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	B1	20070023184A1	02-01-2007	JACKSON ET AL.
	B2	20070125543A1	06-07-2007	MCNEEL ET AL.
	B3	20090194273A1	08-06-2009	SURJAATMADJA ET AL.
	B4	20170315566A1	11-02-2017	MARTINO ET AL.
	B5			

FOREIGN PATENT DOCUMENTS

Examiner's Initials	Cite No.	Foreign Patent Document (Country Code – Number – Kind)	Publication Date MM-DD-YYYY	Patentee or Applicant of Cited Document	Translation Y/N
	C1	WO-2017201526-A1	11-23-2017	GAS TECHNOLOGY INSTITUTE	

NON-PATENT LITERATURE DOCUMENTS

Examiner's Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article, title of the item, date, page(s), volume-issue number(s), publisher, city/country where published
	D1	USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Decision Granting Institution of Inter Partes Review, dated June 10, 2024, 37 pages.
	D2	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Decision Denying Institution of Inter Partes Review, dated June 5, 2024, 23 pages.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

In place of PTO-1449 Form	U. S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE			*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	18/158,122
				Filing Date	January 23, 2023
				First Inventor Name	Jordan Kuehn
				Art Unit	3676
				Examiner Name	Daniel P. Stephenson
SHEET	2	OF	4	Attorney Docket Number	57959.12US03

	D3	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Petition for Inter Partes Review, dated December 1, 2023, 106 pages.
	D4	USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Petition for Inter Partes Review, dated December 15, 2023, 111 pages.
	D5	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, IWS Exhibit 1002, Declaration of Dr. Robert Durham, executed December 1, 2023, 282 pages.
	D6	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1008, First Amended Complaint for Patent Infringement, Permanent Injunctive Relief Requested, and Demand for a Jury Trial, dated August 7, 2023, 42 pages.
	D7	U.S. Patent No. 11,560,770 Prosecution File History, 201 pages.
	D8	IPR2024-00300 Patent Family Priority Diagram, 1 page.
	D9	U.S. Patent No. 11,401,779 Prosecution File History, 254 pages.
	D10	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1014, Plaintiff Downing Wellhead Equipment, LLC's Objections and Responses to Defendants' Interrogatories (Nos. 1-2), dated November 21, 2023, 10 pages.
	D11	WELLS et al., American Oil & Gas Historical Society: Shooters – A "Fracking" History, IWS Exhibit 1016, April 22, 2023, https://aoghs.org/technology/hydraulic-fracturing/, 14 pages.
	D12	BOURGOYNE JR. et al., Applied Drilling Engineering, Society of Petroleum Engineers, SPE Textbook Series, Volume 2, 125 pages.
	D13	VASSILIOU, Historical Dictionary of the Petroleum Industry, Second Edition, Rowman & Littlefield, 2018, 11 pages.
	D14	HOLZHAUSEN, Impedance of Hydraulic Fractures: Its Measurement and Use for Estimating Fracture Closure Pressure and Dimensions, Society of Petroleum Engineers/U.S. Department of Energy, Applied Geomechanics Inc., and R.P. Gooch, Stanford U., 12 pages.
	D15	IPR2024-00300 Patent Family Specification Comparisons, IWS Exhibit 1012, 274 pages.
	D16	Office Action for U.S. Patent Application No. 17/388,716, mailed January 5, 2022, 10 pages.
	D17	IPR2024-00256 Patent Family Priority Diagram, IWS Exhibit 1011, 1 page.
	D18	IPR2024-00256 Patent Family Specification Comparisons, IWS Exhibit 1012, 254 pages.
	D19	IPR2024-00256 Claim-by-Claim Priority Analysis, IWS Exhibit 1013, 8 pages.
	D20	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Patent Owner Preliminary Response, dated March 8, 2024, 72 pages.
	D21	Office Action for U.S. Patent Application No. 17/651,716, mailed December 20, 2023, 7 pages.
	D22	Continuous Pumping: Freedom Series iControl, retrieved on February 23, 2024, The Wayback Machine - https://web.archive.org/web/20201020115107/https://downingusa.com/freedomseries/continuouspumping/, IPR2024-00256 Exhibit 2001
	D23	IPR2024-00256 Exhibit 2002, Introducing Continuous Pumping, 3 pages.
	D24	IPR2024-00256, Tim Marvel Communication to Brian Wiesner and Austin Johnson regarding Continuous Pumping Website, dated October 9, 2020, Exhibit 2003, 4 pages.
	D25	IPR2024-00256, Tim Marvel LinkedIn Post regarding continuous pumping, dated October 12, 2020, Exhibit 2004
	D26	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of Timothy Marvel, Exhibit 2005, dated March 4, 2024, 7 pages.
	D27	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of John Hughett Support of Patent Owner's Preliminary Response, Exhibit 2006, dated March 8, 2024, 105 pages.
	D28	IPR2024-00256, John P. Hughett, P.E. Resume, Exhibit 2007, 4 pages.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

In place of PTO-1449 Form	U. S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE			*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	18/158,122
				Filing Date	January 23, 2023
				First Inventor Name	Jordan Kuehn
				Art Unit	3676
				Examiner Name	Daniel P. Stephenson
SHEET	3	OF	4	Attorney Docket Number	57959.12US03

	D29	USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Patent Owner Preliminary Response, dated March 11, 2024, 63 pages.
	D30	USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of John Hughett Support of Patent Owner's Preliminary Response, Exhibit 2006, dated March 8, 2024, 111 pages.
	D31	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Petition for Inter Partes Review, dated March 1, 2024, 77 pages.
	D32	USPTO PTAB, IPR2024-00583, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Petition for Inter Partes Review, dated March 1, 2024, 117 pages.
	D33	USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, IWS Exhibit 1002, Declaration of Dr. Robert Durham, executed December 1, 2023, 354 pages.
	D34	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Patent Family Priority Diagram, 1 page.
	D35	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1038, Downing's Response to IWS's Initial Invalidity Contentions, dated January 19, 2024, 13 pages.
	D36	USDC Colorado: Case No. 1:23-cv-01180-RMR-SBP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1039, Plaintiff Downing Wellhead Equipment, LLC's Supplemental Objections and Responses to Defendants' Interrogatories (Nos. 1-2), dated December 15, 2023, 17 pages.
	D37	USDC Colorado: Case No. 1:23-cv-01180-RMR-SBP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1040, Order on Motion to Stay, dated February 14, 2024, 23 pages.
	D38	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of Dr. Robert Durham, Executed March 1, 2024, 199 pages.
	D39	Specification for Wellhead and Christmas Tree Equipment, American Petroleum Institute, 20th Edition, October 2010, 3 pages.
	D40	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1045, Plaintiff Downing's Asserted Claims and Infringement Contentions to Defendants Intelligent Wellhead Systems, Inc., Intelligent Wellhead Systems, Corp., and IWS USA Corp., dated September 27, 2023, 5 pages.
	D41	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Petitioner's Reasons for Parallel Petitions and Petition Ranking, dated March 1, 2024, 10 pages.
	D42	USPTO PTAB, IPR2024-00583, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of Dr. Robert Durham, Executed March 1, 2024, 321 pages.
	D43	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Patent Owner Preliminary Response, dated June 17, 2024, 40 pages.
	D44	IPR2024-00584, Introducing Continuous Pumping, Exhibit 2002, 4 pages.
	D45	IPR2024-00584, Email Correspondence Regarding Meet and Confer, Exhibit 2005, dated December 5, 2023, 5 pages.
	D46	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of John Hughett Support of Patent Owner's Preliminary Response, Ex.2006, dated June 17, 2024, 76 pages.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

In place of PTO-1449 Form	U. S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE			*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	18/158,122
				Filing Date	January 23, 2023
				First Inventor Name	Jordan Kuehn
				Art Unit	3676
				Examiner Name	Daniel P. Stephenson
SHEET	4	OF	4	Attorney Docket Number	57959.12US03

	D47	USPTO PTAB, IPR2024-00583, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Patent Owner Preliminary Response, dated June 17, 2024, 52 pages.
	D48	USPTO PTAB, IPR2024-00583, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of John Hughett Support of Patent Owner's Preliminary Response, Exhibit 2006, dated June 17, 2024, 89 pages.
	D49	Examination Report for Canadian Patent Application No. 3,150,086, dated April 3, 2024, 3 pages.

Examiner Signature	/DANIEL P STEPHENSON/	Date Considered	08/10/2024

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant.

4883-2821-9592 v.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

Bibliographic Data

Application No: 18/158,122

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /DANIEL P STEPHENSON/ (Examiner's Signature) | (Initials)

Title: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/23/2023	166	3676	57959.12US03
RULE			

APPLICANTS

Downing Wellhead Equipment, LLC, Oklahoma City, OK, UNITED STATES

INVENTORS

Jordan Kuehn, Forest Park, IL, UNITED STATES

Austin Johnson, Edmond, OK, UNITED STATES

Ronnie B. Beason, Lexington, OK, UNITED STATES

Nicholas J. Cannon, Washington, OK, UNITED STATES

CONTINUING DATA

This application is a CON of 17878493 08/01/2022 PAT 11560770

17878493 is a CON of 17388716 07/29/2021 PAT 11401779

17388716 has PRO of 63189663 05/17/2021

17388716 is a CIP of 17319854 05/13/2021 PAT 11867023

17319854 is a CIP of 16855749 04/22/2020 PAT 11480027

16855749 is a CIP of 16803156 02/27/2020 PAT 11242724

16803156 is a CIP of 16436623 06/10/2019 PAT 11208856

16855749 has PRO of 62836761 04/22/2019

16803156 is a CIP of 16248633 01/15/2019 PAT 10584552

16855749 is a CIP of 16248648 01/15/2019 PAT 10724682

16436623 has PRO of 62755170 11/02/2018

16803156 is a CIP of 16100741 08/10/2018 PAT 10689938

16100741 has PRO of 62638688 03/05/2018

16100741 has PRO of 62638681 03/05/2018

16100741 has PRO of 62637220 03/01/2018

16100741 has PRO of 62637215 03/01/2018

16248633 has PRO of 62617438 01/15/2018

16248648 has PRO of 62617443 01/15/2018

16100741 has PRO of 62598914 12/14/2017

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/13/2023

**** SMALL ENTITY ****

STATE OR COUNTRY

UNITED STATES

ADDRESS

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201
UNITED STATES

FILING FEE RECEIVED

$704

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	42	(Artificial Intelligence) Similar to: 17/878,493 with 0 CPC Selections and 0 Text Selections Text: (US-20210355784-A1 OR US-20210324706-A1 OR US-20210262315-A1 OR US-11401779-B2 OR US-20210332665-A1 OR US-20200248529-A1 OR US-20190360637-A1 OR US-20190360636-A1 OR CA-3055026-A1 OR US-20170336022-A1 OR US-20220290547-A1 OR CA-3158915-A1 OR US-20200347990-A1 OR CA-3080175-A1 OR US-9447659-B2 OR WO-2020142638-A1 OR CA-3125461-A1 OR US-20210301638-A1 OR CA-2855789-C OR CA-2855789-A1 OR US-20160003006-A1 OR US-9869426-B2 OR US-20170002977-A1 OR US-20200332954-A1 OR US-11137109-B2 OR US-20210301933-A1 OR AU-2018439421-A2 OR JP-7094523-B2 OR JP-WO2020044514-A1 OR WO-2020044514-A1 OR AU-2018439421-A1 OR CN-112567159-A OR GB-2206912-A OR US-4377206-A OR WO-2013059251-A1 OR WO-2020219573-A1 OR CA-3137729-A1 OR US-11193349-B1 OR US-20130092395-A1 OR US-11255446-B1 OR US-20210054839-A1 OR GB-2579734-A8 OR US-4109713-A OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	OR	ON	ON	2022/10/07 10:02 AM

		US-10100978-B2 OR US-20180328536-A1 OR US-11047189-B2 OR US-11125385-B2 OR SG-191515-A1 OR US-20210381640-A1 OR GB-2579734-A).did.					
L2	1	("11401779").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:05 AM
L3	93858	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/07 10:06 AM
L4	1	("20170275980").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 05:48 PM
L5	0	("11480028").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 06:04 PM
L6	4	("20140352968" | "20170123437" | "20170275980" | "20180179848").pn. OR ("11401779").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 06:37 PM
L7	4	beason.in. AND manifold.clm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 07:35 PM
L8	11	("2017/0275980").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 09:58 PM
L9	10	8 AND manifold	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO;	OR	ON	ON	2022/10/07 09:59 PM

			JPO; DERWENT; IBM_TDB)				
L10	3418	(manifold AND valve AND (second secondary) AND fluid AND clos$3) AND 3	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/07 10:15 PM
L11	95927	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/18 04:08 PM
L12	433	11 AND (@pd>"20221007")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/18 04:08 PM
L13	1	("20230160278").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/05/27 07:38 PM
L14	95455	(E21B17/006 OR E21B33/068 OR E21B34/02 OR E21B41/00 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/05/27 07:40 PM

		E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N29/02).cpc.	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L15	105016	14 3	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/27 07:41 PM
L16	2293	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/27 07:42 PM
L17	1	("11560770").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/05/27 10:00 PM
L18	359	15 AND (@pd>"20230527")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO,	OR	ON	ON	2023/07/13 12:24 PM

			NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L23	2	("20220268141").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/11/04 03:28 AM
L24	2170	15 AND (@pd>"20230527")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/11/04 04:35 AM
L25	1562	15 AND (@pd>"20230714")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/11/04 04:35 AM
L26	23	("10533406" OR "20070125543" OR	(US-PGPUB; USPAT)	OR	ON	ON	2024/02/24 09:46 PM

		"20110030963" OR "20110048695" OR "20120255734" OR "20130306322" OR "20150345272" OR "20160061016" OR "20170315566" OR "20180045331" OR "20190233275" OR "20200270977" OR "20200408077" OR "20210324718" OR "20210363856" OR "20210396117" OR "20220099227" OR "20220112796" OR "4721158" OR "4754808" OR "7559373" OR "8061427" OR "8490685").pn.					
L29	1705	15 AND (@pd>"20231104")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/03/09 07:28 PM
L30	20	"2017201526"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/03/09 08:06 PM
L31	14	"2020145978"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2024/03/09 08:10 PM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L33	0	(20070023184A1 20070125543A1 20090194273A1 20170315566A1).pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/08/10 02:16 PM
L34	4	("20070023184" "20070125543" "20090194273" "20170315566.").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/08/10 02:17 PM
L35	20	"2017201526"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/08/10 02:18 PM
L36	2489	15 AND (@pd>"20240309")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/08/10 02:18 PM
L37	2	("20190233275" "2020145978" "8490685").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/08/10 03:23 PM
L42	9	("20190233275"	(US-PGPUB; USPAT;	OR	ON	ON	2024/08/10

		"8490685").pn. "2020145978"	FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO))				03:26 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	5570	(manifold AND valve AND (second secondary) AND fluid AND clos$3) .clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:33 PM
N2	675	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:34 PM
N3	675	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm. AND "3"	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:39 PM
N4	17108	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:40 PM
N5	16	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:40 PM
N6	18	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 04:38 PM
N7	18	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/13 12:24 PM
N8	20	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2023/11/04

							04:35 AM
N9	21	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2024/03/09 09:14 PM
N10	22	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2024/08/10 02:19 PM

In place of PTO-1449 Form	U. S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE			*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	18/158,122
				Filing Date	January 23, 2023
				First Inventor Name	Jordan Kuehn
				Art Unit	3676
				Examiner Name	Daniel P. Stephenson
SHEET	1	OF	4	Attorney Docket Number	57959.12US03

U. S. PATENTS

Examiner's Initials	Cite No.	Document Number	Issue Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	A1	8490685B2	07-23-2013	TOLMAN ET AL.
	A2			
	A3			
	A4			
	A5			
	A6			
	A7			
	A8			
	A9			
	A10			

U. S. PATENT APPLICATION PUBLICATIONS

Examiner's Initials	Cite No.	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
	B1	20070023184A1	02-01-2007	JACKSON ET AL.
	B2	20070125543A1	06-07-2007	MCNEEL ET AL.
	B3	20090194273A1	08-06-2009	SURJAATMADJA ET AL.
	B4	20170315566A1	11-02-2017	MARTINO ET AL.
	B5			

FOREIGN PATENT DOCUMENTS

Examiner's Initials	Cite No.	Foreign Patent Document (Country Code – Number – Kind)	Publication Date MM-DD-YYYY	Patentee or Applicant of Cited Document	Translation Y/N
	C1	WO-2017201526-A1	11-23-2017	GAS TECHNOLOGY INSTITUTE	

NON-PATENT LITERATURE DOCUMENTS

Examiner's Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article, title of the item, date, page(s), volume-issue number(s), publisher, city/country where published
	D1	USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Decision Granting Institution of Inter Partes Review, dated June 10, 2024, 37 pages.
	D2	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Decision Denying Institution of Inter Partes Review, dated June 5, 2024, 23 pages.

In place of PTO-1449 Form	U. S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE			*Complete if Known*	
				Application Number	18/158,122
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Filing Date	January 23, 2023
				First Inventor Name	Jordan Kuehn
				Art Unit	3676
				Examiner Name	Daniel P. Stephenson
SHEET	2	OF	4	Attorney Docket Number	57959.12US03

	D3	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Petition for Inter Partes Review, dated December 1, 2023, 106 pages.
	D4	USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Petition for Inter Partes Review, dated December 15, 2023, 111 pages.
	D5	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, IWS Exhibit 1002, Declaration of Dr. Robert Durham, executed December 1, 2023, 282 pages.
	D6	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1008, First Amended Complaint for Patent Infringement, Permanent Injunctive Relief Requested, and Demand for a Jury Trial, dated August 7, 2023, 42 pages.
	D7	U.S. Patent No. 11,560,770 Prosecution File History, 201 pages.
	D8	IPR2024-00300 Patent Family Priority Diagram, 1 page.
	D9	U.S. Patent No. 11,401,779 Prosecution File History, 254 pages.
	D10	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1014, Plaintiff Downing Wellhead Equipment, LLC's Objections and Responses to Defendants' Interrogatories (Nos. 1-2), dated November 21, 2023, 10 pages.
	D11	WELLS et al., American Oil & Gas Historical Society: Shooters – A "Fracking" History, IWS Exhibit 1016, April 22, 2023, https://aoghs.org/technology/hydraulic-fracturing/, 14 pages.
	D12	BOURGOYNE JR. et al., Applied Drilling Engineering, Society of Petroleum Engineers, SPE Textbook Series, Volume 2, 125 pages.
	D13	VASSILIOU, Historical Dictionary of the Petroleum Industry, Second Edition, Rowman & Littlefield, 2018, 11 pages.
	D14	HOLZHAUSEN, Impedance of Hydraulic Fractures: Its Measurement and Use for Estimating Fracture Closure Pressure and Dimensions, Society of Petroleum Engineers/U.S. Department of Energy, Applied Geomechanics Inc., and R.P. Gooch, Stanford U., 12 pages.
	D15	IPR2024-00300 Patent Family Specification Comparisons, IWS Exhibit 1012, 274 pages.
	D16	Office Action for U.S. Patent Application No. 17/388,716, mailed January 5, 2022, 10 pages.
	D17	IPR2024-00256 Patent Family Priority Diagram, IWS Exhibit 1011, 1 page.
	D18	IPR2024-00256 Patent Family Specification Comparisons, IWS Exhibit 1012, 254 pages.
	D19	IPR2024-00256 Claim-by-Claim Priority Analysis, IWS Exhibit 1013, 8 pages.
	D20	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Patent Owner Preliminary Response, dated March 8, 2024, 72 pages.
	D21	Office Action for U.S. Patent Application No. 17/651,716, mailed December 20, 2023, 7 pages.
	D22	Continuous Pumping: Freedom Series iControl, retrieved on February 23, 2024, The Wayback Machine - https://web.archive.org/web/20201020115107/https://downingusa.com/freedomseries/continuouspumping/, IPR2024-00256 Exhibit 2001
	D23	IPR2024-00256 Exhibit 2002, Introducing Continuous Pumping, 3 pages.
	D24	IPR2024-00256, Tim Marvel Communication to Brian Wiesner and Austin Johnson regarding Continuous Pumping Website, dated October 9, 2020, Exhibit 2003, 4 pages.
	D25	IPR2024-00256, Tim Marvel LinkedIn Post regarding continuous pumping, dated October 12, 2020, Exhibit 2004
	D26	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of Timothy Marvel, Exhibit 2005, dated March 4, 2024, 7 pages.
	D27	USPTO PTAB, IPR2024-00256, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of John Hughett Support of Patent Owner's Preliminary Response, Exhibit 2006, dated March 8, 2024, 105 pages.
	D28	IPR2024-00256, John P. Hughett, P.E. Resume, Exhibit 2007, 4 pages.

In place of PTO-1449 Form	U. S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE			*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	18/158,122
				Filing Date	January 23, 2023
				First Inventor Name	Jordan Kuehn
				Art Unit	3676
				Examiner Name	Daniel P. Stephenson
SHEET	3	OF	4	Attorney Docket Number	57959.12US03

	D29	USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Patent Owner Preliminary Response, dated March 11, 2024, 63 pages.
	D30	USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of John Hughett Support of Patent Owner's Preliminary Response, Exhibit 2006, dated March 8, 2024, 111 pages.
	D31	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Petition for Inter Partes Review, dated March 1, 2024, 77 pages.
	D32	USPTO PTAB, IPR2024-00583, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Petition for Inter Partes Review, dated March 1, 2024, 117 pages.
	D33	USPTO PTAB, IPR2024-00300, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, IWS Exhibit 1002, Declaration of Dr. Robert Durham, executed December 1, 2023, 354 pages.
	D34	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Patent Family Priority Diagram, 1 page.
	D35	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1038, Downing's Response to IWS's Initial Invalidity Contentions, dated January 19, 2024, 13 pages.
	D36	USDC Colorado: Case No. 1:23-cv-01180-RMR-SBP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1039, Plaintiff Downing Wellhead Equipment, LLC's Supplemental Objections and Responses to Defendants' Interrogatories (Nos. 1-2), dated December 15, 2023, 17 pages.
	D37	USDC Colorado: Case No. 1:23-cv-01180-RMR-SBP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1040, Order on Motion to Stay, dated February 14, 2024, 23 pages.
	D38	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of Dr. Robert Durham, Executed March 1, 2024, 199 pages.
	D39	Specification for Wellhead and Christmas Tree Equipment, American Petroleum Institute, 20th Edition, October 2010, 3 pages.
	D40	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC, V. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., AND IWS USA CORP., IWS Exhibit 1045, Plaintiff Downing's Asserted Claims and Infringement Contentions to Defendants Intelligent Wellhead Systems, Inc., Intelligent Wellhead Systems, Corp., and IWS USA Corp., dated September 27, 2023, 5 pages.
	D41	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Petitioner's Reasons for Parallel Petitions and Petition Ranking, dated March 1, 2024, 10 pages.
	D42	USPTO PTAB, IPR2024-00583, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of Dr. Robert Durham, Executed March 1, 2024, 321 pages.
	D43	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Patent Owner Preliminary Response, dated June 17, 2024, 40 pages.
	D44	IPR2024-00584, Introducing Continuous Pumping, Exhibit 2002, 4 pages.
	D45	IPR2024-00584, Email Correspondence Regarding Meet and Confer, Exhibit 2005, dated December 5, 2023, 5 pages.
	D46	USPTO PTAB, IPR2024-00584, Patent No. 11,560,770, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of John Hughett Support of Patent Owner's Preliminary Response, Ex.2006, dated June 17, 2024, 76 pages.

In place of PTO-1449 Form	U. S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE			*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	18/158,122
				Filing Date	January 23, 2023
				First Inventor Name	Jordan Kuehn
				Art Unit	3676
				Examiner Name	Daniel P. Stephenson
SHEET	4	OF	4	Attorney Docket Number	57959.12US03

	D47	USPTO PTAB, IPR2024-00583, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Patent Owner Preliminary Response, dated June 17, 2024, 52 pages.
	D48	USPTO PTAB, IPR2024-00583, Patent No. 11,401,779, INTELLIGENT WELLHEAD SYSTEMS, INC. v. DOWNING WELLHEAD EQUIPMENT, LLC, Declaration of John Hughett Support of Patent Owner's Preliminary Response, Exhibit 2006, dated June 17, 2024, 89 pages.
	D49	Examination Report for Canadian Patent Application No. 3,150,086, dated April 3, 2024, 3 pages.

Examiner Signature		Date Considered	

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant.

4883-2821-9592 v.1

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	06/25/2024 04:21:35 PM Z ET	57959.12US03

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Q Dismuke
PATENT CENTER #	66111563	AUTHORIZED BY	Zachary Halbur
CUSTOMER #	27683	FILING DATE	01/23/2023
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Jordan Kuehn

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 1103	E20246OG22339925	Q Dismuke

PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY
081394	37 CFR 1.17 (Patent application and reexamination processing fees)

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2820	REQUEST FOR CONTINUED EXAMINATION (RCE)- 2ND AND SUBSEQUENT REQUEST (SEE 37 CFR 1.114)	800.00	1	800.00
			TOTAL AMOUNT:	$800.00

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 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

In re application of: Jordan Kuehn *et al.*	§	Group Art Unit: 3676
Application No.: 18/158,122	§	Examiner: Daniel P. Stephenson
Filing Date: January 23, 2023	§	Confirmation No.: 1469
For: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	§	Attorney Docket No.: 57959.12US03

RESPONSE AND SUBMISSION UNDER 37 CFR § 1.114

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

I. Introductory Comments

This document is submitted in response to the Notice of Allowance mailed March 26, 2023, and accompanies a Request for Continued Examination ("RCE").

Estimated fees, including fees for the RCE, have been provided for by credit card separately but concurrently herewith for consideration of this document. If any additional fees, including any extension-of-time fees, are necessary, the Commissioner is hereby authorized to charge such fees, including any extension-of-time fees, to Haynes and Boone, LLP's Deposit Account No. 08-1394.

Amendments to the Claims begin on page 2 of this document.

Remarks begin on page 28 of this document.

II. Amendments to the Claims

This listing of claims will replace all prior version(s), and listing(s), of claims in the application:

1. (Currently amended) A method of hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the method comprising:

communicating fluid from one or more pumps to the first well via a manifold and a first valve, wherein the first valve is associated with both the first well and the manifold so that the first valve is:

in fluid communication with the manifold; and

fluidically positioned between the first well and the one or more pumps;

and

executing a continuous pumping ("CP") swap to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, the CP swap comprising:

opening a second valve while fluid is communicated from the one or more pumps to the first well via the first valve and the manifold,

wherein the second valve is associated with both the second well and the manifold so that the second valve is:

in fluid communication with the manifold; and

fluidically positioned between the second well and the one or more pumps from which fluid is communicated to the first well via the manifold and the first valve[[,]];

wherein opening the second valve causes fluid to be communicated from the one or more pumps to the second well via the manifold and the second valve,

and

wherein the second valve is opened in response to at least a portion of[[the]] fluid communicated via the manifold satisfying one or more conditions, which one or more

conditions include a flow rate, and/or a pressure, of the at least a portion of[[the]] fluid communicated via the manifold;

and

closing the first valve~~, wherein the first valve is closed~~:

after the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of[[the]] fluid communicated via the manifold,

~~after opening the second valve,~~ and

while fluid is communicated from the one or more pumps to the second well via the second valve and the manifold;

wherein, during the CP swap,[[the]] fluid is continuously communicated from the one or more pumps via the manifold~~ so that transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced~~.

2. (Original) The method of claim 1, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

3. (Currently amended) The method of claim 1, wherein the plurality of wells further comprises third and fourth wells, and the method further comprises:
communicating fluid to the third well via the manifold and a third valve,
wherein the third valve is associated with both the third well and the manifold;
wherein executing the CP swap further transitions from hydraulically fracturing the third well to hydraulically fracturing the fourth well, the CP swap further comprising:

opening a fourth valve while fluid is communicated to the third well via the third valve and the manifold,

wherein the fourth valve is associated with both the fourth well and the manifold,

wherein opening the fourth valve causes fluid to be communicated to the fourth well via the manifold and the fourth valve, and

wherein the fourth valve is opened in response to the at least a portion of[[the]] fluid communicated via the manifold satisfying the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of[[the]] fluid communicated via the manifold;

and

closing the third valve~~, wherein the third valve is closed~~:

after the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of[[the]] fluid communicated via the manifold,

~~after opening the fourth valve,~~ and

while fluid is communicated to the fourth well via the fourth valve and the manifold~~;~~

~~and~~

~~wherein, during the CP swap, the continuous communication of the fluid via the manifold reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the fourth well~~.

4. (Cancelled)

5. (Currently amended) The method of claim 1, further comprising:

determining that the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions.

6. (Currently amended) The method of claim 1, wherein the one or more conditions include the flow rate of the at least a portion of[[the]] fluid communicated via the manifold.

7. (Currently amended) The method of claim 6, wherein the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is below an upper threshold.

8. (Currently amended) A non-transitory computer readable medium having stored thereon computer-readable instructions executable by one or more processors to perform operations for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the operations comprising:
communicating fluid from one or more pumps to the first well via a manifold and a first valve,
wherein the first valve is associated with both the first well and the manifold so that the first valve is:
in fluid communication with the manifold; and
fluidically positioned between the first well and the one or more pumps;
and
executing a continuous pumping ("CP") swap to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, the CP swap comprising:
opening a second valve while fluid is communicated from the one or more pumps to the first well via the first valve and the manifold,
wherein the second valve is associated with both the second well and the manifold so that the second valve is:

in fluid communication with the manifold; and

fluidically positioned between the second well and the one or more pumps from which fluid is communicated to the first well via the manifold and the first valve[[,]];

wherein opening the second valve causes fluid to be communicated from the one or more pumps to the second well via the manifold and the second valve, and

wherein the second valve is opened in response to at least a portion of[[the]] fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of[[the]] fluid communicated via the manifold;

and

closing the first valve~~, wherein the first valve is closed~~:

after the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of[[the]] fluid communicated via the manifold,

~~after opening the second valve,~~ and

while fluid is communicated from the one or more pumps to the second well via the second valve and the manifold;

wherein, during the CP swap,[[the]] fluid is continuously communicated from the one or more pumps via the manifold~~ so that transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced~~.

9. (Original) The non-transitory computer readable medium of claim 8, wherein:

the first valve is a first zipper valve; and/or

the second valve is a second zipper valve.

10. (Currently amended) The non-transitory computer readable medium of claim 8, wherein the plurality of wells further comprises third and fourth wells, and the operations further comprise:

communicating fluid to the third well via the manifold and a third valve,

wherein the third valve is associated with both the third well and the manifold;

wherein executing the CP swap further transitions from hydraulically fracturing the third well to hydraulically fracturing the fourth well, the CP swap further comprising:

opening a fourth valve while fluid is communicated to the third well via the third valve and the manifold,

wherein the fourth valve is associated with both the fourth well and the manifold,

wherein opening the fourth valve causes fluid to be communicated to the fourth well via the manifold and the fourth valve, and

wherein the fourth valve is opened in response to the at least a portion of[[the]] fluid communicated via the manifold satisfying the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of[[the]] fluid communicated via the manifold;

and

closing the third valve~~, wherein the third valve is closed~~:

after the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of[[the]] fluid ~~being~~ communicated via the manifold,

~~after opening the fourth valve,~~ and

while fluid is communicated to the fourth well via the fourth valve and the manifold~~;~~

~~and~~

~~wherein, during the CP swap, the continuous communication of the fluid via the manifold reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the fourth well~~.

11. (Cancelled)

12. (Currently amended) The non-transitory computer readable medium of claim 8, wherein the operations further comprise:
determining that the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions.

13. (Currently amended) The non-transitory computer readable medium of claim 8, wherein the one or more conditions include the flow rate of the at least a portion of[[the]] fluid communicated via the manifold.

14. (Currently amended) The non-transitory computer readable medium of claim 13, wherein the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is below an upper threshold.

15. (Currently amended) A system for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the system comprising:
a manifold <u>via which fluid is adapted to be communicated from one or more pumps</u>;
a first valve via which fluid is adapted to be communicated from ~~the manifold~~ <u>the one or more pumps</u> to the first well, the first valve being associated with both the first well and the manifold <u>so that the first valve is:</u>

in fluid communication with the manifold; and

fluidically positioned between the first well and the one or more pumps;

a second valve via which fluid is adapted to be communicated from ~~the manifold~~ the one or more pumps to the second well, the second valve being associated with both the second well and the manifold so that the second valve is:

in fluid communication with the manifold; and

fluidically positioned between the second well and the one or more pumps from which fluid is adapted to be communicated to the first well via the manifold and the first valve; and

one or more controllers configured to execute a continuous pumping ("CP") swap, during which CP swap fluid is continuously communicated from the one or more pumps via the manifold, to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, by:

opening the second valve:

while fluid is communicated from the one or more pumps to the first well via the first valve and the manifold,

to cause fluid to be communicated from the one or more pumps to the second well via the manifold and the second valve, and

in response to at least a portion of[[the]] fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of[[the]] fluid communicated via the manifold;

and

closing the first valve:

after the at least a portion of[[the]] fluid communicated via the manifold has satisfied one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of

the at least a portion of[[the]] fluid communicated via the manifold,

~~after opening the second valve,~~ and

while fluid is communicated from the one or more pumps to the second well via the second valve and the manifold~~;~~

~~wherein the continuous communication of the fluid via the manifold during the CP swap reduces transition time between hydraulically fracturing the first well and hydraulically fracturing the second well.~~

16. (Original) The system of claim 15, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

17. (Currently amended) The system of claim 15, wherein:
the plurality of wells further comprises third and fourth wells;
the system further comprises:
a third valve via which fluid is adapted to be communicated from the manifold to the third well, the third valve being associated with both the third well and the manifold; and
a fourth valve via which fluid is adapted to be communicated from the manifold to the fourth well, the fourth valve being associated with both the fourth well and the manifold;
and
the one or more controllers are further configured to execute the CP swap, during which CP swap fluid is continuously communicated via the manifold, to transition from hydraulically fracturing the third well to hydraulically fracturing the fourth well, by:
opening the fourth valve:
while fluid is communicated to the third well via the third valve and the manifold,

to cause fluid to be communicated to the fourth well via the manifold and the fourth valve, and

in response to the at least a portion of[[the]] fluid communicated via the manifold satisfying the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of[[the]] fluid communicated via the manifold;

and

closing the third valve:

after the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of[[the]] fluid communicated via the manifold,

~~after opening the fourth valve,~~ and

while fluid is communicated to the fourth well via the fourth valve and the manifold~~;~~

~~wherein the continuous communication of the fluid via the manifold during the CP swap reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the fourth well~~.

18. (Cancelled)

19. (Currently amended) The system of claim 15, wherein the one or more controllers are further configured to:

determine that the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions.

20. (Currently amended) The system of claim 15, wherein the one or more conditions include the flow rate of the at least a portion of[[the]] fluid communicated via the manifold.

21. (Currently amended) The system of claim 20, wherein the at least a portion of ~~the~~ fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is below an upper threshold.

22. (Currently amended) The method of claim 6, wherein the at least a portion of ~~the~~ fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is above a lower threshold.

23. (Currently amended) The method of claim 6, wherein the at least a portion of ~~the~~ fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is both below an upper threshold and above a lower threshold.

24. (Currently amended) The method of claim 1, wherein the one or more conditions include the pressure of the at least a portion of[[the]] fluid communicated via the manifold.

25. (Currently amended) The method of claim 24, wherein the at least a portion of [[the]] fluid communicated via the manifold has satisfied the one or more conditions when the pressure is below an upper threshold.

26. (Currently amended) The method of claim 24, wherein the at least a portion of [[the]] fluid communicated via the manifold has satisfied the one or more conditions when the pressure is above a lower threshold.

27. (Currently amended) The method of claim 24, wherein the at least a portion of [[the]] fluid communicated via the manifold has satisfied the one or more

conditions when the pressure is both below an upper threshold and above a lower threshold.

28. (Currently amended) The method of claim 1, wherein the plurality of wells further comprises a third well, and the method further comprises:

communicating fluid to the third well via the manifold and a third valve,

wherein the third valve is associated with both the third well and the manifold;

and

executing another CP swap to transition from hydraulically fracturing the third well to hydraulically fracturing the first well, the another CP swap comprising:

opening the first valve while fluid is communicated to the third well via the third valve and the manifold,

wherein opening the first valve causes fluid to be communicated to the first well via the manifold and the first valve, and

wherein the first valve is opened in response to at least another portion of[[the]] fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least another portion of[[the]] fluid communicated via the manifold;

and

closing the third valve~~, wherein the third valve is closed~~:

after the at least another portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least another portion of[[the]] fluid communicated via the manifold,

~~after opening the first valve,~~ and

while fluid is communicated to the first well via the first valve and the manifold;

wherein, during the another CP swap,[[the]] fluid is continuously communicated via the manifold ~~so that transition time, between hydraulically fracturing the third well and hydraulically fracturing the first well, is reduced~~.

29. (Currently amended) The method of claim 1, further comprising:
hydraulically fracturing the first well; and
hydraulically fracturing the second well;
wherein the fluid, which is continuously communicated via the manifold ~~so that the transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced~~ during the CP swap, is hydraulic fracturing fluid.

30. (Previously presented) The method of claim 29, wherein the hydraulic fracturing fluid comprises sand.

31. (Currently amended) The non-transitory computer readable medium of claim 13, wherein the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is above a lower threshold.

32. (Currently amended) The non-transitory computer readable medium of claim 13, wherein the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is both below an upper threshold and above a lower threshold.

33. (Currently amended) The non-transitory computer readable medium of claim 8, wherein the one or more conditions include the pressure of the at least a portion of[[the]] fluid communicated via the manifold.

34. (Currently amended) The non-transitory computer readable medium of claim 33, wherein the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions when the pressure is below an upper threshold.

35. (Currently amended) The non-transitory computer readable medium of claim 33, wherein the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions when the pressure is above a lower threshold.

36. (Currently amended) The non-transitory computer readable medium of claim 33, wherein the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions when the pressure is both below an upper threshold and above a lower threshold.

37. (Currently amended) The non-transitory computer readable medium of claim 8, wherein the plurality of wells further comprises a third well, and the operations further comprise:

communicating fluid to the third well via the manifold and a third valve,

wherein the third valve is associated with both the third well and the manifold;

and

executing another CP swap to transition from hydraulically fracturing the third well to hydraulically fracturing the first well, the another CP swap comprising:

opening the first valve while fluid is communicated to the third well via the third valve and the manifold,

wherein opening the first valve causes fluid to be communicated to the first well via the manifold and the first valve, and

wherein the first valve is opened in response to at least another portion of[[the]] fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least another portion of[[the]] fluid communicated via the manifold; and

closing the third valve~~, wherein the third valve is closed~~:

after the at least another portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least another portion of[[the]] fluid communicated via the manifold,

~~after opening the first valve,~~ and

while fluid is communicated to the first well via the first valve and the manifold;

wherein, during the another CP swap,[[the]] fluid is continuously communicated via the manifold~~ so that transition time, between hydraulically fracturing the third well and hydraulically fracturing the first well, is reduced~~.

38. (Currently amended) The non-transitory computer readable medium of claim 8, wherein the operations further comprise:

hydraulically fracturing the first well; and

hydraulically fracturing the second well;

and

wherein the fluid, which is continuously communicated via the manifold~~ so that the transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced~~ during the CP swap, is hydraulic fracturing fluid.

39. (Previously presented) The non-transitory computer readable medium of claim 38, wherein the hydraulic fracturing fluid comprises sand.

40. (Currently amended) The system of claim 20, wherein the at least a portion of ~~the~~ fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is above a lower threshold.

41. (Currently amended) The system of claim 20, wherein the at least a portion of ~~the~~ fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is both below an upper threshold and above a lower threshold.

42. (Currently amended) The system of claim 15, wherein the one or more conditions include the pressure of the at least a portion of[[the]] fluid communicated via the manifold.

43. (Currently amended) The system of claim 42, wherein the at least a portion of ~~the~~ fluid communicated via the manifold has satisfied the one or more conditions when the pressure is below an upper threshold.

44. (Currently amended) The system of claim 42, wherein the at least a portion of ~~the~~ fluid communicated via the manifold has satisfied the one or more conditions when the pressure is above a lower threshold.

45. (Currently amended) The system of claim 42, wherein the at least a portion of ~~the~~ fluid communicated via the manifold has satisfied the one or more conditions when the pressure is both below an upper threshold and above a lower threshold.

46. (Currently amended) The system of claim 15, wherein:
the plurality of wells further comprises a third well;

the system further comprises a third valve via which fluid is adapted to be communicated from the manifold to the third well, the third valve being associated with both the third well and the manifold;

the one or more controllers are further configured to execute another CP swap, during which CP swap fluid is continuously communicated via the manifold, to transition from hydraulically fracturing the third well to hydraulically fracturing the first well, by:

opening the first valve:

while fluid is communicated to the third well via the third valve and the manifold,

to cause fluid to be communicated to the first well via the manifold and the first valve, and

in response to at least another portion of[[the]] fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least another portion of[[the]] fluid communicated via the manifold;

and

closing the ~~second~~ third valve:

after the at least another portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least another portion of[[the]] fluid communicated via the manifold,

~~after opening the first valve,~~ and

while fluid is communicated to the first well via the first valve and the manifold[[;]]

~~wherein the continuous communication of the fluid via the manifold during the another CP swap reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the first well~~.

47. (Currently amended) The system of claim 15, wherein the fluid, which is continuously communicated via the manifold ~~so that the transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced~~ during the CP swap, is hydraulic fracturing fluid.

48. (Previously presented) The system of claim 47, wherein the hydraulic fracturing fluid comprises sand.

49. (Previously presented) The method of claim 1, further comprising:
displaying a dashboard, which dashboard comprises:
a visual reference of the first valve; and
a visual reference of the second valve;
wherein the display of the dashboard visually communicates respective states of the first and second valves.

50. (Previously presented) The method of claim 49, wherein the dashboard further comprises:
a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that the state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve.

51. (Previously presented) The method of claim 50, wherein the dashboard further comprises:
a visual reference of a first wellhead in communication with the first well.

52. (Previously presented) The method of claim 50, wherein the dashboard further comprises:

a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that the state of the second valve is closed.

53. (Previously presented) The non-transitory computer readable medium of claim 8, wherein the operations further comprise:
displaying a dashboard, which dashboard comprises:
a visual reference of the first valve; and
a visual reference of the second valve;
and
wherein the display of the dashboard visually communicates respective states of the first and second valves.

54. (Previously presented) The non-transitory computer readable medium of claim 53, wherein the dashboard further comprises:
a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that the state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve.

55. (Previously presented) The non-transitory computer readable medium of claim 54, wherein the dashboard further comprises:
a visual reference of a first wellhead in communication with the first well.

56. (Previously presented) The non-transitory computer readable medium of claim 54, wherein the dashboard further comprises:
a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that the state of the second valve is closed.

57. (Previously presented) The system of claim 15, further comprising:
a dashboard adapted to be displayed, which dashboard comprises:
a visual reference of the first valve; and
a visual reference of the second valve;
wherein the display of the dashboard visually communicates respective states of the first and second valves.

58. (Previously presented) The system of claim 57, wherein the dashboard further comprises:
a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that the state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve.

59. (Previously presented) The system of claim 58, wherein the dashboard further comprises:
a visual reference of a first wellhead in communication with the first well.

60. (Previously presented) The system of claim 58, wherein the dashboard further comprises:
a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that the state of the second valve is closed.

61. (Currently amended) A method of hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the method comprising:
communicating fluid <u>from one or more pumps</u> to the first well via a manifold and a first valve, wherein the first valve is associated with both the first well and the manifold <u>so that the first valve is:</u>
<u>in fluid communication with the manifold; and</u>

fluidically positioned between the first well and the one or more pumps;

displaying a dashboard, which dashboard comprises:

a visual reference of the first valve;

a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that a state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve;

a visual reference of a second valve, wherein the second valve is associated with both the second well and the manifold so that the second valve is:

in fluid communication with the manifold; and

fluidically positioned between the second well and the one or more pumps from which fluid is communicated to the first well via the manifold and the first valve; and

a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that a state of the second valve is closed;

and

executing a continuous pumping ("CP") swap to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, the CP swap comprising:

opening the second valve while fluid is communicated from the one or more pumps to the first well via the first valve and the manifold,

wherein opening the second valve causes fluid to be communicated from the one or more pumps to the second well via the manifold and the second valve, and

wherein the second valve is opened in response to at least a portion of[[the]] fluid communicated via the manifold satisfying one or more conditions;

and

closing the first valve~~, wherein the first valve is closed~~:

after the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions~~, and after opening the second valve~~;

wherein the display of the dashboard visually communicates the respective states of the first and second valves; and

wherein fluid is continuously communicated from the one or more pumps via the manifold during the CP swap ~~to reduce transition time between hydraulically fracturing the first well and hydraulically fracturing the second well~~.

62. (Previously presented) The method of claim 61, wherein the dashboard further comprises a visual reference of a first wellhead in communication with the first well.

63. (Currently amended) The method of claim 61, further comprising:

determining that the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions.

64. (Currently amended) The method of claim 61, wherein the one or more conditions include a flow rate condition of the at least a portion of[[the]] fluid communicated via the manifold.

65. (Currently amended) The method of claim 61, wherein the one or more conditions include a pressure condition of the at least a portion of[[the]] fluid communicated via the manifold.

66. (Currently amended) The method of claim 61, further comprising:

hydraulically fracturing the first well; and

hydraulically fracturing the second well;

wherein the fluid, which is continuously communicated via the manifold ~~to reduce the transition time between hydraulically fracturing the first well and hydraulically fracturing the second well~~ during the CP swap, is hydraulic fracturing fluid.

67. (Previously presented) The method of claim 66, wherein the hydraulic fracturing fluid comprises sand.

68. (Currently amended) A non-transitory computer readable medium of hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the method comprising:

communicating fluid from one or more pumps to the first well via a manifold and a first valve, wherein the first valve is associated with both the first well and the manifold so that the first valve is:

in fluid communication with the manifold; and

fluidically positioned between the first well and the one or more pumps;

displaying a dashboard, which dashboard comprises:

a visual reference of the first valve;

a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that a state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve;

a visual reference of a second valve, wherein the second valve is associated with both the second well and the manifold so that the second valve is:

in fluid communication with the manifold; and

fluidically positioned between the second well and the one or more pumps from which fluid is communicated to the first well via the manifold and the first valve; and

a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that a state of the second valve is closed;

and

executing a continuous pumping ("CP") swap to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, the CP swap comprising:

opening the second valve while fluid is communicated from the one or more pumps to the first well via the first valve and the manifold,

wherein opening the second valve causes fluid to be communicated from the one or more pumps to the second well via the manifold and the second valve, and

wherein the second valve is opened in response to at least a portion of[[the]] fluid communicated via the manifold satisfying one or more conditions;

and

closing the first valve~~, wherein the first valve is closed~~:

after the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions~~; and after opening the second valve~~;

wherein the display of the dashboard visually communicates the respective states of the first and second valves; and

wherein fluid is continuously communicated from the one or more pumps via the manifold during the CP swap ~~to reduce transition time between hydraulically fracturing the first well and hydraulically fracturing the second well~~.

69. (Previously presented) The non-transitory computer readable medium of claim 68, wherein the dashboard further comprises a visual reference of a first wellhead in communication with the first well.

70. (Currently amended) The non-transitory computer readable medium of claim 68, further comprising:
determining that the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions.

71. (Currently amended) The non-transitory computer readable medium of claim 68, wherein the one or more conditions include a flow rate condition of the at least a portion of[[the]] fluid communicated via the manifold.

72. (Currently amended) The non-transitory computer readable medium of claim 68, wherein the one or more conditions include a pressure condition of the at least a portion of[[the]] fluid communicated via the manifold.

73. (Currently amended) The non-transitory computer readable medium of claim 68, further comprising:
hydraulically fracturing the first well; and
hydraulically fracturing the second well;
wherein the fluid, which is continuously communicated via the manifold ~~to reduce the transition time between hydraulically fracturing the first well and hydraulically fracturing the second well~~ during the CP swap, is hydraulic fracturing fluid.

74. (Previously presented) The non-transitory computer readable medium of claim 73, wherein the hydraulic fracturing fluid comprises sand.

75. (Currently amended) A system for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the system comprising:

a manifold via which fluid is adapted to be communicated from one or more pumps;

a first valve via which fluid is adapted to be communicated from ~~the manifold~~ the one or more pumps to the first well, the first valve being associated with both the first well and the manifold so that the first valve is:

in fluid communication with the manifold; and

fluidically positioned between the first well and the one or more pumps;

a second valve via which fluid is adapted to be communicated from ~~the manifold~~ the one or more pumps to the second well, the second valve being associated with both the second well and the manifold so that the second valve is:

in fluid communication with the manifold; and

fluidically positioned between the second well and the one or more pumps from which fluid is adapted to be communicated to the first well via the manifold and the first valve;

a dashboard adapted to be displayed, which dashboard comprises:

a visual reference of the first valve;

a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that a state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve;

a visual reference of the second valve; and

a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that a state of the second valve is closed;

and

one or more controllers configured to execute a continuous pumping ("CP") swap, during which CP swap fluid is continuously communicated from the one or more pumps via the manifold, to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, by:

opening the second valve:

while fluid is communicated from the one or more pumps to the first well via the first valve and the manifold,

in response to at least a portion of[[the]] fluid communicated via the manifold satisfying one or more conditions, and

to cause fluid to be communicated from the one or more pumps to the second well via the manifold and the second valve;

and

closing the first valve:

after the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions~~, and after opening the second valve~~;

wherein the display of the dashboard visually communicates the respective states of the first and second valves~~; and~~

~~wherein the continuous communication of fluid via the manifold during the CP swap reduces transition time between hydraulically fracturing the first well and hydraulically fracturing the second well~~.

76. (Previously presented) The system of claim 75, wherein the dashboard further comprises a visual reference of a first wellhead in communication with the first well.

77. (Currently amended) The system of claim 75, wherein the one or more controllers are further configured to:

determine that the at least a portion of[[the]] fluid communicated via the manifold has satisfied the one or more conditions.

78. (Currently amended) The system of claim 75, wherein the one or more conditions include a flow rate condition of the at least a portion of[[the]] fluid communicated via the manifold.

79. (Currently amended) The system of claim 75, wherein the one or more conditions include a pressure condition of the at least a portion of[[the]] fluid communicated via the manifold.

80. (Currently amended) The system of claim 75, wherein the fluid, which is continuously communicated via the manifold ~~to reduce the transition time between hydraulically fracturing the first well and hydraulically fracturing the second well~~ during the CP swap, is hydraulic fracturing fluid.

81. (Previously presented) The system of claim 80, wherein the hydraulic fracturing fluid comprises sand.

III. Remarks

A. Status of the Application

Claims 1-3, 5-10, 12-17, and 19-81 were previously pending.

Claims 1, 3, 5-8, 10, 12-15, 17, 19-29, 31-38, 40-47, 61, 63-66, 68, 70-73, 75, and 77-80 have been amended.

Claims 2, 9, 16, 30, 39, 48-60, 62, 67, 69, 74, 76, and 81 have been maintained in their original or previously-presented form.

As a result, claims 1-3, 5-10, 12-17, and 19-81 remain pending.

No new subject matter has been added, as support for the new claims can be found throughout the present application as filed.

B. Decision Granting Institution of *Inter Partes* Review of U.S. Patent No. Institution of U.S. Patent No. 11,560,770

On June 10, 2024, the Patent Trial and Appeal Board ("the PTAB") rendered a decision granting institution of an *inter partes* review of U.S. Patent No. 11,560,770 (the "Decision"). U.S. Patent No. 11,560,770 issued from U.S. Application No. 17/878,493, of which the present application is a continuation.

In the Decision, the PTAB indicated that U.S. Publication No. 2019/0233275 ("Carr"), alone and in combination with International Publication No. 2020/145978 ("Beuterbaugh") may *possibly* render claim 1 of U.S. Patent No. 11,560,770 unpatentable. *See* Decision, p. 28, ll. 15-20.

Here, in the present application, Carr, either alone or with Beuterbaugh, does **not** disclose, teach, or suggest the subject matter of each of independent claims 1, 8, 15, 61, 68, and 75, as listed above in the "Amendments to the Claims" section. Therefore, each of independent claims 1, 8, 15, 61, 68, and 75 is allowable over: Carr alone; and Carr in combination with Beuterbaugh.

In the Decision, the PTAB also provided remarks with respect to U.S. Patent No. 8,490,685 ("Tolman") and claim 1 of U.S. Patent No. 11,560,770. *See Id.* at pp. 28-35.

Here, in the present application, Tolman does **not** disclose, teach, or suggest the subject matter of each of independent claims 1, 8, 15, 61, 68, and 75, as listed above in the "Amendments to the Claims" section. Therefore, each of independent claims 1, 8, 15, 61, 68, and 75 is allowable over Tolman.

Each of the remaining pending claims depends upon and includes the subject matter of one of independent claims 1, 8, 15, 61, 68, and 75, as listed above in the "Amendments to the Claims" section. Therefore, all pending claims 1-3, 5-10, 12-17, and 19-81 are allowable over: Carr alone; Carr in combination with Beuterbaugh; and Tolman.

C. Conclusion

In view of the foregoing amendments and remarks, favorable consideration of this application is respectfully requested.

The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,

/Zachary A. Halbur/

Zachary A. Halbur
Registration No. 68,500

Date: June 25, 2024
HAYNES AND BOONE, LLP
Customer No. 27683
Telephone: 817-347-6678
IP Facsimile: 214-200-0853

Attachments:

- Request for Continued Examination ("RCE")
- Information Disclosure Statement ("IDS")

4878-5869-9464 v.1

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 November 2017 (23.11.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/201526 A1

(51) International Patent Classification:
E21B 43/26 (2006.01) *E21B 34/02* (2006.01)

(21) International Application Number:
PCT/US2017/033813

(22) International Filing Date:
22 May 2017 (22.05.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

62/339,233	20 May 2016 (20.05.2016)	US
15/445,044	28 February 2017 (28.02.2017)	US
15/464,939	21 March 2017 (21.03.2017)	US
15/600,155	19 May 2017 (19.05.2017)	US

(71) Applicant: **GAS TECHNOLOGY INSTITUTE** [US/US]; 1700 South Mount Prospect Road, Des Plaines, IL 60018 (US).

(72) Inventors: **CIEZOBKA, Jordan**; 1200 N. Scarlet Court, Addison, IL 60101 (US). **MAITY, Debotyam**; 702 W. Algonquin Road, Apt. 6, Des Plaines, IL 60016 (US).

(74) Agent: **SIEGEL, William, R.** et al.; Pauley Erickson & Kottis, 2800 West Higgins Road, Suite 365, Hoffman Estates, IL 60169 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

(54) Title: HYDRAULIC FRACTURING SYSTEM AND METHOD

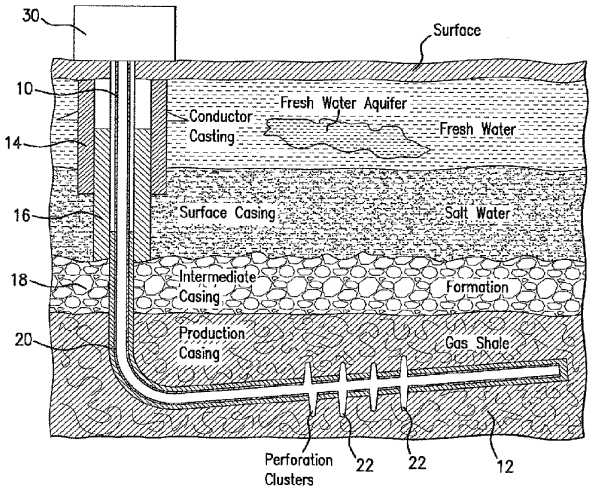


FIG. 1

(57) Abstract: A hydraulic fracturing system and method for enhancing effective permeability of earth formations to increase hydrocarbon production, enhance operation efficiency by reducing fluid entry friction due to tortuosity and perforation, and to open perforations that are either unopened or not effective using traditional techniques, by varying a pump rate and/or a flow rate to a wellbore.

[Continued on next page]

WO 2017/201526 A1

TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

HYDRAULIC FRACTURING SYSTEM AND METHOD

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

This invention was made with government support under Contract No. DE-AC26-07NT42677 awarded by the U.S. Department of Energy. The government has certain rights in the invention.

BACKGROUND OF THE INVENTION

Field of the Invention

This invention is directed to a hydraulic fracturing system and method for enhancing an effective permeability of low permeability earth formations to increase hydrocarbon production, enhance operation efficiency by reducing fluid entry friction due to tortuosity and perforation, and to open perforations that are either unopened or not effective using traditional perforating techniques including techniques utilizing shaped explosive charges, as well as reducing entry friction in slotted pipe during multi stage hydraulic fracturing operations.

Discussion of Related Art

Hydraulic fracturing is a method of extracting hydrocarbons from earth formations in which thousands of gallons of a fracturing fluid, generally water, proppants, and other chemicals, are injected into a wellbore and a surrounding earth formation. The high pressure creates fractures in the earth formation, along which hydrocarbons, such as gas and petroleum, may flow to the wellbore and collected therefrom. However, this basic hydraulic fracturing method is unable to extract a maximum amount of hydrocarbons. Generally, after an initial fracturing operation, pumping continues to cause deepening and widening of the fissures by injection of more fluid. While it is generally desirable to open a plurality of fractures in a selected stratum, the basic process is only capable of creating a suboptimal amount of fractures. When an incipient fracture begins to open, the fracturing fluid enters this new space and the pressure in the wellbore and fractures decreases reducing the tendency to open new fractures. This phenomenon limits the results of the basic fracturing process.

Other known hydraulic fracturing processes attempt to improve the process described above by adding a hammer effect to transmit a relatively large hydraulic shock against the formation to be fractured. For example, U.S. Patent No. 2,915,122 to Donald S.

Hulse and U.S. Patent No. 3,048,226 to E. W. Smith. Other known hydraulic fracturing processes use a series of pressure pulses to improve the typical fracturing process. For example, U.S. Patent No. 3,602,311 to Norman F. Whitsitt and U.S. Patent No. 3,933,205 to Othar Meade Kiel. However, these known processes generally effect only a small number fractures radiating from the wellbore and may cause damage to piping and equipment.

Other known hydraulic fracturing techniques attempt to overcome the issue of reduced pressure due to newly opened fractures by blocking the newly formed fractures to allow a return to the initial pressure to allow additional fractures to be created. These methods include using degradable and/or non-degradable ball sealers that enter newly opened perforations to restrict flow of fracturing fluid into the opened perforations, thus forcing the fracturing fluid to open new perforations and to create new fractures. Ball sealers land on the newly opened perforations until a complete ball-out is achieved, where all possible perforations are opened and then sealed with a ball. At this point, no more flow is possible and the ball sealers have to be removed by flowing the well back, or in the case of using degradable balls, a long period is needed to allow for the balls to dissolve. These techniques are not practical in long horizontal wells where 100 or more perforation clusters are used to stimulate the long horizontal well. Furthermore, the wait time for the degradable ball sealers to dissolve would render the operations uneconomical.

As such, there is a need for an improved hydraulic fracturing process that provides an increased hydrocarbon production without the shortcomings of the known processes.

SUMMARY OF THE INVENTION

It is one object of this invention to provide a system and method for providing a pressure pulse to a wellbore to improve fracturing of an earth formation to provide increased hydrocarbon production.

It is another object of this invention to provide the pressure pulse and minimizes or eliminates wear or damage to a fracturing pump and/or other fracturing equipment.

These and other benefits can be provided by an embodiment of this invention which includes one or more of a fracturing fluid storage tank, a pre-blender, a slurry-blender, a proppant storage and delivery system, a manifold, a high-pressure fracturing pump, a chemical truck, a flow line connected to a wellhead of a wellbore, a bleed-off valve and a bleed-off line connected to a pit. Alternative embodiments of this invention may be created without one or more of the listed components and may include additional components.

In a preferred embodiment, the fracturing tank supplies a primary component of a fracturing fluid and/or a fracturing slurry, each of which preferably comprise water. However, other fluids, gels and other materials may be used as the primary component of the fracturing fluids and/or fracturing slurry. The fracturing tank is connected to the pre-blender, for example, a mixing truck that also connects with a chemical truck, and mixes the water, polymer and other chemicals to make the fracturing fluid (without a proppant). The pre-blender connects to the manifold and/or the slurry-blender to provide either the fracturing fluid or the fracturing slurry to the high-pressure fracturing pumps. The slurry-blender is connected to the proppant storage and delivery system to create the fracturing slurry by mixing the fracturing fluid with the proppant. The slurry-blender connects to the manifold. The manifold receives the fracturing fluid, with or without proppant, at a low pressure from the pre-blender or the slurry-blender and distributes the fluid and/or slurry to the high-pressure fracturing pumps. The manifold then receives the fluids at a high pressure from the high-pressure fracturing pumps and directs the fluid to a ground iron leading to the wellhead and the wellbore.

The high-pressure fracturing pump pumps the fracturing fluid, with or without proppant, to the wellhead at a pump rate through a flow line. In a preferred embodiment, the flow line comprises a plurality of pipes which connect the high-pressure fracturing pumps, through a single or multiple common manifolds, to a wellhead of the wellbore. In an embodiment of this invention, the plurality of flow lines comprise at least one constant-flow flow line and at least one variable-flow flow line which includes the bleed-off valve and the bleed-off line. The constant-flow line supplies a first percentage of a flow rate supplied by the high-pressure fracturing pump to the wellhead. The flow rate of the constant-flow line preferably does not vary significantly. The variable-flow line supplies a second percentage of the flow rate supplied by the high-pressure fracturing pump to the wellhead. In a preferred embodiment, the flow rate of the variable-flow line can be varied by diverting a portion of the fracturing fluid via the bleed-off valve to a pit, tank, another wellhead and wellbore, or to any other holding device. In an alternative embodiment, the flow line may comprise a single pipe connected to the wellhead with a bleed-off line and without the constant-flow line.

In operation, a method of hydraulic fracturing stimulation according to one embodiment of this invention includes pumping the fracturing fluid, with or without the proppant, at a pump rate and injecting the fracturing fluid under pressure into the wellhead at an initial flow rate and creating small fractures in deep rock formations. As the system moves towards an equilibrium pressure with few or no new fractures being created and/or a fracture network complexity is no longer increasing, the method of this invention includes introducing

a pressure pulse into the wellbore for a pulse period of time causing a temporary increase of pressure leading to opening new fractures. The pressure pulse comprises changing the initial flow rate to a primary or pulse flow rate and then to a secondary flow rate. In embodiments of this invention, the primary or pulse flow rate is less than the initial flow rate, ranging from 10% lower to nearly 100% lower, and the secondary flow rate is equal to the initial flow rate. In preferred embodiments, the primary or pulse flow rate may range from 25% to 75% lower that the initial flow rate. More preferably, the primary or pulse flow rate is 50% lower than the initial flow rate. In another embodiment of this invention, the primary or pulse flow rate is ideally dropped to zero, however a zero flow rate may not be practical because of limitations on the equipment and/or because a zero flow rate will cause proppant transport issues and may damage equipment. In alternative embodiments, the primary or pulse flow rate may be greater than the initial flow rate and/or the secondary flow rate may not equal the initial flow rate and may instead be greater than or less than the initial flow rate. In an embodiment of this invention, the pulse period of time is less than one minute. In a preferred embodiment of this invention, the pulse period of time is less than 10 seconds.

In an embodiment of the method of this invention, the pressure pulse is introduced by diverting a portion of the fracturing fluid away from the wellbore to provide a reduced flow rate to the wellbore for the pulse period of time. In this embodiment, the pump rate of the high-pressure fracturing pump remains constant so as to avoid placing additional stress on the high-pressure fracturing pump. In a preferred embodiment, the step of introducing the pressurized pulse comprises a plurality of pressurized pulses.

In an alternative embodiment, the pressure pulse is introduced by changing the pump rate of a fracturing pump from the pump rate to the pulse pump rate and back to the pump rate. Preferably, the pulse pump rate is less than the pump rate. Alternatively, the pulse pump rate is greater than the pump rate.

In another alternative embodiment, the pressure pulse includes increasing the initial flow rate to a pre-pulse or intermediate flow rate, rapidly dropping the flow rate to a primary or pulse flow rate and returning the flow rate to the pre-pulse or intermediate flow rate and repeating this cycle for a number of times before returning the flow rate to the initial flow rate. This approach may be done by increasing and decreasing the pump rate and/or by redirecting the flow of fracturing fluid to change the flow rate.

In one aspect of the subject development, a new method of hydraulic fracturing to create a number of additional open perforations in an earth formation having a total number of perforations is provided. In accordance with one embodiment, such a method involves

pumping a fracturing fluid into the earth formation at a first pressure (P_1) and a first flow rate (Q_1). Subsequently, the fracturing fluid is pumped into the earth formation at a second pressure (P_2) and a second flow rate (Q_2) to introduce a change of flow rate into the earth formation for a period of time, where the second flow rate (Q_2) is significantly reduced as compared to the first flow rate (Q_1). The method further involves return pumping of the fracturing fluid into the earth formation at the first flow rate (where the flow rate on said return of the pumping is designated (Q_R)), and identifying a pumping pressure (P_R) associated with the flow rate on said return of the pumping (Q_R) and calculating the number of additional open perforations and a total number of open perforations in the earth formation.

In accordance with another embodiment, a method of hydraulic fracturing to create a number of additional open perforations in an earth formation is provided. Such a method involves pumping a fracturing fluid into the earth formation at a first pressure (P_1) and a first flow rate (Q_1). Followed by, pumping the fracturing fluid into the earth formation at a second pressure (P_2) and a second flow rate (Q_2) to introduce a change of flow rate into the earth formation for a period of time, where the second flow rate (Q_2) is significantly reduced as compared to the first flow rate (Q_1). Subsequently, return pumping of the fracturing fluid into the earth formation at the first flow rate (where the flow rate on said return of the pumping is designated (Q_R)) and identifying a pumping pressure (P_R) associated with the flow rate on said return of the pumping (Q_R). The pumping pressure associated with return to the first flow rate (P_R) is compared with the first pressure (P_1) and at least one fracturing fluid operation parameter selected from the group of flow rate, duration, and frequency is correspondingly adjusted.

A method of hydraulic fracturing to create a number of additional open perforations in an earth formation, in accordance with another embodiment involves:

a. pumping a fracturing fluid into the earth formation at a first pressure (P_1) and a first flow rate (Q_1);

b. pumping the fracturing fluid into the earth formation at a second pressure (P_2) and a second flow rate (Q_2) to introduce a change of flow rate into the earth formation for a period of time, where the second flow rate (Q_2) is significantly reduced as compared to the first flow rate (Q_1);

c. return pumping of the fracturing fluid into the earth formation at the first flow rate (where the flow rate on said return of the pumping is designated (Q_R)) and identifying a pumping pressure (P_R) associated with return to the first flow rate (Q_R); and

d. comparing the pumping pressure associated with return to the first flow rate (P_R)

with the first pressure (P_1) to determine one or more of: number of open perforations originally in the earth formation and the number of additional open perforations resulting from the hydraulic fracturing.

The invention provides an improved hydraulic fracturing process that provides increased hydrocarbon production without the shortcomings of known processes.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and features of this invention will be better understood from the following detailed description taken in conjunction with the drawings, wherein:

Fig. 1 is a schematic diagram of a wellbore.

Fig. 2 is a graph showing a pump rate and a surface treating pressure of a method of hydraulic fracturing according to an embodiment of this invention.

Fig. 3 is a graph showing a wellhead pump rate and a surface treating pressure of a method of hydraulic fracturing according to an embodiment of this invention.

Fig. 4 is a schematic diagram of a system for hydraulic fracturing according to an embodiment of this invention.

Fig. 5 is a graph showing a surface treating pressure and a wellhead pump rate where a portion of a total pump flow is diverted according to another embodiment of this invention.

Fig. 6 is a schematic diagram of a portion of a system for hydraulic fracturing according to an alternative embodiment of this invention.

Fig. 7 is a graph showing a first total flow rate to a first wellhead and a second total flow rate to a second wellhead in another embodiment of this invention.

Fig. 8 is a graph showing a treatment pressure and a wellhead pump rate for a rate fluctuation introduction in accordance with one embodiment of this invention.

Fig. 9 is a schematic showing of a graph showing a treatment pressure and a wellhead pump rate for a variable rate fluctuation workflow design in accordance with one embodiment of this invention.

Fig. 10 is a graph showing of a workforce to design variable rate fluctuations for optimizing perforation opening in accordance with one embodiment of the subject development.

Fig. 11 is a graphical presentation of perforation opening "synthetic curves" and three potential scenarios in terms of opening of additional perforations due to introduced rate fluctuations "r".

Fig. 12 is a graphical presentation of observed opening of perforations for a treatment stage from the Permian Basin in accordance with one embodiment of the subject development.

Fig. 13 is a graph showing surface geophone locations and borehole projection at 1000's of feet below surface in accordance with one embodiment of the subject development.

Fig. 14 is a simplified flow schematic for using microseismic attributes to diagnose completion effectiveness in accordance with one embodiment of the subject development.

Fig. 15 is a schematic of one embodiment of the subject development.

DESCRIPTION OF PREFERRED EMBODIMENTS

Hydraulic fracturing stimulation is a method of enhancing an effective permeability of a low permeability formation by extending a wellbore in the formation and creating propped fractures that enable hydrocarbon production from vast amounts of reservoir and channeling the hydrocarbons back to the wellbore from which the hydraulic fractures emanate. Fig. 1 shows a schematic view of a horizontal wellbore 10 for a fracturing operation. In this representation, the wellbore 10 extends vertically downward into the earth until reaching a target reservoir 12 (e.g. gas shale) where the wellbore 10 extends generally horizontal at a slight upward angle. It should be noted that the wellbore 10 is representative and the system and method of this invention be used with any type of wellbore that is necessary to access an earth formation. Furthermore, the method of this invention will be described in connection with gas shale however, it should be understood that the method may also be used with tight gas, tight oil, coal seam gas and other earth formations requiring hydraulic fracture stimulation including but not limited to geothermal reservoirs.

In the embodiment of Fig. 1, the wellbore 10 includes a conductor casing 14, a surface casing 16, an intermediate casing 18 and a production casing 20. However, it should be understood that the method of this invention is not limited to the wellbore 10 of Fig. 1 and may be used with other types of wellbore configurations, including fracture stimulation of vertical or slant wellbores. Fig. 1 shows the wellbore extending into the earth including a surface layer, a salt water layer, a formation layer, and the gas shale layer. However, it should be understood that the system of this invention is not limited to this geologic formation and may be used with other geologic formations. It should also be understood, that the system and method of this invention may be used with a subterranean extraction process including, but not limited to, enhanced geothermal systems.

In a preferred embodiment of this invention, the wellbore 10 further includes a plurality of perforation clusters 22. The industry standard is to perforate multiple sections of the horizontal or vertical wellbore usually in 3 or 4 short sections called perforation clusters, spaced a short distance apart. For example, if a 200 foot section of the reservoir is to be fracture stimulated, an approach would be to perforate four, 1 foot sections of the wellbore spaced 50 feet apart, resulting in 4 clusters of perforations that should create 4 or more individual fractures. However, any number of perforation clusters and/or spacing may be used. For example, long horizontal wells may include 120 or more perforation clusters.

A typical fracture treatment is designed to be pumped at a constant flow rate to a wellhead and a wellbore, where increasing pressure in the wellbore fractures the earth formation. The method of this invention involves changing the fracturing flow rate rapidly to impart a pressure pulse that can open unopened perforations by exceeding a perforation breakdown pressure.

In an embodiment of this invention, the pressure pulse is imparted by rapidly shutting off a fracturing pump 42 (Fig. 4) and turning the fracturing pump 42 back on. Alternatively, the pressure pulse may be imparted by changing by rapidly increasing or decreasing a pressure of a pump rate of the fracturing pump 42. These methods are preferably conducted with fracturing fluid which does not include proppant, however; the methods may also be conducted with the fracturing fluid with proppant, also known as a fracturing slurry.

Fig. 2 shows a graph showing an embodiment of this invention where a pump rate 70 is varied to impart a pressure pulse to the wellhead to cause a change (ΔP) in a surface treating pressure 72. In this embodiment, the pump rate 70 starts at an initial pump rate 74 and rapidly dropped to primary or pulse pump rate 76 before returning to the initial pump rate 74, this cycle is preferably repeated a plurality of times. As shown in the upper plot, the surface treating pressure 72 increases until it reaches a plateau pressure 78. When the primary or pulse pump rate 76 is introduced, the surface treating pressure 72 follows by dropping in pressure and rapidly increasing to a second plateau pressure 80. The second plateau pressure 80 is at lower pressure than the plateau pressure 78. This change in pressure (delta P (ΔP)) shows the pressure drop in the surface treating pressure 72 is associated with opening of additional perforations and/or fractures in the formation. In the embodiment of Fig. 2, the method of this invention starts without proppant in the fracturing fluid. As the method of this embodiment proceeds, a proppant concentration 82 in the fracturing fluid is increased.

Fig. 2 also shows, in dashed line form, an embodiment wherein one or more drop or decrease in pump rate and associated drop or decrease in the surface treating pressure is for relatively extended period of time.

In another embodiment as shown in Fig. 3, the method includes changing a fracturing pump rate 100 from 90 barrels per minute (bpm) to approximately 45 bpm, and then rapidly bringing the rate back to 90 bpm. Note that the rates mentioned here are meant as examples of sudden substantial rate decrease for creating a pressure pulse and are not intended to be limiting. The pumping of fracturing fluid or slurry into the wellhead causes a surface treating pressure 110 increase in the earth formation. In Fig. 3, the pump rate 100 is increased until it reaches an initial pump rate 102, approximately 20 bpm. Beginning at point 1, the pump rate 100 is increased to a pre-pulse or intermediate pump rate 104, approximately 90 bpm, and rapidly dropped to a primary or pulse pump rate 106, approximately 45 bpm, and returned to the pre-pulse or intermediate pump rate 104, approximately 90 bpm. In this embodiment, the pulse is repeated three times before returning to the initial pump rate 102 at point 2. The pump rate 100 causes a treating pressure 110 in the wellbore. This embodiment was implemented to induce three pressure impulses 112, however any number of pressure impulses may be used. In each successive pulse, when the pump rate 106 was brought back up to the pre-pulse or intermediate pump rate 104, the treating pressure 110, the pressure impulse 112, was lower, indicating that there was less friction in the system. This could only happen if additional flow channels have been opened, thus implying that previously unopened perforations have been opened or new fractures extending from perforations have been created. Delta P (ΔP) 114 shows the pressure drop in the treating pressure 110 of each the pressure impulses 112 associated with opening of additional perforations and/or fractures in this embodiment. The significance of this is that the method of this invention opens new perforations without physical flow diverters such as ball sealers or frac balls and doesn't cost anything extra to execute. However, strain is placed on the fracturing pumps while performing this kind of rapid pump rate change.

In a preferred embodiment of this invention, rather than rapidly increasing and/or decreasing the pump rate of the fracturing pumps or in addition to changing the pump rate, a portion of the fracturing fluid, with or without proppant, is diverted away from the wellhead, changing the flow rate, in order to provide a pressure pulse to the wellbore 10. Fig. 4 shows a schematic representation of an embodiment of an overall system layout 30 of this invention for providing a pressure pulse to the wellbore 10 with or without changing the pump rate. The system 30 of this embodiment preferably includes a fracturing tank 32, generally a

water tank, to store the water and/or other fluid that will comprise a portion of the fracturing fluid. The system 30 preferably also includes a pre-blender 34, preferably a mixing truck that mixes the water or other fluid from the fracturing tank with other components of the fracturing fluid such as polymers and other chemicals to make the fracturing fluid. At this point, the fracturing fluid preferably does not include a proppant. The system of this invention further includes a slurry-blender 36 that mixes the fracturing fluid with the proppant and/or other chemicals to create a fracturing slurry. The proppant is stored in a proppant storage and delivery system 38 prior to mixing in the slurry-blender 36. The system of this invention preferably further includes a manifold 40 that receives a fracturing slurry from the slurry-blender at a low pressure and distributes to a high-pressure fracturing pump 42. The high-pressure fracturing pump 42 returns the fracturing fluid, with or without the proppant, to the manifold 40 at a high-pressure and to a flow line 44 to a wellhead 46 connected to the wellbore 10. In a preferred embodiment, the system 30 further includes a chemical truck 48 which supplies chemicals to at least one of the pre-blender 34 and the slurry-blender 36.

In a preferred embodiment, the system of this invention includes a plurality of flow lines 44 to the wellhead 46. Preferably, at least one of the flow lines 44 is a variable-flow flow line 58 that is connected to a bleed-off line 50 connected to a pit 52 or some other type of storage, open or enclosed, or to another wellhead. While at least another one of the flow lines 44 is a constant rate flow line 60. These lines 58, 60 may remain independent or may be joined at or before introduction to the wellhead. In operation, the high-pressure fracturing pump 42 supplies the fracturing fluid or the initial fracturing fluid to the flow lines 44 at a constant pressure and the constant-flow line 60 supplies a first percentage of the flow rate supplied by the high-pressure fracturing pump to the wellbore and the variable-flow line 58 supplies a second percentage of the flow rate supplied by the high-pressure fracturing pump. In a preferred embodiment, the flow rate supplied by the constant-flow line 60 does not change during the pressure pulse, while the flow rate supplied by the variable-flow line 58 changes during the pressure pulse. A bleed-off valve 54 in the bleed-off line 50 connected to the variable-flow line 58 can be opened and closed to divert a portion of the fluid from the wellhead 46 to provide the pressure pulse to the wellhead 46. For example in Fig. 5, two flow lines are used to supply a wellhead pump rate 90, for example a total flow rate of 90 barrels per minute (bpm), to the wellhead 46. In this embodiment, the constant-flow line 60 and the variable-flow line 58 each supply a percentage of the total flow (F1 + F2) for example the constant flow line supplies a constant flow rate 92 of 50% of the total flow, equaling 45 bpm, and the variable flow line supplies a variable flow rate 94 of 50% of the total flow, equaling 45 bpm. A pressure

pulse is induced by allowing the constant-flow line F2 to continue supplying the 45 bpm and redirecting the flow F1 of the variable-flow line 58 away from the wellhead 46 for a short period of time into the pit 52. For example, the short period of time may range from 1 minute to 1 second. Preferably, the short period of time equals 10 seconds. Alternatively, any period of time may be used. By redirecting the flow for the short amount of time, the method simulates the case where some of the pumps are being shut down (one half of the pumps in the example case), inducing a pressure impulse in a surface treating pressure 96. As shown in Fig. 5, when the bleed-off valve was closed and the wellhead pump rate was returned to the truck pump rate, the surface treating pressure 96 is lower than the initial treating pressure, Delta P (ΔP) 98, indicating that there was less friction in the system. This could only happen if additional flow channels have been opened, thus implying that previously unopened perforations have been opened or new fractures extending from perforations have been created. The significance of this is that the method of this invention opens new perforations without physical flow diverters such as ball sealers or frac balls and does not require the truck pump rate to change. Please note the flow rates and times in the above example are exemplary and may be varied depending on the requirements of the wellbore and the earth formation.

In the embodiment of Fig. 5, the method of this invention starts without proppant in the fracturing fluid. As the method of this embodiment proceeds, a proppant concentration 82 in the fracturing fluid is increased. Alternatively, the entire process may be conducted with or without the proppant.

In an alternative embodiment, one or more of the flow lines 44 may include a valve, not shown, that can be opened and closed to restrict a flow of fluid to the wellbore 10 to provide the pressure pulse.

In another embodiment of this invention, partially shown in Fig. 6, the system includes a pair of wellheads 202, 204 each connected to a wellbore 206, 208. A plurality of flow lines 210 connect to the wellheads 202, 204. In this embodiment, each of the wellheads include a constant rate flow line 212, 214 and a diverter line 216 which is connected to both of the wellheads 202, 204. Each of the lines 212, 214, and 216 preferably connects to a system, not shown, for providing a pressure flow rate to the wellheads 202, 204, such as the system shown in Fig. 4. In the embodiment of Fig. 6, each of the wellheads 202, 204 includes a separate constant flow rate line 212, 214 and the wellheads 202, 204 share the diverter line 216 with one or more valves 218, 219. In operation, the high-pressure fracturing pump, not shown, supplies the fracturing fluid or the fracturing slurry to the flow lines 210 at a constant flow rate. A first percentage of the flow rate passes through the first constant rate flow line 212, a second

percentage of the flow rate passes through the second constant flow rate line 2014, and a third percentage of the flow rate passes the diverter line 216. In a preferred embodiment, the flow rate supplied by each of the constant rate flow lines 212, 214 does not change during the pressure pulse. While the flow rate supplied by the diverter line 216 is diverted to each of the wellheads 202, 204 during the pressure pulse. For example in Fig. 7, the high-pressure fracturing pump provides a first total flow rate 220 to the first wellhead 202 and a second total flow rate 230 to the second wellhead 204. Initially, both valves 218 are open allowing the third percentage of the flow rate to be provided to both of the wellheads 202, 204. A pressure pulse 222, 232 is induced by closing one of the valves 219, increasing the total flow rate 220 to the first wellhead 202 and decreasing the total flow rate 230 to the second wellhead 204 for a short period of time. For example, the short period of time may range from 1 minute to 1 second. Preferably, the short period of time equals 10 seconds. Alternatively, any period of time may be used. The process is then repeated by closing the valve 218, increasing the total flow rate 230 to the second wellhead 204 and decreasing the total flow rate 220 to the first wellhead 202 for a short period of time. With this system, the fracturing fluid is conserved and not diverted to a pit.

In operation, one or more methods of this invention impart a flow rate change in the fracturing fluid flow that is preferably at least 10% below an original wellhead treatment rate, all the way to 0 (zero) rate. In a preferred embodiment, the flow rate change ranges from 25% to 75% lower and more preferably changes by 50%. Furthermore, the pressure impulse has a duration ranging from 1 minute to 1 second. Alternatively, the pressure impulses can be induced by increasing the flow rate change.

Multiple rate reductions can be executed during any part of the fracturing process. In a preferred embodiment, the method of this invention the rate reduction, pressure pulse, is least risky and potentially most effective in a pad stage, i.e. a stage of providing the fracturing fluid without the proppant. Performing these rapid, large flow rate variations and/or pump rate variations, especially reductions, in the pad stage presents the least amount of risk because there is no proppant in the equipment, the wellbore and the formation that can settle out or bridge during rate reductions as rate reductions decrease the fluid velocity and in turn decrease the fluids' proppant transport capabilities. The rate variations are also potentially more effective in the pad stage as they open new perforations and then the proppant-less fluid is able to extend the newly created fracture before proppant has a chance to bridge off and potentially close it.

The present development is described in further detail in connection with the following examples which illustrate or simulate various aspects involved in or with the practice of the invention. It is to be understood that all changes that come within the spirit of the invention are desired to be protected and thus the invention is not to be construed as limited by these examples.

EXAMPLES

Experimentation with variable rate fracturing in shale resources has shown to increase production when comparing fracture stages that have been executed with rapid rate fluctuations (variable rate fracturing) and stages without rapid rate fluctuations. Although production rate, or change in rate, is a reliable indicator of technology impact, it does not necessarily allow for optimization of the technology or future improvements. As will be appreciated by those skilled in the art and guided by the teachings herein provided, production by itself does not lead to an understating of the basic physical processes that drive the production increase.

Below is a discussion of a series of ongoing efforts to better understand the variable rate fracturing technique on a basic-physics level as well as ongoing field implementation, development of software, analysis techniques, correlations, etc., for future optimization.

Calculation of the number of open perforations during hydraulic fracturing treatments generally involves use of fluid flow equations of some sort. In such processing, since the frac fluid is typically pumped downhole and through previously created perforations into the formation, fluid flow through an orifice can be used to model this problem. In its simplest form, for subsonic fluid flow, the incompressible Bernoulli's equation can be used to describe the flow through an orifice with intrinsic assumptions of steady state, incompressible flow with negligible viscous forces acting along the tubing surface.

$$\Delta P = \frac{1}{2}\rho V_2^2 - \frac{1}{2}\rho V_1^2 \qquad (1)$$

Equation of continuity can be used to convert the model into volumetric form. A discharge coefficient is used to account for viscosity and turbulence effects and a flow coefficient is used to account for uncertainty at downstream end of the flow model.

$$Q = CA\sqrt{\frac{2\Delta P}{\rho}} \tag{2}$$

Rearranging for the required ΔP across "n" perforations for flow at given rate,

$$\Delta P_{perf} = \frac{C_{MF}\,\rho\,Q^2}{n^2\,D^4\,C^2} \quad or \quad \Delta P_{perf} = k_{perf}Q^2 \quad where \quad k_{perf} = \frac{C_{MF}\,\rho}{n^2\,D^4\,C^2} \tag{3}$$

Where C_{MF} gives the multiplier to convert to any desirable units of measurement as required and D denotes the diameter of the open perforations (generally < 1"). The discharge coefficient "C" varies significantly with changes in the cross-sectional area of the flow conduits as well as the flow conditions (Reynold's number). For limited entry treatment calculations, values of ~0.6 can be used before treatment (new perforations) and 0.85 post treatment (highly eroded perforations). Similarly, a tortuosity pressure drop can also be accounted for by:

$$\Delta P_{tort} = k_{tort}\,Q^{\alpha} \tag{4}$$

Traditionally, a step-down test has been employed to identify open perforations by matching the observed pressure drop after each drop in flow rate with the theoretical pressure drop obtained from the two models above. The observed pressure drop should match the sum of the pressure drops across perforations as well as the drop due to fluid tortuosity. With such testing, multiple rate drops are needed in order to fit for all of the unknowns and to get reasonably accurate predictions. In practice, a step-down test can be performed as part of the shut-in procedure at the beginning or end of treatment as required. In standard step-down testing, a fluid of known properties is injected into the formation at a rate that is high enough to initiate a fracture. Once steady rate of injection is achieved, the injection rate is reduced in a step wise fashion before the final shut-in of the well. The pressure responses due to rate changes are primarily a result of perforation friction as well as tortuosity. Also, since it takes some finite period of time for the pressure response to stabilize after each rate drop, data points for calculation need to be carefully selected. Without careful control over the testing parameters, the results could include significant errors. The analysis of this data involves

matching the pressure loss models highlighted above with the actual pressure vs. rate data observed during controlled step-down tests.

The number of open perforations is calculated by minimizing the error between all actual pressure-rate observations and theoretical pressure calculations for corresponding rates from model defined earlier, i.e.,

$$\Delta P_{calc} = \Delta P_{perf} + \Delta P_{tort} \quad (5)$$

$$n : \min_{i=1:N} (\Delta P_{calc}{}^{i} - \Delta P_{obs}{}^{i}) \quad (6)$$

Thus, the result of such analysis is based on minimized error between the two values for each observation (each step-down in rate) computed by taking all step-down observations (N in total) into account.

In accordance with a preferred aspect of the subject development, a method or technique to evaluate the effectiveness of variable rate fracturing such as herein described is provided and can be implemented as a means to increase number of open perforations before proppant pumping in initiated. The aim is to calculate the additional perforations opened while applying variable rate fracturing without making any significant changes in the treatment design such as explicit inclusion of step-down tests. As further detailed below, this not only helps in understanding the effectiveness of rate fluctuations in opening additional perforations but also helps with selection and design of variable rate fracturing processing and parameters including, for example, for variable rate fracturing, parameters such as flow rate (e.g., magnitude of change and duration) as well as frequency (for example, such as measured in terms of the period of time between the endings of successive flow rate variations).

Calculation of additional perforations

In accordance with one aspect of the subject development, a method or technique to determine or calculate the number of additional perforations that open as a result or while applying the variable or pulse rate fluctuations during treatments as part of the hydraulic fracturing process is provided.

Since in accordance with one aspect of the subject development, variable or pulse rate fluctuations involve a drop in pressure for a period of time with a corresponding drop in flow rate, followed by a returning of the flow rate back up to the level prior to rate drop, observed changes in the pressure observed pre- and post- said rate drop can be attributed to

opening of new perforations and higher cumulative flow throughput for the set of perforations, i.e., stage being completed. This assumes that impact of other factors such as changes in tortuosity, unsteady state conditions, flow rate mismatch, etc. are minimized. Fig. 8 shows an example where the distinctive change in pressure after instantaneous rate drop during variable rate fracturing when compared to the pressure before the introduction of the variance in rate.

Fig. 8 shows a representative stage completion data subset highlighting how the variable rate fracturing design produces drops in treatment pressure. Actual field tests indicate pressure drops ranging in 100's of psi. Since the pre-rate variation and post-rate variation steady state flow rates are maintained the same (within a narrow error band of ± 2 bpm), the effect on pressure drop due to tortuosity effects should also remain similar unless there is significant difference in said flow rates. Thus, in accordance with one preferred embodiment, it is critical that the new flow rate achieved after each introduced rate variation as per design remains within a narrow range of what the original steady state flow rate was. This also implies that the observed ΔP after each rate drop is predominantly a function of changes in the perforation friction.

Based on the original equation for pressure drop across perforations, the observed pressure drops (see Fig. 8) can be fitted to the flow model to get the following relations:

$$r_1 = \frac{C_c\, Q}{D^2\, k}\sqrt{\frac{\rho}{P_0}} \quad , \quad r_2 = \frac{C_c\, Q}{D^2\, k}\sqrt{\frac{\rho}{P_0 - \Delta P_1}} \quad , \quad r_3 = \frac{C_c\, Q}{D^2\, k}\sqrt{\frac{\rho}{P_0 - \Delta P_1 - \Delta P_2}} \tag{7}$$

where,

P_o is the initial steady state pressure before any of the rate fluctuations are introduced;

"r" is the number of open perforations at any point under evaluation;

ΔP_1 & ΔP_2 are the pressure drops (see Fig. 8); and

C_C is a constant which is dependent on the units being used for evaluation.

Based on these individual relations, two characteristic functions can be obtained which can be used to predict the number of perforations and more importantly, additional perforations being open at the three points of interest.

$$\frac{{r_2}^2 - {r_1}^2}{{r_2}^2\,{r_1}^2} = \frac{D^4\,k^2\,\Delta P_1}{{C_c}^2\,Q^2\rho} \qquad and \qquad \frac{{r_3}^2 - {r_2}^2}{{r_3}^2\,{r_2}^2} = \frac{D^4\,k^2\,\Delta P_2}{{C_c}^2\,Q^2\rho} \tag{8}$$

Now there are two non-linear equations and three unknowns to resolve (Note in other possible implementations, there can be a higher number of rate pulses which will create more equations but the number of unknowns will always be one more than the number of equations). However, the maximum possible number of perforations is limited by the number of perforation shots for the particular stage in question as per the completion design. For this case, the system of equations is solved by minimizing the error for all possible combinations of "r" between the calculated ΔP_1 & ΔP_2 and the actual observations using a least squares approach. This can be done individually (i.e., for each rate drop separately) or for all systems based on number of rate pulses being analyzed. Thus the minimization function becomes:

$$f(r_i, r_{i+1}) = \min_i \left\{\frac{{r_{i+1}}^2 - {r_i}^2}{{r_{i+1}}^2\,{r_i}^2}\right\} - \left\{\frac{D^4\,k^2\,\Delta P_i}{{C_c}^2\,Q^2\rho}\right\} \tag{9}$$

The function, when minimized for all values of "r" at once depending on the number of rate pulses introduced, can be represented as:

$$f(r_{i=1:final}) = \min \sum_{i=1}^{final} \left\{\frac{{r_{i+1}}^2 - {r_i}^2}{{r_{i+1}}^2\,{r_i}^2}\right\} - \left\{\frac{D^4\,k^2\,\Delta P_i}{{C_c}^2\,Q^2\rho}\right\} \tag{10}$$

$$r_1 \le r_2 \le r_3 \le \cdots \le r_{final} \tag{11}$$

Where r_{final} is the final observed number of open perforation at the end of the last rate fluctuation. Since the uncertainty associated with each point being considered for analysis can differ significantly depending on the differences in flow rate (though small) as well as errors in identified steady state pressure measurements from the post- rate pulse pressure data and since the chances of such uncertainty are significant, in accordance with one embodiment, each equation of the system is solved individually and in sequence starting with the first rate pulse and limit the value of parameter "r" for previous rate pulse in subsequent equations of the system being solved. At the same time, a composite fit is calculated where data from all of the rate drops are solved together and use the mismatch between the open perforations observed between the two calculations to predict how uncertain the resulting estimates are. In order to

constrain the solution for "r", the uncertainty measure is minimized. Uncertainty for each evaluation of "r" for open perforations is computed as:

$$r_i^{uncertainty} = \frac{r_i^{singular} - r_i^{composite}}{r_{maximum}} \quad (12)$$

i.e., the uncertainty is higher as the predicted open perforations calculated individually ($r_i^{singular}$) and from all of the rate drops together ($r_i^{composite}$) diverges significantly. The range of uncertainty function is between 0 & 1 (since it is scaled to maximum possible perforations, i.e., $r_{maximum}$, based on perforation shots). Thus the final solution for "r" minimizes the uncertainty for r as:

$$r: \min_{i=1:total} f(r_i) \quad \& \quad \min \sum_{i=1}^{total} r_i^{uncertainty} \quad (13)$$

Based on testing, the following two important observations are here made with respect to the evaluated uncertainty:

Firstly, the uncertainty generally increased as the processing progressed from the first rate variation or pulse to subsequent rate variations or pulses. This is attributed to any error from the first calculation or evaluation being "carried" to the next or subsequent calculation or evaluation since the number of open perforations prior to any rate fluctuation is fixed by what was observed at the end of the previous rate fluctuation. However, under certain situations where the subsequent rate pulses may be "cleaner" with a well-defined treatment compared to the first rate variation or pulse, the uncertainty for subsequent rate variations or pulses can be lower. Secondly, the number of open perforations has been found to be generally higher post rate variation or pulse compared to the number of open perforations prior to the introduction of the said rate variation or pulse. This results in solution to be below the "r-prior = r-posterior" identity. Also, there are multiple local minima highlighting multiple possible solutions but the optimal solutions is chosen based on the secondary constraint, i.e., minimizing the cumulative uncertainty of all evaluated "r" (eq. 13).

In accordance with one preferred embodiment, results with minimum possible model uncertainties are utilized. To that end, as a first step, a subjective classification is made for both "usable" and "unusable" rate pulse experiments depending on data quality. It is noted that those deemed "unusable" may still have opened additional perforations and created

additional flow pathways but accurate modeling for perforations is difficult and error-prone. Following, in order to validate that the subjective classification is similar to what is observed from the calculations, the calculated distribution for uncertainties was mapped and a distinct difference with those stages identified as usable showing lower uncertainties. The distribution of the uncertainties suggests that quantified uncertainty from such analysis can also be used as a fairly reliable indicator of "usability".

Since, as discussed above, traditional rate step-down tests can be used to estimate number of open perforations as long as the analysis is carefully conducted, such experiments when introduced before and after introduction of rate variations or pulses, in accordance with the subject development, can be used to validate the above-described technique to calculate additional open perforations from pressure drop following rate variations or pulses alone. In practice under actual operational conditions in the field, step-down tests are generally not conducted due to time constraints but more importantly, difficulty in controlling such experiments at significantly high initial flow rates. Examples of issues that can arise in such field practice include lack of pressure stabilization and inadequate fluid volumes to incorporate such experiments without prior planning. With the subject approach, such step-down tests are made redundant and data which gets generated naturally as part of subject fracturing technique can be directly used for diagnostics.

Data from rate step-down tests introduced before and after treatment per the subject development can be used to validate results observed from analysis of data from pressure drop post pulse fracturing technique.

Based on the modeled open perforations, for some stages, the introduction of variable rate pulses was more effective in opening new perforations compared to others. This real time diagnostic tool can be useful in designing rate pulses which are the basis of variable rate fracturing. As an example, if adequate fluid is available for flexible pad volumes, more rate fluctuations, higher ΔQ's, i.e., rate drops, etc. can be tried out before actual proppant pumping and fracture development begins. To decide on when to cease additional fluctuations, number of open perforations can be calculated in real time.

Finally, to see the overall effect of variable rate pulse fracturing on the number of perforations opened during typical treatments, the distribution of additional open perforations before and after treatment with variable rate pulse fracturing and without can be compared. For example, in one trial in which the stages where variable rate fracturing was used, the average number of additional open perforations before and after treatment was found to be 14 [6 stages]. For the stages with normal completion (i.e., did not use variable rate pulses

before treatment), the average number of additional open perforations was found to be 7 [5 stages].

It is important to note that not all additional open perforations will accept or take in fluid and proppant during treatment. Completion diagnostics using a fiber deployed in a wellbore have shown the perforation clusters close to the heel and those close to the toe behave differently in terms of flow throughput. Thus a 100% increase in additional open perforations will not necessarily lead to a commensurate 100% increase in productivity from these stages. However, some increase may occur depending on which perforation clusters are impacted due to the introduction of variable rate pulses. In at least one trial, there was no significant difference between the first and the second rate drop as far as opening of additional perforations was concerned. In some cases, the first pulse seems to create more openings, for some cases it is the second rate pulse while for other cases both seem to create similar number of additional opening of perforations.

In view of the findings that not all of the perforations accept or take in fluid and that additional perforations can be opened using variable rate fracturing before proppant is introduced into the formation, alternative schemes are proposed to design parameters for variable rate fracturing during treatment.

Scheme A: Introducing step-down tests before and/or after variable rate fluctuations and using initial estimate of open perforations constrain estimation of perforation openings and/ or identify perforation opening behavior.

If multiple experiments were conducted to identify the variation in number of open perforations as a result of variable rate fracturing and a significant number of variable rate fluctuations are introduced, the overall behavior of perforation opening is expected to behave as a sigmoid function Fig. 9 shows the schematics of possible experimental design and Fig. 10 shows the expected behavior of data from proposed testing. Note that the final measurement point r-sdt2 step-down test is conducted immediately after the final variable rate fluctuation before proppant is pumped. Previous testing has found that open perforations observed at r-sdt1 & r1 are similar if not the same. With the proposed experimental design, the open perforation count from rk & r-sdt2 observations are expected to be same/similar.

While in the scenario depicted in Fig. 9, the variable rate fluctuations are straddled with two separate rate step-down tests, in other alternate designs, either or both of the two straddling step-down tests can be discarded. The implication in terms of possible advantages or issues with each of these alternatives will be discussed briefly. A primary

purpose for having the pre- (r-sdt1) and post- (r-sdt2) rate step-down tests is to estimate the number of open perforations both before and after variable rate fluctuations are introduced. This helps to accurately predict the open perforation count for each of the rate drops and ensure that the calculated values tie with another similar yet independent set of calculations. This is because the results from the first step-down test can be used to constrain the r-prior estimate for the first rate fluctuation. The final rate step-down test provides a control point to make sure that the estimated values from all the variable rate fluctuations tie together with minimized error in estimates.

In another variation, the initial and final rate step-down test are discarded and the rate fluctuations are followed directly by proppant injection. While this scheme will generally not allow for an accurately constrained solution, it can still allow useful data points for design and diagnostics. In accordance with one embodiment, to increase or maximize the number of possible open perforations, the number of rate fluctuations is desirably required to be sufficiently high. In order to design this in the field, it is necessary to see if asymptotic behavior is being approached in terms of open perforations. The generation of perforation "synthetic curves" is proposed as a means to determine the overall response of variable pulse fracturing and its effectiveness. These curves quantify the change in number of open perforations at the end of the introduced fluctuation being studied and help describe the response behavior in terms of perforations with variable rate fluctuations. Evaluation using these synthetic curves involve identifying open perforations at any observation point and plotting it on the curves to identify trend behavior. Note that for referencing data from these curves, the evaluated number of open perforations will have to be normalized for data from each experiment using feature scaling to limit all observed values between 0 & 1, i.e., to have standardized range. Fig. 1 shows three possible scenarios indicating early, gradual or late jumps in open perforations for a test case. Here, the initial number of perforations is known to be 24 (based on step-down test or analysis of first variable rate fluctuation) and maximum number of possible open perforations ($r_{maximum}$) is 48. For design purposes, those behaving as the former require less number of rate fluctuations while those behaving as the latter require more rate drops with potentially higher ΔQ. At the same time, the three highlighted scenarios vary in terms of final open perforations that could be attained through introduction of variable rate pulses. The decision in terms of design or additional rate fluctuations can either be done subjectively based on how the opening behaves (Figure 41) or soft computing tools such as Fuzzy decision systems can be used for this. As an example, normalized open perforations from prior rate fluctuation can be used as well as gradient (difference) function over all prior

rate fluctuations as inputs to such a decision system. Other parameters for design could include ratio of area under the traced perforation curve to the area under the curve corresponding with "$r_{maximum}$".

In accordance with one preferred embodiment, the final asymptotic behavior should never exceed $r_{maximum}$ (i.e., 1 on the normalized curves) as per the perforation design for the hydraulic fracturing stage in question and for most stages should be significantly lower than $r_{maximum}$. Fig. 12 shows actual data from one of the stages from the Permian Basin where proposed experimental design was implemented and for which the asymptotic behavior towards the end and overall fit in relation to the synthetic curves can be clearly seen.

From Fig. 12, it can clearly be seen that the design has not been optimized since additional variable rate fluctuations were not applied to see if additional perforations could be opened. The observed behavior was similar to Case II highlighted in Figure 4. A sigmoid behavior, as proposed above, was also not seen. There was a slight difference (of 1 perforation count) between r-sdt1 and r1 (the "r" calculations were not constrained based on observed open perforations from r-sdt1 calculation). The following design workflow is proposed to design these variable rate fluctuations:

1. Introduce a single variable rate fluctuation once the flow has adequately stabilized post breakdown. Calculate the number of open perforations before and after introduced variable rate fluctuation. Wait for steady state treating pressure before introducing additional variable rate fluctuations.
2. Normalize the data and plot the perforation data as an overlay on the modeled synthetic curves. If the data trend remains close to zero on the synthetic curves (i.e., significant perforations do not open initially), adjust (increase) variable rate fluctuation parameter (ΔQ, frequency, etc.).
3. Repeat steps 1 & 2 with data from each evaluation step. Repeat until close to one of the asymptotic limits is reached as per the fit from the synthetic curves. Alternately, use a fuzzy decision system to decide on rate drop design parameters and termination of additional drops.

Scheme B: Sequentially compare open perforations after each variable rate fluctuation

In this scheme, the number of open perforations at the end of prior variable rate fluctuation and post the current variable rate fluctuation are compared and a design decision is made based on either large or negligible/no difference between these data points. Other

parameters could also be used for design which may or may not involve a fuzzy decision system.

While this approach towards design workflow for these variable rate fluctuations may be simpler, as for example it does not require synthetic curve generation, the final design might remain suboptimal since only the last few data points are compared for design decisions and therefore, overall trend behavior as far as opening of additional perforations are not considered.

Summary

Thus, a method is proposed to make use of rapid rate fluctuations introduced as part of the subject variable rate fracture technique to identify additional perforations that open as a result of said rate fluctuations. The proposed method develops and expands upon the existing technique of using a step-down test but without requiring an actual drop in flow rate after each rate fluctuation. The solutions are non-unique by the very nature of problem as described earlier but an estimate of change in the number of open perforations can be obtained which can be used as a diagnostic tool to quantify the effectiveness of using pulse fracturing technique as well as a design tool to decide when to stop these rapid rate fluctuations. With more or additional open perforations, the expectation is that more fluid flow channels will develop from the perforations at the wellbore into the subsurface rock formation leading to reduction in bypassed zones and a more effective stimulation overall.

Thus, in accordance with one embodiment, there is provided a method of hydraulic fracturing to create a number of additional open perforations in an earth formation having a total number of perforations, the method comprising:

a. pumping a fracturing fluid into the earth formation at a first pressure (P_1) and a first flow rate (Q_1);

b. pumping the fracturing fluid into the earth formation at a second pressure (P_2) and a second flow rate (Q_2) to introduce a change of flow rate into the earth formation for a period of time, where the second flow rate (Q_2) is significantly reduced as compared to the first flow rate (Q_1);

c. return pumping of the fracturing fluid into the earth formation at the first flow rate (where the flow rate on said return of the pumping is designated (Q_R)), and identifying a pumping pressure (P_R) associated with the flow rate on said return of the pumping (Q_R); and

d. calculating the number of additional open perforations and a total number of open perforations in the earth formation.

As set forth above, in a preferred embodiment, such significantly reduced second flow rate may range from 25% to 75% lower that the initial flow rate.

Further, such method may further involve repeating steps b, c, and d including, for example in some embodiments, such repeating wherein the pressure and flow rate of the fracturing fluid in repeated step b are different from the pressure and flow rate of the fracturing fluid in initial step b as well as in some embodiment, such repeating wherein the pressure and flow rate of the fracturing fluid in repeated step b are unchanged from the pressure and flow rate of the fracturing fluid in initial step b.

In some embodiments, steps b, c, and d are repeated until such time as wherein, in successive iterations, the number of additional open perforations decreases and the total number of open perforations is at least 90% of the total number of perforations.

In some embodiments, in successive iterations, the number of additional open perforations decreases and the total number of open perforations is no more than 75% of the total number of perforations, the method additionally comprises, in the next iteration, aggressive altering of at least one fracturing fluid operation parameter selected from the group of flow rate, duration, and frequency, wherein said aggressive altering of flow rate comprises employing a Q_2/Q_1 ratio of less than 40%; wherein said aggressive altering of duration comprises employing a duration of less than 20 seconds between when Q_1 is changed and when Q_R is achieved; and wherein said aggressive altering of frequency comprises employing more than one cycle per minute.

In some embodiments, in successive iterations, the number of additional open perforations increases or remains unchanged and the total number of open perforations is more than 75% of the total number of perforations, the method additionally comprises, in the next iteration, conservative altering of at least one fracturing fluid operation parameter selected from the group of flow rate, duration, and frequency, wherein said conservative altering of flow rate comprises employing a Q_2/Q_1 ratio of greater than 40%; wherein said conservative altering of duration comprises employing a duration of greater than 20 seconds between when Q_1 is changed and when Q_R is achieved; and wherein said conservative altering of frequency comprises employing less than one cycle per minute.

In some embodiments, in successive iterations, the number of additional open perforations increases and the total number of open perforations decreases or remains unchanged, the method additionally comprises, in the next iteration, applying the fracturing fluid operation parameters of the preceding iteration.

In some embodiments, the method of may additionally involve calculating an

uncertainty value for at least one of the number of additional open perforations and the total number of open perforations in the earth formation.

In some embodiments, such as wherein the uncertainty value is greater than 5% and less than 15%, the method additionally involves repeating steps b, c, and d without altering fracturing fluid operation parameters of flow rate, duration, and frequency.

In some embodiments, such as wherein the uncertainty value is at least 15%, the method additionally involves repeating steps b, c, and d with a conservative altering of at least one fracturing fluid operation parameter selected from the group of flow rate, duration, and frequency, wherein said conservative altering of flow rate comprises employing a Q_2/Q_1 ratio of greater than 40%; wherein said conservative altering of duration comprises employing a duration of greater than 20 seconds between when Q_1 is changed and when Q_R is achieved; and wherein said conservative altering of frequency comprises employing less than one cycle per minute.

Water hammer pressure transient analysis

Water hammer pressure transient analysis (or as sometimes referred to herein as "pressure pulse attenuation analysis") is a way of extracting information from productive reservoir volume (SRV) created during hydraulic fracturing process using pressure response to unsteady state conditions. A transient state pressure response modeling approach is proposed to identify and isolate issues with completion and show how the accompanying analysis can be used routinely to optimize completions in real time and generally improve production performance from fracture stages. This methodology does not require any additional data collection but can provide significant potential for improving understanding of the effective productive reservoir volume. In essence, the water hammer response observed at various stages of the treatment is modeled so as to match the modeled transient response with observations and identify model parameters.

Two specific parameters of interest evaluated in this analysis include: 1) the fractured rock volume (VRock) which is an analog to SRV and is indicative of how productive a stage might be and 2) an inter-stage isolation parameter (LOF) which identifies potential inter-stage isolation issues. Real time treatment and completion diagnostics can be very useful in understanding the effectiveness of the proposed hydraulic fracturing method and allow for immediate or medium term remediation. The proposed use of PPA completion diagnostics and optimization workflow is fast enough to be done in near-real time, accurate enough to be of

practical use and finally, is very economical. The proposed method provides direct indicators for inter-stage isolation issues as well as completion quality. The modeled parameters can be used to carry out fracture diagnostics during, and at the end of, the treatment and help optimize stimulations in progress.

"Water Hammer" pressure transients are generated when there is a sudden change in flow conditions within a wellbore such as a pump shut in or failure, or sudden rate fluctuations. Classically; water hammer flow and pressure response data at the end of hydraulic fracturing treatment has been used to estimate entry friction. Also, modeling of fluid transients to characterize fracture dimensions, etc. has been studied by others. However, these methods were devised for characterization of single vertical completions and they require extension to be applicable to horizontal mile long laterals. More recently, attempts have been made to utilize these pressure transients to understand the created hydraulic fractures and other aspects of completion such as quality and effectiveness.

In one embodiment, estimated V_{Rock} along with degree of fluid loss can be used to understand completion effectiveness. The "number of additional open perforations" can be correlated with the modeled productive rock volume, resulting in the finding of a strong positive correlation between the two parameters. This indicates that the additional perforations opened as a result of rate changes or pulses introduced in the subject hydraulic fracturing design potentially results in significant boost in productivity from stimulated stage. This makes intuitive sense since additional perforations result in propped open fractures connected to wellbore resulting in higher estimated V_{Rock}.

In the past, microseismic emission mapping has been observed to be a very useful tool for fracture diagnostics. However, instead of using traditional surveys involving hundreds of surface geophones of wellbore geophone deployment which is limited in coverage due to acquisition geometry and faces other issues such as cost and well availability, the use of a "mini surface array" is here proposed. Fig. 13 shows a possible deployment pattern for such an array but other alternatives in terms of design such as types of geophones used, placement of geophones, etc. can be varied depending on multiple design criteria. Apart from surface placement, current practice of downhole geophone placement can also be used for similar analysis. In another embodiment, both surface and borehole instrumentation (geophones/ accelerometers) are used to map the emissions.

The workflow for analyzing the surface data involves mapping seismic attributes traditionally not mapped in microseismic surveys. This includes using attributes such as dominant frequency as well as average bandwidth mapped continuously over the entire

treatment and using the same to understand the effectiveness of rate fluctuation treatments being introduced as part of our hydraulic fracture design approach. This involves using an estimated moveout based on calculated travel times for any event occurring in the subsurface for a particular stage being treated and using the moveout to select multiple "arrival windows" at each point in time during treatment. Within this window, the presence of any energy from potential microseismic event will be detectable using attributes such as "total energy", "dominant frequency", "average bandwidth", "signal coherence", "maximum energy", etc. Other signal processing techniques such as use of filters (bandpass, etc.), beamformers (adaptive, time delay and sum, etc.) is also possible as it helps removes coherent and incoherent noise artifacts that may otherwise influence our interpretations at a later stage.

Based on analysis of the behavior of these attributes close to introduced rate pulses with our hydraulic fracturing method, whether the said rate pulses were "effective" or "not effective" can be deduced. This helps in deciding on number of rate fluctuations and their temporal distribution during treatment. Artificial intelligence (AI) tools can be used to identify the efficacy of said rate pulses in the subject processing.

Predictive models to understand what could be expected in terms of emission behavior or other observable changes when introducing said rate fluctuations are developed. Such models can use an artificial neural network based classifier (could use multiple variations in terms of network design). They could also use other classifiers such as fuzzy classification techniques or hybrid techniques, etc. Even simple regression could be used. Once correlations are identified, the attributes to use for our diagnostic analysis are identified in real time.

Classification trials can be used to help narrow the search and to focus on a few identified attributes of interest. Other attributes can also be analyzed in a similar fashion and could be studied as needed. Fig. 14 shows two possible ways of using this approach to diagnose completions and help design the subject hydraulic fracturing processing.

The diagnostic approach devised for the subject hydraulic fracturing method has been implemented in a software toolbox which incorporates all of the data handling and data analysis elements for real time application in the field during hydraulic fracturing operations as well as post completion using the data collected during field activities. In accordance with one preferred practice of the subject development, one way envisioned for combining different attributes showing high dependence in the subject diagnostic approach is to select desired attributes and associated classification models and then based on output from all selected models, a composite score is computed which provides the "effectiveness" and "confidence"

measures in the output. These are then used to decide on further rate fluctuations as envisioned to be part of subject hydraulic fracturing method.

Using treatment pressure data to decide on optimal time for introducing rate fluctuations

As a diagnostic tool, the treatment pressure can be used to understand fracturing behavior during treatment. In accordance with one embodiment, a modified approach to fracture propagation/growth behavior as originally suggested by Nolte & Smith (1981) and further expanded by Pirayesh at al. (2013) is used. This computed attribute is referred to herein as "modified nolte index". The modified parameter is computed in real time and the mapped attribute is verified for local temporal behavior. Rapid fluctuations in said parameter are used as an indicator of interaction of propagating hydraulic fracture with natural fracture swarms of fracture activation due to local stress perturbations. The degree of fluctuation are quantified and used to determine the necessity of additional "rate drops" at any given time during treatment.

Fig. 15 shows another preferred embodiment of the invention that includes a pump 304 directing high pressure fracturing fluid to a wellhead 302, generally as described above. A series of valves direct the fracturing fluid to the wellhead 302 and/or a fluid tank 308 to store the fracturing fluid at high or low pressure. The fracturing fluid may be reused from the fluid tank 308 through to the pump 304 and/or low pressure fracturing fluid may be redirected to a blender 306 and then provided to the pump 304 for transmission to the wellhead 302 and/or the fluid tank 308. In this manner, diverted fracturing fluid can be recycled and put back into the use stream thereby eliminating waste. Similar variations may utilize multiple wells or multiple fluid flow lines to the wellhead or from one or more pumps. Fluid can be diverted from one wellhead to another in situations where two wells are simultaneously stimulated. Such a method may alternate the injection rate between two wells without having diverted fluid to recycle or dispose.

Thus, the invention provides an improved hydraulic fracturing process that provides increased hydrocarbon production without the shortcomings of known processes.

It will be appreciated that details of the foregoing embodiments, given for purposes of illustration, are not to be construed as limiting the scope of this invention. Although only a few exemplary embodiments of this invention have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included

within the scope of this invention, which is defined in the following claims and all equivalents thereto. Further, it is recognized that many embodiments may be conceived that do not achieve all of the advantages of some embodiments, particularly of the preferred embodiments, yet the absence of a particular advantage shall not be construed to necessarily mean that such an embodiment is outside the scope of the present invention.

What is claimed is:

1. A method of hydraulic fracturing stimulation comprising:

pumping a fracturing fluid with a fracturing pump;

injecting the fracturing fluid under pressure into a well at an initial flow rate to at least one of: open perforations, create a fracture and open natural fractures;

changing the initial flow rate to a primary flow rate lower than the initial flow rate to introduce a change of flow rate into the well for a period of time; and

changing the primary flow rate to a secondary flow rate to at least one of: initiate additional fractures, extend existing fractures, open additional perforations and further extend natural fractures.

2. The method of Claim 1, wherein the changing the initial flow rate comprises diverting a portion of the fracturing fluid away from the well to provide a reduced flow rate to the well for a period of time.

3. The method of Claim 1, wherein the primary flow rate is at least 25% lower than the initial flow rate.

4. The method of Claim 1, wherein a system for conducting the method comprises a plurality of flow lines from a fracturing pump to the well and wherein at least one of the plurality of flow lines includes a valve to redirect the portion of the fracturing fluid away from the well to at least one of a pit, a frac tank, a storage tank and a second well.

5. The method of Claim 1, further comprising:

providing two supply lines to the wellhead, a constant rate flow line and a variable rate flow line; and

adjusting the rate of fracturing fluid through the variable rate flow line to effect the primary flow rate and the secondary flow rate.

6. The method of Claim 1, wherein the constant rate flow line and the variable rate flow line are connected at or before the well.

7. The method of Claim 1, wherein the secondary flow rate is equal to the initial flow rate.

8. The method of Claim 1, further comprising reusing the fracturing fluid following injection to effect one of the primary flow rate and the secondary flow rate.

9. The method of Claim 1, further comprising:

modulating a valve to change between the primary flow rate and the secondary flow rate.

10. The method of Claim 1, wherein the steps of changing the initial flow rate and changing the primary flow rate are repeated.

11. A method of hydraulic fracturing stimulation comprising:

pumping a fracturing fluid with a fracturing pump;

injecting the fracturing fluid under pressure into a well at an initial flow rate to create a fracture;

diverting a supply of fracturing fluid to change the initial flow rate to a primary flow rate lower than the initial flow rate to introduce a change of flow rate into the well for a period of time; and

changing the primary flow rate to a secondary flow rate to at least one of: initiate additional fractures, extend existing fractures, open additional perforations and further extend natural fractures.

12. The method of Claim 11, further comprising:

providing two supply lines to the well, a constant rate flow line and a variable rate flow line joined at or before the well; and

adjusting the rate of fracturing fluid through the variable rate flow line to effect the primary flow rate and the secondary flow rate.

13. The method of Claim 11, further comprising a plurality of supply lines provided to the well.

14. The method of Claim 11, further comprising:

modulating a valve to change between the primary flow rate and the secondary flow rate.

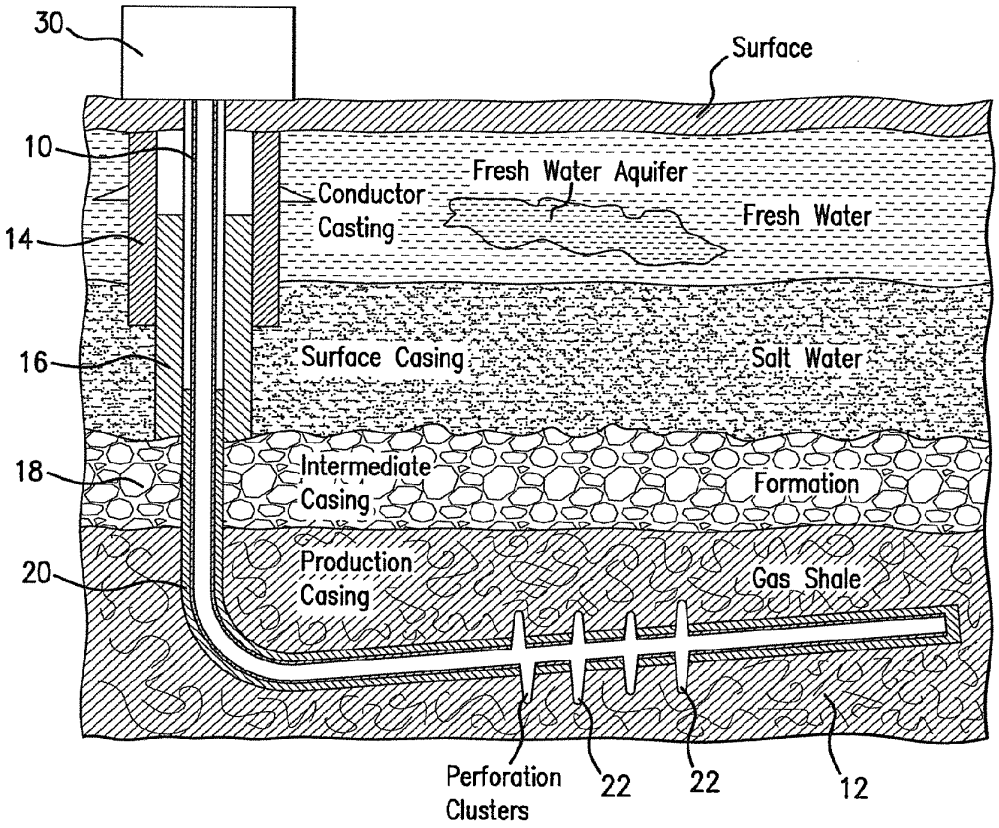

30
Surface
10
Fresh Water Aquifer
Conductor
Casting
Fresh Water
14
16
Surface Casing
Salt Water
18
Intermediate
Casing
Formation
20
Production
Casing
Gas Shale
Perforation
Clusters
22
22
12

FIG. 1

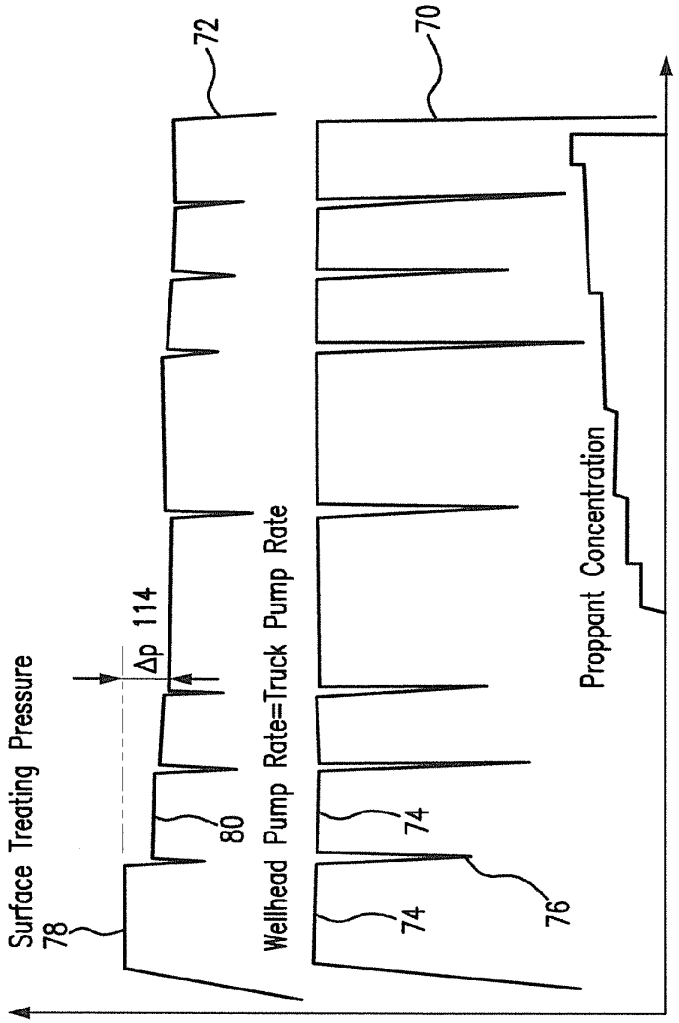

72
70
Surface Treating Pressure
78
Δp 114
80
Wellhead Pump Rate=Truck Pump Rate
74
74
76
Proppant Concentration
Time

FIG. 2

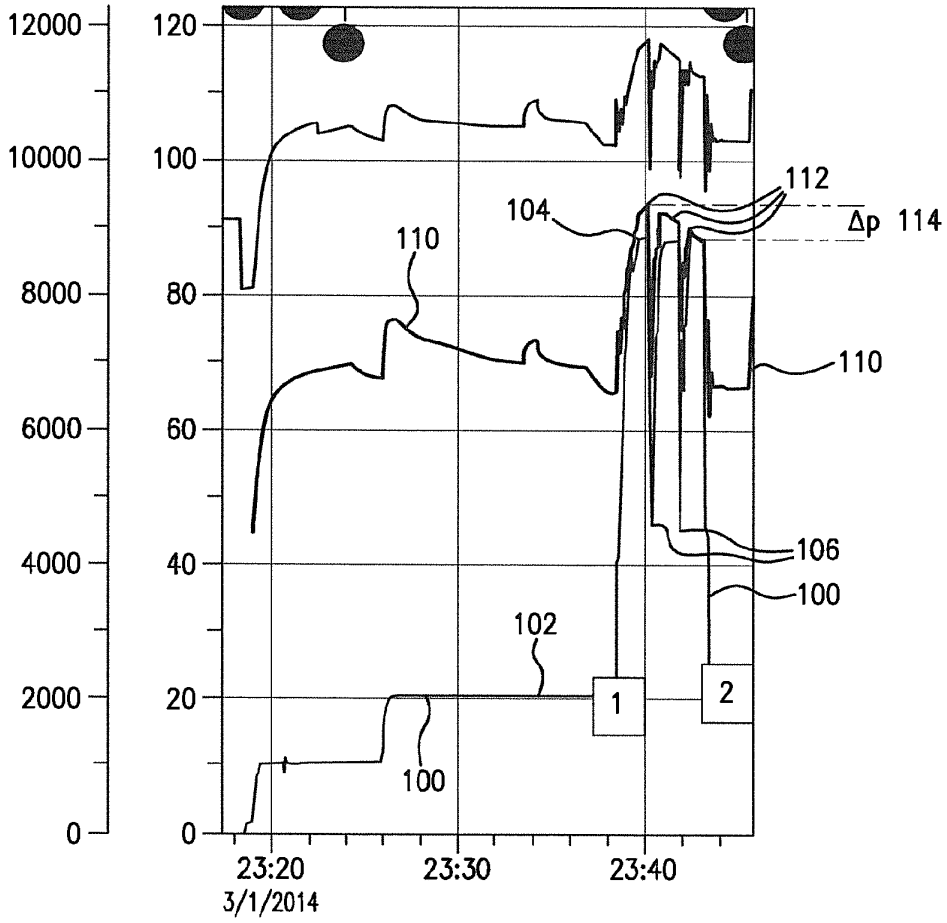

12000
10000
8000
6000
4000
2000
0
120
100
80
60
40
20
0
23:20
3/1/2014
23:30
23:40
112
104
Δp 114
110
110
106
100
102
1
2
100

FIG. 3

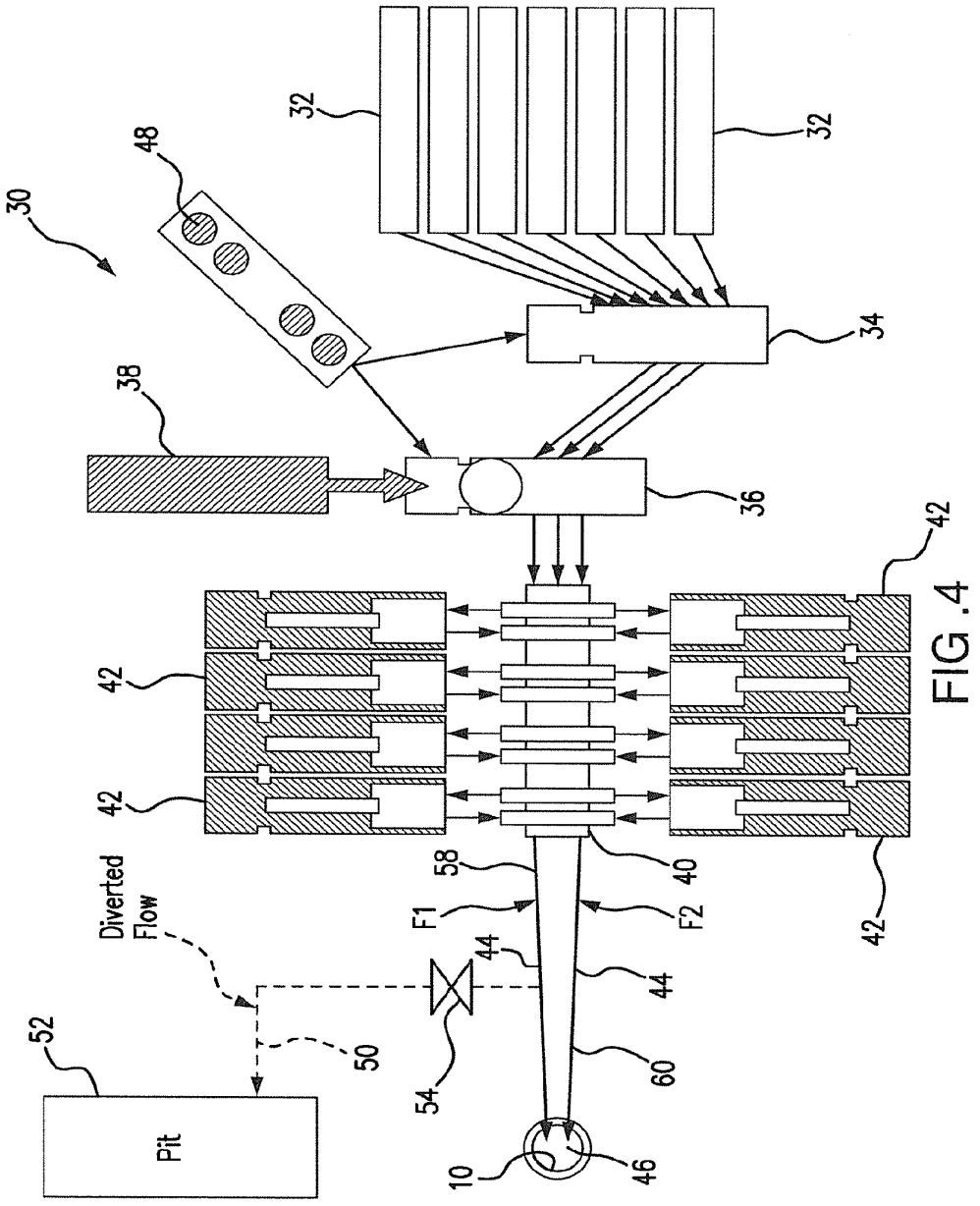

30
32
32
48
34
38
36
42
42
42
42
Diverted Flow
58
40
F1
F2
44
44
52
50
54
60
Pit
10
46

FIG .4

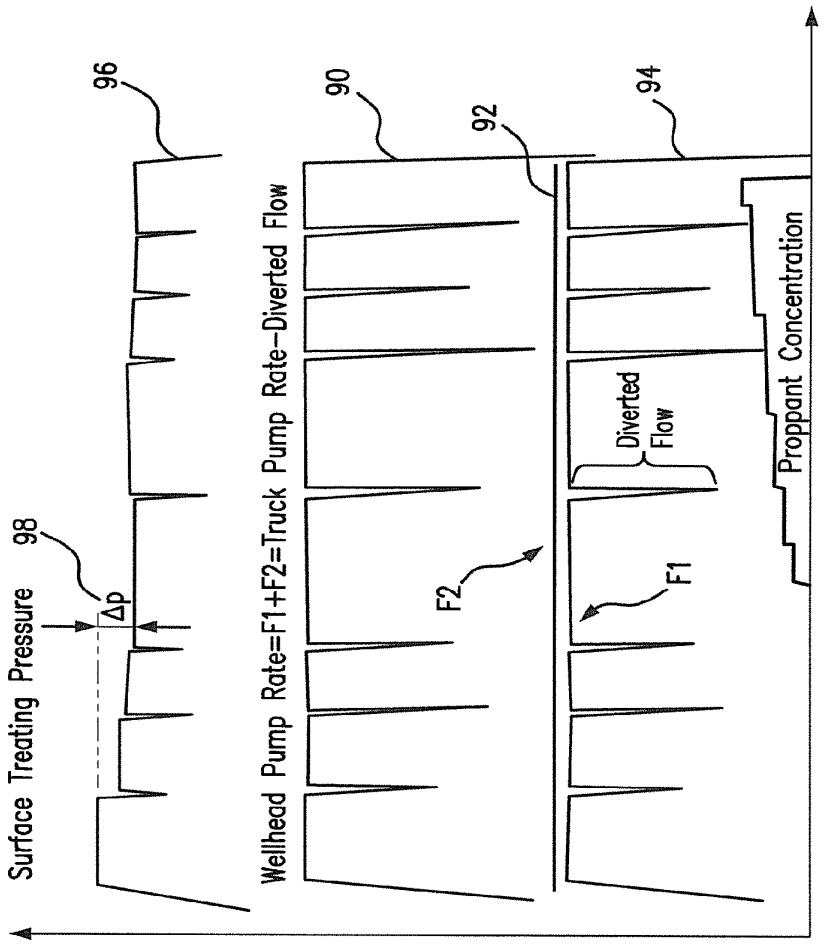

96
90
92
94
98
Δp
Surface Treating Pressure
Wellhead Pump Rate=F1+F2=Truck Pump Rate-Diverted Flow
F2
F1
Diverted Flow
Proppant Concentration
Time

FIG. 5

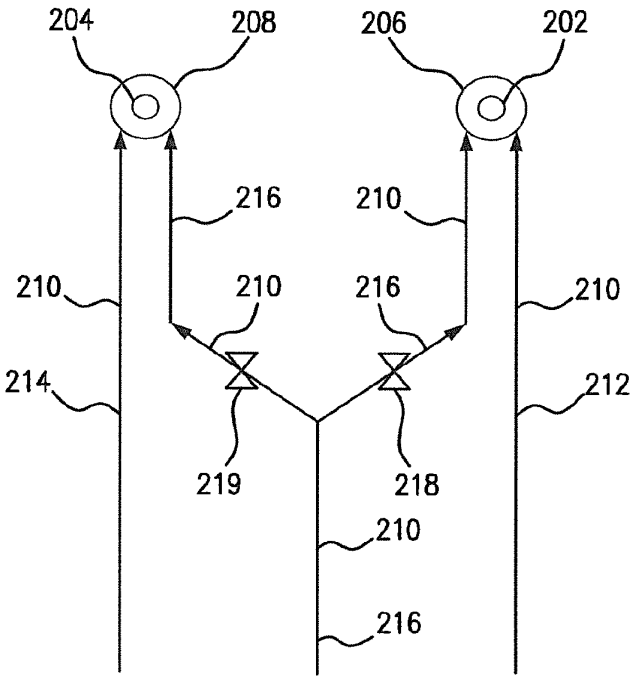


FIG. 6

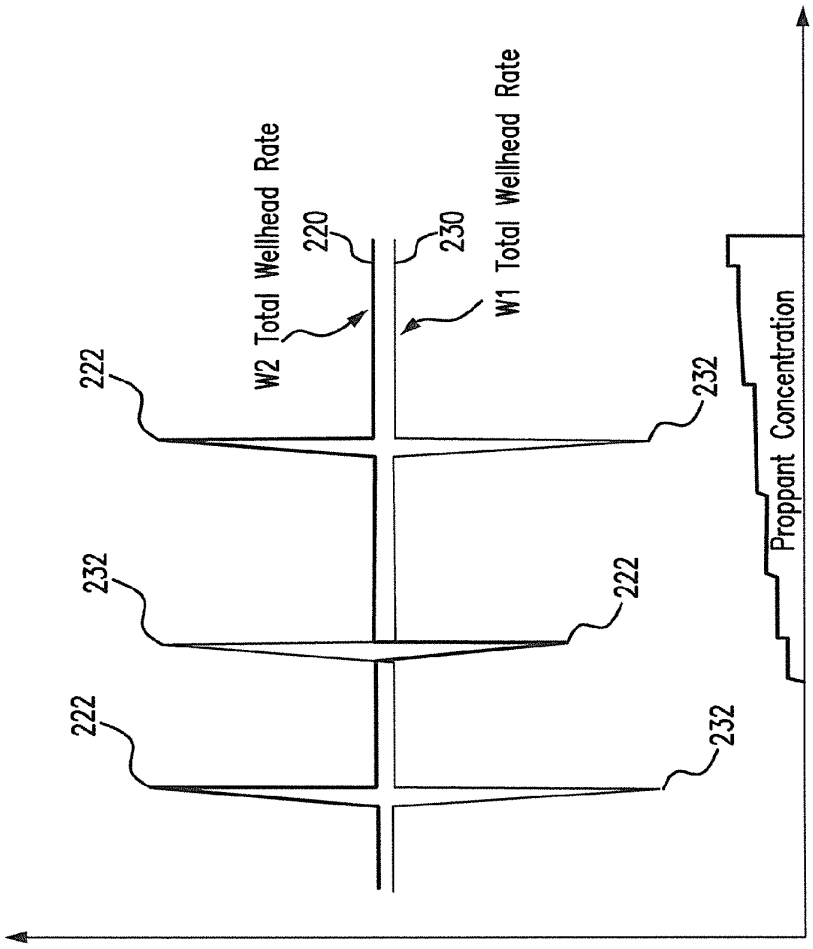

W2 Total Wellhead Rate
220
230
W1 Total Wellhead Rate
222
232
232
222
222
232
Proppant Concentration
Time

FIG. 7

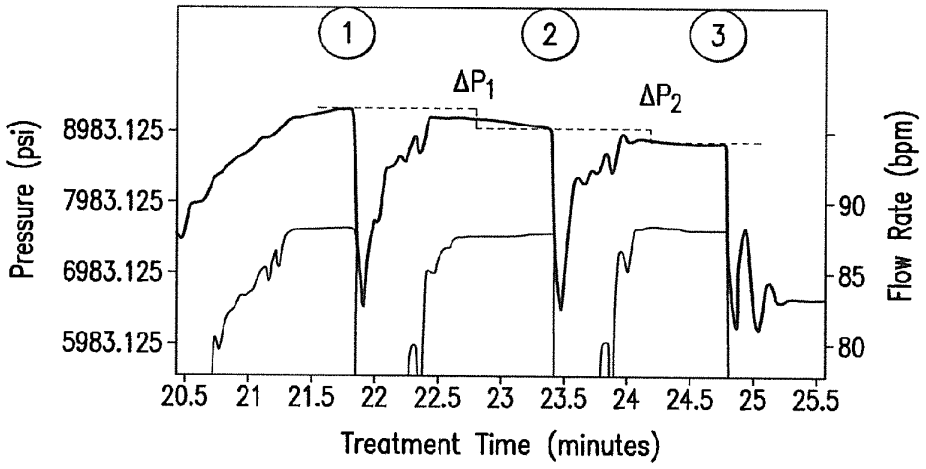


Figure 8: Rate fluctuations introduced in rapid succession at 21st minute and 23rd minute of treatment and corresponding pressure profile for a representative completion.

FIG. 8

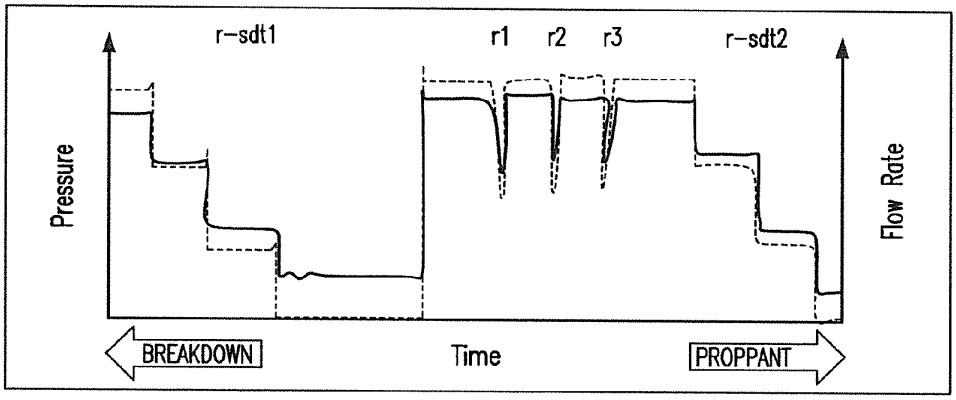


Figure 9: Schematic showing proposed experimental design for variable rate fluctuations workflow outlined in the discussion.

FIG. 9

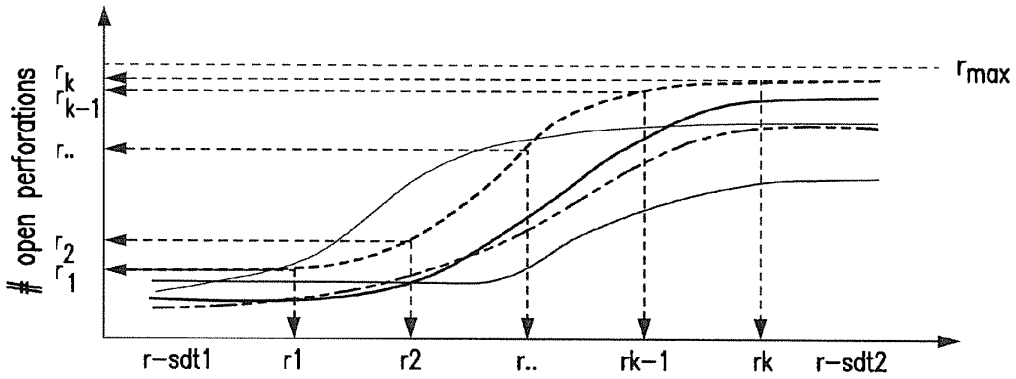


Figure 10: Results from proposed experimental workflow variable rate fluctuations for optimizing perforation opening.

FIG. 10

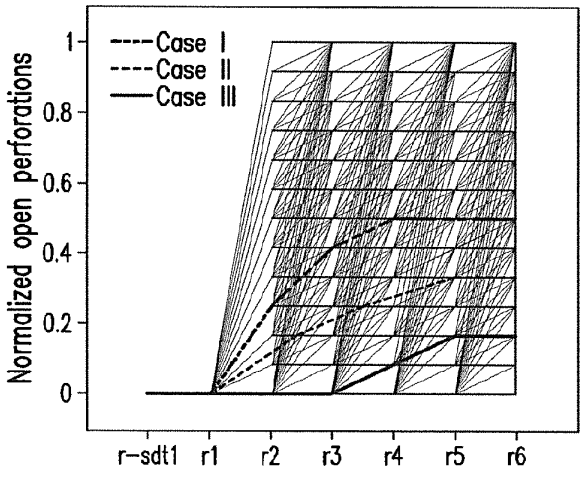


Figure 11: Perforation opening "synthetic curves" and three potential scenarios in terms of opening of additional perforations due to introduced rate fluctuations "r".

FIG. 11

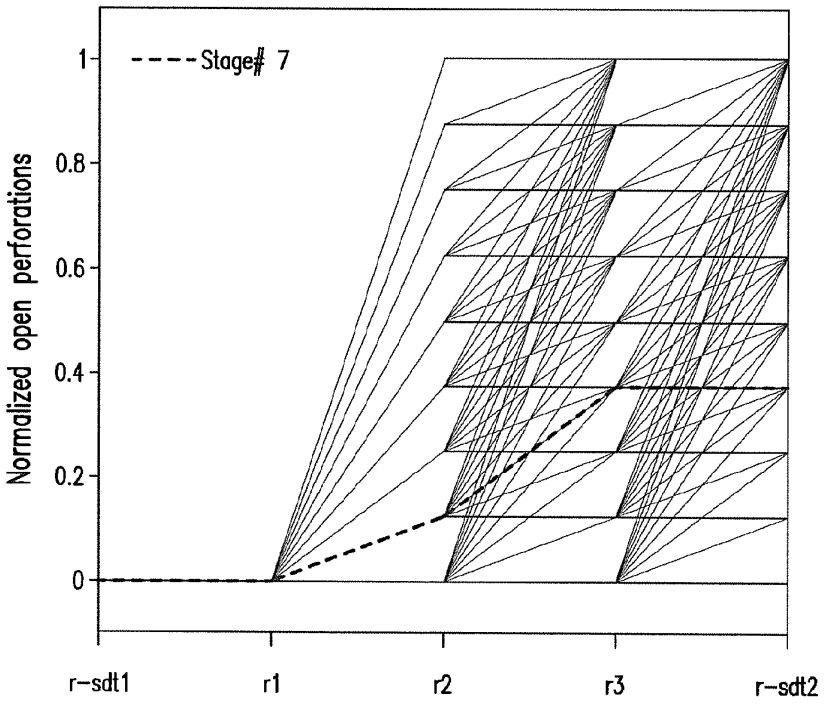


Figure 12: Observed opening of perforations for an actual treatment stage from the Permian Basin.

FIG. 12

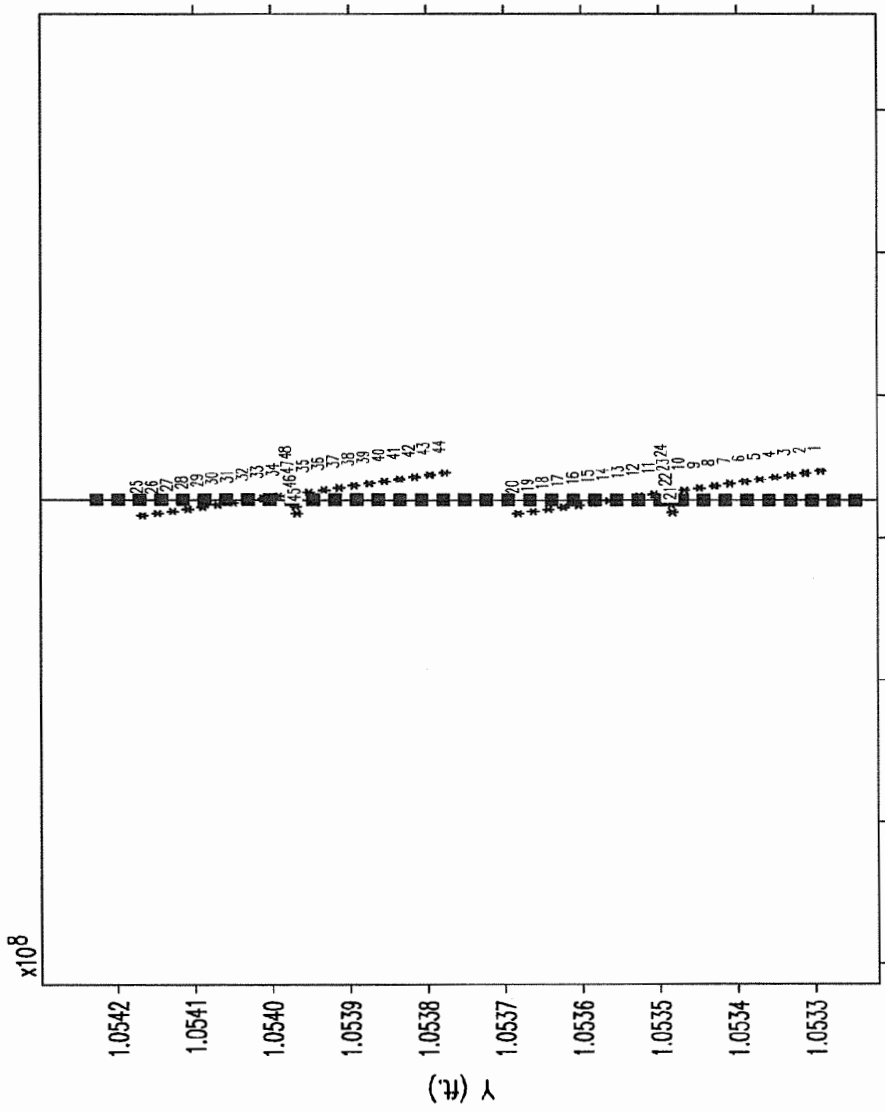


Figure 13: Surface geophone locations (* dots) and borehole projection (■ insert) at 1000's of feet below surface.

FIG. 13

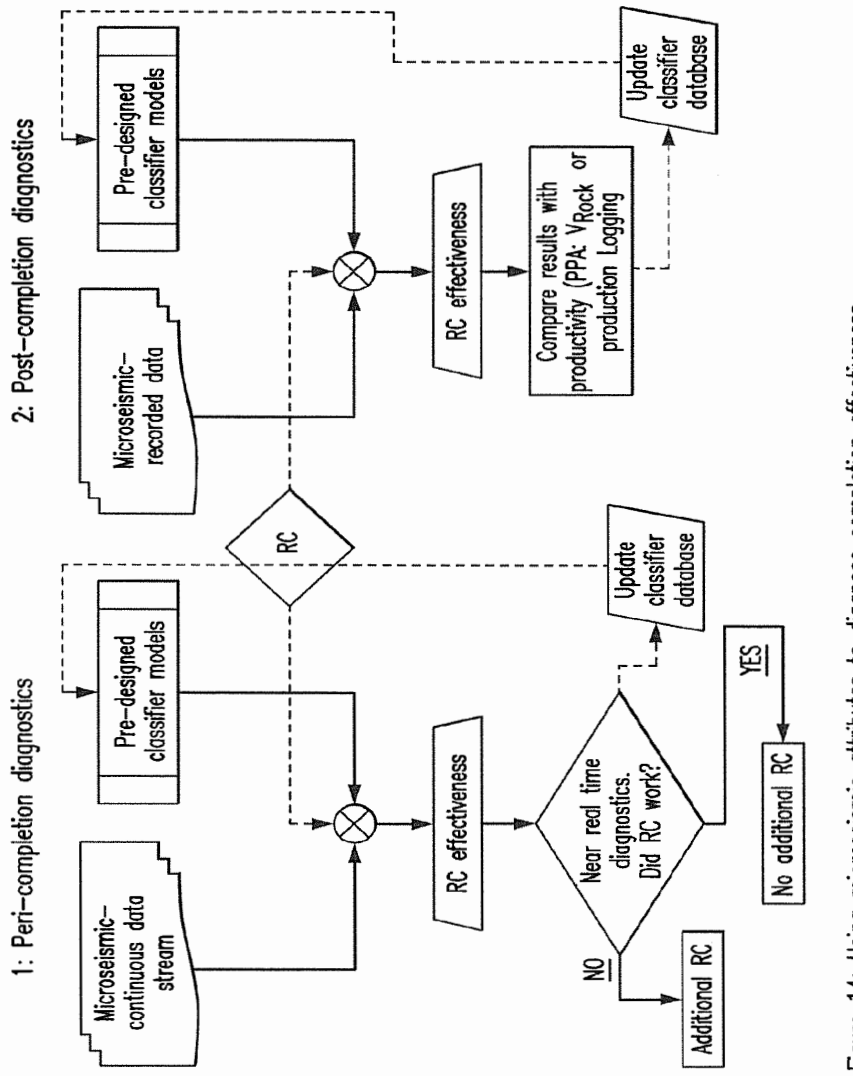


FIG. 14

Figure 14: Using microseismic attributes to diagnose completion effectiveness.

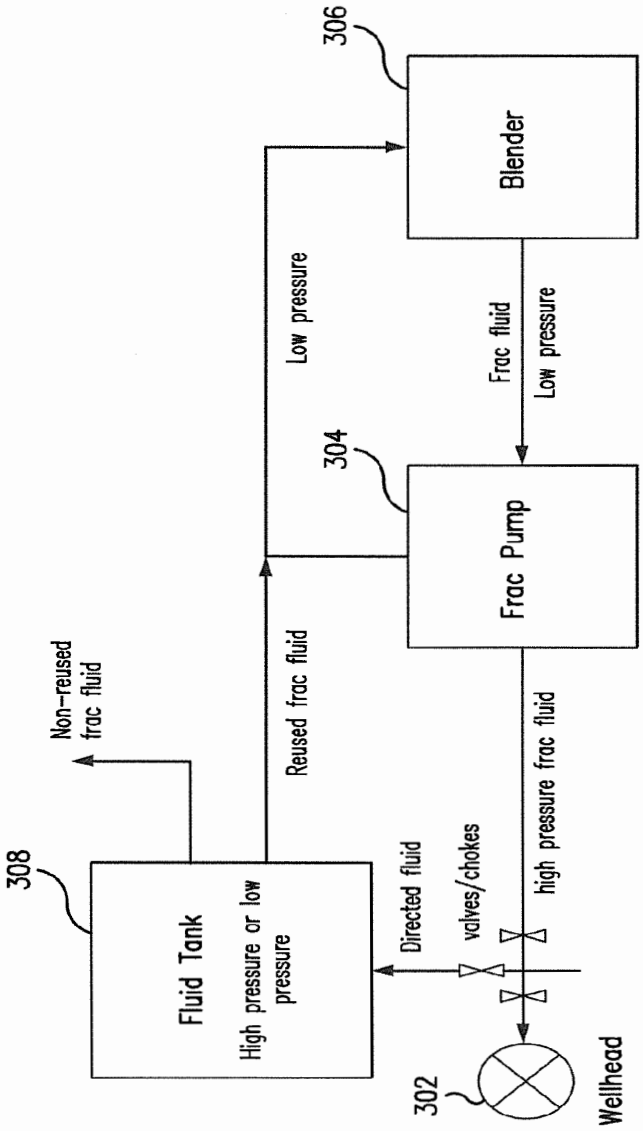

306
Blender
Low pressure
Frac fluid
Low pressure
304
Frac Pump
Non-reused frac fluid
Reused frac fluid
high pressure frac fluid
valves/chokes
Directed fluid
308
Fluid Tank
High pressure or low pressure
302
Wellhead

FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US17/33813

A. CLASSIFICATION OF SUBJECT MATTER
IPC - E21B 43/26, 34/02 (2017.01)
CPC - E21B 43/26, 34/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2016/0061016 A1 (CIEZOBKA, J et al.) 3 March 2016; Paragraphs [0016] and [0034]; Claims 1-3, 5, 18-20	1-14 --- 8
Y	US 3,602,311 A (WHITSITT, N) 31 August 1971; Column 2, Lines 25-40	8

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 July 2017 (20.07.2017)	17 AUG 2017
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

Attorney Docket No. 57959.12US03
Customer No. 27683

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	§	
Jordan Kuehn et al.	§	Confirmation No.: 1469
	§	
Application No.: 18/158,122	§	Group Art Unit: 3676
	§	
Filed: January 23, 2023	§	Examiner: Daniel P. Stephenson
	§	
For: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	§	
	§	

INFORMATION DISCLOSURE STATEMENT

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

Dear Commissioner:

In compliance with the duty of disclosure under 37 CFR §1.56, and in accordance with the practice under 37 CFR §1.97 and §1.98, the Examiner's attention is directed to the documents listed on the enclosed modified Form PTO-1449. No inference should be made that the cited references are in fact material, are in fact prior art, or that no better art exists. Pursuant to 37 CFR § 1.98(a)(2)(i), copies of the U.S. patent documents listed on the enclosed modified Form PTO-1449 are not attached.

This Information Disclosure Statement is being filed within three months of the United States filing date or before the mailing date of a first Office Action on the merits. No certification or fee is required (37 CFR 1.97(b)).

The Commissioner is hereby authorized to charge any additional fees which may be required or credit any overpayment to Deposit Account No. 08-1394. It is respectfully requested that the above information be considered by the Examiner and that a copy of the enclosed modified Form PTO-1449 be returned indicating that such information has been considered.

Respectfully submitted,

/Zachary A. Halbur/

Zachary A. Halbur
Registration No. 68,500

Date: June 25, 2024
HAYNES AND BOONE, LLP
Customer No. 27683
Telephone: 817-347-6678
IP Facsimile: 214-200-0853

4874-7153-3000 v.1

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. 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.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	18158122	Filing Date	2023-01-23	Docket Number (if applicable)	57959.12US03	Art Unit	3676
First Named Inventor	Jordan Kuehn			Examiner Name	Daniel P. Stephenson		

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 _____

☒ Enclosed

☒ Amendment/Reply

☒ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

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 081394

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. 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.

Signature of Registered U.S. Patent Practitioner			
Signature	/Zachary A. Halbur/	Date (YYYY-MM-DD)	2024-06-25
Name	Zachary A. Halbur	Registration Number	68,500

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.

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.

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.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	**06/25/2024 04:21:35 PM Z ET**	**57959.12US03**

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Q Dismuke
PATENT CENTER #	66111563	FILING DATE	01/23/2023
CUSTOMER #	27683	FIRST NAMED INVENTOR	Jordan Kuehn
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Zachary Halbur

Documents

TOTAL DOCUMENTS: 56

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
57959.12US03 Request for Continued Examination Transmittal.pdf		3	Request for Continued Examination (RCE)	1628 KB
57959.12US03 Amendment for RCE Filing.pdf		31	-	135 KB
57959.12US03 Amendment for RCE Filing-AMSB.pdf	(1-1)	1	Amendment Submitted/Entered with Filing of Continued Prosecution Application (CPA)/Request for Continued Examination(RCE)	19 KB
57959.12US03 Amendment for RCE Filing-CLM.pdf	(2-29)	28	Claims	112 KB

57959.12US03 Amendment for RCE Filing-REM.pdf	(30-31)	2	Applicant Arguments/Remarks Made in an Amendment	29 KB
57959.12US03 Information Disclosure Statement 3 Transmittal.pdf		1	Transmittal Letter	19 KB
C1 WO2017201526A1.pdf		47	Foreign Reference	2817 KB
D8 Patent Family Priority Diagram.pdf		1	Non Patent Literature	738 KB
D10 DWH Objections and Responses to Def Interrogatories.pdf		10	Non Patent Literature	808 KB
D1 770 Institution Decision.pdf		37	Non Patent Literature	516 KB
D2 779 Request for Trial Denied.pdf		23	Non Patent Literature	2062 KB
D3 779 PIPR.pdf		106	Non Patent Literature	3143 KB
D4 770 PIPR.pdf		111	Non Patent Literature	5840 KB
D6 First Amended Complaint.pdf		42	Non Patent Literature	1310 KB
D9 779 Prosecution History.pdf		254	Non Patent Literature	24236 KB
D7 770 Prosecution History.pdf		201	Non Patent Literature	19639 KB
D5 779 Durham Declaration.pdf		282	Non Patent Literature	18851 KB
D17 IPR2024-00256 Patent Family Priority Diagram.pdf		1	Non Patent Literature	82 KB

D19 Claim-by-Claim Priority Analysis.pdf	8	Non Patent Literature	131 KB
D20 779 1st POPR.pdf	72	Non Patent Literature	584 KB
D18 Patent Family Specification Comparisons.pdf	254	Non Patent Literature	1019 KB
D15 Patent Family Specification Comparisons.pdf	274	Non Patent Literature	2222 KB
D14 Holzhausen Article.pdf	12	Non Patent Literature	5423 KB
D11 Wells Article - A Fracking History.pdf	14	Non Patent Literature	1997 KB
D13 Vassiliou Article.pdf	11	Non Patent Literature	5034 KB
D12 Applied Drilling Engineering - 17.pdf	125	Non Patent Literature	17552 KB
D16 Office Action dated 5 January 2022.pdf	10	Non Patent Literature	6483 KB
D25 Tim Marvel LinkedIn Email.pdf	1	Non Patent Literature	819 KB
D28 Hughett Resume.pdf	4	Non Patent Literature	777 KB
D29 770 POPR.pdf	63	Non Patent Literature	948 KB
D27 Hughett Declaration.pdf	105	Non Patent Literature	2629 KB
D21 Office Action mailed 12-20-2023 in U.S. Application No. 17651716.pdf	7	Non Patent Literature	409 KB
D23 Continuous Pumping Ex.	3	Non Patent Literature	951 KB

2002.pdf			
D22 Continuous Pumping.pdf	3	Non Patent Literature	2129 KB
D30 770 Hughett Declaration.pdf	111	Non Patent Literature	2987 KB
D26 Tim Marvel Declaration.pdf	7	Non Patent Literature	867 KB
D24 Tim Marvel Email.pdf	4	Non Patent Literature	438 KB
57959.12US03 Information Disclosure Statement 3.pdf	4	Information Disclosure Statement (IDS) Form (SB08)	49 KB
Warning: This is not a USPTO supplied IDS fillable form. Data in the form cannot be automatically loaded to other USPTO systems.			
D34 IPR2024-00584 Patent Family Priority Diagram.pdf	1	Non Patent Literature	190 KB
D35 USDC Colorado Ex 1038.pdf	13	Non Patent Literature	877 KB
D39 Specification for Christmas Tree Equipment.pdf	3	Non Patent Literature	187 KB
D40 USDC Colorado Ex 1045.pdf	5	Non Patent Literature	147 KB
D36 USDC Colorado Ex 1039.pdf	17	Non Patent Literature	4736 KB
D31 770 Second PIPR.pdf	77	Non Patent Literature	7643 KB
D38 IPR2024-00584 Durham Declaration.pdf	199	Non Patent Literature	10881 KB
D32 779 Second PIPR.pdf	117	Non Patent Literature	15119 KB

D33 IPR 2024-00300 Durham Declaration.pdf	354	Non Patent Literature	21934 KB
D37 USDC Colorado Ex 1040.pdf	23	Non Patent Literature	288 KB
D49 CA3150086 Examination Report.pdf	3	Non Patent Literature	97 KB
D47 779 IPR 2024-00583 POPR.pdf	52	Non Patent Literature	522 KB
D45 IPR2024-00584 Email re Meet and Confer 2005.pdf	5	Non Patent Literature	960 KB
D41 IPR2024-00584 Parallel Petitions and Petition Ranking.pdf	10	Non Patent Literature	333 KB
D43 770 IPR 2024-00584 POPR.pdf	40	Non Patent Literature	585 KB
D44 770 IPR 2024-00584 Continuous Pumping 2002.pdf	4	Non Patent Literature	4876 KB
D42 Durham 321 pages.pdf	321	Non Patent Literature	20436 KB
D46 IPR2024-00584 Hughett Declaration Ex2006.pdf	76	Non Patent Literature	5341 KB
D48 779 IPR 2024-00583 Hughett Declaration Ex 2006.pdf	89	Non Patent Literature	5320 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)

57959.12US03 Request for Continued Examination Transmittal.pdf	E24BAFBAFC82CF18CB218D48E7A60E3F4EE8E7B93A0888D7AAFBB132CD3C4FE1ECEA9F7189A71BCC7DD2B20CE3EAAA76319C4725FEBAA18AFEB0A01CBE2663C2
57959.12US03 Amendment for RCE Filing.pdf	5D6861A09FFF63D3328E9C94904F388220CE7C3683150AB8DB0609D33E4D248C0C2C456E62437E501181248510377 12AC0C3073A45C25B7822B342C50C1DA49F
57959.12US03 Amendment for RCE Filing-AMSB.pdf	D6E75CAD51DA40C66BAB8D0F0EDF55CCCBF1A26C406BB2869E997760BCC71D47FCCEBD58BB53837D5F20E344DBB0045A814ADE8E17CCEE1C4D1CF1A4BA1D162F
57959.12US03 Amendment for RCE Filing-CLM.pdf	2A937454505E714210A60C5053854516 5B1D66798F26A01EECDCDCAD71DBAAB817964891CB332FDA286C22AAE7037963644A071CB2B0982C2D22770C516E4694
57959.12US03 Amendment for RCE Filing-REM.pdf	372058920211438 6C06A8EA4E1CE4FBA62C8BF263A98AFF2D5428A6A8AB85C0C2CFC1D03DD2C7FD4DDDB979CA27FABBF644F8BC4E1014BD39605BEB97B5C233D
57959.12US03 Information Disclosure Statement 3 Transmittal.pdf	62E084C97642A53C5BD05A77E8E78B2FA0C849D90A59539C386FA574036885E878C0895BCC322AF9401965657036 6B4C1E321C26578A95C13D32EB802EA00A34
C1 WO2017201526A1.pdf	9D8B857BD026BC85F5991C846C987EABC6881878E247A59913FAD84A854C0836438983E83D2D0097E13507C09D17F62457D83AA40E336B4AE368DAFDD8DCE49E
D8 Patent Family Priority Diagram.pdf	5161CE50810864C7CBA2D192EF8D2E1588E18A3A9FF1211FE49A84C0F4DDA9A1863C7087B366C32F2448200689D90620397D2D4D4B8AB79B10210E0BC340BD1D
D10 DWH Objections and Responses to Def Interrogatories.pdf	3B67E7C5DCB76343912D3632A3BAC7FCEC27A18AE95CF9599E8CB9F297BD5D08E340FEC7B32FB35893C6C32DE9A47038773323575CDD2C283CB48C7AC922379A
D1 770 Institution Decision.pdf	C2D0EC2FB2DE68BA1E926557E0BBA678B9B46573E669B095C05D4A984FFF7654C8B774B3B4A18DE3770E8DDB9E8A23DC9AC902A1138ED33BD33A5F1CBDAF484B

D2 779 Request for Trial Denied.pdf	02E6635518246235FE83AD9F6628FE6BB1B3F7AF7D5267857EC3D1AB2289D59BB721507296C3212FBB09C031F442E1B8C4AD52DD682AB0908AB665D55B2DDEA5
D3 779 PIPR.pdf	226428F1D4A4D40DFB9CCF77D185D244FD5811DB70974480E7A726822A7398F8B661D64DA2AFF539D1C0F79D702AE0C8D342A439DE147603C01434A0436EEAFC
D4 770 PIPR.pdf	3C92778922A705259AB4E5430D9AEBB50EF18BDDE39D8BF02339AB5C971B7C5DED3F51C08D857F01F95AB0CDA24D7BBFC0430CA30BE1F3FFFCE72239EE51AED6
D6 First Amended Complaint.pdf	D7128DA0E216CD13C251753AA5A0E58042A468FCA68AD6DDD82FC3E80180B9AB6AAD12409DC3CDD027C40973376C96F1807BD0357D570A774B1D20C5F7C72D7B
D9 779 Prosecution History.pdf	9200B1D5E0FFE377B08033EDC89308641226D7F6523347E6E0AE92EAA0392FCB37B7F7166EB717D547C040284B8E15081AE2F6C66E5589D4AC4BC0A769FC7B58
D7 770 Prosecution History.pdf	C9A1D52FE6927ED3A3E0DC1A7B9CE6D034022F50BB3AC3EE54926F47C38BF096EC7C94A12B9E8A8E305FF615B549443A4229D42F26995D34346BD771DA939AB7
D5 779 Durham Declaration.pdf	1A4A3C3F8B264E132224298B9491B7A74D8D79A2FC7B1E4401C4756FFD8E8B61AC0F2E578E036AB860EBBA05D14999727C14F8299B7EBE0007F1D3877D5FAED4
D17 IPR2024-00256 Patent Family Priority Diagram.pdf	52F20E07A673F528FC0FC770E395CF4FBFF71EA0A1229BF8A535A5D2594D22F991B6445F0FC9F3C9A5CEC50B989FB1082F93B061882650511924376 5DB6A785D
D19 Claim-by-Claim Priority Analysis.pdf	AAA614137FFC7943D7C723C25DF34160C33658B89BFC2753F8820302F3BDB608C9C2DC2908298F37E1D4906EB6B57EC8816D9E5BBAE5B23F4E722209A66B8D52
D20 779 1st POPR.pdf	683229C09766C96FCEA3F73AF5A07A88D44B31C335A7DA1F54DF2C0A3972C18FDE08F8234CB6AB0B6A6DE6BD577A54047DE94C5D83DD27C8903F8342AE0563E1

D18 Patent Family Specification Comparisons.pdf	41F78E66A2261A9AB3B344F475281C8D080606DD8371876BB2A13E74BFD5C321CA828A5B7EECFC63F1EB3D2914771794A853104AB7CCC145E4985E7ADC1D6798
D15 Patent Family Specification Comparisons.pdf	5E5A22FD02F2A5D1FCF661C097CB0A1B01AE5314E0E41DA4F07E953917DA767363493EC4039AD72EC7B6C1AA162373E77F9E9C2DE1926B4D7B3483A70B0ABE3F
D14 Holzhausen Article.pdf	C3332CBC783B109889FE2BE33175E12B6394F9D8279BE84AECDCB9E57C97C6757AA795CF09F7733398AA9EC56979BB88A701AF0BEBEDCED4464396738E6FFA4A
D11 Wells Article - A Fracking History.pdf	0104C79F0A3CA36BB1A0FFB296BD4663B3020E20CB66641E8F0003D9C5FA873C1E568C648BCA517CD4137D4811E2AFB66D876031E0571922C5433BE6EF1CBA91
D13 Vassiliou Article.pdf	2851C0D422B8C57034FDDD2924C69AAE5371DCA0D7AA2C1E7E32D045D24C0CB377D14766AD312F27DAF6B8F691171DD8D3EDF3E8276CA5E658342B83350D5CF3
D12 Applied Drilling Engineering - 17.pdf	8F001549A0D6D2D7C6C53940C9DCF5D20B5B198888BF2FC66B78BB72C1681ACEF56ED185DE1B2340A1B810CAE05BE462AC07C4820B147C03A955D7D0244F6025
D16 Office Action dated 5 January 2022.pdf	3E97D11E7528C541B442652F66EB51CE27CEBF4F3349F6E95FC765FACE299CDCB01BE15DC12234B9A74191D2AC4D25DCBD541A0F03DA48E7B4359479F802B3C8
D25 Tim Marvel LinkedIn Email.pdf	9A5F815FC31BD49C8B532E90CA5A2F91403120194D9A4C339E90E0C6BDBB3F126B8C26573998 14B34B31CB2F6858CC93052967B77A1AB14F3CDEF9F74C551F96
D28 Hughett Resume.pdf	F7B2778A550E5E68C018C50A8EF2BB24EF62712B63BFD5B8A3883EA093C6F04789DBF60BE8DBAB4EA01908EFA45612AAF04E11A51C1DBF41C79D48F08B06501A
D29 770 POPR.pdf	BC0C8DB420BE08D9626BDD80F07F3542673488468FA382735D9E1D1EFBE25DE5EE2B8F480480DC0A509B4C34C1882DF695402B94003EFEBC56CAC5B614228 8B8

D27 Hughett Declaration.pdf	AC0D476CFA0329F5F19BA1BCDAB56CE1DC74330A2E018D8C CFD17CD8166D7732252618160E3C1117FAD2B38AFF9330917 BD9DD7D82D3EEE08430CA3BB139B2F0
D21 Office Action mailed 12-20-2023 in U.S. Application No. 17651716.pdf	433F31D3B38BF3C190EDDBE130ED50ADECEB6B315A77E817 2F2BBF69329B297030C1FC283A8E7AAF0EC9752A66EB0A3E1 9EC520B82E947ADBCA11E7914E99F8F
D23 Continuous Pumping Ex. 2002.pdf	932B2314DB6D1D0D144C663C482E0F87F41B80AE8CF7AF33D 055303958B40BCC7AAB394BE33ED398895E7A4C36C4D9AAF5 E22037944DC3866C317B58E2918017
D22 Continuous Pumping.pdf	EC06C579BACD4D03DE4868448831927225 2F2EBEA828CFA58 C26626368543D378855D5C8F217FE60F4B6C19079D006B05E4 D2AF3A760E597553289BF71C56748
D30 770 Hughett Declaration.pdf	2221C1A8537CFCEB82E41BD346D0E7C8AC0DD79900E164585 6FDD8E535957388186CECE30D5B9C146E4DF60029E354C57 6FD8EA1D237AAEDA65E32983644C62
D26 Tim Marvel Declaration.pdf	38D0A54C068AEEDE1CAF031AD9F02E2D81ED4918702652F9A 823DF4EAE44C0CD96F968C287243B18C4FDC8F9DA8EFC6E5 E8F38EBCFB7D36608B173683C954BFA
D24 Tim Marvel Email.pdf	D846E7CAE1D606E8628A04B6EF690D56F44DF049EC59BF025 63A1DB85842046772849C8663AAFA58CB2B4AC5CEC15E5453 6552DDA5DFA737A4762D385E401643
57959.12US03 Information Disclosure Statement 3.pdf	D8B589CD05D4AD2CABE109C0E4A91399EAE9EC37CA7B098 E6CD41DB9F444DACB572D92E5B1A8F43697D93655C7969901 94645B7C2262D8B682B772E7723D481D
D34 IPR2024-00584 Patent Family Priority Diagram.pdf	42F45F19E9E1461EF996050C2A95D945246F13D8665292CF14 A7B3822DFE97CD93A8B8E122F02CB5396D86020CAF52F29F6 C84475F6CDF6D78FD1C519167A2D3
D35 USDC Colorado Ex 1038.pdf	E133E59F6860ADC1636A3786A2F7341036A41AE3CD9900DCD C4841CADD4F98695BB2F5768D03F9C3D533019D81FD3A25D8 2E122EE35ECE212AA85754553FC134

D39 Specification for Christmas Tree Equipment.pdf	DF04C8D47C443B6668E91BBD247BB065B0B59D3617E9E27E84DDE6B267F2B1DC40D445CCDE6FF400DD3195331ADDC2FDC5390A292C49B269EFE5AA61D2930B0
D40 USDC Colorado Ex 1045.pdf	E30B074458687 4BDB523F66447BD639066F718DA5374D3F31F3EE7249CD46A8BD7ED9B83D038D7FE49A2E21F74B69181D5E39E5442EDAF8F510E0E42C9E40826
D36 USDC Colorado Ex 1039.pdf	CBAB841B38264BBDFD6FB5F5D452FDB823C1B4C166E5DDD2664AEDBAE6F92CC6799148798 50EAB93AEB8A37C3A54119E25602127FA88A8E7C9D4D43AE62DDE16
D31 770 Second PIPR.pdf	D5965EAD0C9E7913C7F0730C689BCF6CC0AF0BAACC1F325567EDD938B4A2FEF637DDE1F5B1F09C6C41CD93DE2DD0343A61CDB79878EEDB40985515 5D21300B90
D38 IPR2024-00584 Durham Declaration.pdf	C47AD25B5C162B055D42D0791F907A099613BB20EE02EB92E461D410D5F122AA75B368DBDD381FA4C1728C0A0290B7A5C53E9E9FE7BC98EF92F4224314237A7D
D32 779 Second PIPR.pdf	DC6F1250E61511760FBC3069ED024ED184A38FEF30FBEA6F9393EA0967893D6BDC4D90176BBA9A9F9A851EBA8C65727401986A3B448D341ED69DBE9EABF8E10D
D33 IPR 2024-00300 Durham Declaration.pdf	5922E9591FC7582C51347C3F14C775F0265B250DC6FFDFB836C5FA9EDF66A34D479CC43DDEEA5F4A3C1889F5F4AC62F94DE3FB6C1695C1E9736FB92B1161BAA9
D37 USDC Colorado Ex 1040.pdf	1C36143ED37221F0E61A557A4CCB5637867B5673CBD7A3A4A6CDE762671F6F9F188D8A111CDFA6CEBA7C163C7C9EBD16A5419123B1497BB1A5B9D2AEF2AD52B5
D49 CA3150086 Examination Report.pdf	952B40DF2896727F2C1234FA051D4D19FD169318C09DC763DA1CD21BFFE37BEB25367AFEA86BA7AFE6AA2C06DAE996D22C54EBC766A8406DC0378394283EEE01
D47 779 IPR 2024-00583 POPR.pdf	11D67909AE91E56BE90B8D8F5E055A3EDE533071A9CBCA58568975BA4EBB7A495D4DFEE0DEC7C9178786A79EC4BF47B17A121BAA32F3BBDB9FCE39B306D7917

D45 IPR2024-00584 Email re Meet and Confer 2005.pdf	56C9930804A0A28EEBA2863C893CE2A318D6A88636F592DC732FC1845D7B5803A89DD81DDB35F229994C4C102C9D39B932210B92F4BDD0629A238D5EBD040363
D41 IPR2024-00584 Parallel Petitions and Petition Ranking.pdf	A3246749A12811DDD7A379B05812903D8233CA6FFAC33C72AF94AEEC26ED75D488BC722375651512E0DD30088E71F471C4CA4A7EE35ED73E42959EFEEE2FC3C8
D43 770 IPR 2024-00584 POPR.pdf	4EFD0FC3F86E529770F40651DD452652387DD264CC6A31DA7D01C928B2CDBD535025C95D81B3EA1CFEE332FB7CAF5D3397C371D55C8D8CD257688D1A2B9FB15D
D44 770 IPR 2024-00584 Continuous Pumping 2002.pdf	4EA45F639936A12308794A94873824F65B5536A18CB0044C86B5E404427027B9F02F22145E8926D6255F7DC61EB1CF7457F6DDACF0B99E01F20F90ACD915B766
D42 Durham 321 pages.pdf	C64EA067266A56C4CC60B1E045CF35A796CD5EC83B10469C4A80448164976F602924CF1D23E584EEB927A68FD9931B3B3C4655D896C96F643B6D62590967B54C
D46 IPR2024-00584 Hughett Declaration Ex2006.pdf	B3AA486CFABDBD756BD17063362560A617B0BBF5419CB5A5659F70D948C865E4E7FB3D255A0700078A0DC08FC7D45EA6BCB33D4508F5D41EC54AD4AC1A6D6860
D48 779 IPR 2024-00583 Hughett Declaration Ex 2006.pdf	9042FD22353B61C7157065E5679377B8B929D4DF9A2C071B8BF7B7E2F3197D4D93F6C5A7CCDDBF9C9817F4C76B39B96A75F65EA98F0D46BBCE41891E8320FBEC

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 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/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 18/158,122	Filing Date 01/23/2023	☐ 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 $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $ 192 =	
☐ 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	06/25/2024	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 78	Minus	** 78	= 0		x $40 =	0
	Independent (37 CFR 1.16(h))	* 6	Minus	*** 6	= 0		x $ 192 =	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.	ADMIN
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/KREIGHTON LAMBERT SR/
*** 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.

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

27683 7590 03/26/2024

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

EXAMINER	
STEPHENSON, DANIEL P	
ART UNIT	PAPER NUMBER
3676	

DATE MAILED: 03/26/2024

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

TITLE OF INVENTION: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	06/26/2024

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 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted 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. 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.

PTOL-85 (Rev. 11/23)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

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 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. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

27683 7590 03/26/2024

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

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 the USPTO patent electronic filing system 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.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

TITLE OF INVENTION: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	06/26/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
STEPHENSON, DANIEL P	3676	166-373000

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/AIA/122 or PTO/SB/122) attached.

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

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

1_____
2_____
3_____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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)

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

❑ Electronic Payment via the USPTO patent electronic filing system ❑ 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

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.

❑ Applicant asserting small entity status. See 37 CFR 1.27

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.

❑ Applicant changing to regular undiscounted fee 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. _____

IWS EXHIBIT 1003 EX_1003_145

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.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

27683 7590 03/26/2024

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

EXAMINER	
STEPHENSON, DANIEL P	
ART UNIT	**PAPER NUMBER**
3676	

DATE MAILED: 03/26/2024

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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/ owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).
https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf

Routine uses of the information in this record may include disclosure to:

1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
2) a federal, state, local, or international agency, in response to its request;
3) a contractor of the USPTO having need for the information in order to perform a contract;
4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
8) 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));
9) the Office of Personnel Management (OPM) for personnel research purposes; and
10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	**Application No.** 18/158,122	**Applicant(s)** Kuehn et al.	
	Examiner DANIEL P STEPHENSON	**Art Unit** 3676	**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 2/8/24.
   ☐ 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 See Continuation Sheet . 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 _____.

/DANIEL P STEPHENSON/
Primary Examiner, Art Unit 3676

Continuation of 3. The allowed claim(s) is/are: 1-3,5-10,12-17 and 19-81

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.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance: the closest prior art of record is Kajaria (US 2017/0275980).

3. Kajaria discloses a method opening a second valve associated with the second well to permit pumping of fluid into the second well via the second valve (opening valve 66 of second well 14); and opening a first valve (opening valve of first well 14) associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well.

4. The prior art of record fails to disclose, alone or in combination, the key features of "opening the second valve causes fluid to be communicated to the second well via the manifold and the second valve, and wherein the second valve is opened in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of the fluid communicated via the manifold" and "during the CP swap, the fluid is continuously communicated via the manifold so that transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced" in combination with the other limitations currently presented in the combination of claim 1, 8 and 15.

5. The prior art of record fails to disclose, alone or in combination, the key features of "the second valve is opened in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions; and closing the first valve, wherein the first valve is closed: after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, and after opening the second valve; wherein the display of the dashboard visually communicates the respective states of the first and second valves; and wherein fluid is continuously communicated via the manifold

during the CP swap to reduce transition time between hydraulically fracturing the first well and hydraulically fracturing the second well" in combination with the other limitations currently presented in the combination of claim 61 and 68.

6. The prior art of record fails to disclose, alone or in combination, the key features of "opening the second valve: while fluid is communicated to the first well via the first valve and the manifold, in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions, and to cause fluid to be communicated to the second well via the manifold and the second valve; and closing the first valve: after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, and after opening the second valve; wherein the display of the dashboard visually communicates the respective states of the first and second valves; and wherein the continuous communication of fluid via the manifold during the CP swap reduces transition time between hydraulically fracturing the first well and hydraulically fracturing the second well" in combination with the other limitations currently presented in the combination of claim 75.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL P STEPHENSON whose telephone number is (571)272-7035. The examiner can normally be reached M-F 10am-6pm.

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, Tara Schimpf can be reached on 571-270-7741. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DANIEL P STEPHENSON/
Primary Examiner, Art Unit 3676

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	Art Unit
	DANIEL P STEPHENSON	3676

CPC - Searched*		
Symbol	**Date**	**Examiner**
E21B33/068, E21B34/02, E21B41/00, E21B43/11, E21B43/26, E21B43/2607, F16K3/36, F16N11/00, F16N2210/00, F16N2210/02, F16N29/02, F16N39/00, F16N7/38, F16N7/40	10/07/2022	DPS
updated	11/19/2022	DPS
updated, E21B17/006	05/27/2023	DPS
updated	07/14/2023	DPS
updated	11/04/2023	DPS
updated	03/09/2024	DPS

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**
SEARCH text, Inventor name, Forward/Backward search	10/07/2022	DPS
IPR2024-00583 Reviewed Inter Partes Review of U.S. Patent No. 11,401,779 on 3/7/2024	03/07/2024	DPS
IPR2024-00300 Reviewed Inter Partes Review of U.S. Patent No. 11,560,770 on 3/7/2024	03/07/2024	DPS

IWS EXHIBIT 1003 EX_1003_153

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	Art Unit
	DANIEL P STEPHENSON	3676

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
see history		10/07/2022	DPS
updated		11/04/2023	DPS
updated		03/09/2024	DPS

IWS EXHIBIT 1003 EX_1003_154

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

CPC						
Symbol					**Type**	**Version**
E21B	/	34	/	02	F	2013-01-01
E21B	/	41	/	00	I	2013-01-01
E21B	/	43	/	2607	I	2020-05-01
E21B	/	33	/	068	I	2013-01-01
F16N	/	11	/	00	I	2013-01-01
F16N	/	29	/	02	I	2013-01-01
F16K	/	3	/	36	I	2013-01-01
E21B	/	43	/	11	I	2013-01-01
E21B	/	17	/	006	I	2013-01-01
E21B	/	43	/	26	I	2013-01-01
F16N	/	2210	/	00	A	2013-01-01

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	78	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	09 March 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20240309

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

INTERNATIONAL CLASSIFICATION				
CLAIMED				
E21B	/	43	/	26
E21B	/	33	/	068
E21B	/	34	/	02
E21B	/	41	/	00
E21B	/	43	/	11
F16K	/	3	/	36
F16N	/	11	/	00
F16N	/	29	/	02

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

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

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	78	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	09 March 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20240309

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	Art Unit
	DANIEL P STEPHENSON	3676

☐ 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	1	23	12	8	23	29	34	50	45	38	56	64	67	75	78
2	2	24	13	9	24	30	35	51	46	54	57	65	68	76	79
3	3	25	14	10	25	31	36	52	47	55	58	66	69	77	80
	4	39	15	11	26	32	37	53	48	56	59	67	70	78	81
4	5	40	16	12	27	33	38	16	49	57	60	68	71		
5	6	47	17	13	28	34	39	17	50	58	61	69	72		
6	7		18	14	29	45	40	18	51	59	62	70	73		
20	8	42	19	15	30	46	41	19	52	60	63	71	74		
21	9	43	20	26	31	47	42	35	53	61	64	72	75		
22	10	44	21	27	32	48	43	36	54	62	65	73	76		
	11	7	22	28	33	49	44	37	55	63	66	74	77		

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	78	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	09 March 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20240309

Bibliographic Data

Application No: 18/158,122

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /DANIEL P STEPHENSON/ (Examiner's Signature) | (Initials)

Title: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/23/2023	166	3676	57959.12US03
RULE			

APPLICANTS

Downing Wellhead Equipment, LLC, Oklahoma City, OK, UNITED STATES

INVENTORS

Jordan Kuehn, Forest Park, IL, UNITED STATES

Austin Johnson, Edmond, OK, UNITED STATES

Ronnie B. Beason, Lexington, OK, UNITED STATES

Nicholas J. Cannon, Washington, OK, UNITED STATES

CONTINUING DATA

This application is a CON of 17878493 08/01/2022 PAT 11560770

17878493 is a CON of 17388716 07/29/2021 PAT 11401779

17388716 has PRO of 63189663 05/17/2021

17388716 is a CIP of 17319854 05/13/2021 PAT 11867023

17319854 is a CIP of 16855749 04/22/2020 PAT 11480027

16855749 is a CIP of 16803156 02/27/2020 PAT 11242724

16803156 is a CIP of 16436623 06/10/2019 PAT 11208856

16855749 has PRO of 62836761 04/22/2019

16803156 is a CIP of 16248633 01/15/2019 PAT 10584552

16855749 is a CIP of 16248648 01/15/2019 PAT 10724682

16436623 has PRO of 62755170 11/02/2018

16803156 is a CIP of 16100741 08/10/2018 PAT 10689938

16100741 has PRO of 62638688 03/05/2018

16100741 has PRO of 62638681 03/05/2018

16100741 has PRO of 62637220 03/01/2018

16100741 has PRO of 62637215 03/01/2018

16248633 has PRO of 62617438 01/15/2018

16248648 has PRO of 62617443 01/15/2018

16100741 has PRO of 62598914 12/14/2017

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/13/2023

**** SMALL ENTITY ****

STATE OR COUNTRY

UNITED STATES

ADDRESS

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201
UNITED STATES

FILING FEE RECEIVED

$704

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	18158122
Filing Date	2023-01-23
First Named Inventor	Jordan Kuehn
Art Unit	3676
Examiner Name	Daniel P. Stephenson
Attorney Docket Number	57959.12US03

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	4721158	A	1988-01-26	Merritt et al.	
	2	4754808	A	1988-07-05	Harmon et al.	
	3	7559373	B2	2009-07-14	Jackson et al.	
	4	8061427	B2	2011-11-22	Jackson et al.	
	5	8490685	B2	2013-07-23	Tolman et al.	
	6	10533406	B2	2020-01-14	Lopez et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

	1	20070125543	A1	2007-06-07	McNeel et al.	
	2	20110030963	A1	2011-02-10	Demong et al.	
	3	20110048695	A1	2011-03-03	Cherewyk et al.	
	4	20120255734	A1	2012-10-11	Coli et al.	
	5	20130306322	A1	2013-11-21	Sanborn et al.	
	6	20150345272	A1	2015-12-03	Kajaria et al.	
	7	20160061016	A1	2016-03-03	Ciezobka et al.	
	8	20170315566	A1	2017-11-02	Martino et al.	
	9	20180045331	A1	2018-02-15	Lopez et al.	
	10	20190233275	A1	2019-08-01	Carr et al.	
	11	20200270977	A1	2020-08-27	Kraynek	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

	12	20200408077	A1	2020-12-31	An et al.	
	13	20210324718	A1	2021-10-21	Anders	
	14	20210363856	A1	2021-11-25	Martin et al.	
	15	20210396117	A1	2021-12-23	Yeung et al.	
	16	20220099227	A1	2022-03-31	Cherewyk	
	17	20220112796	A1	2022-04-14	Jaaskelainen	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

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]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

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. /DPS/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

	1	BURTON, Comparing Multistage Completions Part 13 – Operational Efficiency of Plug-and-Perf with Zipper Frac, YouTube (June 23, 2020) https://www.youtube.com/watch?v=LnIhENHTGWg.	☐
	2	CASERO et al., "Continuous Pumping, Multistage, Hydraulic Fracturing in Kitina Field, Offshore Congo, West Africa," in SPE International Symposium and Exhibition on Formation Damage Control, 2008, vol. All Days, SPE-112442-MS; 20 pages.	☐
	3	CHEN, "Optimal control of ICV's and well operating conditions for the water-alternating gas injection process," Journal of Petroleum Science and Engineering (2016), pages 623-640.	☐
	4	Cudd Energy Services, Hydraulic Fracturing Process Animation, YouTube (May 7, 2013), https://www.youtube.com/watch?v=eEADi7X3kPM.	☐
	5	Halliburton, Reducing Days on Location and Time to First Oil (2020).	☐
	6	JACOBS, "The Shale Evolution: Zipper Fracture Takes Hold," J Pet Technol 66 (2014): 60–67.	☐
	7	MASSARAS et al., "Enhanced Fracture Entry Friction Analysis of the Rate Step-Down Test," in SPE Hydraulic Fracturing Technology Conference, 2007, vol. All Days, SPE-106058-MS, 16 pages.	☐
	8	MAYERHOFER et al., "What is Stimulated Reservoir Volume (SRV)?" Paper presented at the SPE Shale Gas Production Conference, Fort Worth, Texas, USA, November 2008, 14 pages.	☐
	9	MONDAL, "Pressure transients in wellbores: Water hammer effects and implications for fracture diagnostics," at 12 (2010).	☐
	10	MONTGOMERY et al., "Hydraulic Fracturing: History of an Enduring Technology," Journal of Petroleum Technology vol. 62 issue 12 p. 26 (Dec. 2010).	☐
	11	MORTON, "Unlocking the Earth: A Short History of Hydraulic Fracturing," GEO ExPro, Vol. 10, No. 6, December 2013.	☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

	12	MUTALIK et al., "Case History of Sequential and Simultaneous Fracturing of the Barnett Shale in Parker County." Paper presented at the SPE Annual Technical Conference and Exhibition, Denver, Colorado, USA, September 2008.	☐
	13	OBERHOFER, "Application of Ball-Drop Technology to Improve Efficiency and Stimulation of Limited Entry Completion Systems," in Abu Dhabi International Petroleum Exhibition & Conference, 2016, vol. Day 2 Tue, November 08, 2016, D021S052R004.	☐
	14	PAIGE et al., "Field Application of Hydraulic Impedance Testing for Fracture Measurement," SPE Production & Facilities, vol. 10, no. 01, pp. 7-12, 1995.	☐
	15	PEARSON et al., "Results of Stress-Oriented and Aligned Perforating in Fracturing Deviated Wells." J Pet Technol 44 (1992): 10–18.	☐
	16	RASSENFOSS, "A Look Into What Fractures Really Look Like," Journal of Petroleum Technology, vol. 70, no. 11, pp. 28-36, 2018.	☐
	17	ROUSSEL et al., "Optimizing Fracture Spacing and Sequencing in Horizontal-Well Fracturing." SPE Prod & Oper 26 (2011): 173–184.	☐
	18	SLB, Sundance Energy Saves USD 500,000 with 60% More Stages per Day in Simultaneous Fracturing Operations (2020).	☐
	19	TOLMAN et al. (2009). Method and Apparatus for Simultaneous Stimulation of Multi-Well Pads, SPE Hydraulic fracturing Technology Conference at 1.	☐
	20	TTU Research, Hydraulic Fracturing Symposium at Texas Tech, YouTube (Dec. 3, 2013), https://www.youtube.com/watch?v=pKL1_tog0Kk.	☐
	21	WATERS et al., "Simultaneous Hydraulic Fracturing of Adjacent Horizontal Wells in the Woodford Shale." Paper presented at the SPE Hydraulic Fracturing Technology Conference, The Woodlands, Texas, January 2009.	☐
	22	WEBSTER et al., "A Continuous Multistage Tracing Technique," Journal of Petroleum Technology, vol. 17, no. 06, pp. 619-625, 1965.	☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

	23	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Document 34, Defendants' Rule 12(b)(6) Motion to Dismiss First Amended Complaint, filed August 21, 2023; 32 pages.	☐
	24	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Document 39, Downing's Opposition to Defendants' Rule 12(b)(6) Motion to Dismiss, filed September 11, 2023; 40 pages.	☐
	25	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Document 40, Defendants' Reply to Support of Their Rule 12(b)(6) Motion to Dismiss First Amended Complaint, filed September 25, 2023; 15 pages.	☐
	26	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Defendants' Initial Invalidity Contentions, dated November 22, 2023; 21 pages.	☐
	27	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Appendix A: Invalidity Contentions Claim Chart for U.S. Patent No. 11,401,779; 17 pages.	☐
	28	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Appendix B: Invalidity Contentions Claim Chart for U.S. Patent No. 11,560,770; 16 pages.	☐
	29	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Defendants' Supplemental Invalidity Contentions, dated December 15, 2023; 440 pages.	☐

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

EXAMINER SIGNATURE

Examiner Signature	/DANIEL P STEPHENSON/	Date Considered	03/09/2024

*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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

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	/Zachary A. Halbur/	Date (YYYY-MM-DD)	2024-02-08
Name/Print	Zachary A. Halbur	Registration Number	68,500

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.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

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).

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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	42	(Artificial Intelligence) Similar to: 17/878,493 with 0 CPC Selections and 0 Text Selections Text: (US-20210355784-A1 OR US-20210324706-A1 OR US-20210262315-A1 OR US-11401779-B2 OR US-20210332665-A1 OR US-20200248529-A1 OR US-20190360637-A1 OR US-20190360636-A1 OR CA-3055026-A1 OR US-20170336022-A1 OR US-20220290547-A1 OR CA-3158915-A1 OR US-20200347990-A1 OR CA-3080175-A1 OR US-9447659-B2 OR WO-2020142638-A1 OR CA-3125461-A1 OR US-20210301638-A1 OR CA-2855789-C OR CA-2855789-A1 OR US-20160003006-A1 OR US-9869426-B2 OR US-20170002977-A1 OR US-20200332954-A1 OR US-11137109-B2 OR US-20210301933-A1 OR AU-2018439421-A2 OR JP-7094523-B2 OR JP-WO2020044514-A1 OR WO-2020044514-A1 OR AU-2018439421-A1 OR CN-112567159-A OR GB-2206912-A OR US-4377206-A OR WO-2013059251-A1 OR WO-2020219573-A1 OR CA-3137729-A1 OR US-11193349-B1 OR US-20130092395-A1 OR US-11255446-B1 OR US-20210054839-A1 OR GB-2579734-A8 OR US-4109713-A OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	OR	ON	ON	2022/10/07 10:02 AM

		US-10100978-B2 OR US-20180328536-A1 OR US-11047189-B2 OR US-11125385-B2 OR SG-191515-A1 OR US-20210381640-A1 OR GB-2579734-A).did.					
L2	1	("11401779").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:05 AM
L3	93858	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/07 10:06 AM
L4	1	("20170275980").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 05:48 PM
L5	0	("11480028").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 06:04 PM
L6	4	("20140352968" | "20170123437" | "20170275980" | "20180179848").pn. OR ("11401779").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 06:37 PM
L7	4	beason.in. AND manifold.clm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 07:35 PM
L8	11	("2017/0275980").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 09:58 PM
L9	10	8 AND manifold	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO;	OR	ON	ON	2022/10/07 09:59 PM

			JPO; DERWENT; IBM_TDB)				
L10	3418	(manifold AND valve AND (second secondary) AND fluid AND clos$3) AND 3	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/07 10:15 PM
L11	95927	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/18 04:08 PM
L12	433	11 AND (@pd>"20221007")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/18 04:08 PM
L13	1	("20230160278").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/05/27 07:38 PM
L14	95455	(E21B17/006 OR E21B33/068 OR E21B34/02 OR E21B41/00 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/05/27 07:40 PM

		E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N29/02).cpc.	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L15	105016	14 3	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/27 07:41 PM
L16	2293	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/27 07:42 PM
L17	1	("11560770").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/05/27 10:00 PM
L18	359	15 AND (@pd>"20230527")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO,	OR	ON	ON	2023/07/13 12:24 PM

			NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L23	2	("20220268141").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/11/04 03:28 AM
L24	2170	15 AND (@pd>"20230527")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/11/04 04:35 AM
L25	1562	15 AND (@pd>"20230714")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/11/04 04:35 AM
L26	23	("10533406" OR "20070125543" OR	(US-PGPUB; USPAT)	OR	ON	ON	2024/02/24 09:46 PM

		"20110030963" OR "20110048695" OR "20120255734" OR "20130306322" OR "20150345272" OR "20160061016" OR "20170315566" OR "20180045331" OR "20190233275" OR "20200270977" OR "20200408077" OR "20210324718" OR "20210363856" OR "20210396117" OR "20220099227" OR "20220112796" OR "4721158" OR "4754808" OR "7559373" OR "8061427" OR "8490685").pn.					
L29	1705	15 AND (@pd>"20231104")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/03/09 07:28 PM
L30	20	"2017201526"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/03/09 08:06 PM
L31	14	"2020145978"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2024/03/09 08:10 PM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	5570	(manifold AND valve AND (second secondary) AND fluid AND clos$3) .clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:33 PM
N2	675	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:34 PM
N3	675	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm. AND "3"	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:39 PM
N4	17108	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:40 PM
N5	16	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:40 PM
N6	18	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 04:38 PM
N7	18	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/13 12:24 PM
N8	20	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2023/11/04 04:35 AM

N9	21	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2024/03/09 09:14 PM

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	**02/08/2024 04:55:57 PM Z ET**	**57959.12US03**

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Q Dismuke
PATENT CENTER #	64263800	AUTHORIZED BY	Zachary Halbur
CUSTOMER #	27683	FILING DATE	01/23/2023
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Jordan Kuehn

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 1103	**E202428G56365331**	**Q Dismuke**

PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY
081394	**37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees)**

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2820	REQUEST FOR CONTINUED EXAMINATION (RCE)- 2ND AND SUBSEQUENT REQUEST (SEE 37 CFR 1.114)	800.00	1	800.00
2202	EACH CLAIM IN EXCESS OF 20	40.00	33	1320.00
2201	EACH INDEPENDENT CLAIM IN EXCESS OF THREE	192.00	3	576.00
			TOTAL AMOUNT:	**$2,696.00**

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 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/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	18158122
Filing Date	2023-01-23
First Named Inventor	Jordan Kuehn
Art Unit	3676
Examiner Name	Daniel P. Stephenson
Attorney Docket Number	57959.12US03

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	4721158	A	1988-01-26	Merritt et al.	
	2	4754808	A	1988-07-05	Harmon et al.	
	3	7559373	B2	2009-07-14	Jackson et al.	
	4	8061427	B2	2011-11-22	Jackson et al.	
	5	8490685	B2	2013-07-23	Tolman et al.	
	6	10533406	B2	2020-01-14	Lopez et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

	1	20070125543	A1	2007-06-07	McNeel et al.	
	2	20110030963	A1	2011-02-10	Demong et al.	
	3	20110048695	A1	2011-03-03	Cherewyk et al.	
	4	20120255734	A1	2012-10-11	Coli et al.	
	5	20130306322	A1	2013-11-21	Sanborn et al.	
	6	20150345272	A1	2015-12-03	Kajaria et al.	
	7	20160061016	A1	2016-03-03	Ciezobka et al.	
	8	20170315566	A1	2017-11-02	Martino et al.	
	9	20180045331	A1	2018-02-15	Lopez et al.	
	10	20190233275	A1	2019-08-01	Carr et al.	
	11	20200270977	A1	2020-08-27	Kraynek	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

	12	20200408077	A1	2020-12-31	An et al.	
	13	20210324718	A1	2021-10-21	Anders	
	14	20210363856	A1	2021-11-25	Martin et al.	
	15	20210396117	A1	2021-12-23	Yeung et al.	
	16	20220099227	A1	2022-03-31	Cherewyk	
	17	20220112796	A1	2022-04-14	Jaaskelainen	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

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]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

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]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

	1	BURTON, Comparing Multistage Completions Part 13 – Operational Efficiency of Plug-and-Perf with Zipper Frac, YouTube (June 23, 2020) https://www.youtube.com/watch?v=LnIhENHTGWg.	☐
	2	CASERO et al., "Continuous Pumping, Multistage, Hydraulic Fracturing in Kitina Field, Offshore Congo, West Africa," in SPE International Symposium and Exhibition on Formation Damage Control, 2008, vol. All Days, SPE-112442-MS; 20 pages.	☐
	3	CHEN, "Optimal control of ICV's and well operating conditions for the water-alternating gas injection process," Journal of Petroleum Science and Engineering (2016), pages 623-640.	☐
	4	Cudd Energy Services, Hydraulic Fracturing Process Animation, YouTube (May 7, 2013), https://www.youtube.com/watch?v=eEADi7X3kPM.	☐
	5	Halliburton, Reducing Days on Location and Time to First Oil (2020).	☐
	6	JACOBS, "The Shale Evolution: Zipper Fracture Takes Hold," J Pet Technol 66 (2014): 60–67.	☐
	7	MASSARAS et al., "Enhanced Fracture Entry Friction Analysis of the Rate Step-Down Test," in SPE Hydraulic Fracturing Technology Conference, 2007, vol. All Days, SPE-106058-MS, 16 pages.	☐
	8	MAYERHOFER et al., "What is Stimulated Reservoir Volume (SRV)?" Paper presented at the SPE Shale Gas Production Conference, Fort Worth, Texas, USA, November 2008, 14 pages.	☐
	9	MONDAL, "Pressure transients in wellbores: Water hammer effects and implications for fracture diagnostics," at 12 (2010).	☐
	10	MONTGOMERY et al., "Hydraulic Fracturing: History of an Enduring Technology," Journal of Petroleum Technology vol. 62 issue 12 p. 26 (Dec. 2010).	☐
	11	MORTON, "Unlocking the Earth: A Short History of Hydraulic Fracturing," GEO ExPro, Vol. 10, No. 6, December 2013.	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

	12	MUTALIK et al., "Case History of Sequential and Simultaneous Fracturing of the Barnett Shale in Parker County." Paper presented at the SPE Annual Technical Conference and Exhibition, Denver, Colorado, USA, September 2008.	☐
	13	OBERHOFER, "Application of Ball-Drop Technology to Improve Efficiency and Stimulation of Limited Entry Completion Systems," in Abu Dhabi International Petroleum Exhibition & Conference, 2016, vol. Day 2 Tue, November 08, 2016, D021S052R004.	☐
	14	PAIGE et al., "Field Application of Hydraulic Impedance Testing for Fracture Measurement," SPE Production & Facilities, vol. 10, no. 01, pp. 7-12, 1995.	☐
	15	PEARSON et al., "Results of Stress-Oriented and Aligned Perforating in Fracturing Deviated Wells." J Pet Technol 44 (1992): 10–18.	☐
	16	RASSENFOSS, "A Look Into What Fractures Really Look Like," Journal of Petroleum Technology, vol. 70, no. 11, pp. 28-36, 2018.	☐
	17	ROUSSEL et al., “Optimizing Fracture Spacing and Sequencing in Horizontal-Well Fracturing.” SPE Prod & Oper 26 (2011): 173–184.	☐
	18	SLB, Sundance Energy Saves USD 500,000 with 60% More Stages per Day in Simultaneous Fracturing Operations (2020).	☐
	19	TOLMAN et al. (2009). Method and Apparatus for Simultaneous Stimulation of Multi-Well Pads, SPE Hydraulic fracturing Technology Conference at 1.	☐
	20	TTU Research, Hydraulic Fracturing Symposium at Texas Tech, YouTube (Dec. 3, 2013), https://www.youtube.com/watch?v=pKL1_tog0Kk.	☐
	21	WATERS et al., "Simultaneous Hydraulic Fracturing of Adjacent Horizontal Wells in the Woodford Shale." Paper presented at the SPE Hydraulic Fracturing Technology Conference, The Woodlands, Texas, January 2009.	☐
	22	WEBSTER et al., "A Continuous Multistage Tracing Technique," Journal of Petroleum Technology, vol. 17, no. 06, pp. 619-625, 1965.	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

	23	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Document 34, Defendants' Rule 12(b)(6) Motion to Dismiss First Amended Complaint, filed August 21, 2023; 32 pages.	☐
	24	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Document 39, Downing's Opposition to Defendants' Rule 12(b)(6) Motion to Dismiss, filed September 11, 2023; 40 pages.	☐
	25	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Document 40, Defendants' Reply to Support of Their Rule 12(b)(6) Motion to Dismiss First Amended Complaint, filed September 25, 2023; 15 pages.	☐
	26	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Defendants' Initial Invalidity Contentions, dated November 22, 2023; 21 pages.	☐
	27	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Appendix A: Invalidity Contentions Claim Chart for U.S. Patent No. 11,401,779; 17 pages.	☐
	28	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Appendix B: Invalidity Contentions Claim Chart for U.S. Patent No. 11,560,770; 16 pages.	☐
	29	USDC Colorado: Case No. 1:23-cv-01180-RMR-SP, DOWNING WELLHEAD EQUIPMENT, LLC v. INTELLIGENT WELLHEAD SYSTEMS, INC., INTELLIGENT WELLHEAD SYSTEMS, CORP., and IWS USA CORP., Defendants' Supplemental Invalidity Contentions, dated December 15, 2023; 440 pages.	☐

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	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

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	/Zachary A. Halbur/	Date (YYYY-MM-DD)	2024-02-08
Name/Print	Zachary A. Halbur	Registration Number	68,500

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).

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.

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. 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.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	18158122	Filing Date	2023-01-23	Docket Number (if applicable)	57959.12US03	Art Unit	3676
First Named Inventor	Jordan Kuehn			Examiner Name	Daniel P. Stephenson		

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 _____

☒ Enclosed

- ☒ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

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 081394

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. 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.

Signature of Registered U.S. Patent Practitioner			
Signature	/Zachary A. Halbur/	Date (YYYY-MM-DD)	2024-02-08
Name	Zachary A. Halbur	Registration Number	68,500

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.

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.

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.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	**02/08/2024 04:55:57 PM Z ET**	**57959.12US03**

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Q Dismuke
PATENT CENTER #	64263800	FILING DATE	01/23/2023
CUSTOMER #	27683	FIRST NAMED INVENTOR	Jordan Kuehn
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Zachary Halbur

Documents

TOTAL DOCUMENTS: 34

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
57959.12US03 Amendment for RCE Filing.pdf		27	-	113 KB
57959.12US03 Amendment for RCE Filing-AMSB.pdf	(1-1)	1	Amendment Submitted/Entered with Filing of Continued Prosecution Application (CPA)/Request for Continued Examination(RCE)	18 KB
57959.12US03 Amendment for RCE Filing-CLM.pdf	(2-26)	25	Claims	99 KB
57959.12US03 Amendment for RCE Filing-REM.pdf	(27-27)	1	Applicant Arguments/Remarks Made in an Amendment	17 KB
NPL4 Cudd Energy Services - Hydraulic Fracturing Process Animation.pdf		1	Non Patent Literature	720 KB

NPL5 2020-MKTG-PES-11950_SimulFrac_Brochure.pdf	3	Non Patent Literature	716 KB
57959.12US03 Information Disclosure Statement 2.pdf	8	Information Disclosure Statement (IDS) Form (SB08)	601 KB
NPL6 Jacobs-The shale evolution_ Zipper fracture ta.pdf	7	Non Patent Literature	1076 KB
57959.12US03 Request for Continued Examination Transmittal.pdf	3	Request for Continued Examination (RCE)	1628 KB
NPL3 Chen_Optimal Control of ICVs_IWS.pdf	18	Non Patent Literature	2233 KB
NPL8 Mayerhofer-What is stimulated reservoir volume.pdf	14	Non Patent Literature	1307 KB
NPL11 Morton-Unlocking the Earth_ A short history of_.pdf	5	Non Patent Literature	825 KB
NPL7 Massaras-Enhanced Fracture Entry Friction Anal.pdf	16	Non Patent Literature	2355 KB
NPL12 Mutalik-Case history of sequential and simulta.pdf	7	Non Patent Literature	894 KB
NPL13 Oberhofer-Application of Ball-Drop Technology.pdf	9	Non Patent Literature	1286 KB
NPL10 Montgomery-Hydraulic fracturing_ History of an.pdf	16	Non Patent Literature	2239 KB
NPL9 Mondal-Pressure transients in wellbores_ Water.pdf	71	Non Patent Literature	3598 KB
NPL14 Paige-Field Application of Hydraulic Impedance.pdf	6	Non Patent Literature	987 KB
NPL16 Rassenfoss-A Look Into What Fractures Really L.pdf	6	Non Patent Literature	1145 KB
NPL15 Pearson-Results of stress-oriented and aligned.pdf	9	Non Patent Literature	1688 KB

NPL19 Tolman-Method and Apparatus for Simultaneous.pdf	9	Non Patent Literature	1207 KB
NPL23 34 - Motion to Dismiss First Amended Complaint.pdf	32	Non Patent Literature	386 KB
NPL17 Roussel-Optimizing fracture spacing and sequen.pdf	16	Non Patent Literature	1677 KB
NPL20 TTU Research - Hydraulic Fracturing Symposium.pdf	1	Non Patent Literature	1894 KB
NPL26 2023-11-22 IWS Initial Invalidity Contentions.pdf	21	Non Patent Literature	316 KB
NPL27 IWS Initial Invalidity Contentions - Appx A.pdf	17	Non Patent Literature	263 KB
NPL28 IWS Initial Invalidity Contentions - Appx B.pdf	16	Non Patent Literature	259 KB
NPL22 Webster-A Continuous Multistage Tracing Techni.pdf	10	Non Patent Literature	1823 KB
NPL21 Waters-Simultaneous hydraulic fracturing of ad.pdf	22	Non Patent Literature	2693 KB
NPL29 2023-12-15 IWS Supp. Initial Invalidity Contentions.pdf	440	Non Patent Literature	1026 KB
NPL1 Burton Comparing Multistage Completions.pdf	1	Non Patent Literature	2794 KB
NPL2 Casero-2008-Continuous Pumping Multistage.pdf	20	Non Patent Literature	3043 KB
NPL18 Sundance Energy Saves USD 500000 on Fracs _ SLB.pdf	8	Non Patent Literature	2060 KB
NPL24 39 - Downings Response to IWSs MTD.pdf	40	Non Patent Literature	492 KB
NPL25 40 - Defendants Reply in Support of Their Motion to Dismiss the First	15	Non Patent Literature	226 KB

Amended Complaint.pdf

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
57959.12US03 Amendment for RCE Filing.pdf	6202843E5D6D7D096D9C95CE7AE59E7B47D9628F3C37BB4F1841C53A75342EEF09BE8958C3CBEFC6D174A2BB9A34EF4656178D7AB2186D42763E4FF1A35D64EA
57959.12US03 Amendment for RCE Filing-AMSB.pdf	416D86BE1E9303C040488929A8DB5E9D78C433185CF8A90F79E02B68B450E5F035F341A6F28F68C52D96349E9ABA0868122CD617BBCA4A3E2E302410508A8301
57959.12US03 Amendment for RCE Filing-CLM.pdf	F72D063A30D91E14B3C5DAEC571C5FBB5BF3B2559935A33E4901B2A6E597B46A029E9FE6582492E94577F06EFB952A3B09FA81201F9EA4CE636350C29B4132C5
57959.12US03 Amendment for RCE Filing-REM.pdf	BFDF025FC4866527DA3FF4F27077394340A648AE4B0C37ECEF52FD5C4AD03352CB716092B3F2938B9E74FBE34AA45FEDE6C61DB3FDD04C26F9CA1D0CE70B517B
NPL4 Cudd Energy Services - Hydraulic Fracturing Process Animation.pdf	33EF3E870770BD6C2A4BFCC99B1D824DCF4D8ED38882D95F4930021433862FAD1945E0698151B6CC2EA65ECCBC27AD42EF22F6896CEE81747ABD91438B0DCDD5
NPL5 2020-MKTG-PES-11950_SimulFrac_Brochure.pdf	59BFCC05629CD10E369386C64B2AE20D626B43D18F3D4748F583433FA7F8EBDE242C26CC4AA2140FE4D3DA6989B134C4AB5A29C95B2ADE3D869BBC0113078F5F
57959.12US03 Information Disclosure Statement 2.pdf	E947AFA46FCF508C643EC4CD1488F496C9F6BF850B26E5104C6673017B21750E2C702C30CC6BB52A2B3CFD2E4DFE161387B040FBD96AA0F856D69FE23B97E5CF
NPL6 Jacobs-The shale evolution_ Zipper fracture ta.pdf	78A60CF89B9A6C677936414600016F0989CDB10CE27D8CDD97BBC932569888ED6745CCD1A37E6C3C6FAE227B8C7589464722F35A12D69CE7AA2C3480CA64F983
57959.12US03 Request for Continued Examination Transmittal.pdf	7138BC4924C01E4A08C03446C92F24766CA335184D3B063CAEE92A5A55157513697140F2E5E53E5EBB262D43F0FE31845766CA62CF9B4B963DC8A12C6611B0AF
NPL3 Chen_Optimal Control of ICVs_IWS.pdf	47FEFF01962C3EE611D95274F435A53911F01C0E097DEDEF8C89FA89DF201A8CB05C28D03E905FD933F93526321B8BCB6D3F065D1EA62A3BF05044001AD162A4
NPL8 Mayerhofer-What is stimulated reservoir volume.pdf	C85A2ED48AFF4049B42694A1B4DF68BDA5B2FC0B7FABF87BCE78FF72AE9ACBE39A058E4C8710375F506CB4AB3677375BA80F7E12EAE5C31740516FB62BD01AD6
NPL11 Morton-Unlocking the	053E3BA3B9CAEC9F4850CC59947140D3875EBA5FDA6D8CE1

Earth_ A short history of_.pdf	2301D6F3A47506D19BE5E124E5768EDB6AE409E6C1EF10CF120BFE4BAE1917C27E59DD7C34BAAD4D
NPL7 Massaras-Enhanced Fracture Entry Friction Anal.pdf	8D926ACB4D1AA6D8653A57745E3374A8B0BAB583E54B2F15C2AEFAAB3D1B8F02305CE3CEDA6D0089B9408C81028367DB818C8794B9B7CF4DBEE6B9BA23EC8D8C
NPL12 Mutalik-Case history of sequential and simulta.pdf	F73C3713747165E4073BE4A43EABF47C80658924C51C38C6EE8594ABB86C13A889934D36EE87805F0F38CCA6962B9B58F7DF1E1F526CE808D1B4CAA1033C049D
NPL13 Oberhofer-Application of Ball-Drop Technology.pdf	8E078A1F0CBB9DCC65EE1709B1F0B78EB1FCBDC36C1420F47E20471095B54EAF1114ADB54AE148F481BADA0A1EBA19433A70731B25D3A4C7B8E9F80E0DFC9D9F
NPL10 Montgomery-Hydraulic fracturing_ History of an.pdf	40688067FBAF6C34287B77DCCEFED3D692E15C0E82726881FB22E187AD2151F6243E7C7A3C42F9E2E402C1EC44D4341AEF97E0E4ADB060FB5284782144E3A1E2
NPL9 Mondal-Pressure transients in wellbores_ Water.pdf	B5741A448B29FAEB7AFCBB65123CA7EFE8BE619D64FE516A55FBA0BCF8812F66037918AD04FB8C55928BDA00956404BA2E9F705EE937BE43D1B0BA8D036E301B
NPL14 Paige-Field Application of Hydraulic Impedance.pdf	203AC7566649C60CF7C08E2E7AED0A03D2E8193D2A1C8B454CF0A792B13FC519DCDF156355CF73A9AD165E0B2E069B608CA216D3B759E9CA70E67704BB1C30BA
NPL16 Rassenfoss-A Look Into What Fractures Really L.pdf	1412022256CA9C845959A312E5400118A6D78689749310AEA0FABC0BEB0E20E86301CD25073615D40E2748E32600FA39D28FCCA91B3560F9EFD528FFADD62C86
NPL15 Pearson-Results of stress-oriented and aligned.pdf	9B8256F7CC3E90B1502C75B8E376446EC7A7F172DCA9D0AC8C64AA0B547ABF677C6CA5A433D25D02148F93787E1CBF92CD3F4EF4157B268B68DF617E0FEBD5A4
NPL19 Tolman-Method and Apparatus for Simultaneous.pdf	055977F1D5D213406B04358EC79D532FB8BDF1ADEE26DECD3A9905B904332B0DE413A025FFF9DFFC19C9B450F8EED4CAEB7DE8ADA89B8FF81844842F03A2C8B8
NPL23 34 - Motion to Dismiss First Amended Complaint.pdf	6E7BC9A697D96D73F9643DB75A4B98164DDC5916ABD3E2E6AA04939165A0FBE97D89C3B7802DEDD30F5C4BCCCA5CC2B68BA3BA1E7698346D55BA3D001286067C
NPL17 Roussel-Optimizing fracture spacing and sequen.pdf	EF89CF11391DBE8A31BAA15786DC4C0E6CF28D1BBDC32189B827B03116BE03F60E84228294A5CF122337D1C148F8631199839D4CC825017690F5DC1B5057178D
NPL20 TTU Research - Hydraulic Fracturing Symposium.pdf	94D1B45B56740B1DA01F60FEBC42BB919AA592B4FF708B164FEAD006242507238415 2C277FFDE9143731EC39E3BF36833E2A551D329C1923B6F79E607B60C081
NPL26 2023-11-22 IWS Initial Invalidity Contentions.pdf	255D5A2E48BD04B40A86E3530557FB747B7FF967C0275199ED478F16EB6C803B67D57793A7E3C74A0870C359882D8B876F5426AC3D1513843102585D3DE70736

NPL27 IWS Initial Invalidity Contentions - Appx A.pdf	7AC5C1E3119CA45D8FCE7D171F6E4FC5B92E497BA634BC9B246C4266BCC1D2740FAAC2F36659A25AAF500F875D1FFEFDD455D8078170FB73C2B8CBF5C89D7FB8
NPL28 IWS Initial Invalidity Contentions - Appx B.pdf	74D56812535F3387DBF34B48B4C3A7B3571FF17E1D4A53F75398F9E8DE7BE1376DA2444178C0537B5B41945B21F9F22BB3FF080CF56B0CA9C3630BDD95A6100A
NPL22 Webster-A Continuous Multistage Tracing Techni.pdf	CF55D57B1D1BC0EF25611F1FD8F7CDB4839B678B5139A920FAC9AE85D224954B4E43BB00FC93D78F86B614B362D7F029AFA043AB69E9A22555C7B7149AD06433
NPL21 Waters-Simultaneous hydraulic fracturing of ad.pdf	84C4A557CF30C39F0E7D0F60B4BFB6FBE78952D87817389DA2FDB3360CBB5831997ABD49B70F22761665F6FA83393CAD240896FFDA503F5A06160EDF4A3BD108
NPL29 2023-12-15 IWS Supp. Initial Invalidity Contentions.pdf	034541E16E4F52231A7D061EF89E828A6B028F11A526F685ECD2BF4629CF74E975D92575A7F04388080695735D9C9BE98D4BB51622924C84123EC9C8C95CBA99
NPL1 Burton Comparing Multistage Completions.pdf	7335271E4D8B4515050E221D73A957D58A2736821E31BEBF81F09DCC035C8D270F4B2375526FC6AE36BFBF28D8521EA5383E1A8A1D70547AC590D5918342A888
NPL2 Casero-2008-Continuous Pumping Multistage.pdf	571977D0CAFA15B0519EFBAF329B677250706BE2A7B290A8A7BCADB3E88C387579991D80FA7DEED9D964ABFE689A9227A547B16C3D2B6DE48A7ADBECE6F9571E
NPL18 Sundance Energy Saves USD 500000 on Fracs _ SLB.pdf	5BAD913341E3E845332277F78FCA1C807D02F3A7661A5EE758A6CD91593A1C018C480E6E4C55BA6197870D12446F12339292A2689F22394FE74B798C08A42AD0
NPL24 39 - Downings Response to IWSs MTD.pdf	6FD39A03F068627B8B4363978D23DE55DFBC500CB43154681755629D84DCC7BA5B42A6FD451A92AD1B2D02C7BE3DB139A8289AF4A6DF24E589D8ED3C4BE04E20
NPL25 40 - Defendants Reply in Support of Their Motion to Dismiss the First Amended Complaint.pdf	12137C5B02D9309BD37A08C8E1D56B4E52F2DEF1EC6DA93396408869DCC248087F8756C952CD83E386432F2A155983004CDA9E5FA16F372D8896204ECE5C7519

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 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

In re application of: Jordan Kuehn *et al.*	§	Group Art Unit: 3676
Application No.: 18/158,122	§	Examiner: Daniel P. Stephenson
Filing Date: January 23, 2023	§	Confirmation No.: 1469
For: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	§	Attorney Docket No.: 57959.12US03

RESPONSE AND SUBMISSION UNDER 37 CFR § 1.114

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

I. Introductory Comments

This document is submitted in response to the Notice of Allowance mailed November 9, 2023, and accompanies a Request for Continued Examination ("RCE").

Estimated fees, including fees for the RCE, have been provided for by credit card separately but concurrently herewith for consideration of this document. If any additional fees, including any extension-of-time fees, are necessary, the Commissioner is hereby authorized to charge such fees, including any extension-of-time fees, to Haynes and Boone, LLP's Deposit Account No. 08-1394.

Amendments to the Claims begin on page 2 of this document.

Remarks begin on page 28 of this document.

II. Amendments to the Claims

This listing of claims will replace all prior version(s), and listing(s), of claims in the application:

1. (Previously presented) A method of hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the method comprising:
communicating fluid to the first well via a manifold and a first valve, wherein the first valve is associated with both the first well and the manifold;
and
executing a continuous pumping ("CP") swap to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, the CP swap comprising:
opening a second valve while fluid is communicated to the first well via the first valve and the manifold,
wherein the second valve is associated with both the second well and the manifold,
wherein opening the second valve causes fluid to be communicated to the second well via the manifold and the second valve,
and
wherein the second valve is opened in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of the fluid communicated via the manifold;
and
closing the first valve, wherein the first valve is closed:
after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure,

of the at least a portion of the fluid communicated via the manifold,

after opening the second valve, and

while fluid is communicated to the second well via the second valve and the manifold;

wherein, during the CP swap, the fluid is continuously communicated via the manifold so that transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced.

2. (Original) The method of claim 1, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

3. (Previously presented) The method of claim 1, wherein the plurality of wells further comprises third and fourth wells, and the method further comprises:
communicating fluid to the third well via the manifold and a third valve,
wherein the third valve is associated with both the third well and the manifold;
wherein executing the CP swap further transitions from hydraulically fracturing the third well to hydraulically fracturing the fourth well, the CP swap further comprising:
opening a fourth valve while fluid is communicated to the third well via the third valve and the manifold,
wherein the fourth valve is associated with both the fourth well and the manifold,
wherein opening the fourth valve causes fluid to be communicated to the fourth well via the manifold and the fourth valve, and
wherein the fourth valve is opened in response to the at least a portion of the fluid communicated via the manifold satisfying the one or more conditions, which one or more conditions

include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold;

and

closing the third valve, wherein the third valve is closed:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold,

after opening the fourth valve, and

while fluid is communicated to the fourth well via the fourth valve and the manifold;

and

wherein, during the CP swap, the continuous communication of the fluid via the manifold reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the fourth well.

4. (Cancelled)

5. (Previously presented) The method of claim 1, further comprising:

determining that the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions.

6. (Previously presented) The method of claim 1, wherein the one or more conditions include the flow rate of the at least a portion of the fluid communicated via the manifold.

7. (Previously presented) The method of claim 6, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is below an upper threshold.

8. (Previously presented) A non-transitory computer readable medium having stored thereon computer-readable instructions executable by one or more processors to perform operations for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the operations comprising:

communicating fluid to the first well via a manifold and a first valve,

wherein the first valve is associated with both the first well and the manifold;

and

executing a continuous pumping ("CP") swap to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, the CP swap comprising:

opening a second valve while fluid is communicated to the first well via the first valve and the manifold,

wherein the second valve is associated with both the second well and the manifold,

wherein opening the second valve causes fluid to be communicated to the second well via the manifold and the second valve, and

wherein the second valve is opened in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of the fluid communicated via the manifold;

and

closing the first valve, wherein the first valve is closed:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold,

after opening the second valve, and

while fluid is communicated to the second well via the second valve and the manifold;

wherein, during the CP swap, the fluid is continuously communicated via the manifold so that transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced.

9. (Original) The non-transitory computer readable medium of claim 8, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

10. (Previously presented) The non-transitory computer readable medium of claim 8, wherein the plurality of wells further comprises third and fourth wells, and the operations further comprise:
communicating fluid to the third well via the manifold and a third valve,
wherein the third valve is associate with both the third well and the manifold;
wherein executing the CP swap further transitions from hydraulically fracturing the third well to hydraulically fracturing the fourth well, the CP swap further comprising:
opening a fourth valve while fluid is communicated to the third well via the third valve and the manifold,
wherein the fourth valve is associated with both the fourth well and the manifold,
wherein opening the fourth valve causes fluid to be communicated to the fourth well via the manifold and the fourth valve, and
wherein the fourth valve is opened in response to the at least a portion of the fluid communicated via the manifold satisfying the one or more conditions, which one or more conditions

include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold;

and

closing the third valve, wherein the third valve is closed:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid being communicated via the manifold,

after opening the fourth valve, and

while fluid is communicated to the fourth well via the fourth valve and the manifold;

and

wherein, during the CP swap, the continuous communication of the fluid via the manifold reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the fourth well.

11. (Cancelled)

12. (Previously presented) The non-transitory computer readable medium of claim 8, wherein the operations further comprise:

determining that the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions.

13. (Previously presented) The non-transitory computer readable medium of claim 8, wherein the one or more conditions include the flow rate of the at least a portion of the fluid communicated via the manifold.

14. (Previously presented) The non-transitory computer readable medium of claim 13, wherein the at least a portion of the fluid communicated via the manifold has

satisfied the one or more conditions when the flow rate is below an upper threshold.

15. (Previously presented) A system for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the system comprising:
a manifold;
a first valve via which fluid is adapted to be communicated from the manifold to the first well, the first valve being associated with both the first well and the manifold;
a second valve via which fluid is adapted to be communicated from the manifold to the second well, the second valve being associated with both the second well and the manifold; and
one or more controllers configured to execute a continuous pumping ("CP") swap, during which fluid is continuously communicated via the manifold, to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, by:
opening the second valve:
while fluid is communicated to the first well via the first valve and the manifold,
to cause fluid to be communicated to the second well via the manifold and the second valve, and
in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of the fluid communicated via the manifold;
and
closing the first valve:
after the at least a portion of the fluid communicated via the manifold has satisfied one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of

the at least a portion of the fluid communicated via the manifold,

after opening the second valve, and

while fluid is communicated to the second well via the second valve and the manifold;

wherein the continuous communication of the fluid via the manifold during the CP swap reduces transition time between hydraulically fracturing the first well and hydraulically fracturing the second well.

16. (Original) The system of claim 15, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

17. (Previously presented) The system of claim 15, wherein:
the plurality of wells further comprises third and fourth wells;
the system further comprises:
a third valve via which fluid is adapted to be communicated from the manifold to the third well, the third valve being associated with both the third well and the manifold; and
a fourth valve via which fluid is adapted to be communicated from the manifold to the fourth well, the fourth valve being associated with both the fourth well and the manifold;
and
the one or more controllers are further configured to execute the CP swap, during which fluid is continuously communicated via the manifold, to transition from hydraulically fracturing the third well to hydraulically fracturing the fourth well, by:
opening the fourth valve:
while fluid is communicated to the third well via the third valve and the manifold,

to cause fluid to be communicated to the fourth well via the manifold and the fourth valve, and

in response to the at least a portion of the fluid communicated via the manifold satisfying the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold;

and

closing the third valve:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold,

after opening the fourth valve, and

while fluid is communicated to the fourth well via the fourth valve and the manifold;

wherein the continuous communication of the fluid via the manifold during the CP swap reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the fourth well.

18. (Cancelled)

19. (Previously presented) The system of claim 15, wherein the one or more controllers are further configured to:

determine that the at least a portion of the communicated via the manifold has satisfied the one or more conditions.

20. (Previously presented) The system of claim 15, wherein the one or more conditions include the flow rate of the at least a portion of the fluid communicated via the manifold.

21. (Previously presented) The system of claim 20, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is below an upper threshold.

22. (Previously presented) The method of claim 6, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is above a lower threshold.

23. (Previously presented) The method of claim 6, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is both below an upper threshold and above a lower threshold.

24. (Previously presented) The method of claim 1, wherein the one or more conditions include the pressure of the at least a portion of the fluid communicated via the manifold.

25. (Previously presented) The method of claim 24, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is below an upper threshold.

26. (Previously presented) The method of claim 24, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is above a lower threshold.

27. (Previously presented) The method of claim 24, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions

when the pressure is both below an upper threshold and above a lower threshold.

28. (Previously presented) The method of claim 1, wherein the plurality of wells further comprises a third well, and the method further comprises:

communicating fluid to the third well via the manifold and a third valve,

wherein the third valve is associated with both the third well and the manifold;

and

executing another CP swap to transition from hydraulically fracturing the third well to hydraulically fracturing the first well, the another CP swap comprising:

opening the first valve while fluid is communicated to the third well via the third valve and the manifold,

wherein opening the first valve causes fluid to be communicated to the first well via the manifold and the first valve, and

wherein the first valve is opened in response to at least another portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least another portion of the fluid communicated via the manifold; and

closing the third valve, wherein the third valve is closed:

after the at least another portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least another portion of the fluid communicated via the manifold,

after opening the first valve, and

while fluid is communicated to the first well via the first valve and the manifold;

wherein, during the another CP swap, the fluid is continuously communicated via the manifold so that transition time, between hydraulically fracturing the third well and hydraulically fracturing the first well, is reduced.

29. (Previously presented) The method of claim 1, further comprising:
hydraulically fracturing the first well; and
hydraulically fracturing the second well;
wherein the fluid, which is continuously communicated via the manifold so that the transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced, is hydraulic fracturing fluid.

30. (Previously presented) The method of claim 29, wherein the hydraulic fracturing fluid comprises sand.

31. (Previously presented) The non-transitory computer readable medium of claim 13, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is above a lower threshold.

32. (Previously presented) The non-transitory computer readable medium of claim 13, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is both below an upper threshold and above a lower threshold.

33. (Previously presented) The non-transitory computer readable medium of claim 8, wherein the one or more conditions include the pressure of the at least a portion of the fluid communicated via the manifold.

34. (Previously presented) The non-transitory computer readable medium of claim 33, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is below an upper threshold.

35. (Previously presented) The non-transitory computer readable medium of claim 33, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is above a lower threshold.

36. (Previously presented) The non-transitory computer readable medium of claim 33, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is both below an upper threshold and above a lower threshold.

37. (Previously presented) The non-transitory computer readable medium of claim 8, wherein the plurality of wells further comprises a third well, and the operations further comprise:

communicating fluid to the third well via the manifold and a third valve,

wherein the third valve is associated with both the third well and the manifold;

and

executing another CP swap to transition from hydraulically fracturing the third well to hydraulically fracturing the first well, the another CP swap comprising:

opening the first valve while fluid is communicated to the third well via the third valve and the manifold,

wherein opening the first valve causes fluid to be communicated to the first well via the manifold and the first valve, and

wherein the first valve is opened in response to at least another portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least another portion of the fluid communicated via the manifold; and

closing the third valve, wherein the third valve is closed:

after the at least another portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least another portion of the fluid communicated via the manifold,

after opening the first valve, and

while fluid is communicated to the first well via the first valve and the manifold;

wherein, during the another CP swap, the fluid is continuously communicated via the manifold so that transition time, between hydraulically fracturing the third well and hydraulically fracturing the first well, is reduced.

38. (Previously presented) The non-transitory computer readable medium of claim 8, wherein the operations further comprise:

hydraulically fracturing the first well; and

hydraulically fracturing the second well;

and

wherein the fluid, which is continuously communicated via the manifold so that the transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced, is hydraulic fracturing fluid.

39. (Previously presented) The non-transitory computer readable medium of claim 38, wherein the hydraulic fracturing fluid comprises sand.

40. (Previously presented) The system of claim 20, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is above a lower threshold.

41. (Previously presented) The system of claim 20, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is both below an upper threshold and above a lower threshold.

42. (Previously presented) The system of claim 15, wherein the one or more conditions include the pressure of the at least a portion of the fluid communicated via the manifold.

43. (Previously presented) The system of claim 42, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is below an upper threshold.

44. (Previously presented) The system of claim 42, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is above a lower threshold.

45. (Previously presented) The system of claim 42, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is both below an upper threshold and above a lower threshold.

46. (Previously presented) The system of claim 15, wherein:
the plurality of wells further comprises a third well;
the system further comprises a third valve via which fluid is adapted to be communicated from the manifold to the third well, the third valve being associated with both the third well and the manifold;

the one or more controllers are further configured to execute another CP swap, during which fluid is continuously communicated via the manifold, to transition from hydraulically fracturing the third well to hydraulically fracturing the first well, by:

opening the first valve:

while fluid is communicated to the third well via the third valve and the manifold,

to cause fluid to be communicated to the first well via the manifold and the first valve, and

in response to at least another portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least another portion of the fluid communicated via the manifold; and

closing the second valve:

after the at least another portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least another portion of the fluid communicated via the manifold,

after opening the first valve, and

while fluid is communicated to the first well via the first valve and the manifold;

wherein the continuous communication of the fluid via the manifold during the another CP swap reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the first well.

47. (Previously presented) The system of claim 15, wherein the fluid, which is continuously communicated via the manifold so that the transition time, between

hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced, is hydraulic fracturing fluid.

48. (Previously presented) The system of claim 47, wherein the hydraulic fracturing fluid comprises sand.

49. (New) The method of claim 1, further comprising:
displaying a dashboard, which dashboard comprises:
a visual reference of the first valve; and
a visual reference of the second valve;
wherein the display of the dashboard visually communicates respective states of the first and second valves.

50. (New) The method of claim 49, wherein the dashboard further comprises:
a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that the state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve.

51. (New) The method of claim 50, wherein the dashboard further comprises:
a visual reference of a first wellhead in communication with the first well.

52. (New) The method of claim 50, wherein the dashboard further comprises:
a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that the state of the second valve is closed.

53. (New) The non-transitory computer readable medium of claim 8, wherein the operations further comprise:
displaying a dashboard, which dashboard comprises:

a visual reference of the first valve; and

a visual reference of the second valve;

and

wherein the display of the dashboard visually communicates respective states of the first and second valves.

54. (New) The non-transitory computer readable medium of claim 53, wherein the dashboard further comprises:

a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that the state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve.

55. (New) The non-transitory computer readable medium of claim 54, wherein the dashboard further comprises:

a visual reference of a first wellhead in communication with the first well.

56. (New) The non-transitory computer readable medium of claim 54, wherein the dashboard further comprises:

a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that the state of the second valve is closed.

57. (New) The system of claim 15, further comprising:

a dashboard adapted to be displayed, which dashboard comprises:

a visual reference of the first valve; and

a visual reference of the second valve;

wherein the display of the dashboard visually communicates respective states of the first and second valves.

58. (New) The system of claim 57, wherein the dashboard further comprises:
a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that the state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve.

59. (New) The system of claim 58, wherein the dashboard further comprises:
a visual reference of a first wellhead in communication with the first well.

60. (New) The system of claim 58, wherein the dashboard further comprises:
a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that the state of the second valve is closed.

61. (New) A method of hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the method comprising:
communicating fluid to the first well via a manifold and a first valve, wherein the first valve is associated with both the first well and the manifold;
displaying a dashboard, which dashboard comprises:
a visual reference of the first valve;
a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that a state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve;
a visual reference of a second valve, wherein the second valve is associated with both the second well and the manifold; and
a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that a state of the second valve is closed;

and

executing a continuous pumping ("CP") swap to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, the CP swap comprising:

opening the second valve while fluid is communicated to the first well via the first valve and the manifold,

wherein opening the second valve causes fluid to be communicated to the second well via the manifold and the second valve, and

wherein the second valve is opened in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions;

and

closing the first valve, wherein the first valve is closed:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, and

after opening the second valve;

wherein the display of the dashboard visually communicates the respective states of the first and second valves; and

wherein fluid is continuously communicated via the manifold during the CP swap to reduce transition time between hydraulically fracturing the first well and hydraulically fracturing the second well.

62. (New) The method of claim 61, wherein the dashboard further comprises a visual reference of a first wellhead in communication with the first well.

63. (New) The method of claim 61, further comprising:

determining that the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions.

64. (New) The method of claim 61, wherein the one or more conditions include a flow rate condition of the at least a portion of the fluid communicated via the manifold.

65. (New) The method of claim 61, wherein the one or more conditions include a pressure condition of the at least a portion of the fluid communicated via the manifold.

66. (New) The method of claim 61, further comprising:
hydraulically fracturing the first well; and
hydraulically fracturing the second well;
wherein the fluid, which is continuously communicated via the manifold to reduce the transition time between hydraulically fracturing the first well and hydraulically fracturing the second well, is hydraulic fracturing fluid.

67. (New) The method of claim 66, wherein the hydraulic fracturing fluid comprises sand.

68. (New) A non-transitory computer readable medium of hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the method comprising:
communicating fluid to the first well via a manifold and a first valve, wherein the first valve is associated with both the first well and the manifold;
displaying a dashboard, which dashboard comprises:
a visual reference of the first valve;
a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that a state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve;
a visual reference of a second valve, wherein the second valve is associated with both the second well and the manifold; and

a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that a state of the second valve is closed;

and

executing a continuous pumping ("CP") swap to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, the CP swap comprising:

opening the second valve while fluid is communicated to the first well via the first valve and the manifold,

wherein opening the second valve causes fluid to be communicated to the second well via the manifold and the second valve, and

wherein the second valve is opened in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions;

and

closing the first valve, wherein the first valve is closed:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions; and

after opening the second valve;

wherein the display of the dashboard visually communicates the respective states of the first and second valves; and

wherein fluid is continuously communicated via the manifold during the CP swap to reduce transition time between hydraulically fracturing the first well and hydraulically fracturing the second well.

69. (New) The non-transitory computer readable medium of claim 68, wherein the dashboard further comprises a visual reference of a first wellhead in communication with the first well.

70. (New) The non-transitory computer readable medium of claim 68, further comprising:
determining that the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions.

71. (New) The non-transitory computer readable medium of claim 68, wherein the one or more conditions include a flow rate condition of the at least a portion of the fluid communicated via the manifold.

72. (New) The non-transitory computer readable medium of claim 68, wherein the one or more conditions include a pressure condition of the at least a portion of the fluid communicated via the manifold.

73. (New) The non-transitory computer readable medium of claim 68, further comprising:
hydraulically fracturing the first well; and
hydraulically fracturing the second well;
wherein the fluid, which is continuously communicated via the manifold to reduce the transition time between hydraulically fracturing the first well and hydraulically fracturing the second well, is hydraulic fracturing fluid.

74. (New) The non-transitory computer readable medium of claim 73, wherein the hydraulic fracturing fluid comprises sand.

75. (New) A system for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the system comprising:
a manifold;
a first valve via which fluid is adapted to be communicated from the manifold to the first well, the first valve being associated with both the first well and the manifold;

a second valve via which fluid is adapted to be communicated from the manifold to the second well, the second valve being associated with both the second well and the manifold;

a dashboard adapted to be displayed, which dashboard comprises:

a visual reference of the first valve;

a first visual indicator associated with the visual reference of the first valve, the first visual indicator indicating that a state of the first valve is open to permit communicating fluid to the first well via the manifold and the first valve;

a visual reference of the second valve; and

a second visual indicator associated with the visual reference of the second valve, the second visual indicator being different from the first visual indicator to indicate that a state of the second valve is closed;

and

one or more controllers configured to execute a continuous pumping ("CP") swap, during which fluid is continuously communicated via the manifold, to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, by:

opening the second valve:

while fluid is communicated to the first well via the first valve and the manifold,

in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions, and

to cause fluid to be communicated to the second well via the manifold and the second valve;

and

closing the first valve:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, and

after opening the second valve;

wherein the display of the dashboard visually communicates the respective states of the first and second valves; and

wherein the continuous communication of fluid via the manifold during the CP swap reduces transition time between hydraulically fracturing the first well and hydraulically fracturing the second well.

76. (New) The system of claim 75, wherein the dashboard further comprises a visual reference of a first wellhead in communication with the first well.

77. (New) The system of claim 75, wherein the one or more controllers are further configured to:

determine that the at least a portion of the communicated via the manifold has satisfied the one or more conditions.

78. (New) The system of claim 75, wherein the one or more conditions include a flow rate condition of the at least a portion of the fluid communicated via the manifold.

79. (New) The system of claim 75, wherein the one or more conditions include a pressure condition of the at least a portion of the fluid communicated via the manifold.

80. (New) The system of claim 75, wherein the fluid, which is continuously communicated via the manifold to reduce the transition time between hydraulically fracturing the first well and hydraulically fracturing the second well, is hydraulic fracturing fluid.

81. (New) The system of claim 80, wherein the hydraulic fracturing fluid comprises sand.

III. Remarks

Claims 1-3, 5-10, 12-17, and 19-48 were previously pending.

Claims 1-3, 5-10, 12-17, and 19-48 have been maintained in their original or previously-presented form.

Claims 49-81 have been added.

As a result, claims 1-3, 5-10, 12-17, and 19-81 are pending.

No new subject matter has been added, as support for the new claims can be found throughout the present application as filed, including at least on page 21 in the Appendix of U.S. Patent Application No. 63/189,663, to which the present application claims priority, and which was incorporated by reference in its entirety into the present application as filed.

In view of the foregoing amendments and remarks, favorable consideration of this application is respectfully requested.

The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,

/Zachary A. Halbur/

Zachary A. Halbur
Registration No. 68,500

Date: February 8, 2024
HAYNES AND BOONE, LLP
Customer No. 27683
2801 N. Harwood St., Suite 2300
Dallas, TX 75201
Telephone: 817-347-6678
IP Facsimile: 214-200-0853

Attachments:

- Request for Continued Examination ("RCE")
- Information Disclosure Statement ("IDS")

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 18/158,122	Filing Date 01/23/2023	☐ 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 $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $ 192 =	
☐ 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	02/08/2024	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 78	Minus	** 45	= 33		x $40 =	1320
	Independent (37 CFR 1.16(h))	* 6	Minus	*** 3	= 3		x $ 192 =	576
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	1896

		(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.	PSA
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/VENESSA JONES/
*** 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.

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

27683 7590 11/09/2023

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

EXAMINER	
STEPHENSON, DANIEL P	
ART UNIT	PAPER NUMBER
3676	

DATE MAILED: 11/09/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

TITLE OF INVENTION: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	02/09/2024

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 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted 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. 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.

PTOL-85 (Rev. 02/11)

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 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. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

27683 7590 11/09/2023

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

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.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

TITLE OF INVENTION: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	02/09/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
STEPHENSON, DANIEL P	3676	166-373000

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/AIA/122 or PTO/SB/122) attached.

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

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

1_____
2_____
3_____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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)

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

❑ Electronic Payment via Patent Center or 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

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.

❑ Applicant asserting small entity status. See 37 CFR 1.27

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.

❑ Applicant changing to regular undiscounted fee 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. _____

IWS EXHIBIT 1003 EX_1003_225

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.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

27683 7590 11/09/2023

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201

EXAMINER	
STEPHENSON, DANIEL P	
ART UNIT	PAPER NUMBER
3676	

DATE MAILED: 11/09/2023

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.** 18/158,122	**Applicant(s)** Kuehn et al.	
	Examiner DANIEL P STEPHENSON	**Art Unit** 3676	**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 10/18/23.
   ☐ 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 See Continuation Sheet . 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 _____.

/DANIEL P STEPHENSON/
Primary Examiner, Art Unit 3676

Continuation of 3. The allowed claim(s) is/are: 1-3,5-10,12-17 and 19-48

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.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance: the closest prior art of record is Kajaria (US 20170275980).

3. Kajaria discloses a method opening a second valve associated with the second well to permit pumping of fluid into the second well via the second valve (opening valve 66 of second well 14); and opening a first valve (opening valve of first well 14) associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well.

4. The prior art of record fails to disclose, alone or in combination, the key features of "opening the second valve causes fluid to be communicated to the second well via the manifold and the second valve, and wherein the second valve is opened in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of the fluid communicated via the manifold" and "during the CP swap, the fluid is continuously communicated via the manifold so that transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced" in combination with the other limitations currently presented in the combination of claim 1, 8 and 15.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL P STEPHENSON whose telephone number is (571)272-7035. The examiner can normally be reached M-F 10am-6pm.

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, Tara Schimpf can be reached on 571-270-7741. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DANIEL P STEPHENSON/
Primary Examiner, Art Unit 3676

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	Art Unit
	DANIEL P STEPHENSON	3676

CPC - Searched*		
Symbol	**Date**	**Examiner**
E21B33/068, E21B34/02, E21B41/00, E21B43/11, E21B43/26, E21B43/2607, F16K3/36, F16N11/00, F16N2210/00, F16N2210/02, F16N29/02, F16N39/00, F16N7/38, F16N7/40	10/07/2022	DPS
updated	11/19/2022	DPS
updated, E21B17/006	05/27/2023	DPS
updated	07/14/2023	DPS
updated	11/04/2023	DPS

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**
SEARCH text, Inventor name, Forward/Backward search	10/07/2022	DPS

IWS EXHIBIT 1003 EX_1003_232

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	Art Unit
	DANIEL P STEPHENSON	3676

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
see history		10/07/2022	DPS
updated		11/04/2023	DPS

IWS EXHIBIT 1003 EX_1003_233

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

CPC						
Symbol					**Type**	**Version**
E21B	/	34	/	02	F	2013-01-01
E21B	/	41	/	00	I	2013-01-01
E21B	/	43	/	2607	I	2020-05-01
E21B	/	33	/	068	I	2013-01-01
F16N	/	11	/	00	I	2013-01-01
F16N	/	29	/	02	I	2013-01-01
F16K	/	3	/	36	I	2013-01-01
E21B	/	43	/	11	I	2013-01-01
E21B	/	17	/	006	I	2013-01-01
E21B	/	43	/	26	I	2013-01-01
F16N	/	2210	/	00	A	2013-01-01

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	45	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	04 November 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20231104

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

INTERNATIONAL CLASSIFICATION				
CLAIMED				
E21B	/	43	/	26
E21B	/	33	/	068
E21B	/	34	/	02
E21B	/	41	/	00
E21B	/	43	/	11
F16K	/	3	/	36
F16N	/	11	/	00
F16N	/	29	/	02

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	45	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	04 November 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20231104

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

☐ 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	1	18	10	34	19	13	28	28	37	43	46				
2	2		11	35	20	14	29	29	38	44	47				
3	3	19	12	36	21	15	30	30	39	45	48				
	4	20	13	7	22	22	31	37	40						
4	5	21	14	8	23	23	32	38	41						
5	6	31	15	9	24	24	33	39	42						
6	7	32	16	10	25	25	34	40	43						
16	8	33	17	11	26	26	35	41	44						
17	9		18	12	27	27	36	42	45						

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	45	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	04 November 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20231104

Bibliographic Data

Application No: 18/158,122

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /DANIEL P STEPHENSON/ Examiner's Signature | Initials

Title: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/23/2023	166	3676	57959.12US03
RULE			

APPLICANTS

Downing Wellhead Equipment, LLC, Oklahoma City, OK, UNITED STATES

INVENTORS

Jordan Kuehn, Forest Park, IL, UNITED STATES

Austin Johnson, Edmond, OK, UNITED STATES

Ronnie B. Beason, Lexington, OK, UNITED STATES

Nicholas J. Cannon, Washington, OK, UNITED STATES

CONTINUING DATA

This application is a CON of 17878493 08/01/2022 PAT 11560770

17878493 is a CON of 17388716 07/29/2021 PAT 11401779

17388716 has PRO of 63189663 05/17/2021

17388716 is a CIP of 17319854 05/13/2021

17319854 is a CIP of 16855749 04/22/2020 PAT 11480027

16855749 is a CIP of 16803156 02/27/2020 PAT 11242724

16803156 is a CIP of 16436623 06/10/2019 PAT 11208856

16855749 has PRO of 62836761 04/22/2019

16803156 is a CIP of 16248633 01/15/2019 PAT 10584552

16855749 is a CIP of 16248648 01/15/2019 PAT 10724682

16436623 has PRO of 62755170 11/02/2018

16803156 is a CIP of 16100741 08/10/2018 PAT 10689938

16100741 has PRO of 62638688 03/05/2018

16100741 has PRO of 62638681 03/05/2018

16100741 has PRO of 62637220 03/01/2018

16100741 has PRO of 62637215 03/01/2018

16248633 has PRO of 62617438 01/15/2018

16248648 has PRO of 62617443 01/15/2018

16100741 has PRO of 62598914 12/14/2017

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/13/2023

**** SMALL ENTITY ****

STATE OR COUNTRY

UNITED STATES

ADDRESS

Haynes and Boone, LLP
IP Section
2801 N. Harwood St.
Suite 2300
Dallas, TX 75201
UNITED STATES

FILING FEE RECEIVED

$704

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	18158122
Filing Date	2023-01-23
First Named Inventor	Jordan Kuehn
Art Unit	3676
Examiner Name	Daniel P. Stephenson
Attorney Docket Number	57959.12US03

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

U.S.PATENT APPLICATION PUBLICATIONS Remove

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	20220268141	A1	2022-08-25	Krupa et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

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]
	1	2020145978	WO	A1	2020-07-16	Halliburton Energy Services, Inc.		☐
	2							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

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		☐

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

EXAMINER SIGNATURE

Examiner Signature	/DANIEL P STEPHENSON/	Date Considered	11/04/2023

*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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

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	/Zachary A. Halbur/	Date (YYYY-MM-DD)	2023-10-18
Name/Print	Zachary A. Halbur	Registration Number	68,500

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.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

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).

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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /DPS/

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	42	(Artificial Intelligence) Similar to: 17/878,493 with 0 CPC Selections and 0 Text Selections Text: (US-20210355784-A1 OR US-20210324706-A1 OR US-20210262315-A1 OR US-11401779-B2 OR US-20210332665-A1 OR US-20200248529-A1 OR US-20190360637-A1 OR US-20190360636-A1 OR CA-3055026-A1 OR US-20170336022-A1 OR US-20220290547-A1 OR CA-3158915-A1 OR US-20200347990-A1 OR CA-3080175-A1 OR US-9447659-B2 OR WO-2020142638-A1 OR CA-3125461-A1 OR US-20210301638-A1 OR CA-2855789-C OR CA-2855789-A1 OR US-20160003006-A1 OR US-9869426-B2 OR US-20170002977-A1 OR US-20200332954-A1 OR US-11137109-B2 OR US-20210301933-A1 OR AU-2018439421-A2 OR JP-7094523-B2 OR JP-WO2020044514-A1 OR WO-2020044514-A1 OR AU-2018439421-A1 OR CN-112567159-A OR GB-2206912-A OR US-4377206-A OR WO-2013059251-A1 OR WO-2020219573-A1 OR CA-3137729-A1 OR US-11193349-B1 OR US-20130092395-A1 OR US-11255446-B1 OR US-20210054839-A1 OR GB-2579734-A8 OR US-4109713-A OR US-10100978-B2 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	OR	ON	ON	2022/10/07 10:02 AM

		US-20180328536-A1 OR US-11047189-B2 OR US-11125385-B2 OR SG-191515-A1 OR US-20210381640-A1 OR GB-2579734-A).did.					
L2	1	("11401779").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:05 AM
L3	93858	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/07 10:06 AM
L4	1	("20170275980").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 05:48 PM
L5	0	("11480028").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 06:04 PM
L6	4	("20140352968" | "20170123437" | "20170275980" | "20180179848").pn. OR ("11401779").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 06:37 PM
L7	4	beason.in. AND manifold.clm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 07:35 PM
L8	11	("2017/0275980").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 09:58 PM
L9	10	8 AND manifold	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2022/10/07 09:59 PM

			IBM_TDB)				
L10	3418	(manifold AND valve AND (second secondary) AND fluid AND clos$3) AND 3	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/07 10:15 PM
L11	95927	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/18 04:08 PM
L12	433	11 AND (@pd>"20221007")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/18 04:08 PM
L13	1	("20230160278").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/05/27 07:38 PM
L14	95455	(E21B17/006 OR E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2023/05/27 07:40 PM

		E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N29/02).cpc.	EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L15	105016	14 3	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/27 07:41 PM
L16	2293	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/27 07:42 PM
L17	1	("11560770").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/05/27 10:00 PM
L18	359	15 AND (@pd>"20230527")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK,	OR	ON	ON	2023/07/13 12:24 PM

			TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L23	2	("20220268141").pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/11/04 03:28 AM
L24	2170	15 AND (@pd>"20230527")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/11/04 04:35 AM
L25	1562	15 AND (@pd>"20230714")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/11/04 04:35 AM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp

IWS EXHIBIT 1003 EX_1003_247

N1	5570	(manifold AND valve AND (second secondary) AND fluid AND clos$3) .clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:33 PM
N2	675	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:34 PM
N3	675	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm. AND "3"	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:39 PM
N4	17108	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:40 PM
N5	16	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:40 PM
N6	18	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 04:38 PM
N7	18	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/13 12:24 PM
N8	20	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2023/11/04 04:35 AM

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	**10/18/2023 11:36:27 AM ET**	**57959.12US03**

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Q Dismuke
PATENT CENTER #	63021887	FILING DATE	01/23/2023
CUSTOMER #	27683	FIRST NAMED INVENTOR	Jordan Kuehn
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Zachary Halbur

Documents

TOTAL DOCUMENTS: 6

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
57959.12US03 After-Allowance Amendment for Submission with RCE.pdf		19	-	78 KB
57959.12US03 After-Allowance Amendment for Submission with RCE-AMSB.pdf	(1-1)	1	Amendment Submitted/Entered with Filing of Continued Prosecution Application (CPA)/Request for Continued Examination(RCE)	17 KB
57959.12US03 After-Allowance Amendment for Submission with RCE-CLM.pdf	(2-18)	17	Claims	65 KB

57959.12US03 After-Allowance Amendment for Submission with RCE-REM.pdf	(19-19)	1	Applicant Arguments/Remarks Made in an Amendment	16 KB
57959.12US03 Information Disclosure Statement.pdf		4	Information Disclosure Statement (IDS) Form (SB08)	598 KB
57959.12US03 IDS C1.pdf		23	Foreign Reference	945 KB
57959.12US03 Request for Continued Examination Transmittal.pdf		3	Request for Continued Examination (RCE)	1628 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
57959.12US03 After-Allowance Amendment for Submission with RCE.pdf	8BFB6C59B7EBCCB93FF067594EEE77D27446E45245545D6A31D5A5E9C074AAC1348B2F07F56CD032619EF9D2CE402C10F17A2C359975F555F1CE65EC549144CC
57959.12US03 After-Allowance Amendment for Submission with RCE-AMSB.pdf	EF2DE7FA681E50EA33E401C0166810477869E7C63AC6E3188E85BEF7751BD9B818C6195A108DE7A8562199C64C119CF3C2DE30A9934CAF4999DDDD785DC0E0C3
57959.12US03 After-Allowance Amendment for Submission with RCE-CLM.pdf	E46EFDE23B2A296F3665880D213E7DD6D4550012C548EA9F1394CD6EEB0CCF0BD3BBA640CED5FFFEE6EB03819517A1C9C4BFC02C55FB0D6E74112128CCC48752
57959.12US03 After-Allowance Amendment for Submission with RCE-REM.pdf	D79015696C4D1D9148AA1A31CE8CECC4C8223D8DDA5AA39DA708F41AB3ABA4A03A59A5009430ACE6A4CF4DA124F386D2E53F9CF98F4968E1E4424E83FA1FA42A
57959.12US03 Information Disclosure Statement.pdf	9C922ACC830D357E69D4A08A3E6E8506A1A84E04D900CF2C32D4B1C8806043668A69936CCB84047D0F8152E1FB7744B3813272A7C10297E08B37EEB8946EE43D

57959.12US03 IDS C1.pdf	1F434BCE7E9CF1B5D4C5C70CE0B9604D274198083B09BDB65AA5EA31119C1357A05CB700591A4BEA94A3FB47426FE83E218E2CF8F8FC8DFFEADF7EF19DC31C41
57959.12US03 Request for Continued Examination Transmittal.pdf	C32FBFC46B410CCFA4371AF9F19AB0373B0C3BAAD9D6313EF4F91814CCDE185DC070BE4F5D60B77D16337BDA734E2F325E801B5677E05DD52201429140D5710C

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 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.

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. 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.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	18158122	Filing Date	2023-01-23	Docket Number (if applicable)	57959.12US03	Art Unit	3676
First Named Inventor	Jordan Kuehn			Examiner Name	Daniel P. Stephenson		

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 _____

☒ Enclosed

- ☒ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

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 081394

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. 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.

Signature of Registered U.S. Patent Practitioner			
Signature	/Zachary A. Halbur/	Date (YYYY-MM-DD)	2023-10-18
Name	Zachary A. Halbur	Registration Number	68,500

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.

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.

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.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 July 2020 (16.07.2020)

WIPO | PCT

(10) International Publication Number
WO 2020/145978 A1

(51) International Patent Classification:
E21B 43/26 (2006.01) *E21B 34/00* (2006.01)
E21B 43/17 (2006.01)

(21) International Application Number:
PCT/US2019/013063

(22) International Filing Date:
10 January 2019 (10.01.2019)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **HALLIBURTON ENERGY SERVICES, INC.** [US/US]; 3000 N. Sam Houston Pkwy E., Houston, TX 77032-3219 (US).

(72) Inventors: **BEUTERBAUGH, Aaron, Michael**; 17415 Spicewood Springs Ln, Spring, TX 77379 (US). **NGUYEN, Philip, D.**; 13419 Piney View Lane, Houston, TX 77044 (US). **STEPHENSON, Stanley, V.**; 920 E. Osage Rd., Duncan, OK 73533 (US). **SMITH, Jonathan**; 20518 Chapel Glen Ct., Katy, TX 77450 (US).

(74) Agent: **HILTON, Robert** et al.; Mcguirewood LLP, 1750 Tysons Blvd., Suite 1800, Tysons Corner, VA 22102 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,

(54) Title: SIMULFRAC PULSED TREATMENT

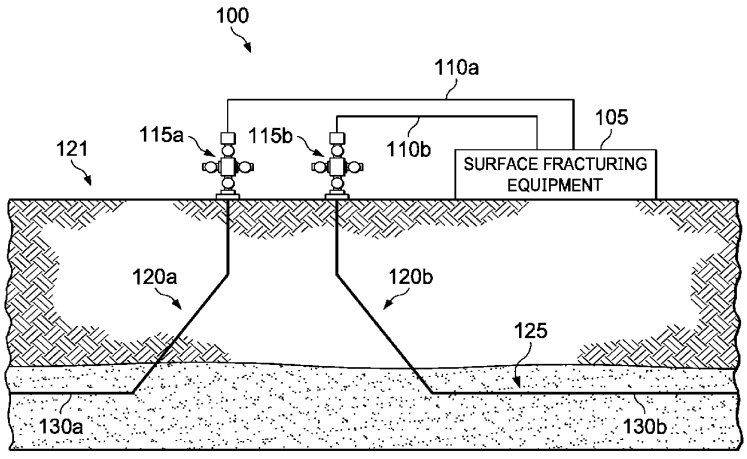


FIG. 1

(57) Abstract: A method and system pulse for treating a plurality of wells simultaneously includes applying a high pressure of fracturing fluid to one or more switching valves and repeatedly opening and closing the one or more switching valves to divert the fracturing fluid near instantaneously from one well to the other well to creating a pulse wave into the plurality of wells for fracturing subterranean formations. The one or more switching valves may be a single 3-way valve incorporating the function of two or more switching valves. This technique reduces wear of surface equipment including high pressure pumps that need only provide a constant pressure.

[Continued on next page]

WO 2020/145978 A1

TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:
— *of inventorship (Rule 4.17(iv))*

Published:
— *with international search report (Art. 21(3))*

SIMULFRAC PULSED TREATMENT

BACKGROUND

[0001] The present disclosure relates generally to pulsed fractured treatment of subterranean formations of wells, among other features.

[0002] Oil and natural gas are generally extracted from fissures or other activities created in subterranean strata. To improve extraction of these resources, a well may be subjected to a fracturing process that promotes creation of fractures in a rock formation.

[0003] Pulse fracturing is often used to create or enhance fractures in a rock formation, but one drawback is the increased strain on surface equipment such as hydraulic high pressure pumps, along with associated gear boxes and diesel engines. Traditional pulse fracturing often leads to increased rate of equipment failure due to the pulsing nature of the fracturing process.

[0004] By reducing the amount of strain on the surface equipment, more effective use of the surface equipment such as, for example, the high pressure pumps, blender, manifolds and valves can be achieved, along with lowering the rate of equipment failure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Illustrative embodiments of the present disclosure are described in detail below with reference to the attached drawings, which are incorporated by reference herein, and wherein:

[0006] FIG. 1 is a generalized schematic view of a plurality of wells in a subterranean formation along with an example system of associated wellheads and surface fracturing equipment, according to principles of the disclosure;

[0007] FIG. 2 is a schematic view of an embodiment of certain surface fracturing equipment, according to principles of the disclosure;

[0008] FIG. 3A-3C are examples of valves of Fig. 2 in different stages of opening and closing, according to principles of the disclosure;

[0009] FIG. 4 is an illustration of a multi-way valve, according to principles of the disclosure;

[0010] FIG. 5 is a flow diagram of steps of performing a pulsed treatment of a plurality of wells, according to principles of the disclosure.

[0011] The illustrated figures are only exemplary and are not intended to assert or imply any limitation with regard to the environment, architecture, design, or process in which different embodiments may be implemented.

DETAILED DESCRIPTION

[0012] In the following detailed description of the illustrative embodiments, reference is made to the accompanying drawings that form a part hereof. These embodiments are described in sufficient detail to enable those skilled in the art to practice the disclosed subject matter, and it is understood that other embodiments may be utilized and that logical structural, mechanical, electrical, and chemical changes may be made without departing from the spirit or scope of the disclosure. To avoid detail not necessary to enable those skilled in the art to practice the embodiments described herein, the description may omit certain information known to those skilled in the art. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the illustrative embodiments is defined only by the appended claims.

[0013] As used herein, the singular forms “a”, “an,” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms “comprise” and/or “comprising,” when used in this specification and/or the claims, specify the presence of stated features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. In addition, the steps and components described in the above embodiments and figures are merely illustrative and do not imply that any particular step or component is a requirement of a claimed embodiment.

[0014] Unless otherwise specified, any use of any form of the terms "connect," "engage," "couple," "attach," or any other term describing an interaction between elements is not meant to limit the interaction to direct interaction between the elements and may also include indirect interaction between the elements described. In the following discussion and in the claims, the terms "including" and "comprising" are used in an open-ended fashion, and thus should be interpreted to mean "including, but not limited to." “Downhole” refers to a direction towards the end or bottom of a well. “Downstream” generally refers to a direction generally towards a wellhead, or towards the end or bottom of a well. The terms “about” or “substantially” refers to within +/- 10%, unless context indicates otherwise.

[0015] The present disclosure relates generally to pulsed fractured treatment of subterranean formations of a plurality of wells. More particularly, the present disclosure relates generally to simultaneous pulsed fractured treatment of a plurality of wells in subterranean formations to reduce wear and equipment failure due to increased or decreased pulsing pumping strain typically associated with traditional fracturing techniques. The system and method herein provides for near instantaneous switching of a single-mode high pressure fracturing fluid to allow two or more wells to be pulsed simultaneously by a single source of high pressure fracturing fluid. The high pressure fracturing fluid is pulsed by using one or more high pressure valves to alternate fluidic flow between two or more wells. This intermittent flow, i.e., pulsed flow, is isolated in an alternating fashion solely to a single well among a plurality of wells, thus leading to increased efficiency in surface equipment and reducing equipment wear. The alternating operation between a plurality of wells leads to multi-well pulsed completions and more effective use of blender, pumps, manifolds and the like at the surface. Moreover, in this way, the surface equipment can service and complete multiple wells often without having to be moved, or disconnected and reconnected again.

[0016] Referring to FIG. 1, a generalized schematic view of a plurality of wells 120a, 120b in a subterranean formation 125, along with associated wellheads 115a, 115b connected to surface fracturing equipment 105 located at the surface 121. The wells 120a and 120b are depicted as horizontal wells 130a, 130b but do not need to be a horizontal well, and could take other forms, e.g., a vertical well. The surface equipment 105 may be interconnected to the wellheads 115a, 115b using corresponding conduits 110a, 110b for conveying hydraulic fracturing fluid to the wells 120a, 120b.

[0017] The hydraulic fracturing fluid may include, for example, water or another liquid mixed with sand or other proppants. The fracturing fluid may be proppant-laden or proppant-free. The fracturing fluid is pumped into subterranean formation 125 to extend or create fractures in subterranean formation 125 and fill the fractures with proppants, which operationally hold open the fractures after pumping of the fracturing fluid has stopped. This permits formation 125 hydrocarbon fluids to more easily flow into the wells 120a, 120b. In some well completion operations, fracturing fluid used in the wells 120a, 120b can include other additives. For example, the fracturing fluid can include acidic chemicals, alkaline chemicals, polymers, or other agents to increase viscosity of the fracturing fluid.

[0018] Referring to FIG. 2, the surface fracturing equipment 105 is shown in more detail. The surface fracturing equipment 105 in this example includes a one or more high pressure pumps 135a-135e, a blender 140, one or more switching valves 150a, 150b, switching valves 155a, 155b, and flapper checks 160a-160d. The blender 140 accepts raw materials such as sand 141, base fluid 145 that may include other additives, and provides blended fracturing fluid to the one or more pulse pumps 135a-135e via high pressure conduits 136. The one or more high pressure pumps 135a-135e run at a constant rate to provide a substantially constant pressure of the blended fracturing fluid to the one or more switching valves 150a, 150b via conduits 136. The number of high pressure pumps and total flow rate from the one or more high pressure pumps 135a-135e determine the pulse size of the fracturing fluid that are selectively diverted to the plurality of wells 120a, 120b by one or more switching valves 150a, 150b. Because the one or more high pressure pumps 135a-135e can run at a constant rate, the wear and tear on the pumps is significantly reduced.

[0019] The one or more switching valves 150a, 150b alternatively redirect the fracturing fluid received via high pressure conduit 136 from the one or more high pressure pumps 135a-135e from one wellhead 115a to another wellhead 115b. Downstream of each of the one or more switching valves 150a, 150b are plug valves 155a, 155b. The plug valves 155a, 155b allow absolute shut off of fracturing fluid flow after one of the switching valves 150a, 150b shifts to a closed position in case there is some leakage flow from the associated switching valve 150a, 150b due to wear thereby causing leakage. The fracturing fluid received via high pressure conduit 136 may be conveyed at 1000 psi or more.

[0020] Downstream of the plug valves 155a, 155b, flapper checks 160a-160d are strategically placed along conduits 110a, 110b as required to prevent an unexpected well control situation if the high pressure conduits 110a, 110b, 136 to the one or more high pressure pumps 135a-135e or the high pressure pumps 135a-135e themselves were to develop a leak. The fracturing fluid flows downstream from flapper checks 160a-160d through downstream high pressure conduits 110a, 110b to the plurality of wellheads 115a, 115b, then onward to the respective well 120a, 120b, as determined by the state of the one or more switching valves 150a, 150b.

[0021] Referring to FIGS. 3A to 3C, sequencing control of the one or more switching valves 150a, 150b include, as a first state, opening switching valve 150a and plug valve 155a such that the flow rate of the fracturing fluid 151 from the one or more high pressure pumps 135a-135e is directed to the first wellhead 115a, delivering a pulse, while switching valve 150b and

associated plug valve 150b are closed preventing fluid flow 151 to the second wellhead 115b, as shown in FIG. 3A. Next, as shown in FIG. 3B, a pulse of fluid flow 151 is directed to the second wellhead 115b by first opening the plug valve 155b downstream of switching valve 150b, then switching valve 150b is opened as switching valve 150a is being closed. Generally, the speed of the transition from open position to closed position of the switching valves 150a, 150b dictates the pulse amplitude directed to the respective well 120a, 120b. After switching valve 150b is fully opened and switching valve 150a is fully closed, as shown in FIG. 3C, initiating a pulse down well 120b, the plug valve 155a downstream of switching valve 155a is closed. The process is then reversed to send a pulse towards wellhead 115a and to well 120a.

[0022] The time duration that a switching valve 150a, 150b is opened can vary, or can be maintained of a constant duration from cycle to cycle. The time may be selected from a range of about 100ms to about 10 secs. Moreover, the time duration of a pulse created may be equal for each well 120a, 120b, or the time duration of a pulse may be unequal for one well 120a, 120b compared to the other well. The control of the one or more switching valves 150a, 150b may be achieved manually, hydraulically, or may be accomplished by a computerized controller, such as shown in FIG. 4.

[0023] As shown in reference to FIG. 4, switching valves 150a, 150b may be incorporated into a single N-way valve 156 for controlling multiple outgoing flows to multiple wellheads. Valve 156 can be a 3-way valve. If separate valves are implemented as shown in FIGS. 3A-3C, then a linkage 152 can be connected between the two to keep them synchronized in relation to one another so that as one valve changes, the other valve changes in proportionate manner. Alternatively, another method to keep the switching valves 150a, 150b synchronized is to employ a rotary actuator with a through shaft that could have one valve above the actuator and the other below the actuator such that one is opening while the other is closing, and vice versa.

[0024] As the one or more switching valves 150a, 150b cause fluid flow to shift from one well 120a, 102b to the other, the rate of opening the flow to one well and closing to the other will have an impact on the pulse seen by each well 120a, 120b. When a flow starts to flow into a first well, a positive waterhammer wave going to that first well is created while a rarefaction wave is created in the second well due to the sudden drop in the flow rate to the second well. The overlap of fluid flows to each well 120a, 120b can be controlled to optimize the downhole pressure waves and minimize the surface impacts.

[0025] FIG. 4 is an illustration of an example N-way switching valve 156. This can be a 3-way switching valve. In essence, the N-way switching valve 156 incorporates the functionality of two or more independent switching valves 150a, 150b into one single unit. The switching valves 150a, 150b and N-way switching valve 156 can be operatively controlled by a controller 158. The controller 158 may also control any of the switching valves 150a, 150b, the N-way switching valve 156, and may control any or all of the other components, including any of the blender 140, plug valves 155a, 155b, flapper checks 160a-160d, and the high pressure pumps 135a-135e. The controller 158 may comprise a computer processor connected by a bus to a memory. The memory may include a software program for performing the control and operational sequencing of the components, including the sequencing of opening and closing the switching valves 150a, 150b, 156, plug valves 155a, 155b, and flapper checks 160a-160d.

[0026] FIG. 5 is an example flow diagram of steps for performing a pulsed treatment of a plurality of wells, according to principles of the disclosure. The flow diagram of FIG. 5 may employ the system or components shown in FIGS. 1-4. At step 170, a constant pressure of fracturing fluid is provided to one or more switching valves switching valves 150a, 150b, or N-way valve 156. The constant pressure is provided by one or more high pressure pumps 135a-135e. The switching valves 150a, 150b, or N-way valve 156, are connected to a plurality of wellheads 115a, 115b. A step 175, a first switching valve 150a is opened or opening while a second valve 150b is at least partially closed, or closing, permitting the fracturing fluid to flow to a first wellhead 115a associated with a first well 120a. A first time period is started to time a duration of a created pulse in the first well 120a. The second switching valve 150b is connected to the second wellhead 115b associated with a second well 120b for treating the plurality of wells simultaneously. As a sub-step, a first plug valve 155a is opened before opening the first valve 150a.

[0027] At step 180, the first switching valve 150a is closed at the end of a first predetermined time period. As a sub-step, the first plug valve 155a is closed. At step 185, a second switching valve is opened. At step 185, a second switching valve 120b is opened, while the first switching valve 120a is at least partially closed or closing. As a sub-step, a second plug valve 155b is opened before opening of the second switching valve. A second time period is started to time a duration of a created pulse in the second well 120b. At step 190, the second switching valve 120b is closed at the end of the predetermined second time period. As a sub-step, the second plug valve 155b is closed. At step 195, the process may be continued as a new cycle by

repeating steps 175, 180, 185 and 190. A new cycle can vary in time with the first time period varying in duration and/or the second time period varying in duration from one cycle to a next cycle. The first time period and the second time period may be predetermined and selected from a range of about 100ms to about 10 secs. In some applications, the first time period and the second time period may be selected from a range of about 500ms to about 8 secs. In some applications, the first time period and the second time period may be selected from a range of about 800ms to about 5 secs. In some applications, the first time period and the second time period may be selected from a range of less than 7 secs and more than 200 ms.

[0028] Optionally, a third switching valve and associated third plug valve operatively connected to a third well head may be included in the process as separate steps that operates in similar sequential fashion after steps 185 and 190 and before steps 175 and 180.

[0029] The following clauses are additional descriptions of various aspects of the disclosure.

[0030] Clause 1: a method of hydraulic fracturing a plurality of wells, comprising

a) applying a constant pressure of fracturing fluid to a plurality of switching valves including a first switching valve connected to a first wellhead associated with a first well and a second switching valve connected to a second wellhead associated with a second well for treating the plurality of wells simultaneously;

b) opening the first switching valve while the second switching valve is a least partially closed permitting the fracturing fluid to flow to the first wellhead and first well for a first time period;

c) closing the first switching valve at the end of the first period;

d) opening the second switching valve while the first valve is at least partially closed for a second time period permitting fluid to flow to the second wellhead and second well during the second time period;

e) closing the second switching valve at the end of the second period; and

repeating steps b) to e) to create a cycle of alternating pulsed pressure wave in the first well for fracturing a subterranean formation associated with the first well and a pulsed pressure wave in the second well for fracturing a subterranean formation associated with the second well.

[0031] Clause 2: the method of clause 1, wherein in step b) the second switching valve is fully closed during the first time period.

[0032] Clause 3: the method of clause 1, wherein in step d) the first switching valve is fully closed during the second time period.

[0033] Clause 4: the method of clause 1, wherein step b) includes opening a first plug valve located between the first switching valve and the first wellhead, before opening the first switching valve.

[0034] Clause 5: the method of clause 4, wherein step c) includes closing the first plug valve.

[0035] Clause 6: the method of clause 1, wherein step d) includes opening a second plug valve positioned between the second switching valve and the second wellhead, before opening the second switching valve.

[0036] Clause 7: the method of clause 6, wherein step e) includes closing the second plug valve.

[0037] Clause 8: the method of clause 1, wherein the first time period is equal to the second time period.

[0038] Clause 9: the method of clause 1, wherein the first time period is not equal to the second time period.

[0039] Clause 10: the method of clause 1, wherein the duration of the first time period or a duration of second time period varies from at least one cycle to at least another cycle.

[0040] Clause 11: the method of clause 1, wherein the first time period or second time period is selected from the range of 100ms to about 10 secs.

[0041] Clause 12: the method of clause 1, further comprising:

applying the constant pressure of fracturing fluid to a third switching valve connected

to a third wellhead associated with a third well for simultaneously treating the plurality of wells including the first well, the second well and the third well;

after each step e) but before each repeated step b), performing:

m) opening the third switching valve while the second switching valve is a least

partially closed permitting the fracturing fluid to flow to the third wellhead and third well for a third time period; and

n) closing the third switching valve at the end of the third period for create a pulsed pressure wave in the third well for fracturing a subterranean formation associated with the third well.

[0042] Clause 13: the method of clause 1, wherein the applying the constant pressure of fracturing fluid to the plurality of wells is supplied by one or more pumps.

[0043] Clause 14: a method of hydraulic fracturing a plurality of wells, comprising:

alternating application of a constant pressure of fracturing fluid to a plurality of wellheads by opening and closing at least one switching valve to create a pulsed pressure wave in each well associated with the plurality of wellheads for fracturing a subterranean formation associated with each well.

[0044] Clause 15: the method of clause 14, wherein the pulse pressure wave is created by opening and closing the at least one switching valve to re-direct the constant pressure of fracturing fluid after a first application period from a first well of the plurality of wells to at least one other subsequent well.

[0045] Clause 16: the method of clause 15, further comprising:

redirecting the constant pressure of fracturing fluid after a second application period time period from the at least one subsequent well back to the first well or another at least one subsequent well.

[0046] Clause 17: the method of clause 16, wherein the first time period substantially equals the second time period.

[0047] Clause 18: the method of clause 16, wherein the at least one valve is a plurality of switching valves.

[0048] Clause 19: a system for hydraulic fracturing a plurality of wells, comprising:

at least one pump to supply a constant pressure of fracturing fluid to a plurality of wells each having a wellhead; and

at least one switching valve connected between the at least one pump and each of the

plurality of wellheads, the at least one valve operable to alternate application of the constant pressure of fracturing fluid to the plurality of wellheads by opening and closing the at least one switching valve to create a pulsed pressure wave in each well associated with the plurality of wellheads for fracturing a subterranean formation associated with each well.

[0049] Clause 20: the system of clause 19, wherein the at least one switching valve is a plurality of switching valves with one of the plurality of switching valves connected to each wellhead, the plurality of switching valves synchronized to permit alternating flow of the constant pressure of fracturing fluid in each of the plurality of wells for a predetermined time period causing the pulsed pressure wave in each well.

[0050] While this specification provides specific details related to providing simultaneous pulsed treatment of a plurality of wells, it may be appreciated that the list of components is illustrative only and is not intended to be exhaustive or limited to the forms disclosed. Other components will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the disclosure. Further, the scope of the claims is intended to broadly cover the disclosed components or steps and any such components or steps that are apparent to those of ordinary skill in the art.

[0051] It should be apparent from the foregoing disclosure of illustrative embodiments that significant advantages have been provided. The illustrative embodiments are not limited solely to the descriptions and illustrations included herein and are instead capable of various changes and modifications without departing from the spirit of the disclosure.

CLAIMS

What is claimed is:

1) A method of hydraulic fracturing a plurality of wells, comprising:

a) applying a constant pressure of fracturing fluid to a plurality of switching valves including a first switching valve connected to a first wellhead associated with a first well and a second switching valve connected to a second wellhead associated with a second well for treating the plurality of wells simultaneously;

b) opening the first switching valve while the second switching valve is a least partially closed permitting the fracturing fluid to flow to the first wellhead and first well for a first time period;

c) closing the first switching valve at the end of the first period;

d) opening the second switching valve while the first valve is at least partially closed for a second time period permitting fluid to flow to the second wellhead and second well during the second time period;

e) closing the second switching valve at the end of the second period; and

repeating steps b) to e) to create a cycle of alternating pulsed pressure wave in the first well for fracturing a subterranean formation associated with the first well and a pulsed pressure wave in the second well for fracturing a subterranean formation associated with the second well.

2) The method of claim 1, wherein in step b) the second switching valve is fully closed during the first time period.

3) The method of claim 1, wherein in step d) the first switching valve is fully closed during the second time period.

4) The method of claim 1, wherein step b) includes opening a first plug valve located between the first switching valve and the first wellhead, before opening the first switching valve.

5) The method of claim 4, wherein step c) includes closing the first plug valve.

6) The method of claim 1, wherein step d) includes opening a second plug valve positioned between the second switching valve and the second wellhead, before opening the second switching valve.

7) The method of claim 6, wherein step e) includes closing the second plug valve.

8) The method of claim 1, wherein the first time period is equal to the second time period.

9) The method of claim 1, wherein the first time period is not equal to the second time period.

10) The method of claim 1, wherein the duration of the first time period or a duration of second time period varies from at least one cycle to at least another cycle.

11) The method of claim 1, wherein the first time period or second time period is selected from the range of 100ms to about 10 secs.

12) The method of claim 1, further comprising:

applying the constant pressure of fracturing fluid to a third switching valve connected to a third wellhead associated with a third well for simultaneously treating the plurality of wells including the first well, the second well and the third well;

after each step e) but before each repeated step b), performing:

f) opening the third switching valve while the second switching valve is a least partially closed permitting the fracturing fluid to flow to the third wellhead and third well for a third time period; and

g) closing the third switching valve at the end of the third period for create a pulsed pressure wave in the third well for fracturing a subterranean formation associated with the third well.

13) The method of claim 1, wherein the applying the constant pressure of fracturing fluid to the plurality of wells is supplied by one or more pumps.

14) A method of hydraulic fracturing a plurality of wells, comprising:

alternating application of a constant pressure of fracturing fluid to a plurality of wellheads by opening and closing at least one switching valve to create a pulsed pressure wave in each well associated with the plurality of wellheads for fracturing a subterranean formation associated with each well.

15) The method of claim 14, wherein the pulse pressure wave is created by opening and

closing the at least one switching valve to re-direct the constant pressure of fracturing fluid after a first time period from a first well of the plurality of wells to at least one other subsequent well.

16) The method of claim 15, further comprising:

redirecting the constant pressure of fracturing fluid after a second time period from the at least one subsequent well back to the first well or another at least one subsequent well.

17) The method of claim 16, wherein the first time period substantially equals the second time period.

18) The method of claim 16, wherein the at least one valve is a plurality of switching valves.

19) A system for hydraulic fracturing a plurality of wells, comprising:

at least one pump to supply a constant pressure of fracturing fluid to a plurality of wells each having a wellhead; and

at least one switching valve connected between the at least one pump and each of the plurality of wellheads, the at least one valve operable to alternate application of the constant pressure of fracturing fluid to the plurality of wellheads by opening and closing the at least one switching valve to create a pulsed pressure wave in each well associated with the plurality of wellheads for fracturing a subterranean formation associated with each well.

20) The system of claim 19, wherein the at least one switching valve is a plurality of switching valves with one of the plurality of switching valves connected to each wellhead, the plurality of switching valves synchronized to permit alternating flow of the constant pressure of fracturing fluid in each of the plurality of wells for a predetermined time period causing the pulsed pressure wave in each well.

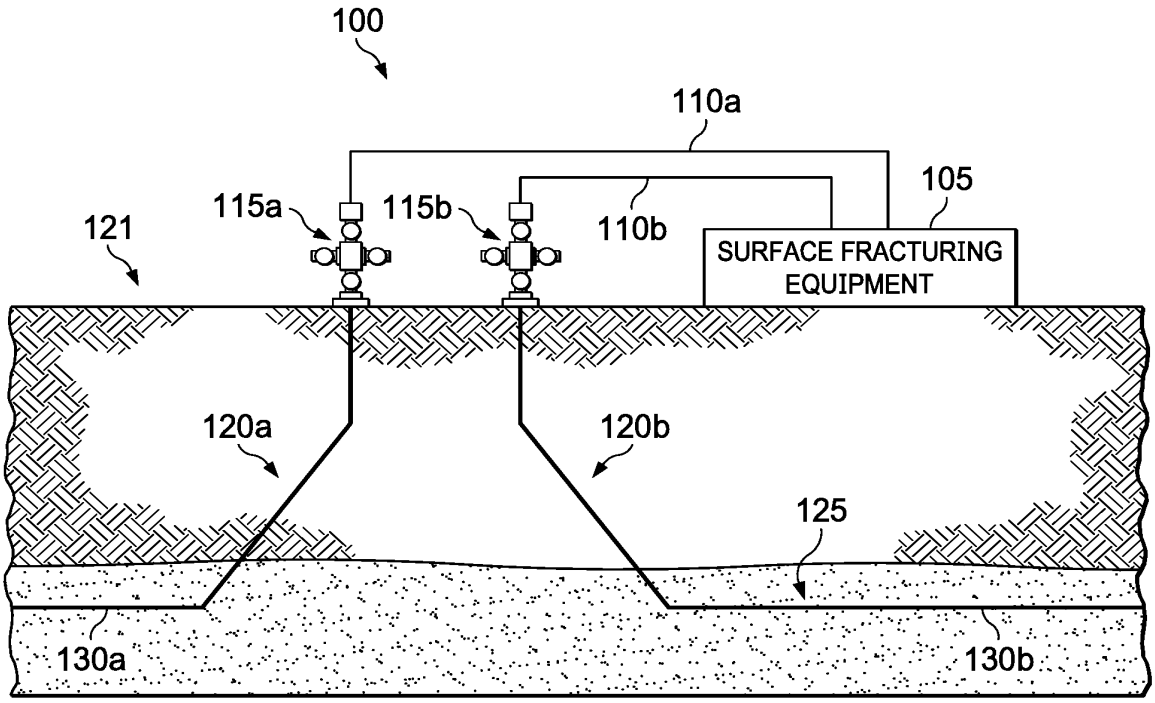

100
110a
105
115a
115b
110b
121
SURFACE FRACTURING EQUIPMENT
120a
120b
125
130a
130b

FIG. 1

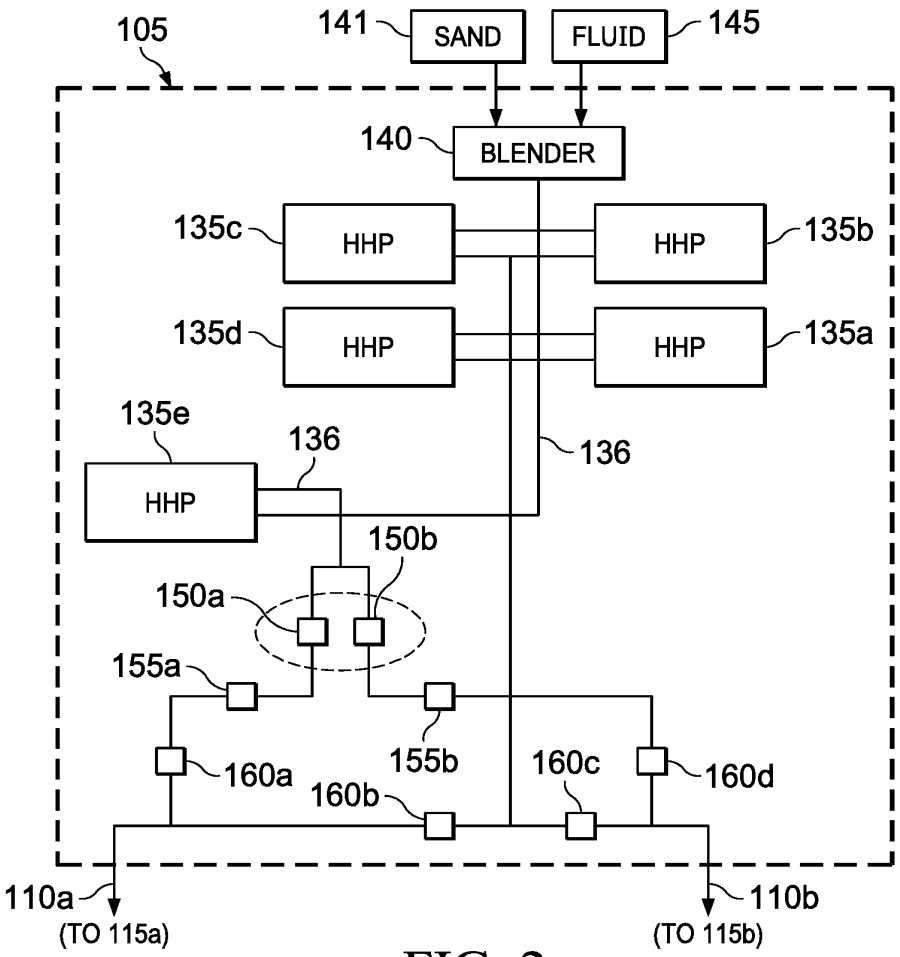

105
141
SAND
FLUID
145
140
BLENDER
135c
HHP
HHP
135b
135d
HHP
HHP
135a
135e
136
136
HHP
150b
150a
155a
155b
160a
160b
160c
160d
110a
(TO 115a)
110b
(TO 115b)

FIG. 2

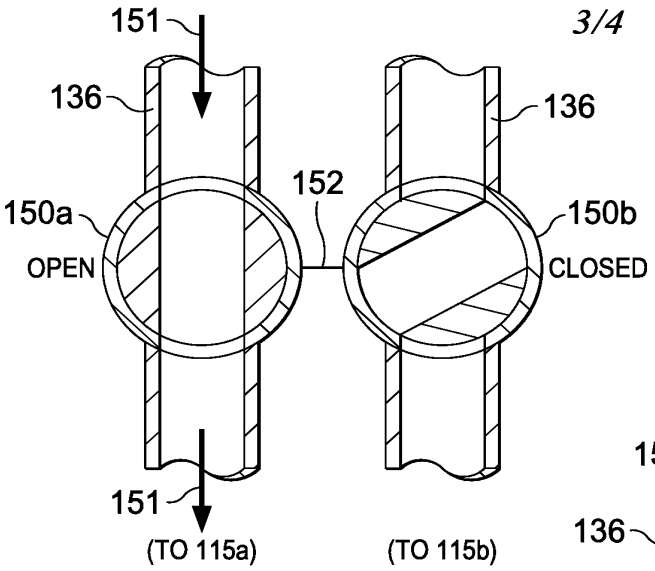


FIG. 3A

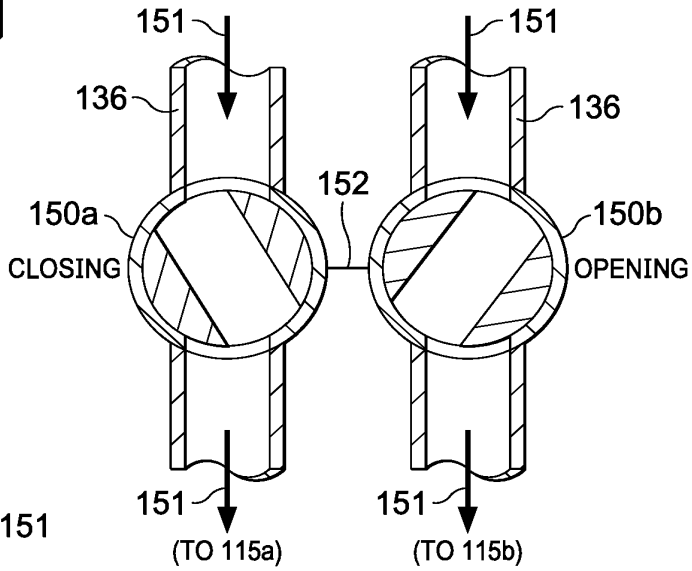


FIG. 3B

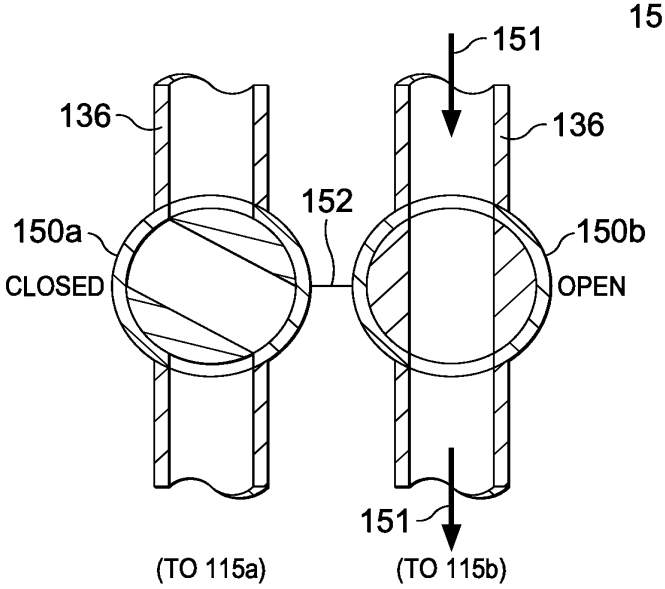


FIG. 3C

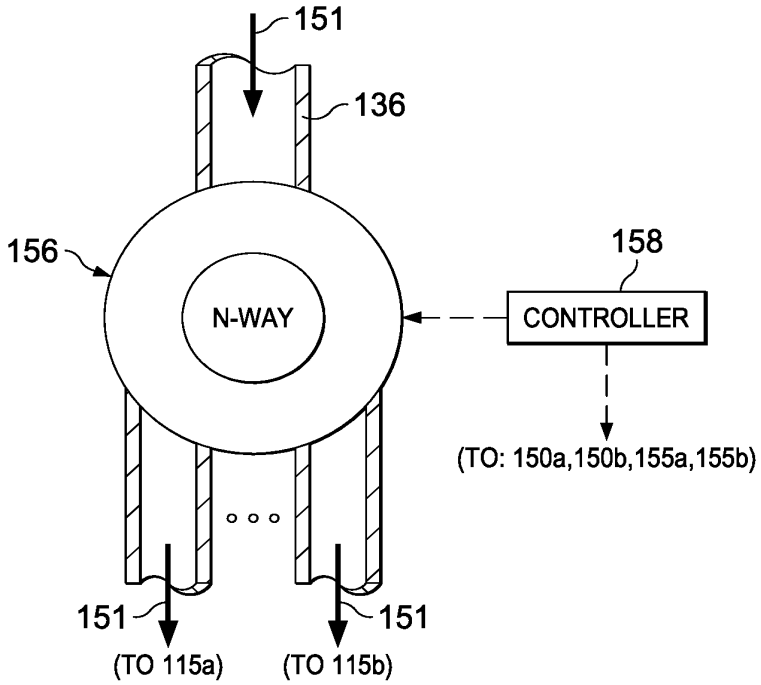

151
136
156
158
N-WAY
CONTROLLER
(TO: 150a,150b,155a,155b)
151
151
(TO 115a)
(TO 115b)

FIG. 4

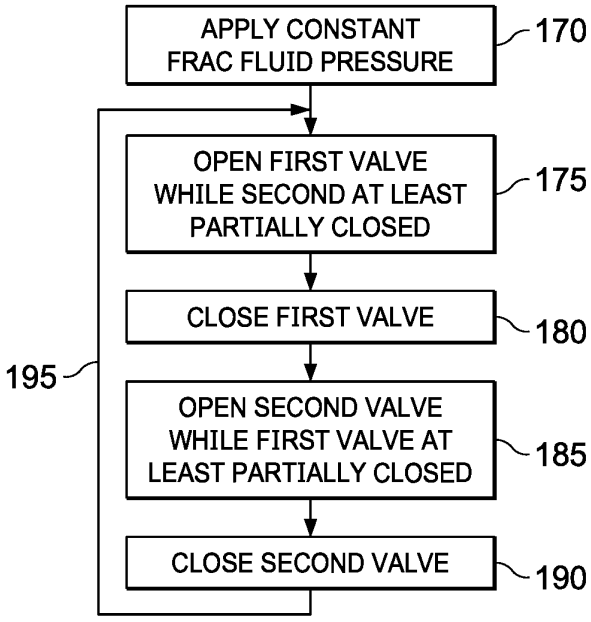

APPLY CONSTANT FRAC FLUID PRESSURE
170
OPEN FIRST VALVE WHILE SECOND AT LEAST PARTIALLY CLOSED
175
CLOSE FIRST VALVE
180
195
OPEN SECOND VALVE WHILE FIRST VALVE AT LEAST PARTIALLY CLOSED
185
CLOSE SECOND VALVE
190

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/013063

A. CLASSIFICATION OF SUBJECT MATTER

E21B 43/26(2006.01)i, E21B 43/17(2006.01)i, E21B 34/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E21B 43/26; B65G 5/00; E21B 17/05; E21B 33/068; E21B 43/00; E21B 43/12; E21B 43/16; E21B 47/00; G01V 1/42; E21B 43/17; E21B 34/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & keywords: hydraulic fracturing, pulsed fractured treatment, switching valves, pulsed pressure wave

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2014-0352968 A1 (CAMERON INTERNATIONAL CORPORATION) 04 December 2014 See paragraphs [0022], [0023], [0026], [0027], [0029] and figure 2.	1-20
Y	WO 2017-223007 A1 (SCHLUMBERGER TECHNOLOGY CORPORATION et al.) 28 December 2017 See paragraphs [0073], [0092], claims 1, 8 and figure 14.	1-20
A	US 2009-0114392 A1 (TOLMAN et al.) 07 May 2009 See paragraphs [0027]-[0031] and figure 2.	1-20
A	US 2018-0179848 A1 (ISOLATION EQUIPMENT SERVICES INC.) 28 June 2018 See paragraphs [0075]-[0081] and figures 6A, 6B.	1-20
A	US 2010-0272515 A1 (CURLETT, HARRY B.) 28 October 2010 See paragraphs [0048], [0049] and figure 3.	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 October 2019 (08.10.2019)	**10 October 2019 (10.10.2019)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea
Facsimile No. +82-42-481-8578

Authorized officer
PARK, Tae Wook
Telephone No. +82-42-481-3405

Form PCT/ISA/210 (second sheet) (July 2019)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2019/013063

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2014-0352968 A1	04/12/2014	WO 2014-197351 A1	11/12/2014
WO 2017-223007 A1	28/12/2017	US 2019-0146115 A1	16/05/2019
US 2009-0114392 A1	07/05/2009	AU 2006-284417 A1	01/03/2007
		AU 2006-284417 B2	26/05/2011
		BR PI0614312 A2	20/11/2012
		BR PI0614312 B1	25/04/2017
		CA 2618277 A1	01/03/2007
		CA 2618277 C	20/08/2013
		CN 101243240 A	13/08/2008
		DK 1929123 T3	02/04/2013
		EA 012893 B1	30/12/2009
		EA 200800621 A1	30/06/2008
		EP 1929123 A2	11/06/2008
		EP 1929123 B1	02/01/2013
		MX 2008001435 A	04/04/2008
		NO 20081335 A	16/05/2008
		NO 335837 B1	02/03/2015
		UA 100837 C2	11/02/2013
		US 8490685 B2	23/07/2013
		WO 2007-024383 A2	01/03/2007
		WO 2007-024383 A3	27/12/2007
US 2018-0179848 A1	28/06/2018	CA 2989914 A1	22/06/2018
US 2010-0272515 A1	28/10/2010	AP 200703885 A0	28/02/2007
		AP 200703885 D0	28/02/2007
		AU 2005-258224 A1	05/01/2006
		BR PI0512499 A	11/03/2008
		CA 2560331 A1	05/01/2006
		CN 101027480 A	29/08/2007
		EA 200700100 A1	26/10/2007
		EP 1966489 A2	10/09/2008
		IL 180163 D0	03/06/2007
		JP 2008-504470 A	14/02/2008
		KR 10-2007-0050041 A	14/05/2007
		LT 2007004 A	27/12/2007
		LT 5472 B	25/02/2008
		MX PA06014998 A	18/05/2007
		US 2007-0223999 A1	27/09/2007
		US 7753122 B2	13/07/2010
		WO 2006-002325 A2	05/01/2006
		WO 2006-002325 A3	08/06/2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Jordan Kuehn *et al.*	§	Confirmation No.: 1469
Appl. No. 18/158,122	§	Group Art Unit: 3676
Filed: January 23, 2023	§	Examiner: Daniel P. Stephenson
For: Hydraulic Fracturing Plan and Execution of Same	§	Attorney Docket No.: 57959.12US03

RESPONSE AND SUBMISSION UNDER 37 CFR 1.114

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

I. Introductory Comments

This document is submitted in response to the Notice of Allowance mailed July 20, 2023.

Estimated fees, including fees for the RCE, have been provided for by credit card separately but concurrently herewith for consideration of this document. If any additional fees, including any extension-of-time fees, are necessary, the Commissioner is hereby authorized to charge such fees, including any extension-of-time fees, to Haynes and Boone, LLP's Deposit Account No. 08-1394.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this document.

Remarks begin on page 19 of this document.

II. Amendments to the Claims

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

1. (Currently amended) A method of hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the method comprising:

communicating fluid to the first well via a manifold and a first valve, wherein the first valve is associated with both the first well and the manifold;

and

executing a continuous pumping ("CP") swap to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, the CP swap comprising:

opening a ~~first~~ second valve while ~~hydraulic fracturing~~ fluid is communicated to the ~~second~~ first well via ~~a second~~ the first valve and[[a]] the manifold,

~~wherein the first valve is associated with both the first well and the manifold, and~~

wherein the second valve is associated with both the second well and the manifold,

wherein opening the second valve causes fluid to be communicated to the second well via the manifold and the second valve,

and

wherein the second valve is opened in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of the fluid communicated via the manifold;

and

closing the ~~second~~ first valve, wherein the ~~second~~ first valve is closed:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold,

after opening the ~~first~~ second valve, and

while ~~hydraulic fracturing~~ fluid is communicated to the ~~first~~ second well via the ~~first~~ second valve and the manifold;

wherein, during the CP swap, the fluid is continuously communicated via the manifold so that transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced.

2. (Original) The method of claim 1, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

3. (Currently amended) The method of claim 1, wherein the plurality of wells further comprises third and fourth wells, and the method further comprises:

communicating fluid to the third well via the manifold and a third valve, wherein the third valve is associated with both the third well and the manifold;

wherein executing the CP swap further transitions from hydraulically fracturing the third well to hydraulically fracturing the fourth well, the CP swap further comprising:

opening a ~~third~~ fourth valve while ~~hydraulic fracturing~~ fluid is communicated to the ~~fourth~~ third well via ~~a fourth~~ the third valve and the manifold,

~~wherein the third valve is associated with both the third well and the manifold, and~~

wherein the fourth valve is associated with both the fourth well and the manifold,

wherein opening the fourth valve causes fluid to be communicated to the fourth well via the manifold and the fourth valve, and

wherein the fourth valve is opened in response to the at least a portion of the fluid communicated via the manifold satisfying the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold;

and

closing the ~~fourth~~ third valve, wherein the ~~fourth~~ third valve is closed:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold,

after opening the ~~third~~ fourth valve, and

while ~~hydraulic fracturing~~ fluid is communicated to the ~~third~~ fourth well via the ~~third~~ fourth valve and the manifold;

and

wherein, during the CP swap, the continuous communication of the fluid via the manifold reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the fourth well.

4. (Cancelled)

5. (Currently amended) The method of ~~claim 4~~ claim 1, further comprising:

determining that the at least a portion of the ~~communication of hydraulic fracturing~~ fluid communicated via the manifold has satisfied the one or more conditions.

6. (Currently amended) The method of ~~claim 4~~ claim 1, wherein the one or more conditions include ~~one or more~~ the flow rate ~~conditions~~ of the at least a portion of the fluid communicated via the manifold.

7. (Currently amended) The method of claim 6, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more ~~flow rate~~ conditions when[[a]] the flow rate ~~of the fluid~~ is below an upper threshold~~, above a lower threshold, or both~~.

8. (Currently amended) A non-transitory computer readable medium having stored thereon computer-readable instructions executable by one or more processors to perform operations for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the operations comprising:
communicating fluid to the first well via a manifold and a first valve,
wherein the first valve is associated with both the first well and the manifold;
and
executing a continuous pumping ("CP") swap to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, the CP swap comprising:
opening a ~~first~~ second valve while ~~hydraulic fracturing~~ fluid is communicated to the ~~second~~ first well via ~~a second~~ the first valve and[[a]] the manifold,
~~wherein the first valve is associated with both the first well and the manifold, and~~
wherein the second valve is associated with both the second well and the manifold,
wherein opening the second valve causes fluid to be communicated to the second well via the manifold and the second valve, and

wherein the second valve is opened in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of the fluid communicated via the manifold;

and

closing the ~~second~~ first valve, wherein the ~~second~~ first valve is closed:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold,

after opening the ~~first~~ second valve, and

while ~~hydraulic fracturing~~ fluid is communicated to the ~~first~~ second well via the ~~first~~ second valve and the manifold;

wherein, during the CP swap, the fluid is continuously communicated via the manifold so that transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced.

9. (Original) The non-transitory computer readable medium of claim 8, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

10. (Currently amended) The non-transitory computer readable medium of claim 8, wherein the plurality of wells further comprises third and fourth wells, and the operations further comprise:

communicating fluid to the third well via the manifold and a third valve, wherein the third valve is associate with both the third well and the manifold;

wherein executing the CP swap further transitions from hydraulically fracturing the third well to hydraulically fracturing the fourth well, the CP swap further comprising:

opening a ~~third~~ fourth valve while ~~hydraulic fracturing~~ fluid is communicated to the ~~fourth~~ third well via ~~a fourth~~ the third valve and the manifold,

~~wherein the third valve is associated with both the third well and the manifold, and~~

wherein the fourth valve is associated with both the fourth well and the manifold,

wherein opening the fourth valve causes fluid to be communicated to the fourth well via the manifold and the fourth valve, and

wherein the fourth valve is opened in response to the at least a portion of the fluid communicated via the manifold satisfying the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold;

and

closing the ~~fourth~~ third valve, wherein the ~~fourth~~ third valve is closed:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid being communicated via the manifold,

after opening the ~~third~~ fourth valve, and

while ~~hydraulic fracturing~~ fluid is communicated to the ~~third~~ fourth well via the ~~third~~ fourth valve and the manifold;

and

wherein, during the CP swap, the continuous communication of the fluid via the manifold reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the fourth well.

11. (Cancelled)

12. (Currently amended) The non-transitory computer readable medium of ~~claim 11~~ claim 8, wherein the operations further comprise:

determining that the at least a portion of the ~~communication of hydraulic fracturing~~ fluid communicated via the manifold has satisfied the one or more conditions.

13. (Currently amended) The non-transitory computer readable medium of ~~claim 11~~ claim 8, wherein the one or more conditions include ~~one or more~~ the flow rate ~~conditions~~ of the at least a portion of the fluid communicated via the manifold.

14. (Currently amended) The non-transitory computer readable medium of claim 13, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more ~~flow rate~~ conditions when[[a]] the flow rate ~~of the fluid~~ is below an upper threshold~~, above a lower threshold, or both~~.

15. (Currently amended) A system for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the system comprising:

a manifold;

a first valve via which ~~hydraulic fracturing~~ fluid is adapted to be communicated from the manifold to the first well, the first valve being associated with both the first well and the manifold;

a second valve via which ~~hydraulic fracturing~~ fluid is adapted to be communicated from the manifold to the second well, the second valve being associated with both the second well and the manifold; and

one or more controllers configured to execute a continuous pumping ("CP") swap, during which fluid is continuously communicated via the manifold, to transition from hydraulically fracturing the first well to hydraulically fracturing the second well, by:

[[open]]opening the ~~first~~ second valve:

while ~~hydraulic fracturing~~ fluid is communicated to the ~~second~~ first well via the ~~second~~ first valve and the manifold,

to cause fluid to be communicated to the second well via the manifold and the second valve, and

in response to at least a portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least a portion of the fluid communicated via the manifold;

and

~~close~~ closing the ~~second~~ first valve:

after the at least a portion of the fluid communicated via the manifold has satisfied one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold,

after opening the ~~first~~ second valve, and

while ~~hydraulic fracturing~~ fluid is communicated to the ~~first~~ second well via the ~~first~~ second valve and the manifold;

wherein the continuous communication of the fluid via the manifold during the CP swap reduces transition time between hydraulically fracturing the first well and hydraulically fracturing the second well.

16. (Original) The system of claim 15, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

17. (Currently amended) The system of claim 15, wherein:

the plurality of wells further comprises third and fourth wells;

the system further comprises:

a third valve via which ~~hydraulic fracturing~~ fluid is adapted to be communicated from the manifold to the third well, the third valve being associated with both the third well and the manifold; and

a fourth valve via which ~~hydraulic fracturing~~ fluid is adapted to be communicated from the manifold to the fourth well, the fourth valve being associated with both the fourth well and the manifold;

and

the one or more controllers are further configured to execute the CP swap, during which fluid is continuously communicated via the manifold, to transition from hydraulically fracturing the third well to hydraulically fracturing the fourth well, by:

[[open]]opening the ~~third~~ fourth valve:

while ~~hydraulic fracturing~~ fluid is communicated to the ~~fourth~~ third well via the ~~fourth~~ third valve and the manifold,

to cause fluid to be communicated to the fourth well via the manifold and the fourth valve, and

in response to the at least a portion of the fluid communicated via the manifold satisfying the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least a portion of the fluid communicated via the manifold;

and

~~close~~ closing the ~~fourth~~ third valve:

after the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure,

of the at least a portion of the fluid communicated via the manifold,

after opening the ~~third~~ fourth valve, and

while ~~hydraulic fracturing~~ fluid is communicated to the ~~third~~ fourth well via the ~~third~~ fourth valve and the manifold;

wherein the continuous communication of the fluid via the manifold during the CP swap reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the fourth well.

18. (Cancelled)

19. (Currently amended) The system of ~~claim 18~~ claim 15, wherein the one or more controllers are further configured to:

determine that the at least a portion of the ~~communication of hydraulic fracturing fluid~~ communicated via the manifold has satisfied the one or more conditions.

20. (Currently amended) The system of ~~claim 18~~ claim 15, wherein the one or more conditions include ~~one or more~~ the flow rate ~~conditions~~ of the at least a portion of the fluid communicated via the manifold.

21. (Currently amended) The system of claim 20, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more ~~flow rate~~ conditions when[[a]] the flow rate ~~of the fluid~~ is below an upper threshold~~, above a lower threshold, or both~~.

22. (New) The method of claim 6, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is above a lower threshold.

23. (New) The method of claim 6, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is both below an upper threshold and above a lower threshold.

24. (New) The method of claim 1, wherein the one or more conditions include the pressure of the at least a portion of the fluid communicated via the manifold.

25. (New) The method of claim 24, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is below an upper threshold.

26. (New) The method of claim 24, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is above a lower threshold.

27. (New) The method of claim 24, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is both below an upper threshold and above a lower threshold.

28. (New) The method of claim 1, wherein the plurality of wells further comprises a third well, and the method further comprises:

communicating fluid to the third well via the manifold and a third valve,

wherein the third valve is associated with both the third well and the manifold;

and

executing another CP swap to transition from hydraulically fracturing the third well to hydraulically fracturing the first well, the another CP swap comprising:

opening the first valve while fluid is communicated to the third well via the third valve and the manifold,

wherein opening the first valve causes fluid to be communicated to the first well via the manifold and the first valve, and

wherein the first valve is opened in response to at least another portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least another portion of the fluid communicated via the manifold; and

closing the third valve, wherein the third valve is closed:

after the at least another portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least another portion of the fluid communicated via the manifold,

after opening the first valve, and

while fluid is communicated to the first well via the first valve and the manifold;

wherein, during the another CP swap, the fluid is continuously communicated via the manifold so that transition time, between hydraulically fracturing the third well and hydraulically fracturing the first well, is reduced.

29. (New) The method of claim 1, further comprising:

hydraulically fracturing the first well; and

hydraulically fracturing the second well;

wherein the fluid, which is continuously communicated via the manifold so that the transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced, is hydraulic fracturing fluid.

30. (New) The method of claim 29, wherein the hydraulic fracturing fluid comprises sand.

31. (New) The non-transitory computer readable medium of claim 13, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is above a lower threshold.

32. (New) The non-transitory computer readable medium of claim 13, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is both below an upper threshold and above a lower threshold.

33. (New) The non-transitory computer readable medium of claim 8, wherein the one or more conditions include the pressure of the at least a portion of the fluid communicated via the manifold.

34. (New) The non-transitory computer readable medium of claim 33, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is below an upper threshold.

35. (New) The non-transitory computer readable medium of claim 33, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is above a lower threshold.

36. (New) The non-transitory computer readable medium of claim 33, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is both below an upper threshold and above a lower threshold.

37. (New) The non-transitory computer readable medium of claim 8, wherein the plurality of wells further comprises a third well, and the operations further comprise:
communicating fluid to the third well via the manifold and a third valve,

wherein the third valve is associated with both the third well and the manifold;

and

executing another CP swap to transition from hydraulically fracturing the third well to hydraulically fracturing the first well, the another CP swap comprising:

opening the first valve while fluid is communicated to the third well via the third valve and the manifold,

wherein opening the first valve causes fluid to be communicated to the first well via the manifold and the first valve, and

wherein the first valve is opened in response to at least another portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least another portion of the fluid communicated via the manifold; and

closing the third valve, wherein the third valve is closed:

after the at least another portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least another portion of the fluid communicated via the manifold,

after opening the first valve, and

while fluid is communicated to the first well via the first valve and the manifold;

wherein, during the another CP swap, the fluid is continuously communicated via the manifold so that transition time, between hydraulically fracturing the third well and hydraulically fracturing the first well, is reduced.

38. (New) The non-transitory computer readable medium of claim 8, wherein the operations further comprise:

hydraulically fracturing the first well; and

hydraulically fracturing the second well;

and

wherein the fluid, which is continuously communicated via the manifold so that the transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced, is hydraulic fracturing fluid.

39. (New) The non-transitory computer readable medium of claim 38, wherein the hydraulic fracturing fluid comprises sand.

40. (New) The system of claim 20, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is above a lower threshold.

41. (New) The system of claim 20, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the flow rate is both below an upper threshold and above a lower threshold.

42. (New) The system of claim 15, wherein the one or more conditions include the pressure of the at least a portion of the fluid communicated via the manifold.

43. (New) The system of claim 42, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is below an upper threshold.

44. (New) The system of claim 42, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is above a lower threshold.

45. (New) The system of claim 42, wherein the at least a portion of the fluid communicated via the manifold has satisfied the one or more conditions when the pressure is both below an upper threshold and above a lower threshold.

46. (New) The system of claim 15, wherein:
the plurality of wells further comprises a third well;
the system further comprises a third valve via which fluid is adapted to be communicated from the manifold to the third well, the third valve being associated with both the third well and the manifold;
the one or more controllers are further configured to execute another CP swap, during which fluid is continuously communicated via the manifold, to transition from hydraulically fracturing the third well to hydraulically fracturing the first well, by:
opening the first valve:
while fluid is communicated to the third well via the third valve and the manifold,
to cause fluid to be communicated to the first well via the manifold and the first valve, and
in response to at least another portion of the fluid communicated via the manifold satisfying one or more conditions, which one or more conditions include a flow rate, and/or a pressure, of the at least another portion of the fluid communicated via the manifold; and
closing the second valve:
after the at least another portion of the fluid communicated via the manifold has satisfied the one or more conditions, which one or more conditions include the flow rate, and/or the pressure, of the at least another portion of the fluid communicated via the manifold,
after opening the first valve, and

while fluid is communicated to the first well via the first valve and the manifold;

wherein the continuous communication of the fluid via the manifold during the another CP swap reduces transition time between hydraulically fracturing the third well and hydraulically fracturing the first well.

47. (New) The system of claim 15, wherein the fluid, which is continuously communicated via the manifold so that the transition time, between hydraulically fracturing the first well and hydraulically fracturing the second well, is reduced, is hydraulic fracturing fluid.

48. (New) The system of claim 47, wherein the hydraulic fracturing fluid comprises sand.

III. Remarks

Claims 1-21 were previously pending.

Claims 1, 3, 5-8, 10, 12-15, 17, and 19-21 have been amended.

Claims 4, 11, and 18 have been cancelled without prejudice or disclaimer.

Claims 2, 9, and 16 have been maintained in their original form.

Claims 22-48 have been added.

As a result, claims 1-3, 5-10, 12-17, and 19-48 are pending.

No new subject matter has been added.

In view of the foregoing amendments and remarks, favorable consideration of this application is respectfully requested.

The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,

/Zachary A. Halbur/

Zachary A. Halbur
Registration No. 68,500

Date: October 18, 2023
HAYNES AND BOONE, LLP
Customer No. 27683
Telephone: 817-347-6678
IP Facsimile: 214-200-0853

Attachment:

- Request for Continued Examination ("RCE")

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	18158122
Filing Date	2023-01-23
First Named Inventor	Jordan Kuehn
Art Unit	3676
Examiner Name	Daniel P. Stephenson
Attorney Docket Number	57959.12US03

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

U.S.PATENT APPLICATION PUBLICATIONS Remove

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	20220268141	A1	2022-08-25	Krupa et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

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]
	1	2020145978	WO	A1	2020-07-16	Halliburton Energy Services, Inc.		☐
	2							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

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		☐

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	18158122
	Filing Date	2023-01-23
	First Named Inventor	Jordan Kuehn
	Art Unit	3676
	Examiner Name	Daniel P. Stephenson
	Attorney Docket Number	57959.12US03

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	/Zachary A. Halbur/	Date (YYYY-MM-DD)	2023-10-18
Name/Print	Zachary A. Halbur	Registration Number	68,500

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).

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.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	**10/18/2023 11:36:27 AM ET**	**57959.12US03**

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Q Dismuke
PATENT CENTER #	63021887	AUTHORIZED BY	Zachary Halbur
CUSTOMER #	27683	FILING DATE	01/23/2023
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Jordan Kuehn

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 1103	E20230HB37347707	Q Dismuke

PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY
081394	37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees)

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2801	REQUEST FOR CONTINUED EXAMINATION (RCE) - 1ST REQUEST (SEE 37 CFR 1.114)	544.00	1	544.00
2202	EACH CLAIM IN EXCESS OF 20	40.00	24	960.00
			TOTAL AMOUNT:	**$1,504.00**

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 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/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 18/158,122	Filing Date 01/23/2023	☐ 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 $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $ 192 =	
☐ 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	10/18/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 45	Minus	** 21	= 24		x $40 =	960
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $ 192 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	960

		(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".	/DANTE SMITH/
*** 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.

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

27683 7590 07/20/2023

HAYNES AND BOONE, LLP
IP Section
2323 Victory Avenue
Suite 700
Dallas, TX 75219

EXAMINER
STEPHENSON, DANIEL P

ART UNIT	PAPER NUMBER
3676	

DATE MAILED: 07/20/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

TITLE OF INVENTION: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	10/20/2023

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 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted 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. 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.

PTOL-85 (Rev. 02/11)

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 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. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

27683 7590 07/20/2023
HAYNES AND BOONE, LLP
IP Section
2323 Victory Avenue
Suite 700
Dallas, TX 75219

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.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

TITLE OF INVENTION: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	10/20/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
STEPHENSON, DANIEL P	3676	166-373000

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/AIA/122 or PTO/SB/122) attached.

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

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

1_____
2_____
3_____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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)

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

❑ Electronic Payment via Patent Center or 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

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.

❑ Applicant asserting small entity status. See 37 CFR 1.27

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.

❑ Applicant changing to regular undiscounted fee 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. _____

IWS EXHIBIT 1003 EX_1003_305

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.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

27683 7590 07/20/2023

HAYNES AND BOONE, LLP
IP Section
2323 Victory Avenue
Suite 700
Dallas, TX 75219

EXAMINER	
STEPHENSON, DANIEL P	
ART UNIT	PAPER NUMBER
3676	

DATE MAILED: 07/20/2023

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.** 18/158,122	**Applicant(s)** Kuehn et al.	
	Examiner DANIEL P STEPHENSON	**Art Unit** 3676	**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 amendment filed 6/28/23.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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

3. ☑ The allowed claim(s) is/are 1-21 . 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 _____.

/DANIEL P STEPHENSON/
Primary Examiner, Art Unit 3676

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.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance: the closest prior art of record is Kajaria (US 20170275980).

3. Kajaria discloses a method opening a second valve associated with the second well to permit pumping of fluid into the second well via the second valve (opening valve 66 of second well 14); and opening a first valve (opening valve of first well 14) associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well.

4. The prior art of record fails to disclose, alone or in combination, the key features of "the second valve is associated with both the second well and the manifold; and closing the second valve, wherein the second valve is closed: after opening the first valve, and while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold" in combination with the other limitations currently presented in the combination of claim 1.

5. The prior art of record fails to disclose, alone or in combination, the key features of "the second valve is associated with both the second well and the manifold; and closing the second valve, wherein the second valve is closed: after opening the first valve, and while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold" in combination with the other limitations currently presented in the combination of claim 8.

6. The prior art of record fails to disclose, alone or in combination, the key features of "one or more controllers configured to: open the first valve while hydraulic fracturing fluid is communicated to the second well via the second valve and the manifold; and close the second valve after opening the first

valve, and while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold" in combination with the other limitations currently presented in the combination of claim 15.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL P STEPHENSON whose telephone number is (571)272-7035. The examiner can normally be reached M-F 10am-6pm.

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, Tara Schimpf can be reached on 571-270-7741. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DANIEL P STEPHENSON/
Primary Examiner, Art Unit 3676

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	Art Unit
	DANIEL P STEPHENSON	3676

CPC - Searched*		
Symbol	**Date**	**Examiner**
E21B33/068, E21B34/02, E21B41/00, E21B43/11, E21B43/26, E21B43/2607, F16K3/36, F16N11/00, F16N2210/00, F16N2210/02, F16N29/02, F16N39/00, F16N7/38, F16N7/40	10/07/2022	DPS
updated	11/19/2022	DPS
updated, E21B17/006	05/27/2023	DPS
updated	07/14/2023	DPS

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**
SEARCH text, Inventor name, Forward/Backward search	10/07/2022	DPS

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
see history		10/07/2022	DPS

IWS EXHIBIT 1003 EX_1003_312

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

CPC						
Symbol					**Type**	**Version**
E21B	/	34	/	02	F	2013-01-01
E21B	/	41	/	00	I	2013-01-01
E21B	/	43	/	2607	I	2020-05-01
E21B	/	33	/	068	I	2013-01-01
F16N	/	11	/	00	I	2013-01-01
F16N	/	29	/	02	I	2013-01-01
F16K	/	3	/	36	I	2013-01-01
E21B	/	43	/	11	I	2013-01-01
E21B	/	17	/	006	I	2013-01-01
E21B	/	43	/	26	I	2013-01-01
F16N	/	2210	/	00	A	2013-01-01

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	14 July 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230713

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

INTERNATIONAL CLASSIFICATION				
CLAIMED				
E21B	/	43	/	26
E21B	/	33	/	068
E21B	/	34	/	02
E21B	/	41	/	00
E21B	/	43	/	11
F16K	/	3	/	36
F16N	/	11	/	00
F16N	/	29	/	02

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

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

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	21	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	14 July 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230713

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	**Art Unit**
	DANIEL P STEPHENSON	3676

☑ 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

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	21	
/DANIEL P STEPHENSON/ Primary Examiner, Art Unit 3676	14 July 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230713

Bibliographic Data

Application No: 18/158,122

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /DANIEL P STEPHENSON/ (Examiner's Signature) | (Initials)

Title: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/23/2023	166	3676	
RULE			

APPLICANTS

Downing Wellhead Equipment, LLC, Oklahoma City, OK, UNITED STATES

INVENTORS

Jordan Kuehn, Forest Park, IL, UNITED STATES

Austin Johnson, Edmond, OK, UNITED STATES

Ronnie B. Beason, Lexington, OK, UNITED STATES

Nicholas J. Cannon, Washington, OK, UNITED STATES

CONTINUING DATA

This application is a CON of 17878493 08/01/2022 PAT 11560770

17878493 is a CON of 17388716 07/29/2021 PAT 11401779

17388716 has PRO of 63189663 05/17/2021

17388716 is a CIP of 17319854 05/13/2021

17319854 is a CIP of 16855749 04/22/2020 PAT 11480027

16855749 is a CIP of 16803156 02/27/2020 PAT 11242724

16803156 is a CIP of 16436623 06/10/2019 PAT 11208856

16855749 has PRO of 62836761 04/22/2019

16803156 is a CIP of 16248633 01/15/2019 PAT 10584552

16855749 is a CIP of 16248648 01/15/2019 PAT 10724682

16436623 has PRO of 62755170 11/02/2018

16803156 is a CIP of 16100741 08/10/2018 PAT 10689938

16100741 has PRO of 62638688 03/05/2018

16100741 has PRO of 62638681 03/05/2018

16100741 has PRO of 62637220 03/01/2018

16100741 has PRO of 62637215 03/01/2018

16248633 has PRO of 62617438 01/15/2018

16248648 has PRO of 62617443 01/15/2018

16100741 has PRO of 62598914 12/14/2017

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/13/2023

**** SMALL ENTITY ****

STATE OR COUNTRY

UNITED STATES

ADDRESS

FILING FEE RECEIVED

$704

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	42	(Artificial Intelligence) Similar to: 17/878,493 with 0 CPC Selections and 0 Text Selections Text: (US-20210355784-A1 OR US-20210324706-A1 OR US-20210262315-A1 OR US-11401779-B2 OR US-20210332665-A1 OR US-20200248529-A1 OR US-20190360637-A1 OR US-20190360636-A1 OR CA-3055026-A1 OR US-20170336022-A1 OR US-20220290547-A1 OR CA-3158915-A1 OR US-20200347990-A1 OR CA-3080175-A1 OR US-9447659-B2 OR WO-2020142638-A1 OR CA-3125461-A1 OR US-20210301638-A1 OR CA-2855789-C OR CA-2855789-A1 OR US-20160003006-A1 OR US-9869426-B2 OR US-20170002977-A1 OR US-20200332954-A1 OR US-11137109-B2 OR US-20210301933-A1 OR AU-2018439421-A2 OR JP-7094523-B2 OR JP-WO2020044514-A1 OR WO-2020044514-A1 OR AU-2018439421-A1 OR CN-112567159-A OR GB-2206912-A OR US-4377206-A OR WO-2013059251-A1 OR WO-2020219573-A1 OR CA-3137729-A1 OR US-11193349-B1 OR US-20130092395-A1 OR US-11255446-B1 OR US-20210054839-A1 OR GB-2579734-A8 OR US-4109713-A OR US-10100978-B2 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	OR	ON	ON	2022/10/07 10:02 AM

		US-20180328536-A1 OR US-11047189-B2 OR US-11125385-B2 OR SG-191515-A1 OR US-20210381640-A1 OR GB-2579734-A).did.					
L2	1	("11401779").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:05 AM
L3	93858	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/07 10:06 AM
L4	1	("20170275980").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 05:48 PM
L5	0	("11480028").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 06:04 PM
L6	4	("20140352968" | "20170123437" | "20170275980" | "20180179848").pn. OR ("11401779").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 06:37 PM
L7	4	beason.in. AND manifold.clm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 07:35 PM
L8	11	("2017/0275980").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 09:58 PM
L9	10	8 AND manifold	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2022/10/07 09:59 PM

IWS EXHIBIT 1003 EX_1003_319

			IBM_TDB)				
L10	3418	(manifold AND valve AND (second secondary) AND fluid AND clos$3) AND 3	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/07 10:15 PM
L11	95927	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/18 04:08 PM
L12	433	11 AND (@pd>"20221007")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/18 04:08 PM
L13	1	("20230160278").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/05/27 07:38 PM
L14	95455	(E21B17/006 OR E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2023/05/27 07:40 PM

		E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N29/02).cpc.	EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L15	105016	14 3	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/27 07:41 PM
L16	2293	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/27 07:42 PM
L17	1	("11560770").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/05/27 10:00 PM
L18	359	15 AND (@pd>"20230527")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO,	OR	ON	ON	2023/07/13 12:24 PM

			RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	5570	(manifold AND valve AND (second secondary) AND fluid AND clos$3) .clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:33 PM
N2	675	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:34 PM
N3	675	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm. AND "3"	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:39 PM
N4	17108	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:40 PM
N5	16	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:40 PM
N6	18	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 04:38 PM
N7	18	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/13 12:24 PM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Jordan Kuehn *et al.*	§	Confirmation No.: 1469
Appl. No. 18/158,122	§	Group Art Unit: 3676
Filed: January 23, 2023	§	Examiner: Daniel P. Stephenson
For: Hydraulic Fracturing Plan and Execution of Same	§	Attorney Docket No.: 57959.12US03

AMENDMENT IN RESPONSE TO OFFICE ACTION MAILED JUNE 2, 2023

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

I. Introductory Comments

This document is submitted in response to the Office Action mailed June 2, 2023.

No fees, including extension-of-time fees, are believed necessary for consideration of this document. However, if any fees, including extension-of-time fees, are necessary, the extension of time is hereby requested, and the Commissioner is hereby authorized to charge any fees, including those for the extension of time, to Haynes and Boone, LLP's Deposit Account No. 08-1394.

Amendments to the Abstract are set forth on page 2 of this document.

Amendments to the Claims are reflected in the listing of claims, which begins on page 3 of this document.

Remarks begin on page 9 of this document.

II. Amendments to the Abstract

Please replace the abstract, on page 42 of the Specification, with the following amended Abstract (a clean version of the amended Abstract is also attached):

A hydraulic fracturing plan executable by a hydraulic fracturing system to hydraulically fracture ~~a plurality of oil and gas wells~~ at least first and second wells. In one or more embodiments, executing the hydraulic fracturing plan includes opening a first valve while hydraulic fracturing fluid is communicated to the second well via a second valve and a manifold, the first valve being associated with both the first well and the manifold, and the second valve being associated with both the second well and the manifold. In one or more embodiments, executing the hydraulic fracturing plan further includes closing the second valve, wherein the second valve is closed after opening the first valve, and while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold.

III. Amendments to the Claims

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

1. (Original) A method of hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the method comprising:
opening a first valve while hydraulic fracturing fluid is communicated to the second well via a second valve and a manifold,
wherein the first valve is associated with both the first well and the manifold, and
wherein the second valve is associated with both the second well and the manifold;
and
closing the second valve, wherein the second valve is closed:
after opening the first valve, and
while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold.

2. (Original) The method of claim 1, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

3. (Original) The method of claim 1, wherein the plurality of wells further comprises third and fourth wells, and the method further comprises:
opening a third valve while hydraulic fracturing fluid is communicated to the fourth well via a fourth valve and the manifold,
wherein the third valve is associated with both the third well and the manifold, and
wherein the fourth valve is associated with both the fourth well and the manifold;

and

closing the fourth valve, wherein the fourth valve is closed:

after opening the third valve, and

while hydraulic fracturing fluid is communicated to the third well via the third valve and the manifold.

4. (Original) The method of claim 1, wherein the first valve is opened in response to a determination that the communication of hydraulic fracturing fluid via the manifold has satisfied one or more conditions.

5. (Original) The method of claim 4, further comprising:

determining that the communication of hydraulic fracturing fluid via the manifold has satisfied the one or more conditions.

6. (Original) The method of claim 4, wherein the one or more conditions include one or more flow rate conditions.

7. (Original) The method of claim 6, wherein the fluid communicated via the manifold has satisfied the one or more flow rate conditions when a flow rate of the fluid is below an upper threshold, above a lower threshold, or both.

8. (Original) A non-transitory computer readable medium having stored thereon computer-readable instructions executable by one or more processors to perform operations for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the operations comprising:

opening a first valve while hydraulic fracturing fluid is communicated to the second well via a second valve and a manifold,

wherein the first valve is associated with both the first well and the manifold, and

wherein the second valve is associated with both the second well and the manifold;

and

closing the second valve, wherein the second valve is closed:

after opening the first valve, and

while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold.

9. (Original) The non-transitory computer readable medium of claim 8, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

10. (Original) The non-transitory computer readable medium of claim 8, wherein the plurality of wells further comprises third and fourth wells, and the operations further comprise:
opening a third valve while hydraulic fracturing fluid is communicated to the fourth well via a fourth valve and the manifold,

wherein the third valve is associated with both the third well and the manifold, and

wherein the fourth valve is associated with both the fourth well and the manifold;

and

closing the fourth valve, wherein the fourth valve is closed:

after opening the third valve, and

while hydraulic fracturing fluid is communicated to the third well via the third valve and the manifold.

11. (Original) The non-transitory computer readable medium of claim 8, wherein the first valve is opened in response to a determination that the communication of hydraulic fracturing fluid via the manifold has satisfied one or more conditions.

12. (Original) The non-transitory computer readable medium of claim 11, wherein the operations further comprise:
determining that the communication of hydraulic fracturing fluid via the manifold has satisfied the one or more conditions.

13. (Original) The non-transitory computer readable medium of claim 11, wherein the one or more conditions include one or more flow rate conditions.

14. (Original) The non-transitory computer readable medium of claim 13, wherein the fluid communicated via the manifold has satisfied the one or more flow rate conditions when a flow rate of the fluid is below an upper threshold, above a lower threshold, or both.

15. (Original) A system for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the system comprising:
a manifold;
a first valve via which hydraulic fracturing fluid is adapted to be communicated to the first well, the first valve being associated with both the first well and the manifold;
a second valve via which hydraulic fracturing fluid is adapted to be communicated to the second well, the second valve being associated with both the second well and the manifold; and
one or more controllers configured to:
open the first valve while hydraulic fracturing fluid is communicated to the second well via the second valve and the manifold; and
close the second valve after opening the first valve, and while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold.

16. (Original) The system of claim 15, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

17. (Original) The system of claim 15, wherein:
the plurality of wells further comprises third and fourth wells;
the system further comprises:
a third valve via which hydraulic fracturing fluid is adapted to be communicated to the third well, the third valve being associated with both the third well and the manifold; and
a fourth valve via which hydraulic fracturing fluid is adapted to be communicated to the fourth well, the fourth valve being associated with both the fourth well and the manifold;
and
the one or more controllers are further configured to:
open the third valve while hydraulic fracturing fluid is communicated to the fourth well via the fourth valve and the manifold; and
close the fourth valve after opening the third valve, and while hydraulic fracturing fluid is communicated to the third well via the third valve and the manifold.

18. (Original) The system of claim 15, wherein the one or more controllers are configured to open the first valve in response to a determination that the communication of hydraulic fracturing fluid via the manifold has satisfied one or more conditions.

19. (Original) The system of claim 18, wherein the one or more controllers are further configured to:
determine that the communication of hydraulic fracturing fluid via the manifold has satisfied the one or more conditions.

20. (Original) The system of claim 18, wherein the one or more conditions include one or more flow rate conditions.

21. (Original) The system of claim 20, wherein the fluid communicated via the manifold has satisfied the one or more flow rate conditions when a flow rate of the fluid is below an upper threshold, above a lower threshold, or both.

IV. Remarks

A. Status of the Application

Claims 1-21 were previously pending.

Claims 1-21 have been maintained in their original form.

As a result, claims 1-21 remain pending.

No new subject matter has been added. In view of the amendments above and the remarks that follow, favorable consideration of this application is respectfully requested.

B. Objection to the Specification

The Abstract of the disclosure is objected to for being too short. In response, Applicant has amended the Abstract to overcome this objection. Attached is a clean version of the amended Abstract. Therefore, it is respectfully requested that the objection to the Abstract of the disclosure be reconsidered and withdrawn.

C. Double Patenting Rejections

Claims 1, 8, and 15 stand rejected on the ground of nonstatutory double patenting over claims 10, 23, and 35 of U.S. Patent No. 11,560,770 (the "'770 Patent"), and claims 1, 3-8, 10-15, and 17-21 stand rejected on the ground of nonstatutory double patenting over claims 8-22 and 25-33 of U.S. Patent No. 11,401,779 (the "'779 Patent").

An eTerminal Disclaimer was submitted and approved on June 28, 2023 to obviate the nonstatutory double patenting rejections over both the '770 Patent and the '779 Patent. Therefore, it is respectfully requested that the nonstatutory double patenting rejection of claims 1, 8, and 15 over claims 10, 23, and 35 of the '770 Patent, and of claims 1, 3-8, 10-15, and 17-21 over claims 8-22 and 25-33 of the '779 Patent, be reconsidered and withdrawn.

Conclusion

It is believed that all matters set forth in the Office Action mailed June 2, 2023 have been addressed.

Applicant has made a diligent effort to advance the prosecution of this application by submitting arguments in support of the patentability of claims 1-21. In view of all of the above, the allowance of claims 1-21 is respectfully requested.

The Examiner is invited to call the undersigned at the below-listed telephone number if a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,

/Zachary A. Halbur/

Zachary A. Halbur
Registration No. 68,500

Date: June 28, 2023
HAYNES AND BOONE, LLP
Customer No. 27683
Telephone: 817-347-6678
IP Facsimile: 214-200-0853

Attachment: Replacement Abstract

Abstract

A hydraulic fracturing plan executable by a hydraulic fracturing system to hydraulically fracture at least first and second wells. In one or more embodiments, executing the hydraulic fracturing plan includes opening a first valve while hydraulic fracturing fluid is communicated to the second well via a second valve and a manifold, the first valve being associated with both the first well and the manifold, and the second valve being associated with both the second well and the manifold. In one or more embodiments, executing the hydraulic fracturing plan further includes closing the second valve, wherein the second valve is closed after opening the first valve, and while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	**06/28/2023 11:47:08 AM ET**	**57959.12US03**

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Q Dismuke
PATENT CENTER #	62351978	FILING DATE	01/23/2023
CUSTOMER #	27683	FIRST NAMED INVENTOR	Jordan Kuehn
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Zachary Halbur

Documents

TOTAL DOCUMENTS: 5

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
57959.12US03 Replacement Abstract.pdf		1	Abstract	11 KB
57959.12US03 Amendment in Response to Non-Final Rejection.pdf		10	-	49 KB
57959.12US03 Amendment in Response to Non-Final Rejection-A....pdf	(1-1)	1	Amendment/Request for Reconsideration-After Non-Final Rejection	17 KB
57959.12US03 Amendment in Response to Non-Final Rejection-ABST.pdf	(2-2)	1	Abstract	17 KB

57959.12US03 Amendment in Response to Non-Final Rejection-CLM.pdf	(3-8)	6	Claims	28 KB
57959.12US03 Amendment in Response to Non-Final Rejection-REM.pdf	(9-10)	2	Applicant Arguments/Remarks Made in an Amendment	18 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
57959.12US03 Replacement Abstract.pdf	3AD19E2C647E152BC6043969ED122B047D1E874E4575704BA BCCCE3F59FAB2D6DADBA865F1900962A7E1445B475B099B1 42FBB7735279CD6815ED3C76B6F797A
57959.12US03 Amendment in Response to Non-Final Rejection.pdf	A75DDF423D24A07C6CF831135726275148E769E3DE0F665821 20142097480E0EDBF33845378C91B2BE2D3FADD11C30FE262 437F753A09067A0F22324E7DCEDF4
57959.12US03 Amendment in Response to Non-Final Rejection-A....pdf	F727C6B8A64B0ECABD4AB249471C544C0CC1A28405E359C7 FC0506182A5666DE983F515AA842272AD40428FAB53D72BDB 7B787CB1C1A1BE172BF3C69E4EAD139
57959.12US03 Amendment in Response to Non-Final Rejection-ABST.pdf	756111353AFA273AA90364EC97D6DF1FC8BB811EB1448CC13 729ED410B749D1599947710C094E419DA5864B97EC89157735 3402D620A6AC44BE2AB68E680C77C
57959.12US03 Amendment in Response to Non-Final Rejection-CLM.pdf	E708C0702D775D08C8E3669E6054A01536BAB28D1D3D7849C 3DE045EDB49D484FCEA9D658E8AC0BD99F5AD17120A45FA3 C0B16972EFF479AC45C517A4E867DFC
57959.12US03 Amendment in Response to Non-Final Rejection-REM.pdf	0A60E99F9FA0B83213A771D5977D4088F6005270C8CEFFA36F BB76C6ECCBA9D41B63F4187CB4595B7F6B16858F58FACF10F 7520A7CB5A2E1A598CB64AE2E5E83

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 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.

Doc Code: DIST.E.FILE **Document Description: Electronic Terminal Disclaimer - Filed**	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	18158122
Filing Date	23-Jan-2023
First Named Inventor	Jordan Kuehn
Attorney Docket Number	57959.12US03
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
Downing Wellhead Equipment, LLC	100%

The owner(s) with percent interest listed above 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 number(s)

11560770

11401779

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner 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 owner 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.

(●) Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request. ( ) I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.	
Applicant claims the following fee status: (●) Small Entity ( ) Micro Entity ( ) Regular Undiscounted I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.	
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: (●) An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application Registration Number 68500 ( ) A sole inventor ( ) A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ( ) A joint inventor; all of whom are signing this request	
Signature	/Zachary A. Halbur/
Name	Zachary A. Halbur

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	18158122
Filing Date:	23-Jan-2023
Title of Invention:	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME
First Named Inventor/Applicant Name:	Jordan Kuehn
Filer:	Zachary Arnold Halbur/Q Dismuke
Attorney Docket Number:	57959.12US03

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	2814	1	170	170
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**170**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 18158122

Filing Date: 23-Jan-2023

Applicant/Patent under Reexamination: Kuehn

Electronic Terminal Disclaimer filed on June 28, 2023

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	48219511
Application Number:	18158122
International Application Number:	
Confirmation Number:	1469
Title of Invention:	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME
First Named Inventor/Applicant Name:	Jordan Kuehn
Customer Number:	27683
Filer:	Zachary Arnold Halbur/Q Dismuke
Filer Authorized By:	Zachary Arnold Halbur
Attorney Docket Number:	57959.12US03
Receipt Date:	28-JUN-2023
Filing Date:	23-JAN-2023
Time Stamp:	11:39:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$170
RAM confirmation Number	E20236RB38598903
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	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	41401 714fb4f8e709ac397e40d92c49ac59f0d5442700	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	38080 bb478a3381c593ec3c52550f57339ddc2e1050ff	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	79481		

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/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 18/158,122	Filing Date 01/23/2023	☐ 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 $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $ 192 =	
☐ 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	06/28/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 21	Minus	** 21	= 0		x $40 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $ 192 =	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.	SLIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/TONGELINA C TUBBS/
*** 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.

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.
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03	1469

27683 7590 06/02/2023

HAYNES AND BOONE, LLP
IP Section
2323 Victory Avenue
Suite 700
Dallas, TX 75219

EXAMINER	
STEPHENSON, DANIEL P	

ART UNIT	PAPER NUMBER
3676	

NOTIFICATION DATE	DELIVERY MODE
06/02/2023	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):

ipdocketing@haynesboone.com

Office Action Summary	Application No. 18/158,122	Applicant(s) Kuehn et al.	
	Examiner DANIEL P STEPHENSON	Art Unit 3676	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) 1-21 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1,3-8,10-15 and 17-21 is/are rejected.

8) ☑ Claim(s) 2,9 and 16 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 1/23/23 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. Applicant is reminded of the proper content of an abstract of the disclosure.

A patent abstract is a concise statement of the technical disclosure of the patent and should include that which is new in the art to which the invention pertains. The abstract should not refer to purported merits or speculative applications of the invention and should not compare the invention with the prior art.

If the patent is of a basic nature, the entire technical disclosure may be new in the art, and the abstract should be directed to the entire disclosure. If the patent is in the nature of an improvement in an old apparatus, process, product, or composition, the abstract should include the technical disclosure of the improvement. The abstract should also mention by way of example any preferred modifications or alternatives.

Where applicable, the abstract should include the following: (1) if a machine or apparatus, its organization and operation; (2) if an article, its method of making; (3) if a chemical compound, its identity and use; (4) if a mixture, its ingredients; (5) if a process, the steps.

Extensive mechanical and design details of an apparatus should not be included in the abstract. The abstract should be in narrative form and generally limited to a single paragraph within the range of 50 to 150 words in length.

See MPEP § 608.01(b) for guidelines for the preparation of patent abstracts.

3. The abstract of the disclosure is objected to because it is too short. As stated above, it should be a concise statement of the technical disclosure between 50-150 words. Correction is required. See MPEP § 608.01(b).

Double Patenting

4. 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 § 2146 *et seq.* 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.

5. Claims 1, 8 and 15 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 10, 23 and 35 of U.S. Patent No. 11,560,770. Although the claims at issue are not identical, they are not patentably distinct from each other because the claims of the present application merely remove limitations and/or have minor obvious changes in claim language that do not rise to the level of being patentably distinct from the '770 claims.

6. Claims 1, 3-8, 10-15 and 17-21 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 8-22 and 25-33 of U.S. Patent No. 11,401,779. Although the claims at issue are not identical, they are not patentably distinct from each other because the claims of the present application merely remove limitations and/or have minor obvious changes in claim language that do not rise to the level of being patentably distinct from the '779 claims.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art cited all show similar features to those of the claimed invention.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL P STEPHENSON whose telephone number is (571)272-7035. The examiner can normally be reached M-F 10am-6pm.

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, Tara Schimpf can be reached on 571-270-7741. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DANIEL P STEPHENSON/
Primary Examiner, Art Unit 3676

Notice of References Cited	Application/Control No. 18/158,122	Applicant(s)/Patent Under Reexamination Kuehn et al.	
	Examiner DANIEL P STEPHENSON	Art Unit 3676	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-11401779-B2	08-2022	Kuehn; Jordan	F16N39/00	1/1
*	B	US-20210262315-A1	08-2021	Beason; Ronnie B.	E21B43/2607	1/1
*	C	US-20210324706-A1	10-2021	Beason; Ronnie B.	E21B43/26	1/1
*	D	US-20200347990-A1	11-2020	McKim; Noel	F16N25/00	1/1
*	E	US-20200248529-A1	08-2020	Beason; Ronnie B.	E21B4/003	1/1
*	F	US-11137109-B2	10-2021	Babineaux; Chad	F16N11/08	1/1
*	G	US-20210301638-A1	09-2021	Boyd; Joseph Mark	E21B43/26	1/1
*	H	US-11047189-B2	06-2021	Fernandes; Paulo Dore	E21B23/08	1/1
*	I	US-20210301933-A1	09-2021	ASANOMA; Susumu	F16N1/00	1/1
*	J	US-20170336022-A1	11-2017	Gouge; Lee C.	F16N25/00	1/1
*	K	US-20170275980-A1	09-2017	Kajaria; Saurabh	F16L55/07	1/1
*	L	US-20170123437-A1	05-2017	Boyd; Joseph Mark	G05D7/0641	1/1
*	M	US-20140352968-A1	12-2014	Pitcher; Jason L.	E21B43/2607	166/308.1

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

Notice of References Cited	Application/Control No. 18/158,122	Applicant(s)/Patent Under Reexamination Kuehn et al.	
	Examiner DANIEL P STEPHENSON	Art Unit 3676	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20180179848-A1	06-2018	CHEREWYK; Boris (Bruce) P.	E21B47/10	1/1
*	B	US-11396799-B2	07-2022	Johnson; Austin C.	E21B43/2607	1/1
*	C	US-11306835-B1	04-2022	Dille; Mark C.	G05D7/0173	1/1
*	D	US-10801294-B2	10-2020	Jespersen; Michael David	E21B33/068	1/1
*	E	US-10563778-B2	02-2020	Painter; Jay Patrick	E21B34/00	1/1
*	F	US-11460368-B2	10-2022	Yeung; Tony	F02C9/56	1/1
*	G	US-20210188616-A1	06-2021	Shock; Ricky Dean	B67D7/36	1/1
*	H	US-10174584-B2	01-2019	Kajaria; Saurabh	F16K17/16	1/1
*	I	US-20230160278-A1	05-2023	Kuehn; Jordan	E21B43/2607	166/373
*	J	US-11560770-B2	01-2023	Kuehn; Jordan	F16K3/36	1/1
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/158,122	Kuehn et al.
	Examiner	Art Unit
	DANIEL P STEPHENSON	3676

CPC - Searched*		
Symbol	**Date**	**Examiner**
E21B33/068, E21B34/02, E21B41/00, E21B43/11, E21B43/26, E21B43/2607, F16K3/36, F16N11/00, F16N2210/00, F16N2210/02, F16N29/02, F16N39/00, F16N7/38, F16N7/40	10/07/2022	DPS
updated	11/19/2022	DPS
updated, E21B17/006	05/27/2023	DPS

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**
SEARCH text, Inventor name, Forward/Backward search	10/07/2022	DPS

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
see history		10/07/2022	DPS

IWS EXHIBIT 1003 EX_1003_353

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	42	(Artificial Intelligence) Similar to: 17/878,493 with 0 CPC Selections and 0 Text Selections Text: (US-20210355784-A1 OR US-20210324706-A1 OR US-20210262315-A1 OR US-11401779-B2 OR US-20210332665-A1 OR US-20200248529-A1 OR US-20190360637-A1 OR US-20190360636-A1 OR CA-3055026-A1 OR US-20170336022-A1 OR US-20220290547-A1 OR CA-3158915-A1 OR US-20200347990-A1 OR CA-3080175-A1 OR US-9447659-B2 OR WO-2020142638-A1 OR CA-3125461-A1 OR US-20210301638-A1 OR CA-2855789-C OR CA-2855789-A1 OR US-20160003006-A1 OR US-9869426-B2 OR US-20170002977-A1 OR US-20200332954-A1 OR US-11137109-B2 OR US-20210301933-A1 OR AU-2018439421-A2 OR JP-7094523-B2 OR JP-WO2020044514-A1 OR WO-2020044514-A1 OR AU-2018439421-A1 OR CN-112567159-A OR GB-2206912-A OR US-4377206-A OR WO-2013059251-A1 OR WO-2020219573-A1 OR CA-3137729-A1 OR US-11193349-B1 OR US-20130092395-A1 OR US-11255446-B1 OR US-20210054839-A1 OR GB-2579734-A8 OR US-4109713-A OR US-10100978-B2 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	OR	ON	ON	2022/10/07 10:02 AM

		US-20180328536-A1 OR US-11047189-B2 OR US-11125385-B2 OR SG-191515-A1 OR US-20210381640-A1 OR GB-2579734-A).did.					
L2	1	("11401779").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:05 AM
L3	93858	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/07 10:06 AM
L4	1	("20170275980").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 05:48 PM
L5	0	("11480028").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 06:04 PM
L6	4	("20140352968" | "20170123437" | "20170275980" | "20180179848").pn. OR ("11401779").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 06:37 PM
L7	4	beason.in. AND manifold.clm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 07:35 PM
L8	11	("2017/0275980").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/07 09:58 PM
L9	10	8 AND manifold	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2022/10/07 09:59 PM

			IBM_TDB)				
L10	3418	(manifold AND valve AND (second secondary) AND fluid AND clos$3) AND 3	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/07 10:15 PM
L11	95927	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/18 04:08 PM
L12	433	11 AND (@pd>"20221007")	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/18 04:08 PM
L13	1	("20230160278").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/05/27 07:38 PM
L14	95455	(E21B17/006 OR E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2023/05/27 07:40 PM

		E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N29/02).cpc.	EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L15	105016	14 3	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/27 07:41 PM
L16	2293	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/27 07:42 PM
L17	1	("11560770").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/05/27 10:00 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	5570	(manifold AND valve AND (second secondary) AND fluid AND clos$3) .clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:33 PM
N2	675	(manifold AND valve AND (second	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:34 PM

		secondary) AND fluid AND clos$3 AND condition AND open$3) .clm.					
N3	675	(manifold AND valve AND (second secondary) AND fluid AND clos$3 AND condition AND open$3) .clm. AND "3"	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:39 PM
N4	17108	(E21B33/068 OR E21B34/02 OR E21B41/00 OR E21B43/11 OR E21B43/26 OR E21B43/2607 OR F16K3/36 OR F16N11/00 OR F16N2210/00 OR F16N2210/02 OR F16N29/02 OR F16N39/00 OR F16N7/38 OR F16N7/40).cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:40 PM
N5	16	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/07 10:40 PM
N6	18	N3 AND N4	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/18 04:38 PM

Bibliographic Data

Application No: 18/158,122

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /DANIEL P STEPHENSON/ Examiner's Signature | Initials

Title: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/23/2023	166	3676	57959.12US03
RULE			

APPLICANTS

Downing Wellhead Equipment, LLC, Oklahoma City, OK, UNITED STATES

INVENTORS

Jordan Kuehn, Forest Park, IL, UNITED STATES

Austin Johnson, Edmond, OK, UNITED STATES

Ronnie B. Beason, Lexington, OK, UNITED STATES

Nicholas J. Cannon, Washington, OK, UNITED STATES

CONTINUING DATA

This application is a CON of 17878493 08/01/2022 PAT 11560770

17878493 is a CON of 17388716 07/29/2021 PAT 11401779

17388716 has PRO of 63189663 05/17/2021

17388716 is a CIP of 17319854 05/13/2021

17319854 is a CIP of 16855749 04/22/2020 PAT 11480027

16855749 is a CIP of 16803156 02/27/2020 PAT 11242724

16803156 is a CIP of 16436623 06/10/2019 PAT 11208856

16855749 has PRO of 62836761 04/22/2019

16803156 is a CIP of 16248633 01/15/2019 PAT 10584552

16855749 is a CIP of 16248648 01/15/2019 PAT 10724682

16436623 has PRO of 62755170 11/02/2018

16803156 is a CIP of 16100741 08/10/2018 PAT 10689938

16100741 has PRO of 62638688 03/05/2018

16100741 has PRO of 62638681 03/05/2018

16100741 has PRO of 62637220 03/01/2018

16100741 has PRO of 62637215 03/01/2018

16248633 has PRO of 62617438 01/15/2018

16248648 has PRO of 62617443 01/15/2018

16100741 has PRO of 62598914 12/14/2017

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/13/2023

**** SMALL ENTITY ****

STATE OR COUNTRY

UNITED STATES

ADDRESS

HAYNES AND BOONE, LLP
IP Section
2323 Victory Avenue
Suite 700
Dallas, TX 75219
UNITED STATES

FILING FEE RECEIVED

$704

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
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03

CONFIRMATION NO. 1469

27683
HAYNES AND BOONE, LLP
IP Section
2323 Victory Avenue
Suite 700
Dallas, TX 75219

PUBLICATION NOTICE

OC00000013796617 1

Date Mailed: 05/25/2023

Title:HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME
Publication No.US-2023-0160278-A1
Publication Date:05/25/2023

NOTICE OF PUBLICATION OF APPLICATION

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

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

The publication process established by the Office does not provide for mailing a copy of the publication to the applicant. A copy of the publication may be obtained from the Office upon payment of the application fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571)272-3150 or (800)972-6382, by facsimile at (571)273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

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

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

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

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
18/158,122	01/23/2023	Jordan Kuehn	57959.12US03

CONFIRMATION NO. 1469

27683
HAYNES AND BOONE, LLP
IP Section
2323 Victory Avenue
Suite 700
Dallas, TX 75219

POA ACCEPTANCE LETTER

Date Mailed: 03/02/2023

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/27/2023.

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**.

/ctuazon/

PTO/AIA/80 (07-17)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no person is required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 27683

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[X] The address associated with Customer Number: 27683

OR

[ ]

Firm or individual name		
Address		
City	State	Zip
Country		
Telephone	Email	

Assignee name and address: Downing Wellhead Equipment, LLC
8828 S.W. 2nd Street
Oklahoma City, OK 73128

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature	Date 9/27/21
Name Tyler Wallace	Telephone 405.847.6079
Title Corporate Counsel	Downing Wellhead Equipment, LLC

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. 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.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Downing Wellhead Equipment, LLC

Application No./Patent No.: 18/158,122 Filed/Issue Date: January 23, 2023

Titled: HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Downing Wellhead Equipment, 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:

   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 062454, Frame 0026, 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.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. 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.

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.

/Alan N. Herda/	27 February 2023
Signature	Date
Alan N. Herda	50,426
Printed or Typed Name	Title or Registration Number

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	**02/27/2023 05:00:40 PM ET**	**57959.12US03**

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Q Dismuke
PATENT CENTER #	61658078	FILING DATE	01/23/2023
CUSTOMER #	27683	FIRST NAMED INVENTOR	Jordan Kuehn
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Alan Herda

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
57959.12US03 Power of Attorney.pdf	1	Power of Attorney	1268 KB
57959.12US03 Statement under 3.73c.pdf	2	Assignee showing of ownership per 37 CFR 3.73	79 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
57959.12US03 Power of Attorney.pdf	C9ACD4ED72FD3E96C2E817E6D36C47B6E398313A2AE785D2 3DCB9B8603CAA68D4B6D664517529110801OE068583E3CE5A

	6A6DBBB1095C1ADC501C4E093DB07A8
57959.12US03 Statement under 3.73c.pdf	C808B9D38C4E744F1D0E9C0C8C0E7D2F221808EF90CE6DB1B73E95798094CC7C58E35CF25CB9A8CC453371FC929C69B6F345F0C37CF30F3A3711B50BF14981FE

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 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: 18/158,122

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	64		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	280		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	320		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	21 minus 20 =	* 1	x 40 =	40	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*	x =	0			
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			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	664		TOTAL	

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($)	ADDITIONAL FEE($)	OR	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	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
18/158,122	01/23/2023		704	57959.12US03	21	3

CONFIRMATION NO. 1469

FILING RECEIPT



27683
HAYNES AND BOONE, LLP
IP Section
2323 Victory Avenue
Suite 700
Dallas, TX 75219

Date Mailed: 02/14/2023

Receipt is acknowledged of this non-provisional utility 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 FIRST INVENTOR, 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 corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction 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 provided that the request is grantable.

Inventor(s)

Jordan Kuehn, Forest Park, IL;
Austin Johnson, Edmond, OK;
Ronnie B. Beason, Lexington, OK;
Nicholas J. Cannon, Washington, OK;

Applicant(s)

Downing Wellhead Equipment, LLC, Oklahoma City, OK;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 17/878,493 08/01/2022 PAT 11,560,770
which is a CON of 17/388,716 07/29/2021 PAT 11,401,779
which claims benefit of 63/189,663 05/17/2021
and is a CIP of 17/319,854 05/13/2021
which is a CIP of 16/855,749 04/22/2020 PAT 11,480,027
which claims benefit of 62/836,761 04/22/2019
and is a CIP of 16/248,648 01/15/2019 PAT 10,724,682
which claims benefit of 62/617,443 01/15/2018
and said 16/855,749 04/22/2020 is a CIP of 16/803,156 02/27/2020 PAT 11,242,724
which is a CIP of 16/248,633 01/15/2019 PAT 10,584,552
which claims benefit of 62/617,438 01/15/2018
and said 16/803,156 02/27/2020 is a CIP of 16/436,623 06/10/2019 PAT 11,208,856
which claims benefit of 62/755,170 11/02/2018

and said 16/803,156 02/27/2020 is a CIP of 16/100,741 08/10/2018 PAT 10,689,938
which claims benefit of 62/638,688 03/05/2018
and claims benefit of 62/638,681 03/05/2018
and claims benefit of 62/637,220 03/01/2018
and claims benefit of 62/637,215 03/01/2018
and claims benefit of 62/598,914 12/14/2017

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: Yes

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: 02/13/2023

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 18/158,122**

Projected Publication Date: 05/25/2023

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

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

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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

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

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

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed

from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

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 U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	**01/23/2023 03:27:36 PM ET**	**57959.12US03**

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Q Dismuke
PATENT CENTER #	61477174	FILING DATE	-
CUSTOMER #	27683	FIRST NAMED INVENTOR	Jordan Kuehn
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Zachary Halbur

Documents

TOTAL DOCUMENTS: 5

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
57959.12US03 Application Data Sheet.pdf	11	Application Data Sheet	2175 KB
57959.12US03 CON Patent Application-APP.TEXT.docx	42	Application body structured text document	52 KB
Warning: Bookmarks were found and have been removed.			
57959.12US03 CON Drawings.pdf	50	Drawings-only black and white line drawings	3354 KB
57959.12US03 Declarations.pdf	4	Oath or Declaration filed	925 KB

57959.12US03 Application.pdf	42	Auxiliary PDF of Application	200 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
57959.12US03 Application Data Sheet.pdf	CF46E2BC5DC78570D15DD0389AC5AEB204DD3322E3482157 3B7671E206161FEA68B7546C0CA82C89DAA7D3886675154961 A7697F9078FF78800BAF34156D6E49
57959.12US03 CON Patent Application-APP.TEXT.docx	9E35DCE7F656E4C1FC72B2DBCD113DEE988AAB00158E1286 8C5E6BC03FC1D11A029FD5008D077B31B494BBC5A71ECBFA 37162DDBD7988167941E2F195E04C95F
57959.12US03 CON Drawings.pdf	969156D9BA5D882B1CF2195E6EC30AA721000C91E4591C583 1556AA3BA199A718CB0DD8820F7ABEEC86765B4843CA8319A 415EA1FF96BF88A71D2CB6984CCF2B
57959.12US03 Declarations.pdf	15A04419FE813E26BB089412BF8E6C3F4D8C5EEE95D891E7C D323E548BA310817ECE102ED71891F74ED52F71FB174DDE91 ACE64EBB7D495205A63F2B060CC10B
57959.12US03 Application.pdf	88AFFDD1EC5C6B7F381C0F1812644B20B5AEE7AEFAC297C1 E79A54F931887FF710A50152BB51B249C862C907DDDEBF823 07D3E3A05BDC3F097FE1C551A323A50

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 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.

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Cross-Reference to Related Applications

[0001] This application is a continuation of U.S. Patent Application 17/878,493, filed August 1, 2022, which is a continuation of U.S. Patent Application No. 17/388,716 (the "'716 Application"), filed July 29, 2021, now issued as U.S. Patent No. 11,401,779, which claims the benefit of the filing date of, and priority to, U.S. Patent Application No. 63/189,663, filed May 17, 2021, the entire disclosures of which are hereby incorporated herein by reference.

[0002] The '716 Application is a continuation-in-part (CIP) of U.S. Patent Application No. 17/319,854 (the "'854 Application"), filed May 13, 2021, the entire disclosure of which is hereby incorporated herein by reference.

[0003] The '854 Application is a continuation-in-part (CIP) of U.S. Patent Application No. 16/855,749 (the "'749 Application"), filed April 22, 2020, now issued as U.S. Patent No. 11,480,027, the entire disclosure of which is hereby incorporated herein by reference. The '749 Application claims the benefit of the filing date of, and priority to, U.S. Patent Application No. 62/836,761, filed April 22, 2019, the entire disclosure of which is hereby incorporated herein by reference.

[0004] The '749 Application is a continuation-in-part (CIP) of U.S. Patent Application No. 16/248,648 (the "'648 Application"), filed January 15, 2019, now issued as U.S. Patent No. 10,724,682, the entire disclosure of which is hereby incorporated herein by reference. The '648 Application claims the benefit of the filing date of, and priority to, U.S. Application No. 62/617,443, filed January 15, 2018, the entire disclosure of which is hereby incorporated herein by reference.

[0005] The '749 Application is also a CIP of U.S. Patent Application No. 16/803,156 (the "'156 Application"), filed February 27, 2020, now issued as U.S. Patent No. 11,242,724, the entire disclosure of which is hereby incorporated herein by reference. The '156 Application is a CIP of U.S. Patent Application No. 16/248,633 (the "'633 Application"), filed January 15, 2019, now issued as U.S. Patent No. 10,584,552, the entire disclosure of which is hereby incorporated herein by reference. The '633 Application claims the

benefit of the filing date of, and priority to, U.S. Patent Application No. 62/617,438 (the "'438 Application"), filed January 15, 2018, the entire disclosure of which is hereby incorporated herein by reference.

[0006] The '156 Application is also a CIP of U.S. Patent Application No. 16/436,623 (the "'623 Application"), filed June 10, 2019, now issued as U.S. Patent No. 11,208,856, the entire disclosure of which is hereby incorporated herein by reference. The '623 Application claims the benefit of the filing date of, and priority to, U.S. Patent Application No. 62/755,170, filed November 2, 2018, the entire disclosure of which is hereby incorporated herein by reference.

[0007] The '156 Application is also a CIP of U.S. Patent Application No. 16/100,741 (the "'741 Application"), filed August 10, 2018, now issued as U.S. Patent No. 10,689,938, the entire disclosure of which is hereby incorporated herein by reference. The '741 Application claims the benefit of the filing date of, and priority to, U.S. Patent Application No. 62/638,688, filed March 5, 2018, U.S. Patent Application No. 62/638,681, filed March 5, 2018, U.S. Patent Application No. 62/637,220, filed March 1, 2018, U.S. Patent Application No. 62/637,215, filed March 1, 2018, and U.S. Patent Application No. 62/598,914, filed December 14, 2017, the entire disclosures of which are hereby incorporated herein by reference.

[0008] The '749 Application is related to U.S. Patent Application No. 16/801,911, filed February 26, 2020, the entire disclosure of which is hereby incorporated herein by reference.

[0009] The '716 Application is also related to U.S. Patent Application No. 17/360,336, filed June 28, 2021, the entire disclosure of which is hereby incorporated herein by reference.

Background

[0010] This application relates generally to oil and gas hydraulic fracturing operations and, more particularly, to a hydraulic fracturing plan executable by a hydraulic fracturing system to hydraulically fracture a plurality of oil and gas wells.

Brief Description of the Drawings

[0011] Figure 1A is a diagrammatic illustration of a hydraulic fracturing system operably to execute a hydraulic fracturing plan to hydraulically fracture a plurality of oil and gas wells, according to one or more embodiments.

[0012] Figure 1B is a flow diagram illustrating a method for hydraulically fracturing a plurality of wells by executing a hydraulic fracturing plan using the hydraulic fracturing system of Figure 1A, according to one or more embodiments.

[0013] Figure 2A schematically illustrates execution of one or more sub-step(s) of a first step of the method illustrated in Figure 1B, which first step is or includes equalizing a lubricator of a frac leg associated with a first well, and opening the first well, according to one or more embodiments.

[0014] Figure 2B schematically illustrates execution of one or more additional sub-step(s) of the first step of the method illustrated in Figure 1B, according to one or more embodiments.

[0015] Figure 2C schematically illustrates execution of one or more additional sub-step(s) of the first step of the method illustrated in Figure 1B, according to one or more embodiments.

[0016] Figure 2D schematically illustrates execution of one or more additional sub-step(s) of the first step of the method illustrated in Figure 1B, according to one or more embodiments.

[0017] Figure 2E schematically illustrates execution of one or more additional sub-step(s) of the first step of the method illustrated in Figure 1B, according to one or more embodiments.

[0018] Figure 2F schematically illustrates execution of one or more additional sub-step(s) of the first step of the method illustrated in Figure 1B, according to one or more embodiments.

[0019] Figure 2G schematically illustrates execution of one or more additional sub-step(s) of the first step of the method illustrated in Figure 1B, according to one or more embodiments.

[0020] Figure 3 is a flow diagram illustrating the various sub-steps, illustrated schematically in Figures 2A and 2G, of the first step of the method illustrated in Figure 1B, according to one or more embodiments.

[0021] Figure 4 is a flow diagram illustrating various sub-steps of a second step of the method illustrated in Figure 1B, which second step is or includes perforating a stage of the first well using a wireline perforating system, according to one or more embodiments.

[0022] Figure 5A schematically illustrates execution of one or more sub-step(s) of the second step of the method illustrated in Figure 1B, according to one or more embodiments.

[0023] Figure 5B schematically illustrates execution of one or more additional sub-step(s) of the second step of the method illustrated in Figure 1B, according to one or more embodiments.

[0024] Figure 5C schematically illustrates execution of one or more additional sub-step(s) of the second step of the method illustrated in Figure 1B, according to one or more embodiments.

[0025] Figure 6 is a flow diagram illustrating various sub-steps of a third step of the method illustrated in Figure 1B, which third step is or includes closing the first well using a valve apparatus, and draining a lubricator, according to one or more embodiments.

[0026] Figure 7A schematically illustrates execution of one or more sub-step(s) of the third step of the method illustrated in Figure 1B, according to one or more embodiments.

[0027] Figure 7B schematically illustrates execution of one or more additional sub-step(s) of the third step of the method illustrated in Figure 1B, according to one or more embodiments.

[0028] Figure 7C schematically illustrates execution of one or more additional sub-step(s) of the third step of the method illustrated in Figure 1B, according to one or more embodiments.

[0029] Figure 7D schematically illustrates execution of one or more additional sub-step(s) of the third step of the method illustrated in Figure 1B, according to one or more embodiments.

[0030] Figure 7E schematically illustrates execution of one or more additional sub-step(s) of the third step of the method illustrated in Figure 1B, according to one or more embodiments.

[0031] Figure 7F schematically illustrates execution of one or more additional sub-step(s) of the third step of the method illustrated in Figure 1B, according to one or more embodiments.

[0032] Figure 7G schematically illustrates execution of one or more additional sub-step(s) of the third step of the method illustrated in Figure 1B, according to one or more embodiments.

[0033] Figure 7H schematically illustrates execution of one or more additional sub-step(s) of the third step of the method illustrated in Figure 1B, according to one or more embodiments.

[0034] Figure 7I schematically illustrates execution of one or more additional sub-step(s) of the third step of the method illustrated in Figure 1B, according to one or more embodiments.

[0035]

[0036] Figure 8 is a flow diagram illustrating various sub-steps of a fourth step of the method illustrated in Figure 1B, which fourth step is or includes isolating a stage of a second well in preparation for a hydraulic fracturing operation, according to one or more embodiments.

[0037] Figure 9A schematically illustrates execution of one or more sub-step(s) of the fourth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0038] Figure 9B schematically illustrates execution of one or more additional sub-step(s) of the fourth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0039] Figure 9C schematically illustrates execution of one or more additional sub-step(s) of the fourth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0040] Figure 9D schematically illustrates execution of one or more additional sub-step(s) of the fourth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0041] Figure 9E schematically illustrates execution of one or more additional sub-step(s) of the fourth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0042] Figure 9F schematically illustrates execution of one or more additional sub-step(s) of the fourth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0043] Figure 9G schematically illustrates execution of one or more additional sub-step(s) of the fourth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0044]

[0045] Figure 10 is a flow diagram illustrating various sub-steps of a fifth step of the method illustrated in Figure 1B, which fifth step is or includes detecting or otherwise determining that a fracturing stage of a third well has ended, according to one or more embodiments.

[0046] Figure 11 schematically illustrates execution of one or more subs-step(s) of the fifth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0047] Figure 12 is a flow diagram illustrating various sub-steps of a sixth step of the method illustrated in Figure 1B, which sixth step is or includes determining whether to permit a regular swap or a continuous pumping swap (or "CP swap"), according to one or more embodiments.

[0048] Figure 13 is a flow diagram illustrating various sub-steps of a seventh step of the method illustrated in Figure 1B, which seventh step is or includes the regular swap from hydraulically fracturing the third well to hydraulically fracturing the second well, according to one or more embodiments.

[0049] Figure 14A schematically illustrates execution of one or more sub-step(s) of the seventh step of the method illustrated in Figure 1B, according to one or more embodiments.

[0050] Figure 14B schematically illustrates execution of one or more additional sub-step(s) of the seventh step of the method illustrated in Figure 1B, according to one or more embodiments.

[0051] Figure 15 is a flow diagram illustrating various sub-steps of an eighth step of the method illustrated in Figure 1B, which eighth step is or includes the CP swap from hydraulically fracturing the third well to hydraulically fracturing the second well, according to one or more embodiments.

[0052] Figure 16A schematically illustrates execution of one or more sub-step(s) of the eighth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0053] Figure 16B schematically illustrates execution of one or more additional sub-step(s) of the eighth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0054] Figure 16C schematically illustrates execution of one or more additional sub-step(s) of the eighth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0055] Figure 16D is a chart illustrating execution of one or more of the various sub-steps, schematically illustrated in Figures 16A through 16C, of the eighth step of the method illustrated in Figures 1B, according to one or more embodiments.

[0056] Figure 16E is another chart illustrating execution of one or more of the various sub-steps, schematically illustrated in Figures 16A through 16C, of the eighth step of the method illustrated in Figures 1B, according to one or more embodiments.

[0057] Figure 17 is a flow diagram illustrating various sub-steps of a ninth step of the method illustrated in Figure 1B, which ninth step is or includes latching, filling, and pressure testing a frac leg associated with a fourth well in preparation for perforating a stage of the fourth well using the wireline perforating system, according to one or more embodiments.

[0058] Figure 18A schematically illustrates execution of one or more sub-step(s) of the ninth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0059] Figure 18B schematically illustrates execution of one or more additional sub-step(s) of the ninth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0060] Figure 18C schematically illustrates execution of one or more additional sub-step(s) of the ninth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0061] Figure 18D schematically illustrates execution of one or more additional sub-step(s) of the ninth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0062] Figure 18E schematically illustrates execution of one or more additional sub-step(s) of the ninth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0063] Figure 18F schematically illustrates execution of one or more additional sub-step(s) of the ninth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0064] Figure 18G schematically illustrates execution of one or more additional sub-step(s) of the ninth step of the method illustrated in Figure 1B, according to one or more embodiments.

[0065] Figure 19A is a flow diagram illustrating a portion of another method for fracturing wells using the fracturing system of Figure 1A, which another method includes swapping from simultaneously fracturing first and second wells to simultaneously fracturing third and fourth wells, according to one or more embodiments.

[0066] Figure 19B is a flow diagram illustrating another portion of the another method of Figure 20A, according to one or more embodiments.

[0067] Figure 20 is a diagrammatic illustration of a computing node for implementing one or more embodiments of the present disclosure.

Detailed Description

[0068] Referring to Figure 1A, in an embodiment, a hydraulic fracturing system 100 for executing a hydraulic fracturing plan to hydraulically fracture wells 105A through 105C+n is illustrated, which hydraulic fracturing system 100 includes: a blender 110 adapted to mix fluid from a fluid source 115 with sand from a sand source 120 to produce hydraulic fracturing fluid; a suction manifold 125 adapted to receive the hydraulic fracturing fluid from the blender 110; a discharge manifold 130; a plurality of swap stations 135, each adapted to communicate the hydraulic fracturing fluid from the suction manifold 125 to a corresponding pump truck 140, and, after pressurization by the corresponding pump truck 140, to communicate the pressurized hydraulic fracturing fluid from the corresponding pump truck 140 to the discharge manifold 130; and a zipper manifold 145 adapted to communicate the pressurized hydraulic fracturing fluid from the discharge manifold 130 to a plurality of hydraulic fracturing legs (or "frac legs") 150A through 150C+n, each of which is adapted to communicate the pressurized hydraulic fracturing fluid from the zipper manifold 145 to a corresponding one of the wells 105A through 105C+n. In one or more embodiments, each of the swap stations 135 is or includes one or more components shown and described in U.S. Patent Application No. 16/436,189, filed June 10, 2019, now published as U.S. Patent Application Publication No. 2020/0386359, the entire disclosure of which is hereby incorporated herein by reference.

[0069] A grease system 155 is adapted to communicate lubricating grease to various components of the frac legs 150A through 150C+n, including, for example, pump-down valves 160a-b, master valves 165a-b, and zipper valves 170a-b associated with each of the frac legs 150A through 150C+n (which components are shown in Figures 2A-G, 5A-C, 7A-I, 9A-G, 11, 14A-B, 16A-C, and 18A-G). In one or more embodiments, the grease system 155 is or includes one or more components shown and described in U.S. Patent Application No. 16/248,648, filed January 15, 2019 bearing Attorney Docket No. 57959.3US01, now issued as U.S. Patent No. 10,724,682, the entire disclosure of which is hereby incorporated herein by reference. In addition, or instead, in one or more embodiments, the grease system 155 is or includes one or more components shown and described in U.S. Patent Application No. 16/938,341, filed July 24, 2020 bearing Attorney Docket No. 57959.3US02, now published as U.S. Patent Application Publication No.

2020/0355322, the entire disclosure of which is hereby incorporated herein by reference in its entirety. In addition, or instead, in one or more embodiments, the grease system 155 is or includes one or more components shown and described in the '749 Application, filed April 22, 2020 bearing Attorney Docket No. 57959.5US01, now published as U.S. Patent Application Publication No. 2020/0248529, the entire disclosure of which is hereby incorporated herein by reference in its entirety. In addition, or instead, in one or more embodiments, the grease system 155 is or includes one or more components shown and described in the '854 Application, filed May 13, 2021 bearing Attorney Docket No. 57959.11US01, the entire disclosure of which is hereby incorporated herein by reference in its entirety.

[0070] A controller 156 is adapted to control the grease system 155, the frac legs 150A through 150C+n, or both. In one or more embodiments, the controller 156 is or includes a non-transitory computer readable medium and one or more processors adapted to execute instructions stored on the non-transitory computer readable medium. In one or more embodiments, the controller 156 is located on-site at the well site. Alternatively, the controller 156 may be located remotely from the well site. In one or more embodiments, the controller 156 includes a plurality of controllers. In one or more embodiments, the controller 156 includes a plurality of controllers, with one or more controllers located on-site at the well site and/or one or more other controllers located remotely from the well site.

[0071] Referring to Figure 1B, in an embodiment, a method 175 for hydraulically fracturing the wells 105A through 105C+n by executing a hydraulic fracturing plan using the hydraulic fracturing system 100 of Figure 1A is illustrated. The method 175 generally includes: at step(s) 176a, perforating a stage of each well using, for example, a wireline perforating system 177; at step(s) 176b, isolating the perforated stage of each well using an object dropped, for example, from a launcher 178 of the wireline perforating system 177; and, at step(s) 176c, hydraulically fracturing the isolated/perforated stage of each well. More particularly, as will be described in further detail below, the method 175 includes: at a step 225, equalizing a lubricator 220 of the frac leg 150A associated with the well 105A, and opening the well 105A; at a step 230, perforating a stage of the well

105A using the wireline perforating system 177; at a step 235, closing the well 105A using the valve apparatus 210 and draining the lubricator 220; at a step 238a, queuing the well 105A (as indicated at queue position n_2) in a frac queue 239 in preparation for a hydraulic fracturing operation; at a step 238b, dequeuing the well 105B (as indicated at queue position n_1+1) from the frac queue 239 in preparation for the hydraulic fracturing operation; at a step 240, isolating a stage of the well 105B in preparation for the hydraulic fracturing operation; at a step 245, detecting or otherwise determining that a fracturing stage of the well 105D has ended; at a step 250, determining whether to permit a regular swap or a CP swap from hydraulically fracturing (at a step 262) the well 105D to hydraulically fracturing (at the step 262) the well 105B; at a step 255, executing the regular swap from hydraulically fracturing (at the step 262) the well 105D to hydraulically fracturing (at the step 262) the well 105B, or, at a step 260, executing the CP swap from hydraulically fracturing (at the step 262) the well 105D to hydraulically fracturing (at the step 262) the well 105B; at the step 262, hydraulically fracturing the well 105B; optionally, at a step 263a, queuing the well 105D (as indicated at queue position n_1) in a wireline queue 264 in preparation for perforating a next stage of the well 105D; optionally, at a step 238b, dequeuing the well 105E (as indicated at queue position 1) from the wireline queue 264 in preparation for perforating a next stage of the well 105E; and, at a step 265, latching, filling, and pressure testing the frac leg 150E associated with the well 105E.

[0072] In one or more embodiments, the controller 156 is adapted to control the grease system 155, the frac legs 150A through 150C+n, or both, in order to execute the method 175 described herein. In one or more embodiments, the frac queue 239 and the wireline queue 264 are stored on a non-transitory computer readable medium that includes or is part of, for example, the controller 156. In one or more embodiments, the frac queue 239 is or includes a list of data items, commands, etc., stored on the computer readable medium so as to be retrievable by one or more processors in a definite order (but not necessarily in the order stored), and the frac queue 239 is associated with the wells 105A through 105C+n, as shown in Figure 1B. In addition, or instead, the frac queue 239 can be at least partially populated by an external source, such as, for example, the frac operator. Likewise, in one or more embodiments, the wireline queue 264 is or includes a

list of data items, commands, etc., stored on the computer readable medium so as to be retrievable by one or more processors in a definite order (but not necessarily in the order stored), and the wireline queue 264 is associated with the wells 105A through 105C+n, as shown in Figure 1B. In addition, or instead, the wireline queue 264 can be at least partially populated by an external source, such as, for example, the wireline operator.

[0073] Referring to Figures 2A through 2G, in an embodiment, the frac leg 150A associated with the well 105A is illustrated, which frac leg 150A includes: a wellhead including the master valves 165a-b (such as, for example, gate valves) operably coupled to, and adapted to be in fluid communication with, the well 105A, each of the master valves 165a-b including associated grease ports (or "GPs") 185a-b; the pump-down valves 160a-b (such as, for example, gate valves) operably coupled to, and adapted communicate fluid between, a pump-down truck 190 and the well 105A, via the master valves 165a-b, each of the pump-down valves 160a-b including an associated GP 195; and the zipper valves 170a-b (such as, for example, gate valves) operably coupled to, and adapted communicate fluid between, the zipper manifold 145 and the well 105A, via the master valves 165a-b, each of the zipper valves 170a-b including associated GPs 200a-b. In one or more embodiments, one or both of the zipper valves 170a-b of each of the frac legs 150A through 150C+n include(s), or is/are part of, the zipper manifold 145. In one or more embodiments, as in Figures 2A through 2G, the frac leg 150A associated with the well 105A also includes a flow block 205 to which the pump-down valves 160a-b and the zipper valves 170a-b are operably coupled.

[0074] The frac leg 150A associated with the well 105A further includes a valve apparatus 210 via which both the wireline perforating system 177 and the object launched from, for example, the launcher 178, are permitted entry to the well 105A. The valve apparatus 210 includes: a containment area 215a (labeled "WELL") adapted to be in fluid communication with the well 105A via the master valves 165a-b; a containment area 215b (labeled "LUB") adapted to be in fluid communication with the lubricator 220 of the wireline perforating system 177; and a containment area 215c (labeled "LL") adapted to be in fluid communication with the containment area 215a via a flow control device 221a (e.g., a flapper-type flow control device), and adapted to be in fluid communication with the

containment area 215b via a flow control device 221b (e.g., a flapper-type flow control device).

[0075] An equalization ("EQ") valve 222a is connected between the containment areas 215a and 215c, which EQ valve 222a is openable to permit pressure equalization between the containment areas 215a and 215c when the flow control device 221a is closed. Likewise, an equalization valve 222b is connected between the containment areas 215b and 215c, which EQ valve 222b is openable to permit pressure equalization between the containment areas 215b and 215c when the flow control device 221b is closed. Additionally, an EQ valve 222c is connected between the lubricator 220 and atmosphere (labeled "ATM"), which EQ valve 222c permits pressure equalization between the lubricator 220 and atmosphere. A drain 223 is connected between a latch 234 (via which the lubricator 220 is detachably couplable to the valve apparatus 210) and a pump station 224a, via which drain 223 fluid is communicable to and/or from the lubricator 220, using, for example, an auto-fill/auto-drain pump of the pump station 224a, when the lubricator 220 is connected to the valve apparatus 210 via the latch 234. Finally, when the lubricator 220 is connected to the valve apparatus 210 via the latch 234, fluid can also be communicated to the lubricator 220 (via, for example, the containment area 215c and the EQ valve 222b) using one or more boost pump(s) 224b in order to increase a fluid pressure in the lubricator 220, aiding in pressure equalization between the lubricator 220 and the associated wellhead. For example, the boost pump(s) 224b may include: a first boost pump capable of pumping at relatively higher volumes and relatively lower pressures; and a second boost pump capable of pumping at relatively lower volumes and relatively higher pressures. The first and second boost pumps are used in combination to achieve combined pumping at relatively higher volumes and relatively higher pressures. In addition, or instead, a third boost pump capable of pumping at relatively higher volumes and relatively higher pressures may be used. Moreover, although shown as being connected to, and in fluid communication with, the containment area 215c, one or more of the boost pump(s) 224b may instead be, include, or be part of the pump station 224a.

[0076] In one or more embodiments, the valve apparatus 210 is or includes one or more components shown and described in U.S. Patent Application No. 15/487,785, filed April 14, 2017, now issued as U.S. Patent No. 10,662,740, the entire disclosure of which is hereby incorporated herein by reference. In addition, or instead, in one or more embodiments, the valve apparatus 210 is or includes one or more components shown and described in U.S. Patent Application No. 16/721,203, filed December 19, 2019, now published as U.S. Patent Application Publication No. 2020/0123876, the entire disclosure of which is hereby incorporated herein by reference.

[0077] In one or more embodiments, the launcher 178 is or includes one or more components shown and described in U.S. Patent Application No. 16/248,633, filed January 15, 2019 bearing Attorney Docket No. 57959.4US01, now issued as U.S. Patent No. 10,584,552, the entire disclosure of which is hereby incorporated herein by reference. In addition, or instead, in one or more embodiments, the launcher 178 is or includes one or more components shown and described in U.S. Patent Application No. 16/801,911, filed February 26, 2020 bearing Attorney Docket No. 57959.4US02, now published as U.S. Patent Application Publication No. 2020/0190933, the entire disclosure of which is hereby incorporated herein by reference. In addition, or instead, in one or more embodiments, the launcher 178 is or includes one or more components shown and described in U.S. Patent Application No. 16/803,156, filed February 27, 2020 bearing Attorney Docket No. 57959.8US01, now published as U.S. Patent Application Publication No. 2020/0190934, the entire disclosure of which is hereby incorporated herein by reference.

[0078] In one or more embodiments, the frac legs 150B through 150C+n associated with each of the wells 105B through 105C+n, respectively, are substantially identical to the frac leg 150A associated with the well 105A; therefore, the frac legs 150B through 150C+n associated with each of the wells 105B through 105C+n will not be described in further detail. Accordingly, each of the frac legs 150B through 150C+n associated with the wells 105B through 105C+n includes features/components substantially identical to corresponding features/components of the frac leg 150A associated with the well 105A,

which substantially identical features/components are given the same reference numerals and will also not be described in further detail.

[0079] Referring to Figure 3, with continuing reference to Figures 2A through 2G, in an embodiment, various sub-steps 226a-h of the step 225 of the method 175 illustrated in Figure 1B are shown in detail, which step 225 is or includes equalizing the lubricator 220 of the frac leg 150A associated with the well 105A, and opening the well 105A. In one or more embodiments, the lubricator 220 is or includes one or more components shown and described in the '749 Application. In addition, or instead, in one or more embodiments, the lubricator 220 is or includes one or more components shown and described in the '854 Application.

[0080] At the sub-step 226a, the boost pump(s) 224b is/are turned on to increase a fluid pressure in the lubricator 220 of the frac leg 150A, thereby aiding in pressure equalization between said lubricator 220 and the well 105A, as shown in Figures 2A and 3 (indicated by arrow 232a in Figure 2A). As shown in Figure 1B, the step 265 of latching, filling, and pressure testing the frac leg 150A associated with the well 105A is executed on the frac leg 150A just prior to the execution of the sub-step 226a on the frac leg 150A. The step 265 will be described in further detail below as executed on the frac leg 150E; however, the description below also applies to the execution of the step 265 on the frac leg 150A. As a result, in one or more embodiments, just prior to execution of the sub-step 226a on the frac leg 150A: the EQ valve 222c is closed; the drain 223 is closed; the lubricator 220 extends within, and is latched to, the latch 234; the flow control device 221b is closed; the EQ valve 222b is open; the flow control device 221a is closed; the EQ valve 222a is closed; the pump-down valves 160a-b closed, and grease from the grease system 155 is withheld from the corresponding GPs 195; the zipper valves 170a-b are closed, and grease from the grease system 155 is withheld from the corresponding GPs 200a-b; and the master valves 165a-b are open, and grease from the grease system 155 is communicated to the corresponding GPs 185a-b. The communication of grease from the grease system 155 to the corresponding GPs 185a-b is not indicated by arrows in Figure 2A but is instead indicated by a lack of shading of the GPs 185a-b as shown in Figure

2A; the same lack of shading indication applies to the GPs 185a-b as shown in Figures 2B-G, 5A-C, 7A-I, 9A-G, 11, 14A-B, 16A-C, and 18A-G.

[0081] At the sub-step 226b, respective fluid pressures within the containment areas 215a and 215c are compared to determine whether the fluid pressure in the lubricator 220 of the frac leg 150A has been equalized to within a threshold amount of the fluid pressure in the well 105A. If it is determined that the fluid pressure in the lubricator 220 of the frac leg 150A has not been equalized to within the threshold amount of the fluid pressure in the well 105A, the EQ valve 222a is opened at the sub-step 226c to further encourage such pressure equalization between said lubricator 220 and the well 105A, as shown in Figures 2B and 3. Alternatively, the order in which the sub-steps 226a and 226c are executed may be reversed, or one of the sub-steps 226a and 226c may be omitted altogether.

[0082] At the sub-step 226d, once it is determined that the fluid pressure in the lubricator 220 of the frac leg 150A has been equalized to within the threshold amount of the fluid pressure in the well 105A, the flow control device 221a is opened, as shown in Figures 2C and 3. At the sub-step 226e, the EQ valve 222a is closed, as shown in Figures 2D and 3. However, in those embodiments in which the sub-step 226c of opening the EQ valve 222a is omitted, the sub-step 226e of closing the EQ valve 222a is also omitted. Additionally, the sub-step 226e may be executed to close the EQ valve 222a at any time before, during, or after, execution of the sub-steps 226d, 226f, or 226g. At the sub-step 226f, the flow control device 221b is opened, as shown in Figures 2E and 3. At the sub-step 226g, the boost pump(s) 224b is/are turned off, as shown in Figures 2F and 3. At the sub-step 226h, the EQ valve 222b is closed, as shown in Figures 2G and 3. Once the sub-steps 226a-h are executed, the well 105A is ready for execution of the step 230, namely perforating a stage of the well 105A using the wireline perforating system 177, as will be described in detail below in connection with Figures 4 and 5A through 5C.

[0083] Referring to Figures 4 and 5A through 5C, in an embodiment, various sub-steps 231a-h of the step 230 of the method 175 illustrated in Figure 1B are shown in detail, which step 230 is or includes perforating a stage of the well 105A using the wireline perforating system 177. In one or more embodiments, the wireline perforating system

177 is or includes the pump-down truck 190, a wireline truck 233, the lubricator 220, the launcher 178, the latch 234 (via which the lubricator 220 is detachably couplable to the valve apparatus 210), or any combination thereof. In addition, or instead, the wireline perforating system 177 may be or include one or more components shown and described in the '749 Application. In addition, or instead, in one or more embodiments, the wireline perforating system 177 may be or include one or more components shown and described in the '854 Application.

[0084] At the sub-step 231a, a plug and perforating gun(s) are deployed from the lubricator 220, as shown in Figures 4 and 5A (indicated by arrow 232b in Figure 5A). At the sub-step 231b, the pump-down valves 160a-b are opened, as shown in Figures 4 and 5B. At the sub-step 231c, grease from the grease system 155 is communicated to the corresponding GPs 195 of the pump-down valves 160a-b, respectively, as shown in Figures 4 and 5B (indicated by arrows 232c in Figure 5B). At the sub-step 231d, the plug and perforating gun(s) are pumped down into the well 105A using the pump-down truck 190, as shown in Figures 4 and 5B (indicated by arrows 232d and 232e in Figure 5B). At the sub-step 231e, the pump-down valves 160a-b are closed, and grease from the grease system 155 is withheld from the corresponding GPs 195, as shown in Figures 4 and 5C. Additionally, the sub-step 231e may be executed to close the pump-down valves 160a-b at any time before, during, or after, execution of the sub-steps 231f, 231g, or 231h. At the sub-step 231f, the plug is set in the well 105A, as shown in Figure 4. At the sub-step 231g, the perforating gun(s) are detonated in the well 105A, as shown in Figure 4. Finally, at the sub-step 231h, the spent perforating gun(s) are retrieved from the well 105A, as shown in Figures 4 and 5C (indicated by arrows 232f and 232g in Figure 5C). Once the sub-steps 231a-h are executed, the well 105A is ready for execution of the step 235, namely closing the well 105A using the valve apparatus 210 and draining the lubricator 220, as will be described in detail below in connection with Figures 6 and 7A through 7I.

[0085] Referring to Figures 6 and 7A through 7I, in an embodiment, various sub-steps 236a-n of the step 235 of the method 175 illustrated in Figure 1B are shown in detail, which step 235 is or includes closing the well 105A using the valve apparatus 210 and draining the lubricator 220. At the sub-step 236a, bump up of the retrieved spent

perforating gun(s) within the lubricator 220 is determined and/or confirmed. The sub-step 236a can be achieved in several ways, including, but not limited to: prompting the wireline operation for bump up; checking with the wireline operator to determine whether bump up has occurred; detecting bump up using a switch (e.g., a proximity switch) and/or another sensor (e.g., an accelerometer, a wireline speed sensor, a wireline tension sensor, a wireline length sensor, a wireline direction sensor, the like, or any combination thereof) associated with the lubricator 220; receiving verbal confirmation that bump up has occurred; or any combination thereof.

[0086] At the sub-step 236b, once the bump up of the retrieved spent perforating gun(s) within the lubricator 220 is determined and/or confirmed, the flow control device 221b is closed, as shown in Figures 6 and 7A. At the sub-step 236c, the flow control device 221a is closed, as shown in Figures 6 and 7B. At the sub-step 236d, the EQ valve 222c is opened, as shown in Figures 6 and 7C, to bleed down a fluid pressure in the lubricator 220 (indicated by arrow 232g in Figure 7C). At the sub-step 236e, the EQ valve 222b is opened, as shown in Figures 6 and 7D. At the sub-step 236f, the lubricator 220 is checked to determine whether the fluid pressure in the lubricator 220 has dropped (or "bled down") to below a threshold value (e.g., a bleed PSI limit), as shown in Figure 6. At the sub-step 236g, once it has been determined that the fluid pressure in the lubricator 220 has dropped to below the threshold value, the EQ valve 222b is closed, as shown in Figures 6 and 7E.

[0087] At the sub-step 236h, the drain 223 is opened, as shown in Figures 6 and 7F. At the sub-step 236i, the auto-drain pump of the pump station 224a is turned on to drain fluid from the lubricator 220 via the drain 223, as shown in Figures 6 and 7F (indicated by arrow 232h in Figure 7F). At the sub-step 236j, the auto-drain pump is allowed to finish auto-draining the lubricator 220 before the drain 223 is closed, as shown in Figures 6 and 7G. At the sub-step 236k, the latch 234 is unlatched, as shown in Figures 6 and 7G. At the sub-step 236l, the lubricator 220 is removed, as shown in Figures 6 and 7H (indicated by arrow 232i in Figure 7H). At the sub-step 236m, the EQ valve 222c is closed, as shown in Figure 7I. Finally, at the sub-step 236n, an object drop (e.g., from the launcher 178) and/or a pressure test is/are enabled, as shown in Figure 6. More particularly, once the

sub-steps 236a-n are executed, the well 105A is ready for execution of the step 240, namely isolating a stage of the well 105A in preparation for a hydraulic fracturing operation. The step 240 will be described in further detail below (in connection with Figures 8 and 9A through 9G) as executed on the frac leg 150B to isolate a stage of the well 105B; however, the description below also applies to the execution of the step 240 on the frac leg 150A to isolate a stage of the well 105A.

[0088] Referring to Figures 8 and 9A through 9G, in an embodiment, various sub-steps 241a-o of the step 240 of the method 175 illustrated in Figure 1B are shown in detail, which step 240 is or includes isolating a stage of the well 105B in preparation for a hydraulic fracturing operation. In one or more embodiments, the step 240 that is or includes isolating the stage of the well 105B includes or is part of a hydraulic fracturing operation. At the sub-step 241a, the EQ valve 222b is opened to facilitate pressure equalization between the containment areas 215b and 215c, as shown in Figures 8 and 9A. At the sub-step 241b, an object is dropped from the launcher 178, as shown in Figures 8 and 9A. At the sub-step 241c, respective fluid pressures within the containment areas 215b and 215c are checked to determine whether the containment areas 215b and 215c have been pressure equalized to within a threshold amount, as shown in Figure 8. At the sub-step 241d, once it is determined that the containment areas 215b and 215c have been pressure equalized to within the threshold amount, the flow control device 221b is opened, as shown in Figures 8 and 9B. At the sub-step 241e, the object passes into the containment area 215c, as shown in Figures 8 and 9C. At the sub-step 241f, the flow control device 221b is closed, as shown in Figures 8 and 9C. At the sub-step 241g, the EQ valve 222b is closed, as shown in Figures 8 and 9D.

[0089] At the sub-step 241h, the boost pump(s) 224b is/are turned on to increase a fluid pressure in the containment area 215c, thereby aiding in pressure equalization between the containment areas 215a and 215c, as shown in Figures 8 and 9D (indicated by arrow 232j in Figure 9D). At the sub-step 241i, respective fluid pressures within the containment areas 215a and 215c are compared to determine whether the fluid pressure in the containment area 215c has been equalized to within a threshold amount of the fluid pressure in the well 105B. If it is determined that the fluid pressure in the containment

area 215c has not been equalized to within the threshold amount of the fluid pressure in the well 105B, the EQ valve 222a is opened at the sub-step 241j to further encourage such pressure equalization between said containment area 215c and the well 105B, as shown in Figures 8 and 9E. Alternatively, the order in which the sub-steps 241h and 241j are executed may be reversed, or one of the sub-steps 241h and 241j may be omitted altogether.

[0090] At the sub-step 241k, once it is determined that the fluid pressure in the containment area 215c has been equalized to within the threshold amount of the fluid pressure in the well 105B, the flow control device 221a is opened, as shown in Figures 8 and 9F. At the sub-step 241l, the boost pump(s) 224b is/are turned off, as shown in Figures 8 and 9F. At the sub-step 241m, the EQ valve 222a is closed, as shown in Figures 8 and 9F. However, in those embodiments in which the sub-step 241j of opening the EQ valve 222a is omitted, the sub-step 241m of closing the EQ valve 222a is also omitted. Additionally, the sub-step 241m may be executed to close the EQ valve 222a at any time before, during, or after, execution of the sub-steps 241k or 241l. At the sub-step 241n, the object is permitted passage to the well 105B, as shown in Figures 8 and 9G. Finally, at the sub-step 241o, the flow control device 221a is closed, as shown in Figures 8 and 9G. Once the sub-steps 241a-o are executed, the well 105B is ready for execution of the step 245, namely detecting or otherwise determining that a fracturing stage of the well 105D has ended, as will be described in detail below in connection with Figures 10 and 11.

[0091] Referring to Figures 10 and 11, in an embodiment, various sub-steps 246a-c of the step 245 of the method 175 illustrated in Figure 1B are shown in detail, which step 245 is or includes detecting or otherwise determining that a fracturing stage of the well 105D has ended. At the sub-step 246a, the n_1 well (e.g., well 105D) is monitored for an external signal indicating the fracturing stage has ended, as shown in Figure 10. At the sub-step 246b, the n_1 well's frac data is monitored to determine whether the fracturing stage has ended, as shown in Figure 10. Finally, at the sub-step 246c, the zipper valves 170a-b associated with the n_1+1 well (e.g., well 105B) are dequeued and compared against the frac order (if available). During execution of the sub-steps 246a-c: grease

from the grease system 155 is communicated to the corresponding GPs 200a-b of the zipper valves 170a-b, respectively, as shown in Figure 11 (indicated by arrows 232k in Figure 5B); and hydraulic fracturing fluid is communicated from the zipper manifold 145 to the well 105D, as shown in Figure 11 (indicated by arrows 232l and 232m in Figure 11).

[0092] Referring to Figure 12, in an embodiment, various sub-steps 251a-c of the step 250 of the method 175 illustrated in Figure 1B are shown in detail, which step 250 is or includes determining whether to permit a regular swap or a CP swap from hydraulically fracturing (at a step 262) the well 105D to hydraulically fracturing (at the step 262) the well 105B, by, for example: checking an idle rate of the hydraulic fracturing system 100 at the sub-step 251a; and detecting or otherwise determining that an idle rate of the hydraulic fracturing system 100 is below an upper threshold and above a lower threshold at the sub-step 251b, or, at the sub-step 251c, detecting or otherwise determining that the idle rate of the hydraulic fracturing system 100 is below the lower threshold. More particularly, as shown in Figure 12: at the sub-step 251a, a frac rate of the n_1 well (e.g., well 105D) is checked; and, at the sub-step 251b, if the frac rate of the n_1 well is below the upper threshold rate (e.g., 10 bbl) and above the lower threshold rate (e.g., 0 bbl) for a threshold amount of time (e.g., 10s), a CP swap from hydraulically fracturing the n_1 well to hydraulically fracturing the n_1+1 well is permitted at step 260, but, at the sub-step 251c, if the frac rate of the n_1 well is below the lower threshold rate for a threshold amount of time, only a regular swap from hydraulically fracturing the n_1 well to hydraulically fracturing the n_1+1 well is permitted at step 255.

[0093] Referring to Figures 13 and 14A through 14B, in an embodiment, various sub-steps 256a-c of the step 255 of the method 175 illustrated in Figure 1B are shown in detail, which step 255 is or includes executing the regular swap from hydraulically fracturing (at the step 262) the n_1 well (e.g., well 105D) to hydraulically fracturing (at the step 262) the n_1+1 well (e.g., well 105B). At the sub-step 256a, the n_1 well's (e.g., well 105D) zipper valves 170a-b are closed, and grease from the grease system 155 is withheld from the corresponding GPs 200a-b, as shown in Figures 13 and 14A. At the sub-step 256b, a signal to advance is received, as shown in Figure 13. For example, a

user input such as a screen click may be received at the sub-step 256b. In addition, or instead, an external signal, such as an external signal from the frac operator, may be received at the sub-step 256b. In addition, or instead, a signal to advance may be generated by detecting or otherwise determining that pressure equalization has been achieved to within a threshold amount between the hydraulic fracturing pressure in the zipper manifold 145 and the fluid pressure in the n_1+1 well (e.g., well 105B) for a threshold amount of time. At the sub-step 256c, the n_1+1 well's zipper valves 170a-b are opened, as shown in Figures 13 and 14B, so that hydraulic fracturing fluid is communicated from the zipper manifold 145 to the n_1+1 well (indicated by arrows 232n and 232o in Figures 14B), and grease from the grease system 155 is communicated to the corresponding GPs 200a-b (indicated by arrow 232p in Figure 14B).

[0094] Referring to Figures 15 and 16A through 16E, in an embodiment, various sub-steps 261a-c of the step 260 of the method 175 illustrated in Figure 1B are shown in detail, which step 260 is or includes executing the CP swap from hydraulically fracturing (at the step 262) the n_1 well (e.g., well 105D) to hydraulically fracturing (at the step 262) the n_1+1 well (e.g., well 105B). At the sub-step 261a, the n_1+1 well's (e.g., well 105B) zipper valves 170a-b are opened, as shown in Figures 15 and 16A, hydraulic fracturing fluid is communicated from the zipper manifold 145 to the n_1+1 well (indicated by arrows 232n and 232o in Figure 16A), and grease from the grease system 155 is communicated to the corresponding GPs 200a-b (indicated by arrow 232p in Figure 16A). At the sub-step 261b, both the n_1+1 well's (e.g., well 105B) zipper valves 170a-b and the n_1 well's (e.g., well D) zipper valves 170a-b are allowed to fully open, as shown in Figures 15, 16A and 16B, so that: hydraulic fracturing fluid is communicated from the zipper manifold 145 to the n_1 well (indicated by arrows 232l and 232m in Figure 16B) and the n_1+1 well (indicated by arrows 232n and 232o in Figure 14A); and grease from the grease system 155 is communicated to the corresponding GPs 200a-b (indicated by arrows 232p and 232k in Figure 16A and 16B, respectively). Finally, at the sub-step 261c, the n_1 well's (e.g., well 105D) zipper valves 170a-b are closed, as shown in Figures 15 and 16C, and grease from the grease system 155 is withheld from the corresponding GPs 200a-b.

[0095] As shown in Figures 16D and 16E, executing the CP swap from hydraulically fracturing (at the step 262) the n_1 well (e.g., well 105D) to hydraulically fracturing (at the step 262) the n_1+1 well (e.g., well 105B) transitions the zipper valves from one well to the other, opening the second well and subsequently shutting-in the first well, all while pumping. The transition is instantaneous and the total time between stages measured at treatment pressure is less than 20 seconds (as fast as 19 seconds in some instances).

[0096] Referring to Figures 17 and 18A through 18G, in an embodiment, various sub-steps 266a-s of the step 265 of the method 175 illustrated in Figure 1B are shown in detail, which step 265 is or includes latching, filling, and pressure testing the frac leg 150E associated with the well 105E in preparation for perforating a stage of the well 105E using the wireline perforating system 177 (in a manner similar to that described above in connection with the well 105A and shown in Figures 5A through 5C). At the sub-step 266a, the lubricator 220 is stabbed into the latch 234, as shown in Figures 17 and 18A (indicated by arrow 232q in Figure 18A). At the sub-step 266b, the EQ valve 222c is closed, as shown in Figures 17 and 18B. At the sub-step 266c, the latch close relay is energized to close the latch 234, thereby connecting the lubricator 220 to the valve apparatus 210, as shown in Figures 17 and 18C. At the sub-step 266d, a latch close proximity switch is checked to determine whether the latch 234 has successfully latched the lubricator 220 to the valve apparatus 210. At the sub-step 266e, once it is determined that the latch 234 has successfully latched the lubricator 220 to the valve apparatus 210, the latch close relay is de-energized, as shown in Figure 17. At the sub-step 266f, a test pressure relay is energized, as shown in Figure 17. At the sub-step 266g, a determination is made as to whether the connection of the lubricator 220 to the valve apparatus 210 via the latch 234 is or is not capable of holding pressure, as shown in Figure 17. At the sub-step 266h, once the determination is made that the connection of the lubricator 220 to the valve apparatus 210 via the latch 234 is capable of holding pressure, the test pressure relay is de-energized, as shown in Figure 17.

[0097] At the sub-step 266i, the drain 223 is opened, as shown in Figures 17 and 18D. At the sub-step 266j, the EQ valve 222c is opened, as shown in Figures 17 and 18E. At the sub-step 266k, the auto-fill pump of the pump station 224a is turned on to fill the

lubricator 220 via the open drain 223, as shown in Figures 17 and 18E (indicated by arrow 232r in Figure 18E). At the sub-step 266l, the auto-fill pump is allowed to finish auto-filling the lubricator 220, as shown in Figure 17. At the sub-step 266m, the drain 223 is closed, as shown in Figures 17 and 18F. At the sub-step 266n, the EQ valve 222c is closed, as shown in Figures 17 and 18F. At the sub-step 266o, the EQ valve 222b is opened, as shown in Figures 17 and 18F. At the sub-step 266p, the boost pump(s) 224b is/are turned on to increase the fluid pressure within the lubricator 220, as shown in Figures 17 and 18F (indicated by arrow 232s in Figure 18F). At the sub-step 266q, a determination is made as to whether the pressure in the lubricator 220 comes to within the pressure in the well 105E by a threshold amount (e.g., 500 PSI), as shown in Figure 17. Once the determination is made that the pressure in the lubricator 220 comes to within the pressure in the well 105E by the threshold amount, the boost pump(s) 224b is/are turned off at the sub-step 266r, and the EQ valve 222b is closed at the sub-step 266s in preparation for the next wireline swap (e.g., to the well 105E), as shown in Figures 17 and 18G.

[0098] Referring to Figures 19A and 19B, in an embodiment, a method 270 for fracturing the wells 105A through 105C+n using the hydraulic fracturing system 100 of Figure 1A is illustrated, which method 270 includes swapping from simultaneously fracturing the wells n_1 and n_3 (e.g., wells 105D and 105X) to simultaneously fracturing the wells n_1+1 and n_3+1 (e.g., wells 105B and 105V). More particularly, the method 270 includes steps substantially identical to corresponding steps of the method 175 described above, which steps are given the same reference numerals. In addition, the method 270 includes additional steps executable to simultaneously fracture the n_1 and n_3 wells (e.g., wells 105D and 105X), and to swap from simultaneously fracturing the n_1 and n_3 wells to simultaneously fracturing the n_1+1 and n_3+1 wells (e.g., wells 105B and 105V), which additional steps are given the same reference numerals, except that the suffix "'" is added. Specifically, in some instances the suffix "'" signifies that the referenced step of the method 270 is substantially identical to the corresponding step of the method 175, except that the referenced step is instead performed on a different one of the wells than that on which the corresponding step of the method 175 is performed (i.e., the steps 225', 230',

235', 238a', 239', 238b', 263a', 264', 263b', 265', and 268' fall into this category), while, in other instances, the suffix "'" signifies that the referenced step of the method 270 is substantially similar to the corresponding step of the method 175, except that the referenced step is simultaneously performed on another one of the wells other than that on which the corresponding step of the method 175 is performed (i.e., the steps 240', 245', 250', 255', 260', and 262' fall into this category). In one or more embodiments, the controller 156 is adapted to control the grease system 155, the frac legs 150A through 150C+n, or both, in order to execute the method 270 described herein.

[0099] Referring to Figure 20, with continuing reference to Figures 1A through 19B, an illustrative node 1000 for implementing one or more of the embodiments of one or more of the controller(s) (e.g., the controller 156), element(s), apparatus, system(s) (e.g., the hydraulic fracturing system 100), method(s) (e.g., the method 175, the method 270, or both), step(s), and/or sub-step(s), or any combination thereof, described above and/or illustrated in Figures 1A through 19B is depicted. The node 1000 includes a microprocessor 1000a, an input device 1000b, a storage device 1000c, a video controller 1000d, a system memory 1000e, a display 1000f, and a communication device 1000g all interconnected by one or more buses 1000h. In one or more embodiments, the storage device 1000c may include a hard drive, CD-ROM, optical drive, any other form of storage device and/or any combination thereof. In one or more embodiments, the storage device 1000c may include, and/or be capable of receiving, a CD-ROM, DVD-ROM, or any other form of non-transitory computer-readable medium that may contain executable instructions. In one or more embodiments, the communication device 1000g may include a modem, network card, or any other device to enable the node 1000 to communicate with other node(s). In one or more embodiments, the node and the other node(s) represent a plurality of interconnected (whether by intranet or Internet) computer systems, including without limitation, personal computers, mainframes, PDAs, smartphones and cell phones.

[0100] In one or more embodiments, one or more of the embodiments described above and/or illustrated in Figures 1A through 19B include at least the node 1000 and/or components thereof, and/or one or more nodes that are substantially similar to the node

1000 and/or components thereof. In one or more embodiments, one or more of the above-described components of the node 1000 and/or the embodiments described above and/or illustrated in Figures 1A through 19B include respective pluralities of same components.

[0101] In one or more embodiments, one or more of the embodiments described above and/or illustrated in Figures 1A through 19B include a computer program that includes a plurality of instructions, data, and/or any combination thereof; an application written in, for example, Arena, HyperText Markup Language (HTML), Cascading Style Sheets (CSS), JavaScript, Extensible Markup Language (XML), asynchronous JavaScript and XML (Ajax), and/or any combination thereof; a web-based application written in, for example, Java or Adobe Flex, which in one or more embodiments pulls real-time information from one or more servers, automatically refreshing with latest information at a predetermined time increment; or any combination thereof.

[0102] In one or more embodiments, a computer system typically includes at least hardware capable of executing machine readable instructions, as well as the software for executing acts (typically machine-readable instructions) that produce a desired result. In one or more embodiments, a computer system may include hybrids of hardware and software, as well as computer sub-systems.

[0103] In one or more embodiments, hardware generally includes at least processor-capable platforms, such as client-machines (also known as personal computers or servers), and hand-held processing devices (such as smart phones, tablet computers, or personal computing devices (PCDs), for example). In one or more embodiments, hardware may include any physical device that is capable of storing machine-readable instructions, such as memory or other data storage devices. In one or more embodiments, other forms of hardware include hardware sub-systems, including transfer devices such as modems, modem cards, ports, and port cards, for example.

[0104] In one or more embodiments, software includes any machine code stored in any memory medium, such as RAM or ROM, and machine code stored on other devices (such as floppy disks, flash memory, or a CD-ROM, for example). In one or more embodiments, software may include source or object code. In one or more embodiments, software

encompasses any set of instructions capable of being executed on a node such as, for example, on a client machine or server.

[0105] In one or more embodiments, combinations of software and hardware could also be used for providing enhanced functionality and performance for certain embodiments of the present disclosure. In an embodiment, software functions may be directly manufactured into a silicon chip. Accordingly, it should be understood that combinations of hardware and software are also included within the definition of a computer system and are thus envisioned by the present disclosure as possible equivalent structures and equivalent methods.

[0106] In one or more embodiments, computer readable mediums include, for example, passive data storage, such as a random-access memory (RAM) as well as semi-permanent data storage such as a compact disk read only memory (CD-ROM). One or more embodiments of the present disclosure may be embodied in the RAM of a computer to transform a standard computer into a new specific computing machine. In one or more embodiments, data structures are defined organizations of data that may enable an embodiment of the present disclosure. In an embodiment, a data structure may provide an organization of data, or an organization of executable code.

[0107] In one or more embodiments, any networks and/or one or more portions thereof may be designed to work on any specific architecture. In an embodiment, one or more portions of any networks may be executed on a single computer, local area networks, client-server networks, wide area networks, internets, hand-held and other portable and wireless devices and networks.

[0108] In one or more embodiments, a database may be any standard or proprietary database software. In one or more embodiments, the database may have fields, records, data, and other database elements that may be associated through database specific software. In one or more embodiments, data may be mapped. In one or more embodiments, mapping is the process of associating one data entry with another data entry. In an embodiment, the data contained in the location of a character file can be mapped to a field in a second table. In one or more embodiments, the physical location of the database is not limiting, and the database may be distributed. In an embodiment,

the database may exist remotely from the server, and run on a separate platform. In an embodiment, the database may be accessible across the Internet. In one or more embodiments, more than one database may be implemented.

[0109] In one or more embodiments, a plurality of instructions stored on a computer readable medium may be executed by one or more processors to cause the one or more processors to carry out or implement in whole or in part one or more of the embodiments of one or more of the controller(s) (e.g., the controller 156), element(s), apparatus, system(s) (e.g., the hydraulic fracturing system 100), method(s) (e.g., the method 175, the method 270, or both), step(s), and/or sub-step(s), or any combination thereof, described above and/or illustrated in Figures 1A through 19B. In one or more embodiments, such a processor may include one or more of the microprocessor 1000a, any processor(s) that are part of the components of the hydraulic fracturing system 100, such as, for example, the controller 156, and/or any combination thereof, and such a computer readable medium may be distributed among one or more components of the system. In one or more embodiments, such a processor may execute the plurality of instructions in connection with a virtual computer system. In one or more embodiments, such a plurality of instructions may communicate directly with the one or more processors, and/or ay interact with one or more operating systems, middleware, firmware, other applications, and/or any combination thereof, to cause the one or more processors to execute the instructions.

[0110] A first method has been disclosed. The first method generally includes: (a) permitting performance of a first hydraulic fracturing operation on a first well, which first hydraulic fracturing operation includes pumping fluid into the first well via a first valve associated with the first well, and measuring a flow rate of the fluid being pumped into the first well; (b) determining that the flow rate of the fluid being pumped into the first well is below a flow rate threshold and has been below the flow rate threshold for a threshold amount of time; (c) during pumping of the fluid into the first well via the first valve, opening a second valve associated with a second well; (d) permitting performance of a second hydraulic fracturing operation on the second well, which second hydraulic fracturing operation includes pumping fluid into the second well via the second valve; and (e) during

pumping of the fluid into the second well via the second valve, closing the first valve associated with the first well; wherein, during each of steps (a), (b), (c), (d), and (e), fluid is continuously pumped to the first valve, the second valve, or both the first valve and the second valve. In one or more embodiments, each of the first and second valves is in fluid communication with a hydraulic manifold from which fluid is pumped to the first valve and/or the second valve; and, during each of steps (a), (b), (c), (d), and (e), fluid is continuously pumped from the hydraulic manifold to the first valve, the second valve, or both the first valve and the second valve. In one or more embodiments, the second valve is opened after step (b). In one or more embodiments, the first valve includes a grease port; and the method further includes withholding grease from the grease port after step (e). In one or more embodiments, the second valve includes a grease port; and the method further includes: during and/or after opening the second valve, communicating grease to the grease port of the second valve. In one or more embodiments, each of the first and second valves is a zipper valve. In one or more embodiments, step (d): further includes measuring a flow rate of the fluid being pumped into the second well; and is, or is part of, a hydraulic fracturing stage of the second well; and the method further includes: determining that the hydraulic fracturing stage of the second well has ended; determining that the flow rate of the fluid being pumped into the second well is above the flow rate threshold; closing the second valve associated with the second well; withholding grease from a grease port of the second valve; receiving a signal to advance; opening a third valve associated with a third well; and during and/or after opening the third valve, communicating grease to a grease port of the third valve.

[0111] A first apparatus has also been disclosed. The first apparatus generally includes: a non-transitory computer readable medium; and a plurality of instructions stored on the non-transitory computer readable medium and executable by one or more processors, wherein, when the instructions are executed by the one or more processors, the following steps are executed: (a) permitting performance of a first hydraulic fracturing operation on a first well, which first hydraulic fracturing operation includes pumping fluid into the first well via a first valve associated with the first well, and measuring a flow rate of the fluid being pumped into the first well; (b) determining that the flow rate of the fluid being

pumped into the first well is below a flow rate threshold and has been below the flow rate threshold for a threshold amount of time; (c) during pumping of the fluid into the first well via the first valve, opening a second valve associated with a second well; (d) permitting performance of a second hydraulic fracturing operation on the second well, which second hydraulic fracturing operation includes pumping fluid into the second well via the second valve; and (e) during pumping of the fluid into the second well via the second valve, closing the first valve associated with the first well; wherein, during each of steps (a), (b), (c), (d), and (e), fluid is continuously pumped to the first valve, the second valve, or both the first valve and the second valve. In one or more embodiments, each of the first and second valves is in fluid communication with a hydraulic manifold from which fluid is pumped to the first valve and/or the second valve; wherein, during each of steps (a), (b), (c), (d), and (e), fluid is continuously pumped from the hydraulic manifold to the first valve, the second valve, or both the first valve and the second valve. In one or more embodiments, the second valve is opened after step (b). In one or more embodiments, the first valve includes a grease port; and, when the instructions are executed by the one or more processors, the following step is also executed: withholding grease from the grease port after step (e). In one or more embodiments, the second valve includes a grease port; and, when the instructions are executed by the one or more processors, the following step is also executed: during and/or after opening the second valve, communicating grease to the grease port of the second valve. In one or more embodiments, each of the first and second valves is a zipper valve. In one or more embodiments, step (d): further includes measuring a flow rate of the fluid being pumped into the second well; and is, or is part of, a hydraulic fracturing stage of the second well; and, when the instructions are executed by the one or more processors, the following steps are also executed: determining that the hydraulic fracturing stage of the second well has ended; determining that the flow rate of the fluid being pumped into the second well is above the flow rate threshold; closing the second valve associated with the second well; withholding grease from a grease port of the second valve; receiving a signal to advance; opening a third valve associated with a third well; and during and/or after opening the third valve, communicating grease to a grease port of the third valve.

[0112] A second method has also been disclosed. The second method generally includes: (a) queuing, using a controller, a first well in a first hydraulic fracturing queue, which first hydraulic fracturing queue is associated with a first plurality of wells standing by for hydraulic fracturing, including at least the first well and a second well; (b) dequeuing, using the controller, the second well from the first hydraulic fracturing queue; (c) permitting hydraulic fracturing of the second well; (d) dequeuing, using the controller, the first well from the first hydraulic fracturing queue; and (e) swapping from permitting hydraulic fracturing of the second well to permitting hydraulic fracturing of the first well. In one or more embodiments, step (c) includes opening a second valve associated with the second well to permit pumping of fluid into the second well via the second valve; and step (e) includes: opening a first valve associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well. In one or more embodiments, step (c) further includes measuring a flow rate of the fluid being pumped into the second well. In one or more embodiments, step (e) further includes, in response to determining that the flow rate of the fluid being pumped into the second well is below a flow rate threshold and has been below the flow rate threshold for a threshold amount of time, the first valve associated with the first well is opened at step (e) before the second valve associated with the second well is closed at step (e). In one or more embodiments, the step (e) further includes, in response to determining that the flow rate of the fluid being pumped into the second well is above a flow rate threshold, the first valve associated with the first well is opened at step (e) after the second valve associated with the second well is closed at step (e). In one or more embodiments, the method further includes: (f) queuing, using the controller, a third well in a second hydraulic fracturing queue, which second hydraulic fracturing queue is associated with a second plurality of wells standing by for hydraulic fracturing, including at least the third well and a fourth well; (g) dequeuing, using the controller, the fourth well from the second hydraulic fracturing queue; (h) permitting hydraulic fracturing of the fourth well; (i) dequeuing, using the controller, the third well from the second hydraulic fracturing queue; and (j) swapping from permitting hydraulic fracturing of the fourth well to permitting hydraulic fracturing of the third well. In one or more embodiments, steps (c) and (h) are

executed simultaneously using hydraulic fracturing fluid from a hydraulic manifold; and steps (e) and (j) are executed simultaneously using hydraulic fracturing fluid from the hydraulic manifold. In one or more embodiments, step (c) includes opening a second valve associated with the second well to permit pumping of fluid into the second well via the second valve; step (e) includes: opening a first valve associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well; step (h) includes opening a fourth valve associated with the fourth well to permit pumping of fluid into the fourth well via the fourth valve; and step (j) includes: opening a third valve associated with the third well to permit pumping of fluid into the third well via the third valve; and closing the fourth valve associated with the fourth well.

[0113] A second apparatus has also been disclosed. The second apparatus generally includes: a non-transitory computer readable medium; and a plurality of instructions stored on the non-transitory computer readable medium and executable by one or more processors, wherein, when the instructions are executed by the one or more processors, the following steps are executed: (a) queuing a first well in a first hydraulic fracturing queue, which first hydraulic fracturing queue includes a first plurality of wells standing by for hydraulic fracturing, including at least the first well and a second well; (b) dequeuing the second well from the first hydraulic fracturing queue; (c) permitting hydraulic fracturing of the second well; (d) dequeuing the first well from the first hydraulic fracturing queue; and (e) swapping from permitting hydraulic fracturing of the second well to permitting hydraulic fracturing of the first well. In one or more embodiments, step (c) includes opening a second valve associated with the second well to permit pumping of fluid into the second well via the second valve; and step (e) includes: opening a first valve associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well. In one or more embodiments, step (c) further includes measuring a flow rate of the fluid being pumped into the second well. In one or more embodiments, in response to determining that the flow rate of the fluid being pumped into the second well is below a flow rate threshold and has been below the flow rate threshold for a threshold amount of time, the first valve

associated with the first well is opened at step (e) before the second valve associated with the second well is closed at step (e). In one or more embodiments, in response to determining that the flow rate of the fluid being pumped into the second well is above a flow rate threshold, the first valve associated with the first well is opened at step (e) after the second valve associated with the second well is closed at step (e). In one or more embodiments, when the instructions are executed by the one or more processors, the following steps are also executed: (f) queuing a third well in a second hydraulic fracturing queue, which second hydraulic fracturing queue includes a second plurality of wells standing by for hydraulic fracturing, including at least the third well and a fourth well; (g) dequeuing the fourth well from the second hydraulic fracturing queue; (h) permitting hydraulic fracturing of the fourth well; (i) dequeuing the third well from the second hydraulic fracturing queue; and (j) swapping from permitting hydraulic fracturing of the fourth well to permitting hydraulic fracturing of the third well. In one or more embodiments, steps (c) and (h) are executed simultaneously using hydraulic fracturing fluid from a hydraulic manifold; and steps (e) and (j) are executed simultaneously using hydraulic fracturing fluid from the hydraulic manifold. In one or more embodiments, step (c) includes opening a second valve associated with the second well to permit pumping of fluid into the second well via the second valve; step (e) includes: opening a first valve associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well; step (h) includes opening a fourth valve associated with the fourth well to permit pumping of fluid into the fourth well via the fourth valve; and step (j) includes: opening a third valve associated with the third well to permit pumping of fluid into the third well via the third valve; and closing the fourth valve associated with the fourth well.

[0114] It is understood that variations may be made in the foregoing without departing from the scope of the present disclosure.

[0115] In several embodiments, the elements and teachings of the various embodiments may be combined in whole or in part in some (or all) of the embodiments. In addition, one or more of the elements and teachings of the various embodiments may be

omitted, at least in part, and/or combined, at least in part, with one or more of the other elements and teachings of the various embodiments.

[0116] Any spatial references, such as, for example, "upper," "lower," "above," "below," "between," "bottom," "vertical," "horizontal," "angular," "upwards," "downwards," "side-to-side," "left-to-right," "right-to-left," "top-to-bottom," "bottom-to-top," "top," "bottom," "bottom-up," "top-down," etc., are for the purpose of illustration only and do not limit the specific orientation or location of the structure described above.

[0117] In several embodiments, while different steps, processes, and procedures are described as appearing as distinct acts, one or more of the steps, one or more of the processes, and/or one or more of the procedures may also be performed in different orders, simultaneously and/or sequentially. In several embodiments, the steps, processes, and/or procedures may be merged into one or more steps, processes and/or procedures.

[0118] In several embodiments, one or more of the operational steps in each embodiment may be omitted. Moreover, in some instances, some features of the present disclosure may be employed without a corresponding use of the other features. Moreover, one or more of the above-described embodiments and/or variations may be combined in whole or in part with any one or more of the other above-described embodiments and/or variations.

[0119] Although several embodiments have been described in detail above, the embodiments described are illustrative only and are not limiting, and those skilled in the art will readily appreciate that many other modifications, changes and/or substitutions are possible in the embodiments without materially departing from the novel teachings and advantages of the present disclosure. Accordingly, all such modifications, changes, and/or substitutions are intended to be included within the scope of this disclosure as defined in the following claims. In the claims, any means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents, but also equivalent structures. Moreover, it is the express intention of the applicant not to invoke 35 U.S.C. § 112(f) for any limitations of any of the

claims herein, except for those in which the claim expressly uses the word “means” together with an associated function.

Claims

What is claimed is:

1. A method of hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the method comprising:
opening a first valve while hydraulic fracturing fluid is communicated to the second well via a second valve and a manifold,
wherein the first valve is associated with both the first well and the manifold, and
wherein the second valve is associated with both the second well and the manifold;
and
closing the second valve, wherein the second valve is closed:
after opening the first valve, and
while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold.

2. The method of claim 1, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

3. The method of claim 1, wherein the plurality of wells further comprises third and fourth wells, and the method further comprises:
opening a third valve while hydraulic fracturing fluid is communicated to the fourth well via a fourth valve and the manifold,
wherein the third valve is associated with both the third well and the manifold, and
wherein the fourth valve is associated with both the fourth well and the manifold;
and

closing the fourth valve, wherein the fourth valve is closed:

after opening the third valve, and

while hydraulic fracturing fluid is communicated to the third well via the third valve and the manifold.

4. The method of claim 1, wherein the first valve is opened in response to a determination that the communication of hydraulic fracturing fluid via the manifold has satisfied one or more conditions.

5. The method of claim 4, further comprising:

determining that the communication of hydraulic fracturing fluid via the manifold has satisfied the one or more conditions.

6. The method of claim 4, wherein the one or more conditions include one or more flow rate conditions.

7. The method of claim 6, wherein the fluid communicated via the manifold has satisfied the one or more flow rate conditions when a flow rate of the fluid is below an upper threshold, above a lower threshold, or both.

8. A non-transitory computer readable medium having stored thereon computer-readable instructions executable by one or more processors to perform operations for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the operations comprising:

opening a first valve while hydraulic fracturing fluid is communicated to the second well via a second valve and a manifold,

wherein the first valve is associated with both the first well and the manifold, and

wherein the second valve is associated with both the second well and the manifold;

and

closing the second valve, wherein the second valve is closed:

after opening the first valve, and

while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold.

9. The non-transitory computer readable medium of claim 8, wherein:

the first valve is a first zipper valve; and/or

the second valve is a second zipper valve.

10. The non-transitory computer readable medium of claim 8, wherein the plurality of wells further comprises third and fourth wells, and the operations further comprise:

opening a third valve while hydraulic fracturing fluid is communicated to the fourth well via a fourth valve and the manifold,

wherein the third valve is associated with both the third well and the manifold, and

wherein the fourth valve is associated with both the fourth well and the manifold;

and

closing the fourth valve, wherein the fourth valve is closed:

after opening the third valve, and

while hydraulic fracturing fluid is communicated to the third well via the third valve and the manifold.

11. The non-transitory computer readable medium of claim 8, wherein the first valve is opened in response to a determination that the communication of hydraulic fracturing fluid via the manifold has satisfied one or more conditions.

12. The non-transitory computer readable medium of claim 11, wherein the operations further comprise:
determining that the communication of hydraulic fracturing fluid via the manifold has satisfied the one or more conditions.

13. The non-transitory computer readable medium of claim 11, wherein the one or more conditions include one or more flow rate conditions.

14. The non-transitory computer readable medium of claim 13, wherein the fluid communicated via the manifold has satisfied the one or more flow rate conditions when a flow rate of the fluid is below an upper threshold, above a lower threshold, or both.

15. A system for hydraulically fracturing a plurality of wells, the plurality of wells comprising first and second wells, the system comprising:
a manifold;
a first valve via which hydraulic fracturing fluid is adapted to be communicated to the first well, the first valve being associated with both the first well and the manifold;
a second valve via which hydraulic fracturing fluid is adapted to be communicated to the second well, the second valve being associated with both the second well and the manifold; and
one or more controllers configured to:
open the first valve while hydraulic fracturing fluid is communicated to the second well via the second valve and the manifold; and
close the second valve after opening the first valve, and while hydraulic fracturing fluid is communicated to the first well via the first valve and the manifold.

16. The system of claim 15, wherein:
the first valve is a first zipper valve; and/or
the second valve is a second zipper valve.

17. The system of claim 15, wherein:
the plurality of wells further comprises third and fourth wells;
the system further comprises:
a third valve via which hydraulic fracturing fluid is adapted to be communicated to the third well, the third valve being associated with both the third well and the manifold; and
a fourth valve via which hydraulic fracturing fluid is adapted to be communicated to the fourth well, the fourth valve being associated with both the fourth well and the manifold;
and
the one or more controllers are further configured to:
open the third valve while hydraulic fracturing fluid is communicated to the fourth well via the fourth valve and the manifold; and
close the fourth valve after opening the third valve, and while hydraulic fracturing fluid is communicated to the third well via the third valve and the manifold.

18. The system of claim 15, wherein the one or more controllers are configured to open the first valve in response to a determination that the communication of hydraulic fracturing fluid via the manifold has satisfied one or more conditions.

19. The system of claim 18, wherein the one or more controllers are further configured to:
determine that the communication of hydraulic fracturing fluid via the manifold has satisfied the one or more conditions.

20. The system of claim 18, wherein the one or more conditions include one or more flow rate conditions.

21. The system of claim 20, wherein the fluid communicated via the manifold has satisfied the one or more flow rate conditions when a flow rate of the fluid is below an upper threshold, above a lower threshold, or both.

Abstract

A hydraulic fracturing plan executable by a hydraulic fracturing system to hydraulically fracture a plurality of oil and gas wells.

PTO/AIA/01 (06-12)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

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 17/388,716

filed on July 29, 2021.

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: Jordan Kuehn Date (Optional): 9/23/21

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.

PTO/AIA/01 (06-12)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

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 17/388,716 filed on July 29, 2021.

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.

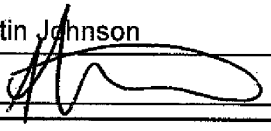
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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: Austin Johnson Date (Optional): 8/4/21

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.

PTO/AIA/01 (06-12)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

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 17/388,716 filed on July 29, 2021.

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: Ronnie B. Beason Date (Optional): 9/28/2021

Signature: [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.

PTO/AIA/01 (08-12)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

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 17/388,716

filed on July 29, 2021.

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: Nicholas J. Cannon Date (Optional): 07/30/2021

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.

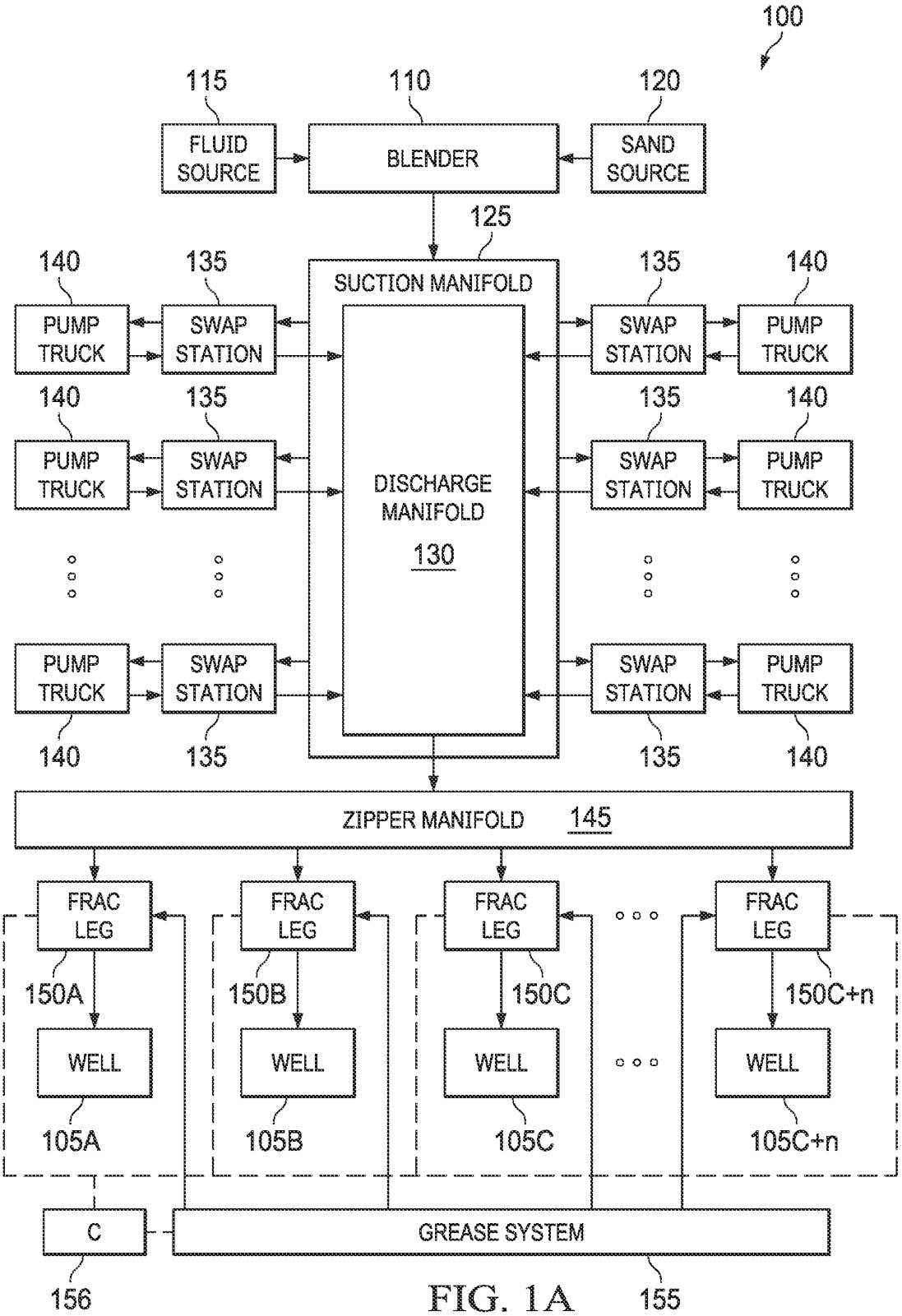

100
115
FLUID SOURCE
110
BLENDER
120
SAND SOURCE
125
SUCTION MANIFOLD
DISCHARGE MANIFOLD
130
140
135
PUMP TRUCK
SWAP STATION
ZIPPER MANIFOLD
145
FRAC LEG
150A
150B
150C
150C+n
WELL
105A
105B
105C
105C+n
C
156
GREASE SYSTEM
155

FIG. 1A

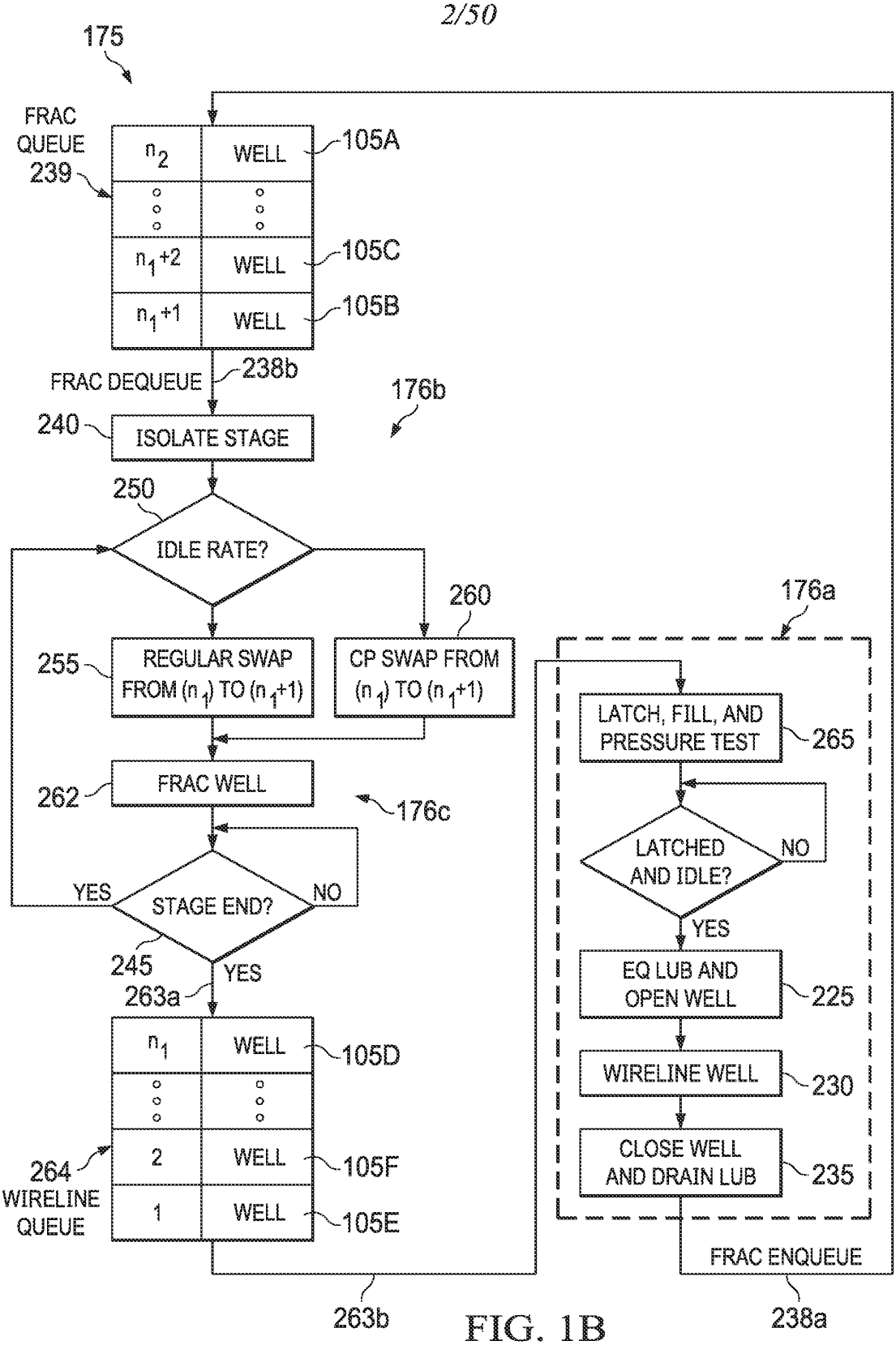

175
FRAC QUEUE 239
n_2
WELL
105A
n_1+2
WELL
105C
n_1+1
WELL
105B
FRAC DEQUEUE
238b
176b
240
ISOLATE STAGE
250
IDLE RATE?
260
255
REGULAR SWAP FROM (n_1) TO (n_1+1)
CP SWAP FROM (n_1) TO (n_1+1)
176a
LATCH, FILL, AND PRESSURE TEST
265
262
FRAC WELL
176c
LATCHED AND IDLE?
NO
YES
YES
STAGE END?
NO
245
YES
263a
EQ LUB AND OPEN WELL
225
n_1
WELL
105D
WIRELINE WELL
230
2
WELL
105F
CLOSE WELL AND DRAIN LUB
235
264 WIRELINE QUEUE
1
WELL
105E
FRAC ENQUEUE
263b
238a

FIG. 1B

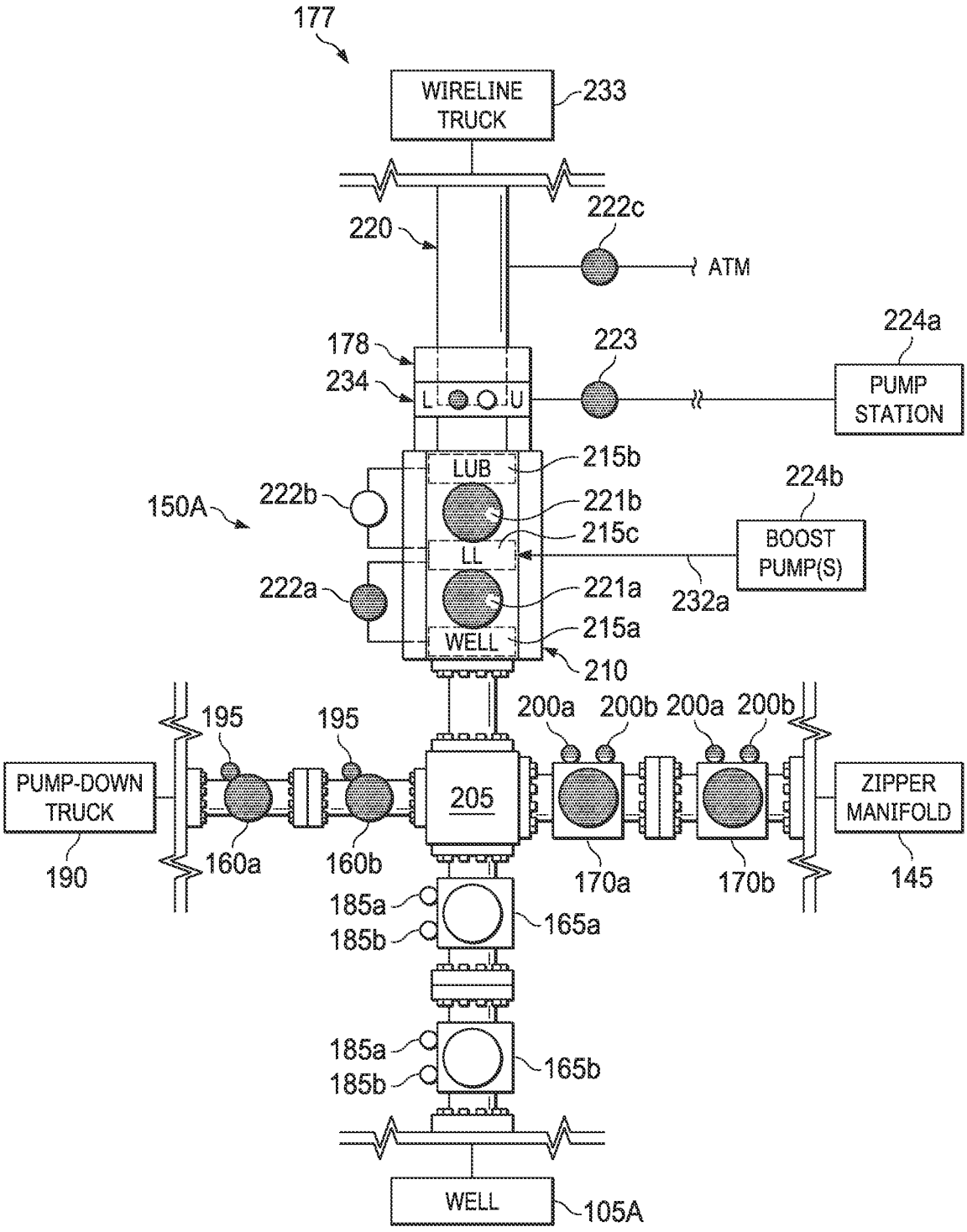

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
150A
222b
221b
215c
BOOST PUMP(S)
LL
222a
221a
232a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 2A

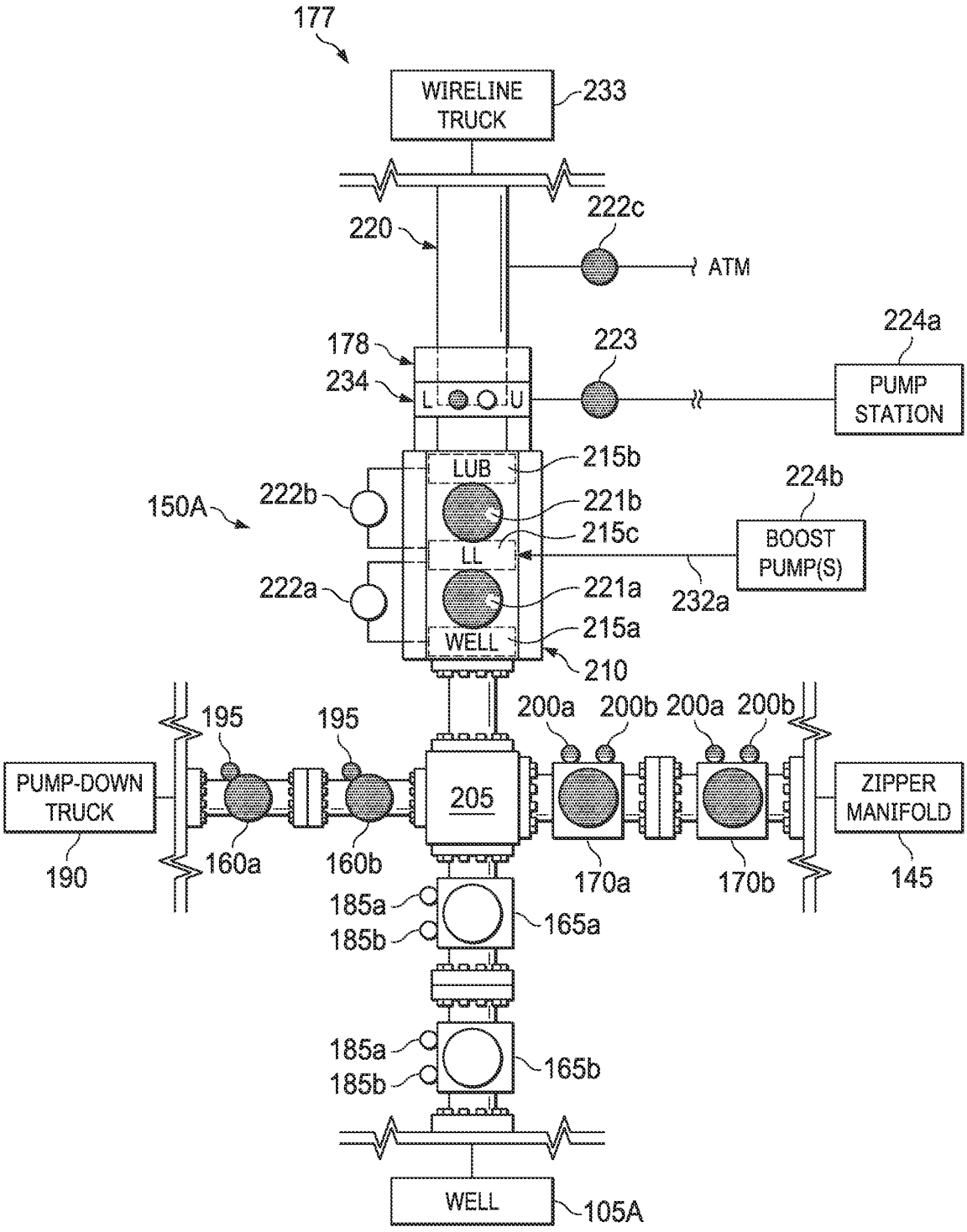

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
150A
222b
221b
215c
BOOST PUMP(S)
LL
222a
221a
232a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 2B

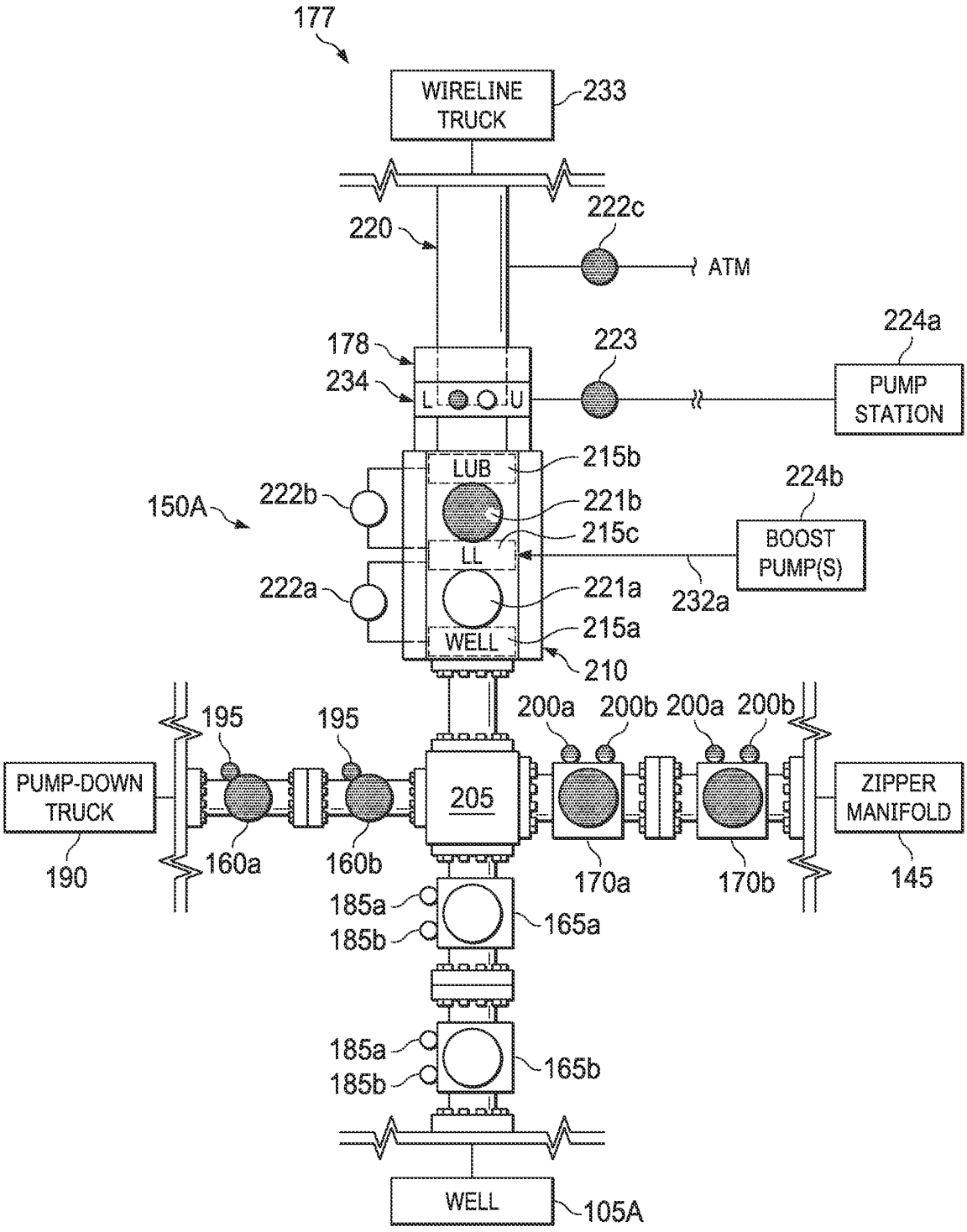

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
150A
222b
221b
215c
BOOST PUMP(S)
LL
222a
221a
232a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 2C

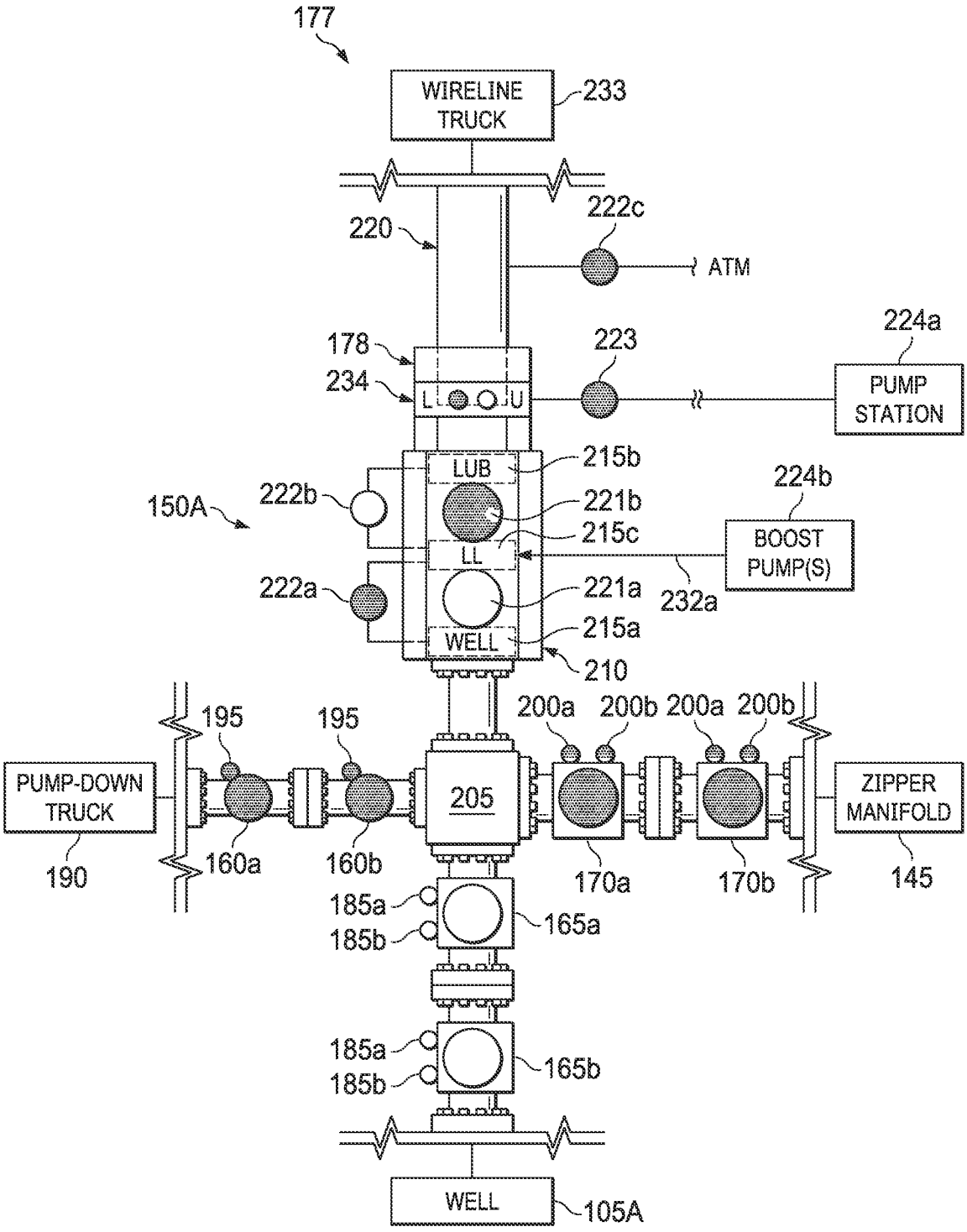

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
150A
222b
221b
215c
BOOST PUMP(S)
LL
222a
221a
232a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 2D

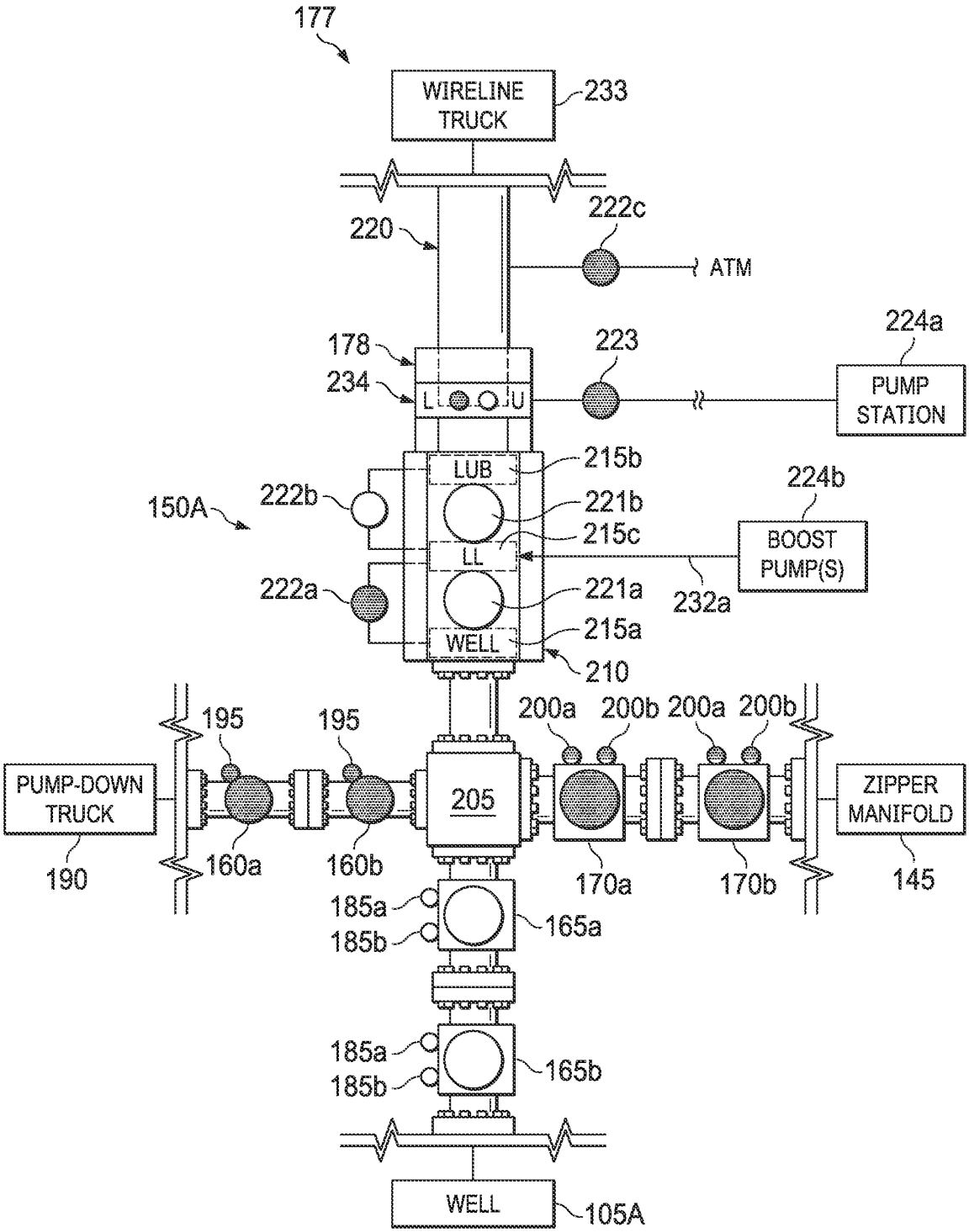

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
L
U
PUMP STATION
215b
LUB
224b
150A
222b
221b
215c
LL
BOOST PUMP(S)
222a
221a
232a
215a
WELL
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 2E

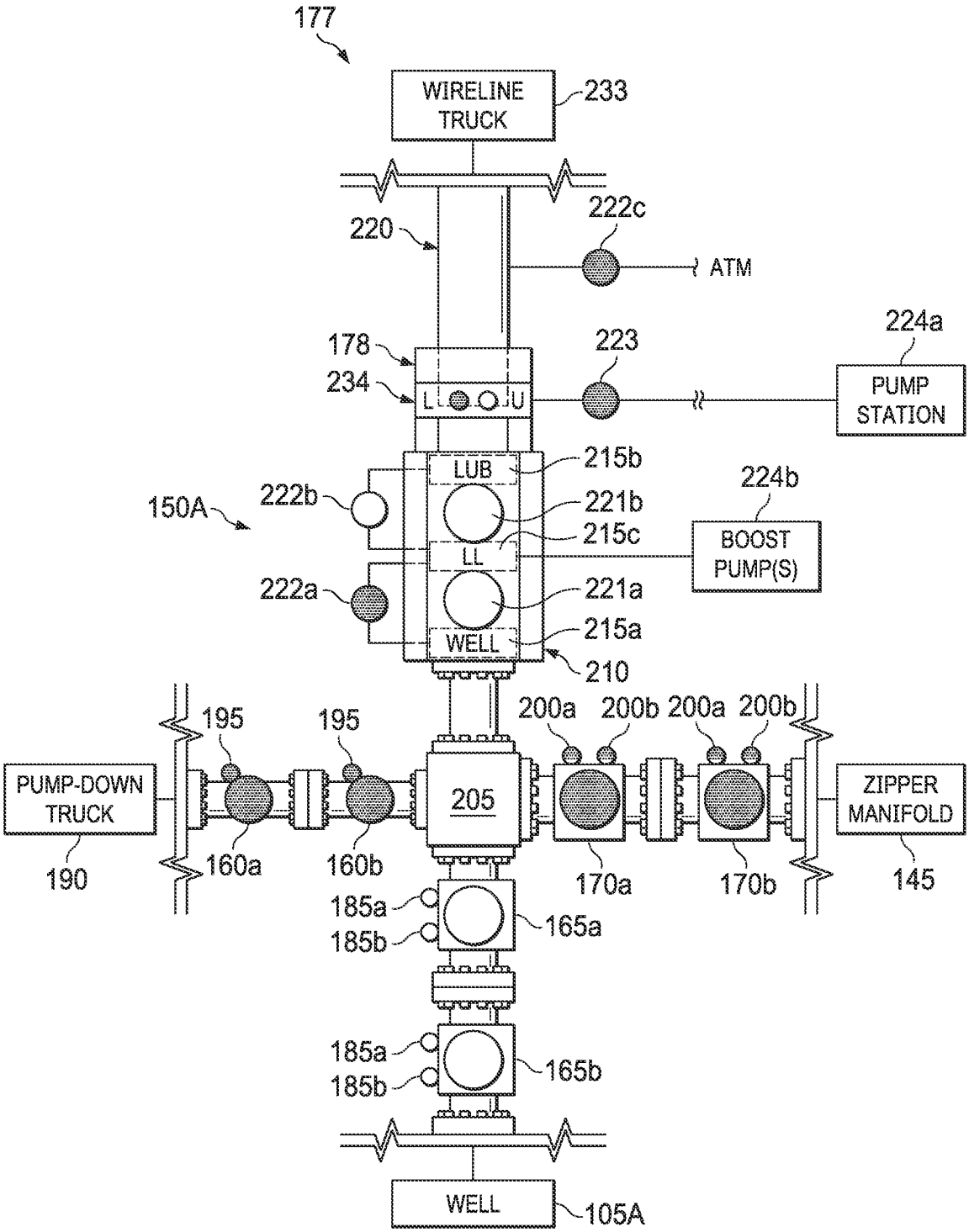

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
222b
150A
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 2F

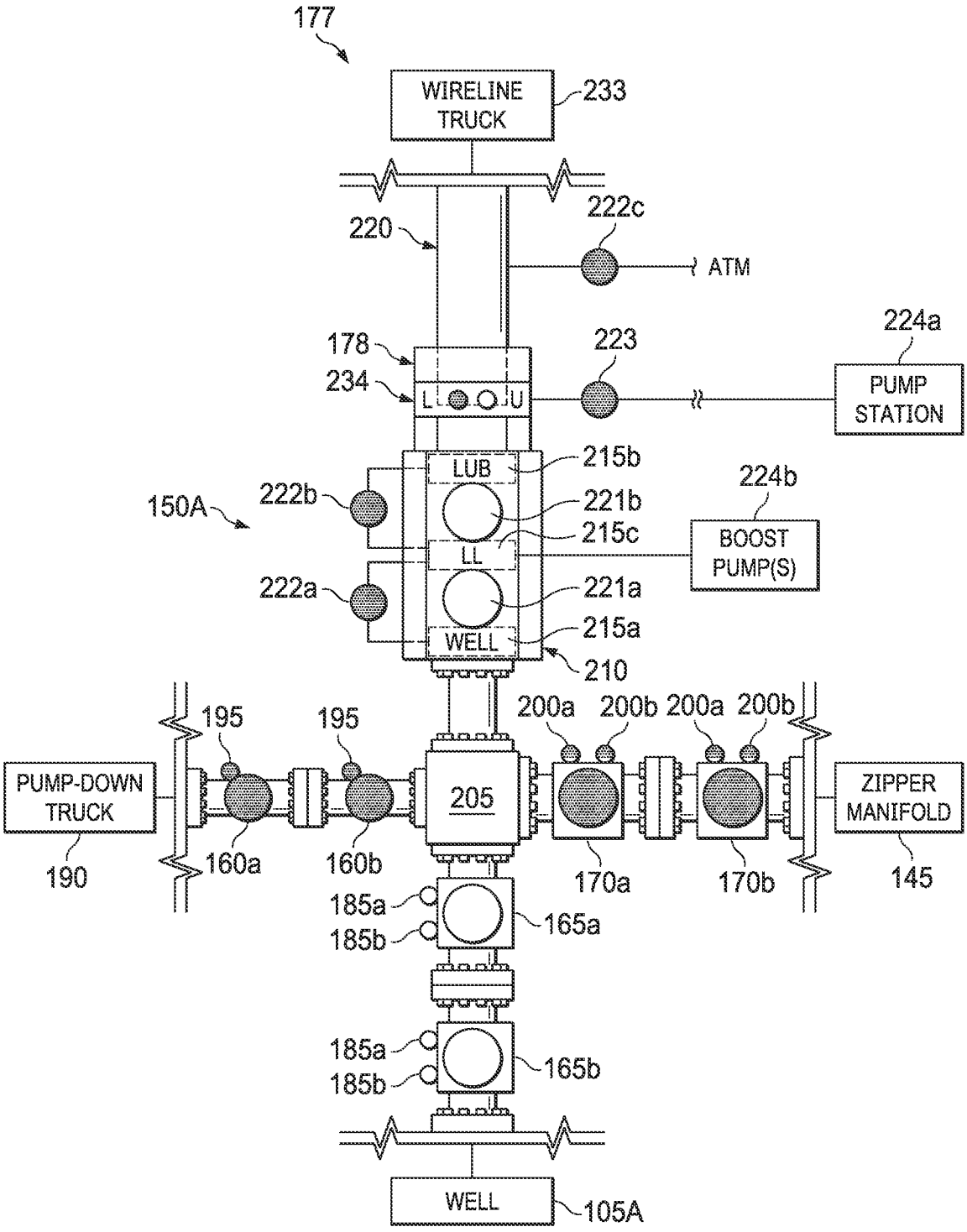

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
150A
222b
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 2G

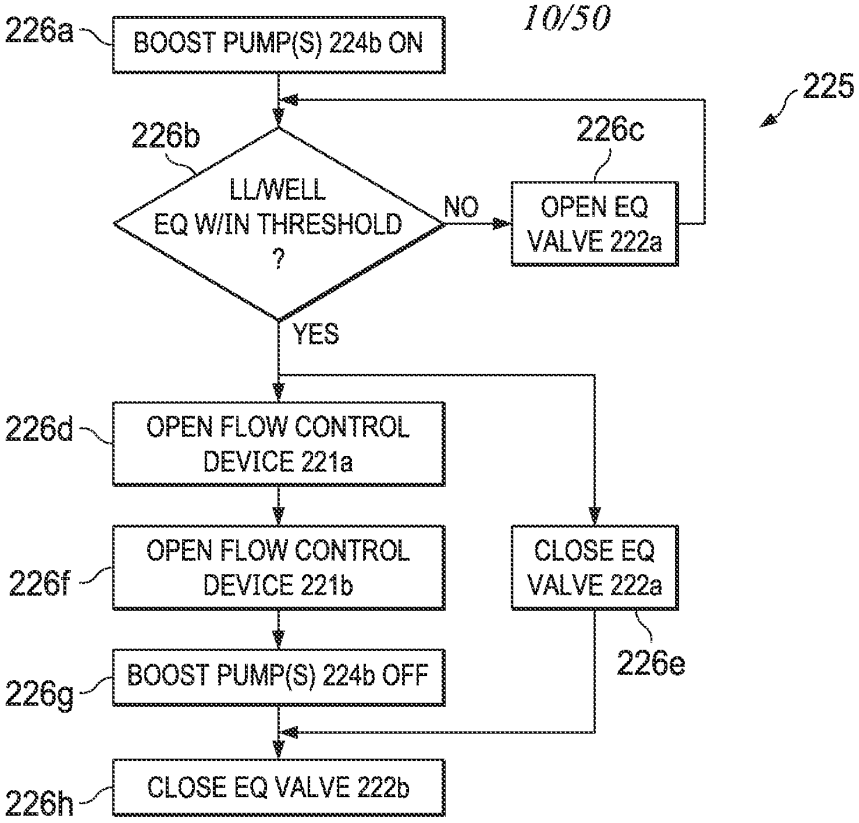

226a
BOOST PUMP(S) 224b ON
225
226b
LL/WELL EQ W/IN THRESHOLD ?
NO
226c
OPEN EQ VALVE 222a
YES
226d
OPEN FLOW CONTROL DEVICE 221a
226f
OPEN FLOW CONTROL DEVICE 221b
CLOSE EQ VALVE 222a
226e
226g
BOOST PUMP(S) 224b OFF
226h
CLOSE EQ VALVE 222b

FIG. 3

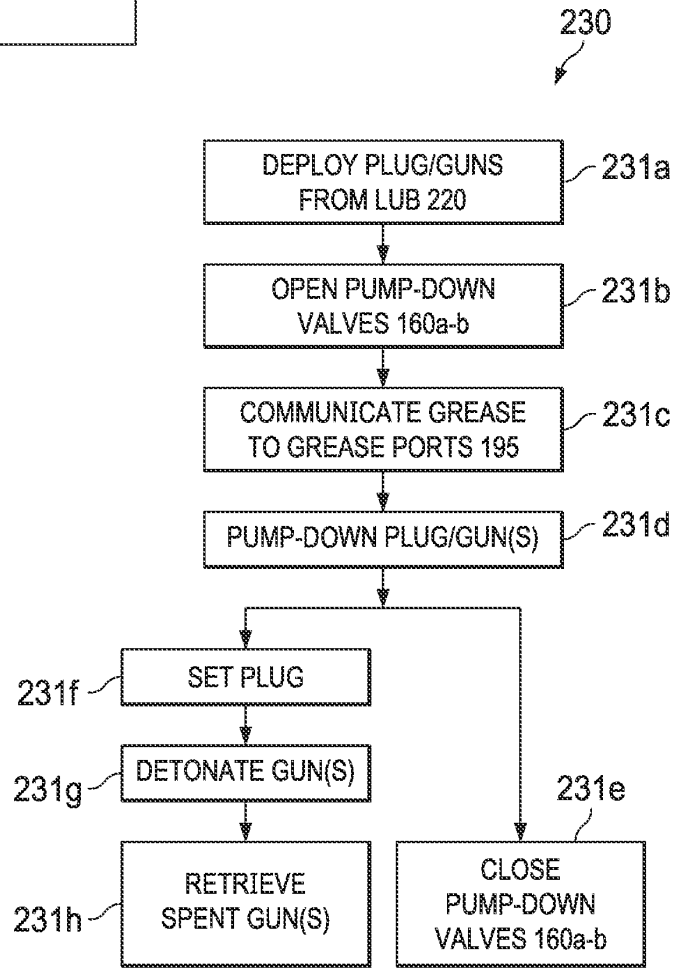

230
DEPLOY PLUG/GUNS FROM LUB 220
231a
OPEN PUMP-DOWN VALVES 160a-b
231b
COMMUNICATE GREASE TO GREASE PORTS 195
231c
PUMP-DOWN PLUG/GUN(S)
231d
231f
SET PLUG
231g
DETONATE GUN(S)
231e
231h
RETRIEVE SPENT GUN(S)
CLOSE PUMP-DOWN VALVES 160a-b

FIG. 4

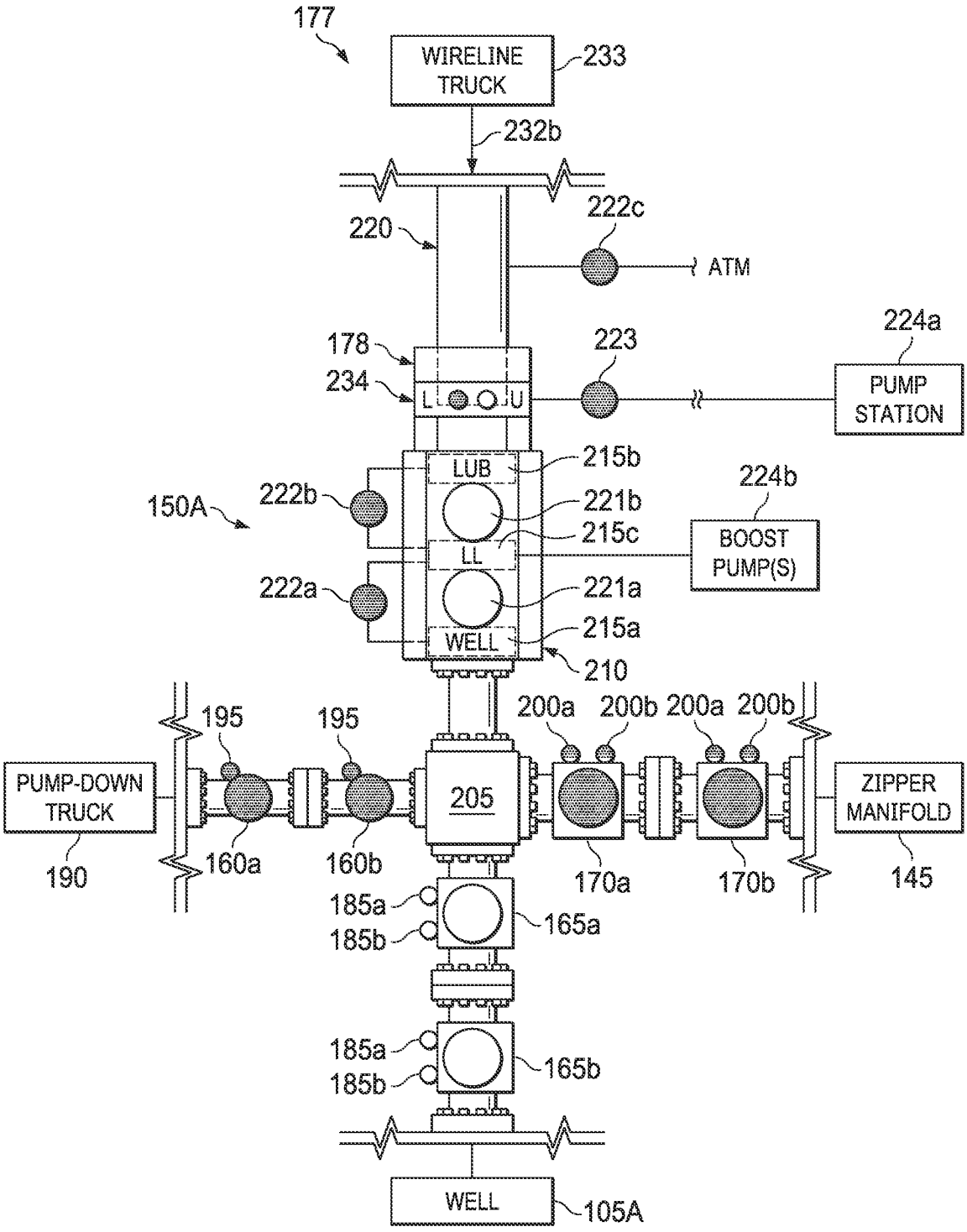

177
WIRELINE TRUCK
233
232b
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
222b
150A
221b
215c
BOOST PUMP(S)
LL
222a
221a
215a
WELL
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 5A

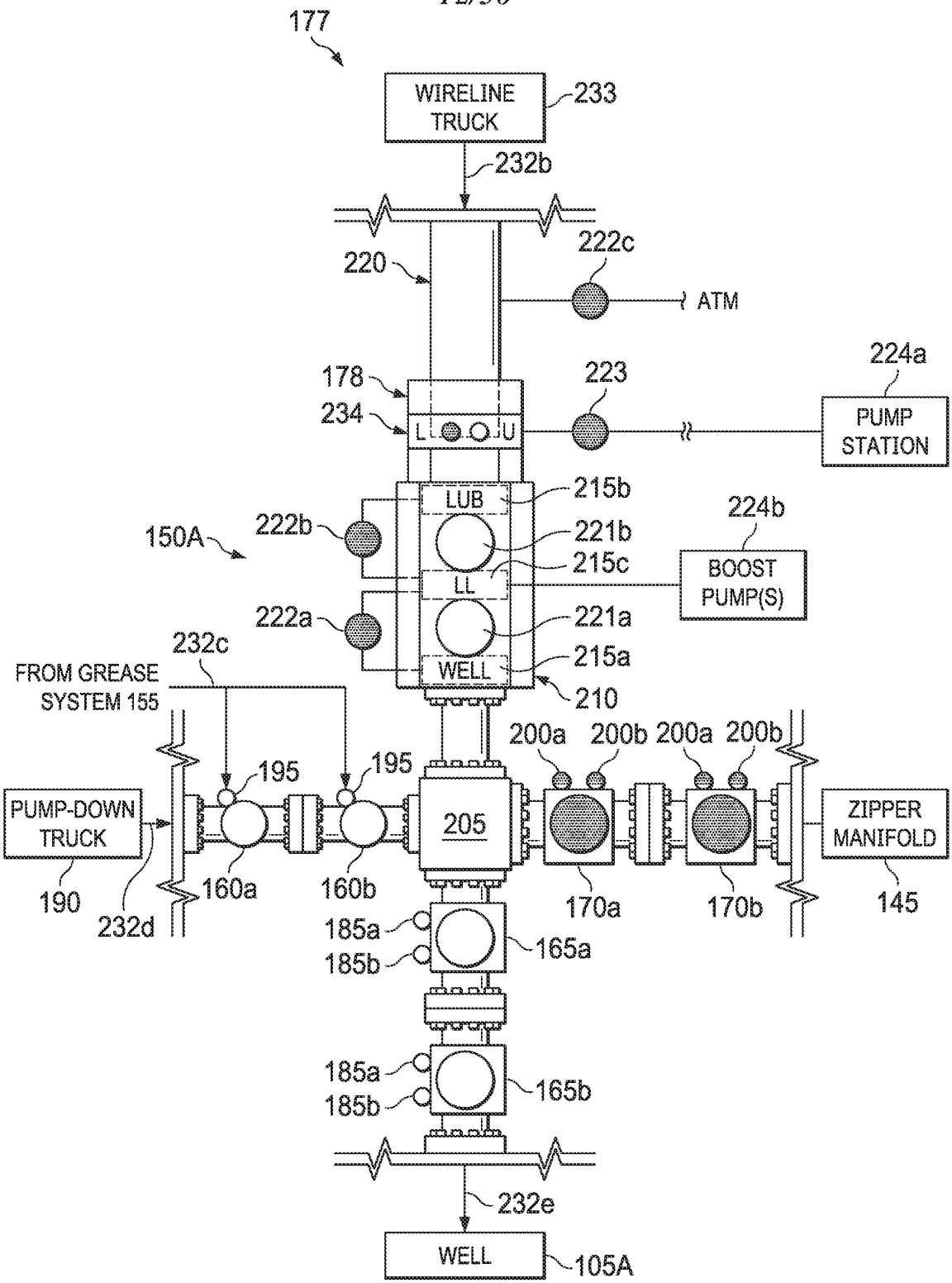

177
WIRELINE TRUCK
233
232b
222c
220
ATM
224a
178
223
234
L
U
PUMP STATION
215b
LUB
224b
150A
222b
221b
215c
LL
BOOST PUMP(S)
222a
221a
232c
215a
FROM GREASE SYSTEM 155
WELL
210
200a
200b
200a
200b
195
195
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
232d
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
232e
WELL
105A

FIG. 5B

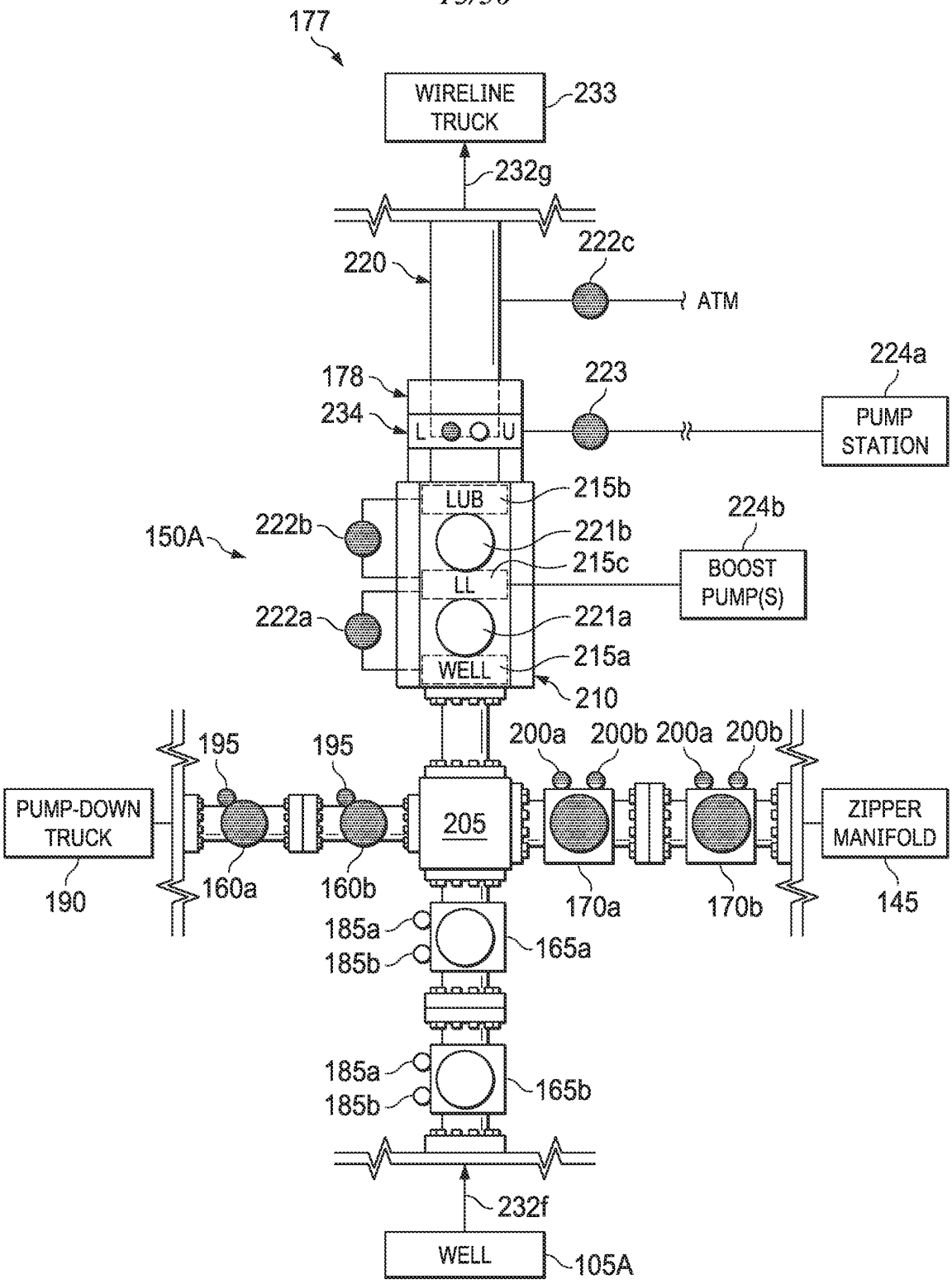

177
WIRELINE TRUCK
233
232g
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
222b
150A
221b
215c
BOOST PUMP(S)
LL
222a
221a
215a
WELL
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
232f
WELL
105A

FIG. 5C

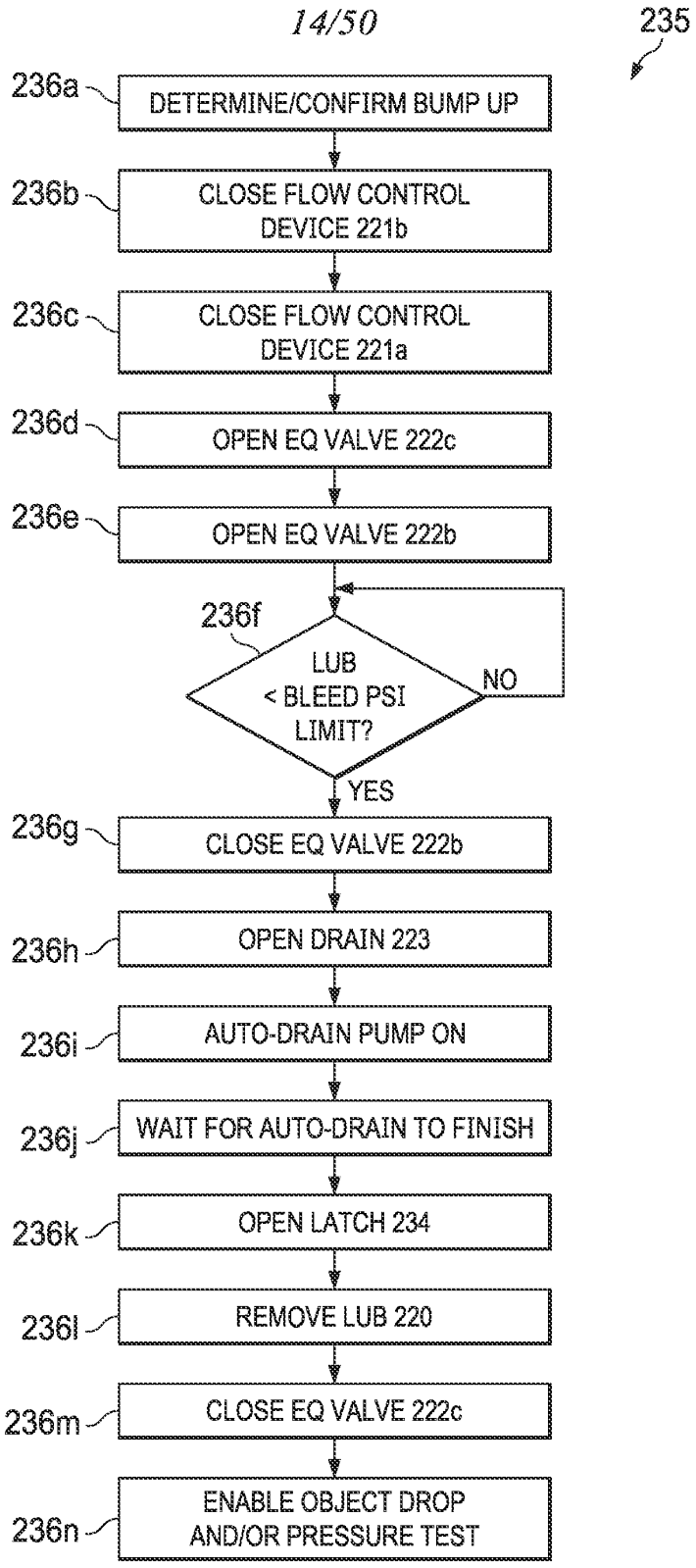

235
236a
DETERMINE/CONFIRM BUMP UP
236b
CLOSE FLOW CONTROL DEVICE 221b
236c
CLOSE FLOW CONTROL DEVICE 221a
236d
OPEN EQ VALVE 222c
236e
OPEN EQ VALVE 222b
236f
LUB < BLEED PSI LIMIT?
NO
YES
236g
CLOSE EQ VALVE 222b
236h
OPEN DRAIN 223
236i
AUTO-DRAIN PUMP ON
236j
WAIT FOR AUTO-DRAIN TO FINISH
236k
OPEN LATCH 234
236l
REMOVE LUB 220
236m
CLOSE EQ VALVE 222c
236n
ENABLE OBJECT DROP AND/OR PRESSURE TEST

FIG. 6

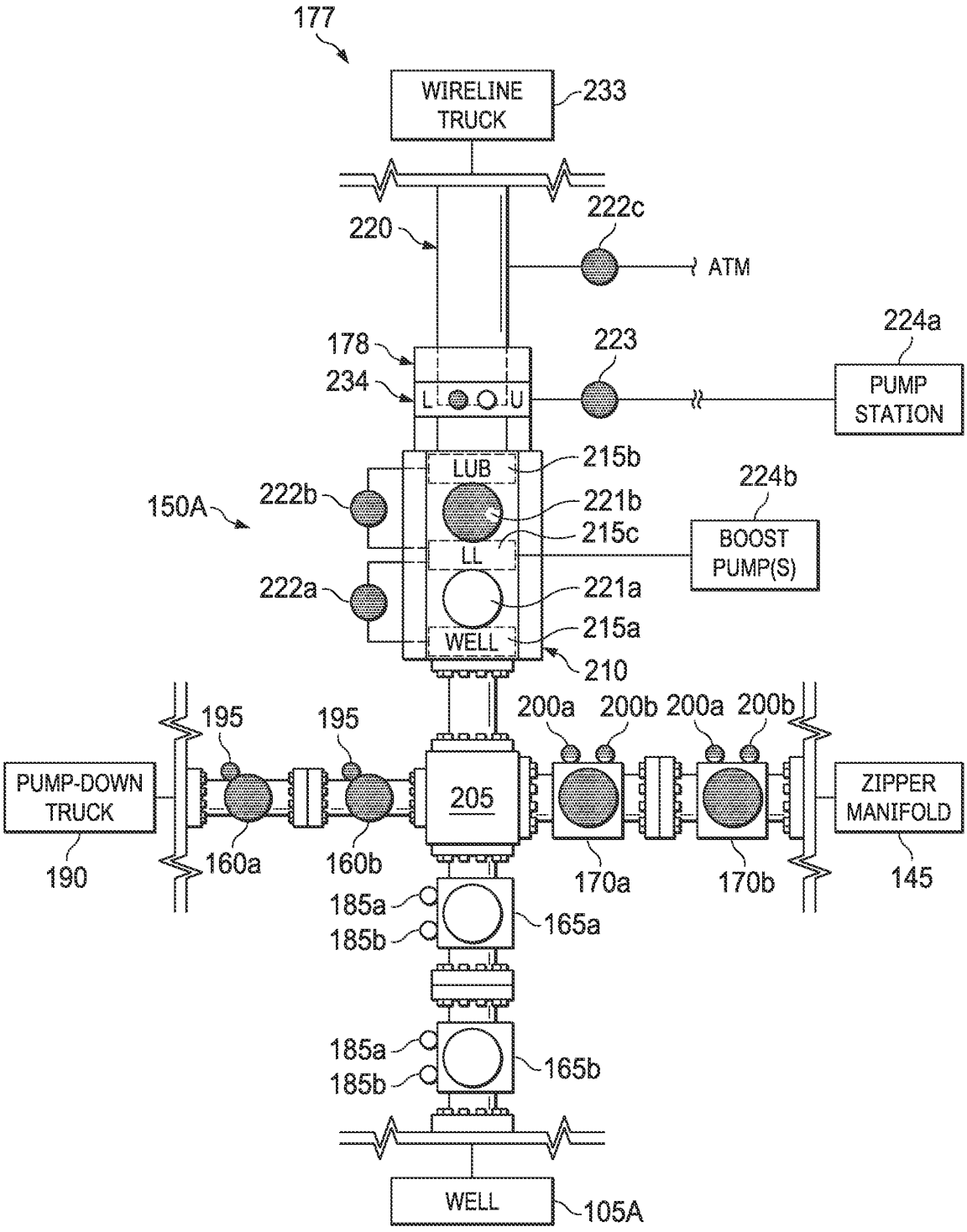

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
222b
150A
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 7A

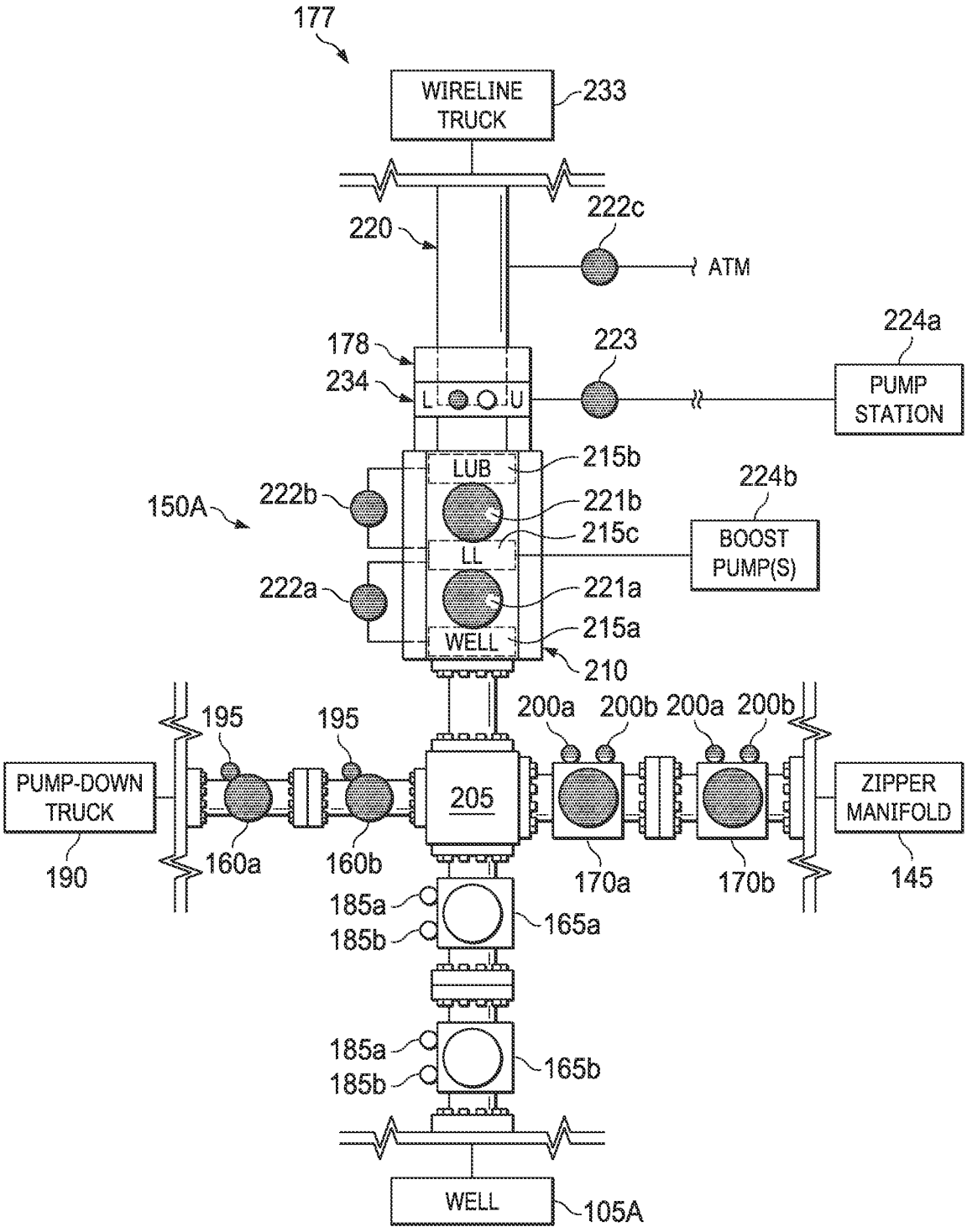

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
222b
221b
150A
215c
BOOST PUMP(S)
LL
222a
221a
215a
WELL
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 7B

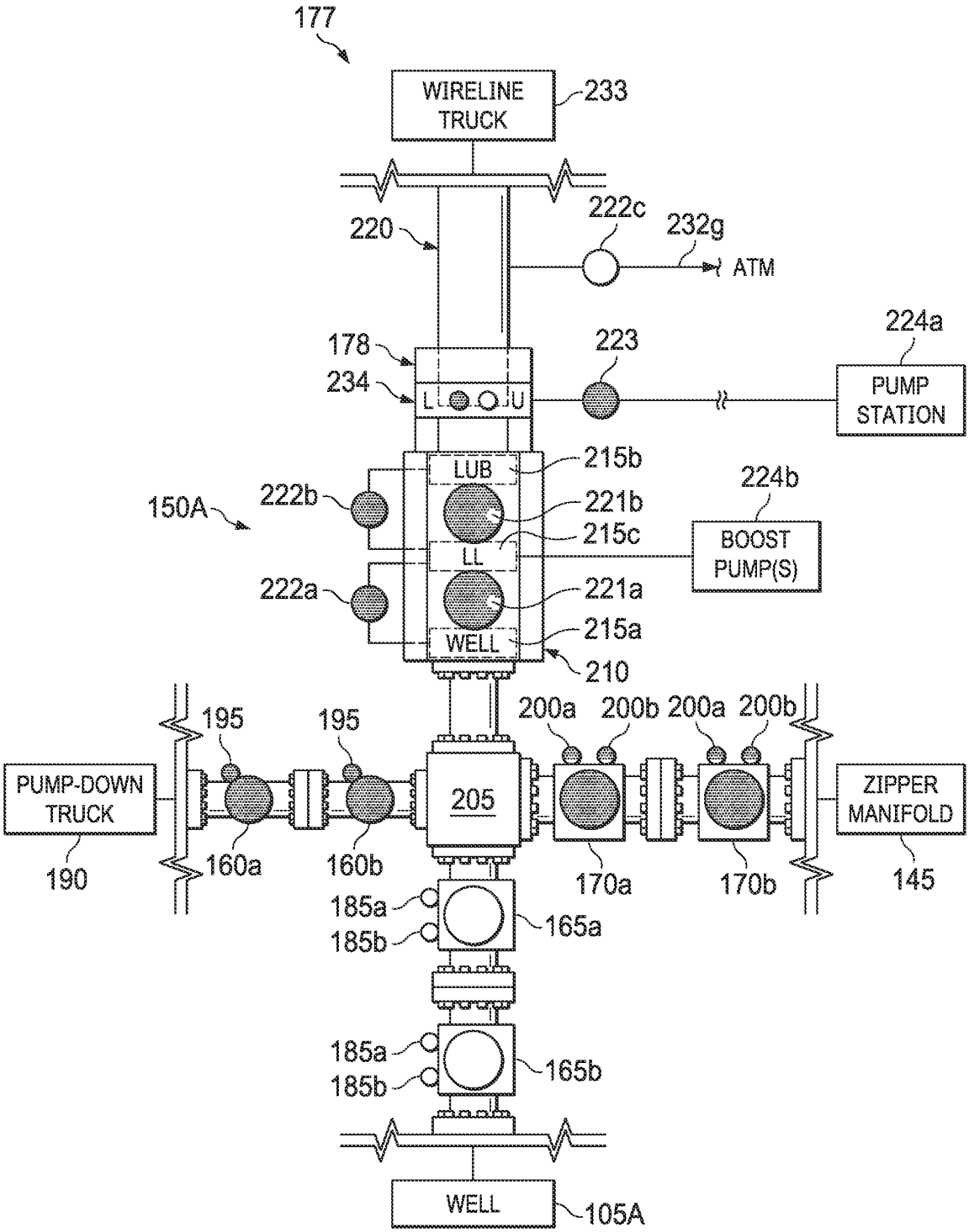

177
WIRELINE TRUCK
233
220
222c
232g
ATM
224a
PUMP STATION
178
234
223
L
U
LUB
215b
224b
150A
222b
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 7C

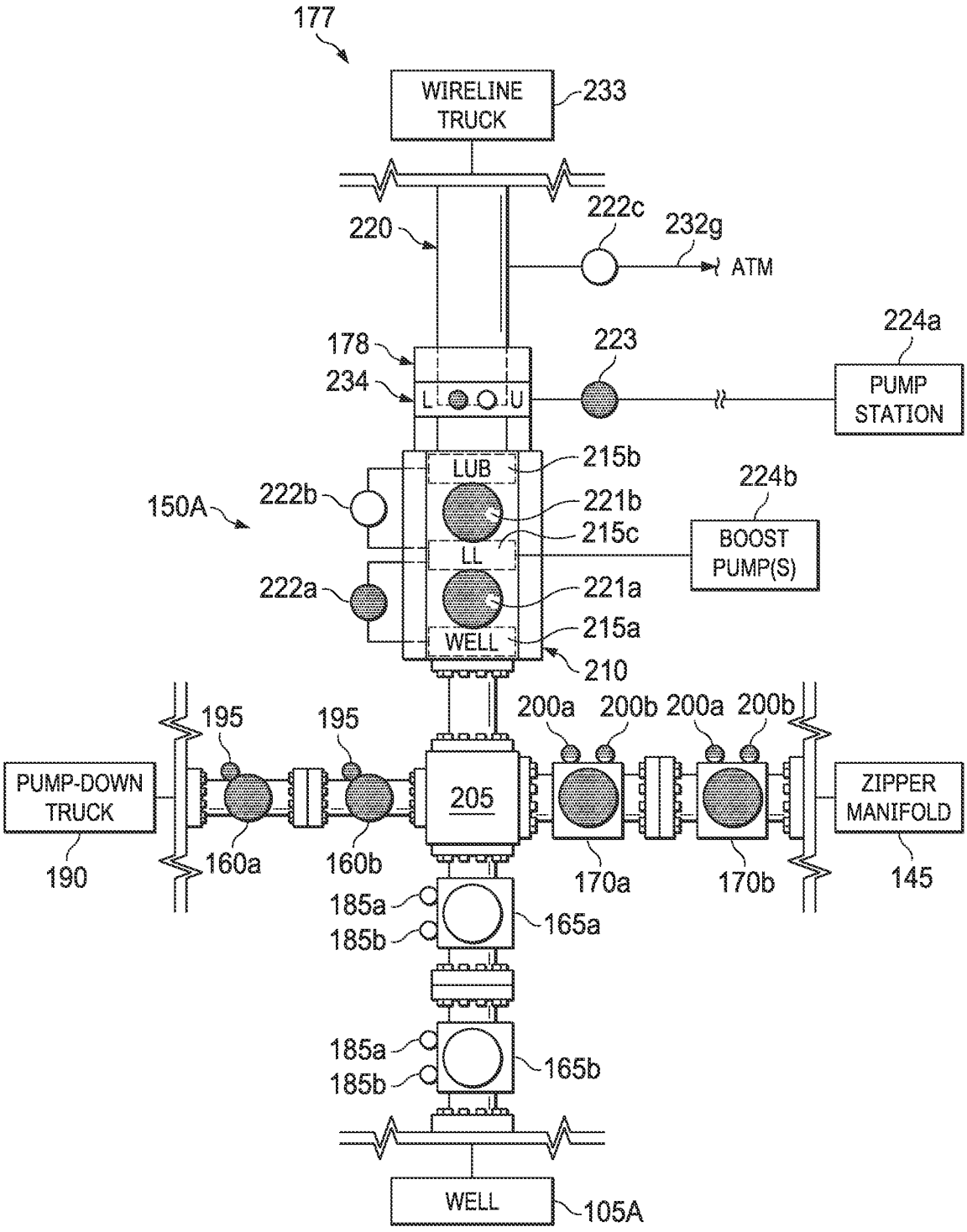

177
WIRELINE TRUCK
233
220
222c
232g
ATM
224a
178
234
223
PUMP STATION
LUB
215b
224b
150A
222b
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 7D

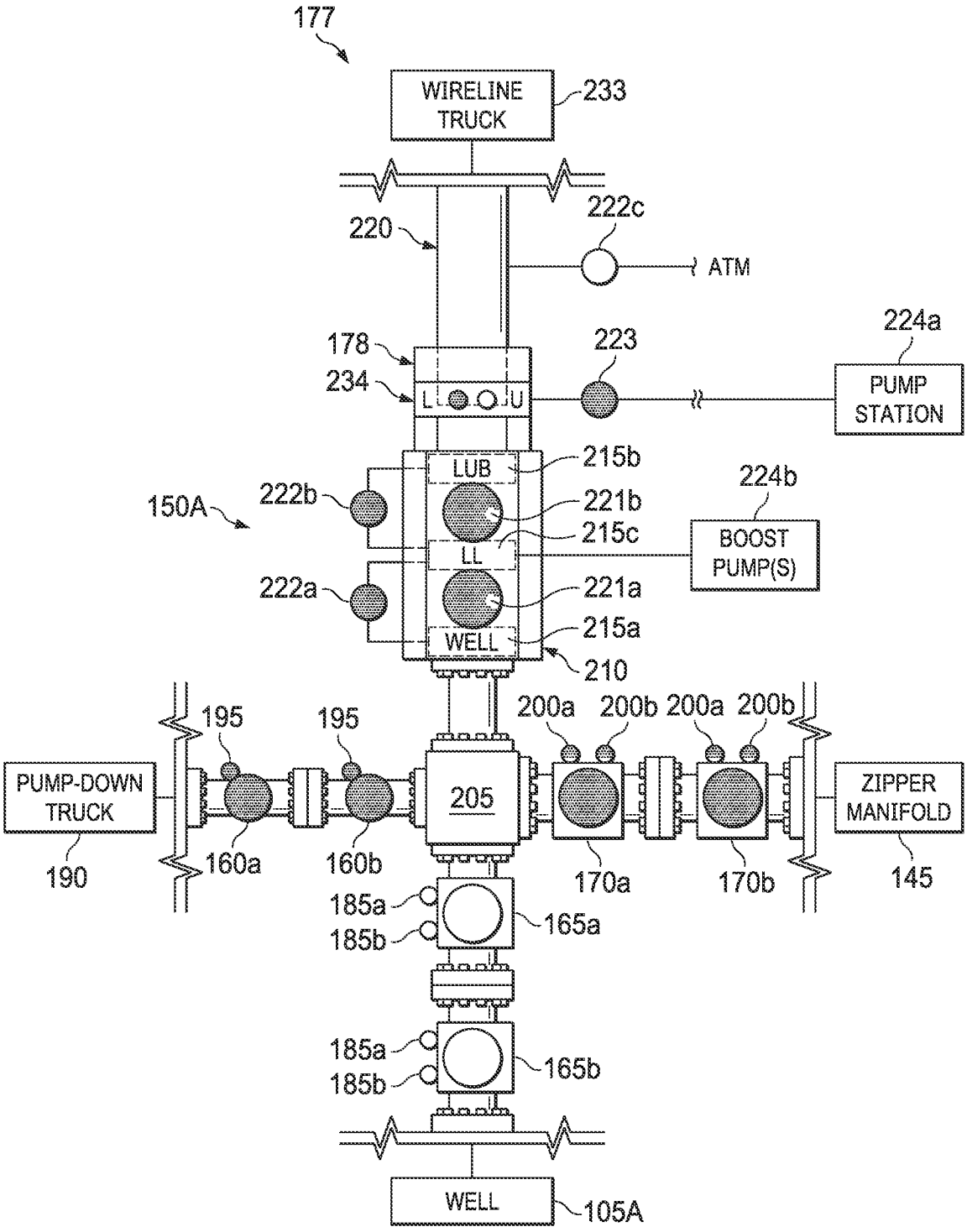

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
222b
150A
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 7E

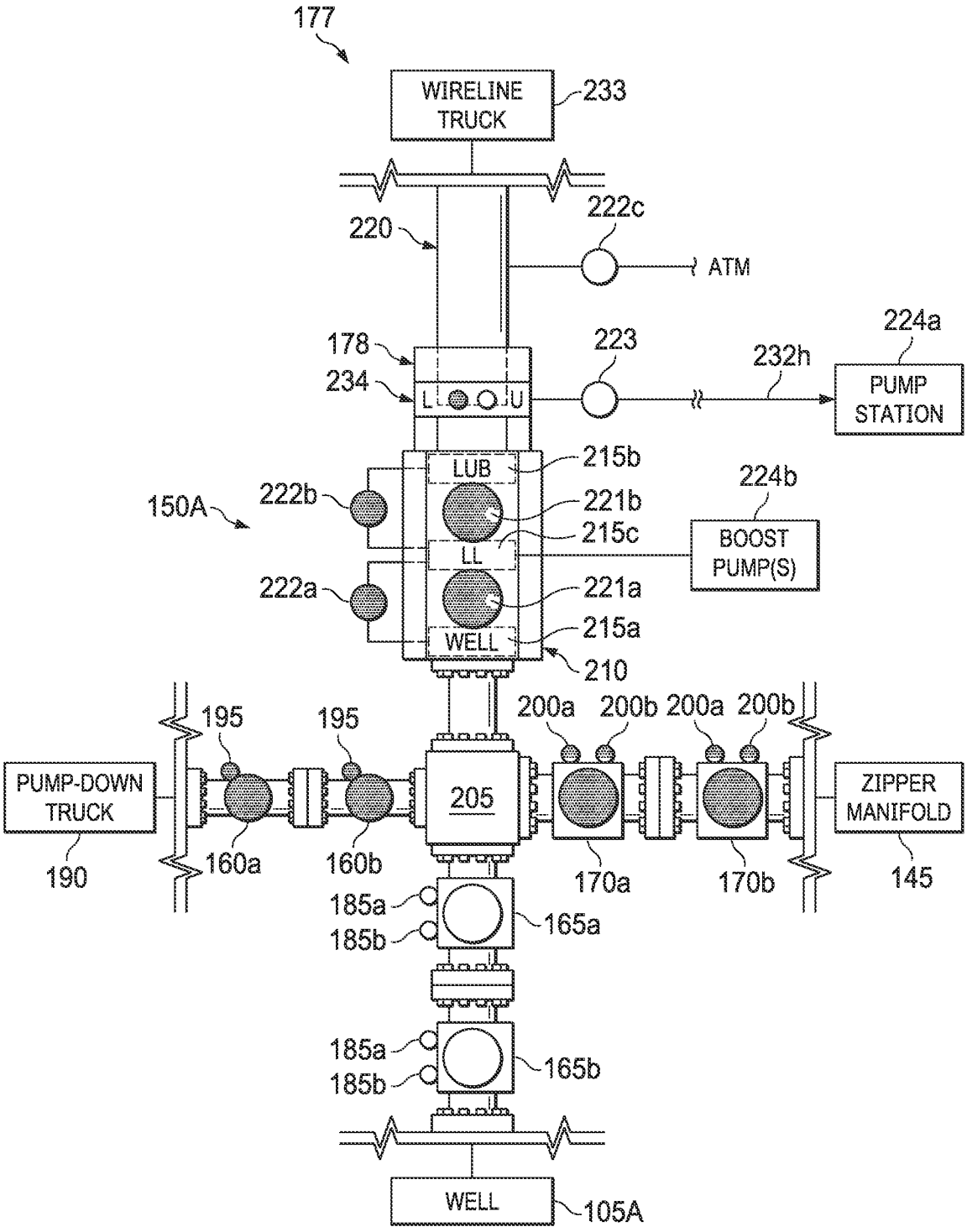

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
232h
234
PUMP STATION
LUB
215b
224b
222b
150A
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 7F

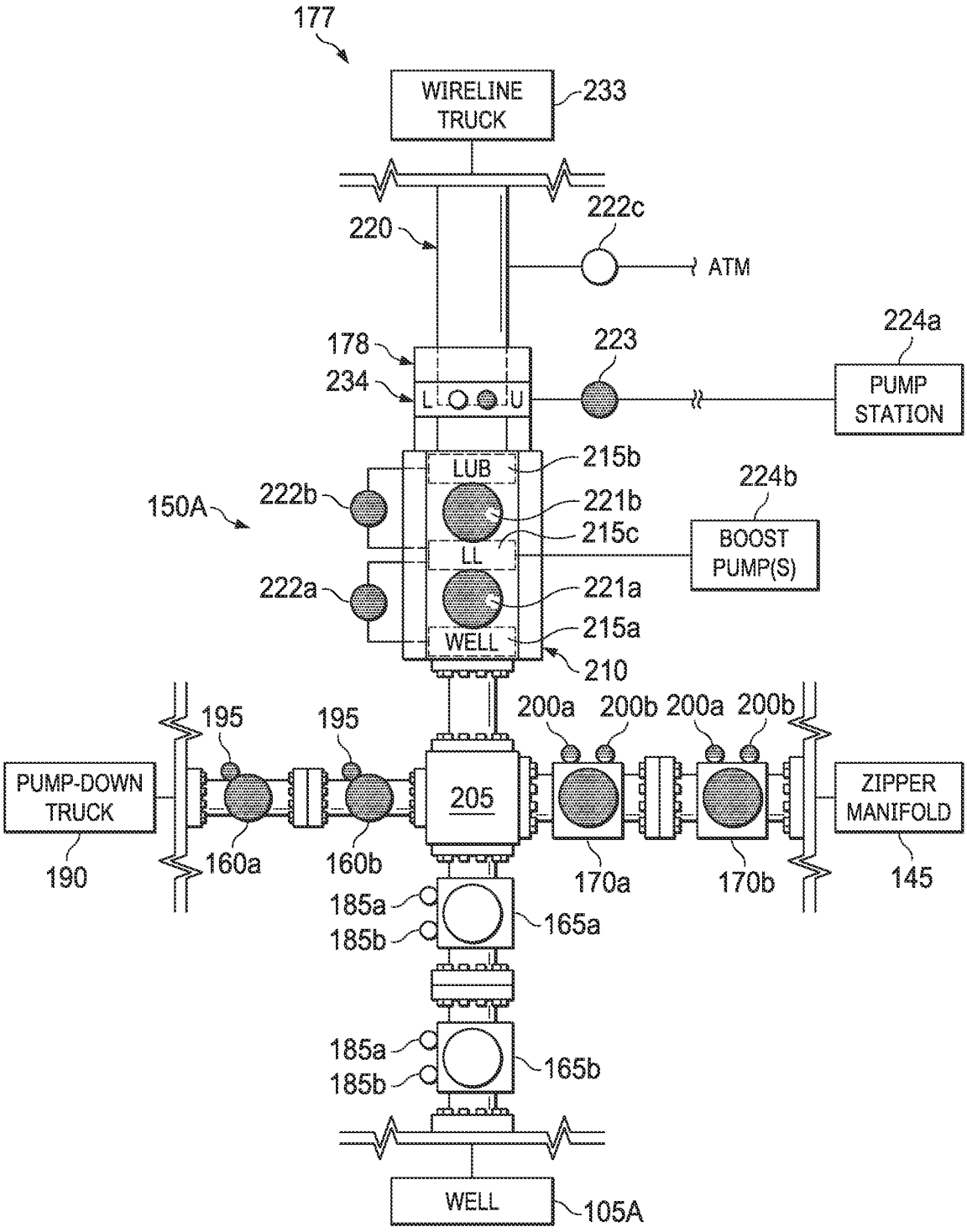

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
222b
150A
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 7G

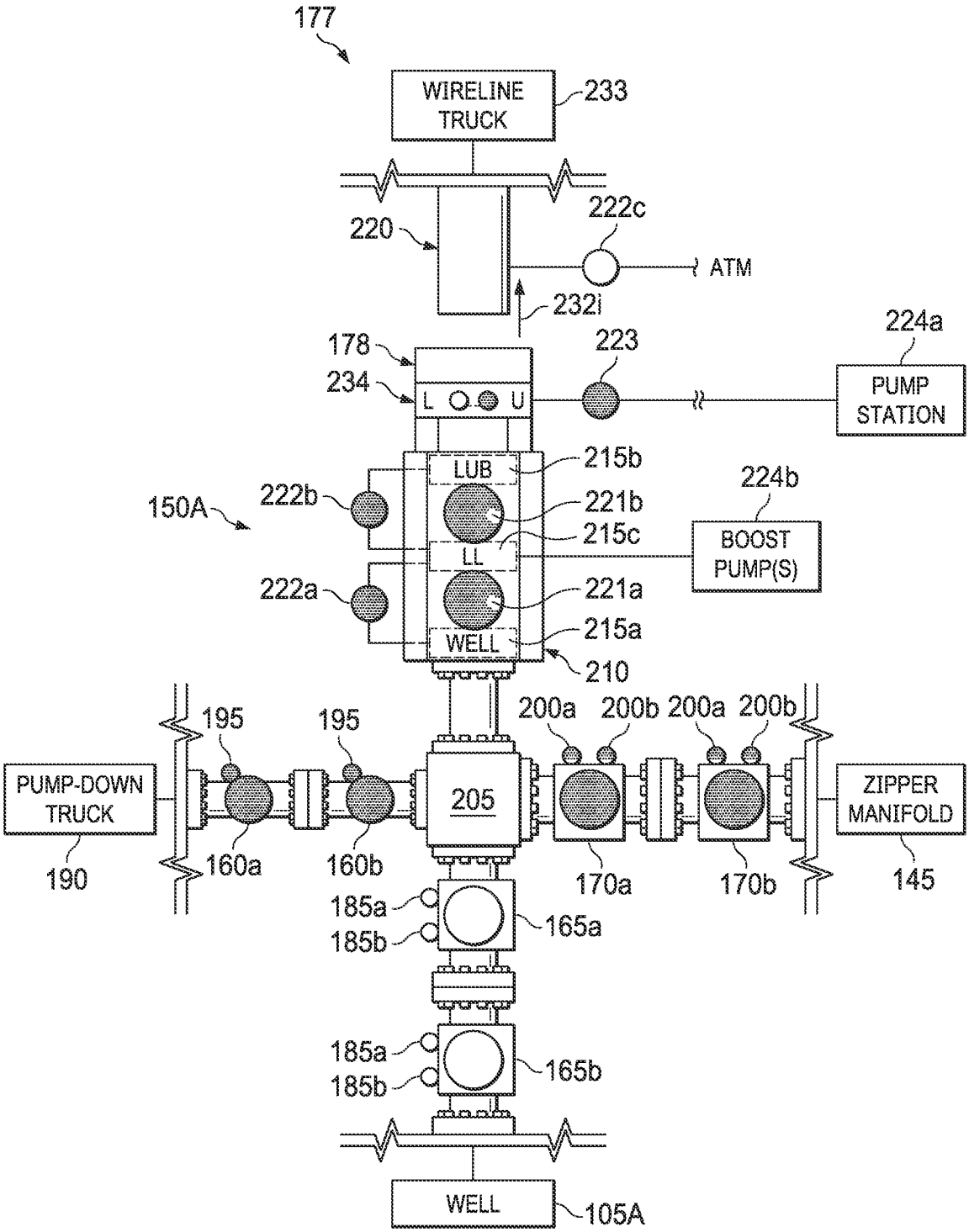

177
WIRELINE TRUCK
233
222c
220
ATM
232i
224a
178
223
234
L
U
PUMP STATION
215b
LUB
224b
222b
150A
221b
215c
BOOST PUMP(S)
LL
222a
221a
215a
WELL
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 7H

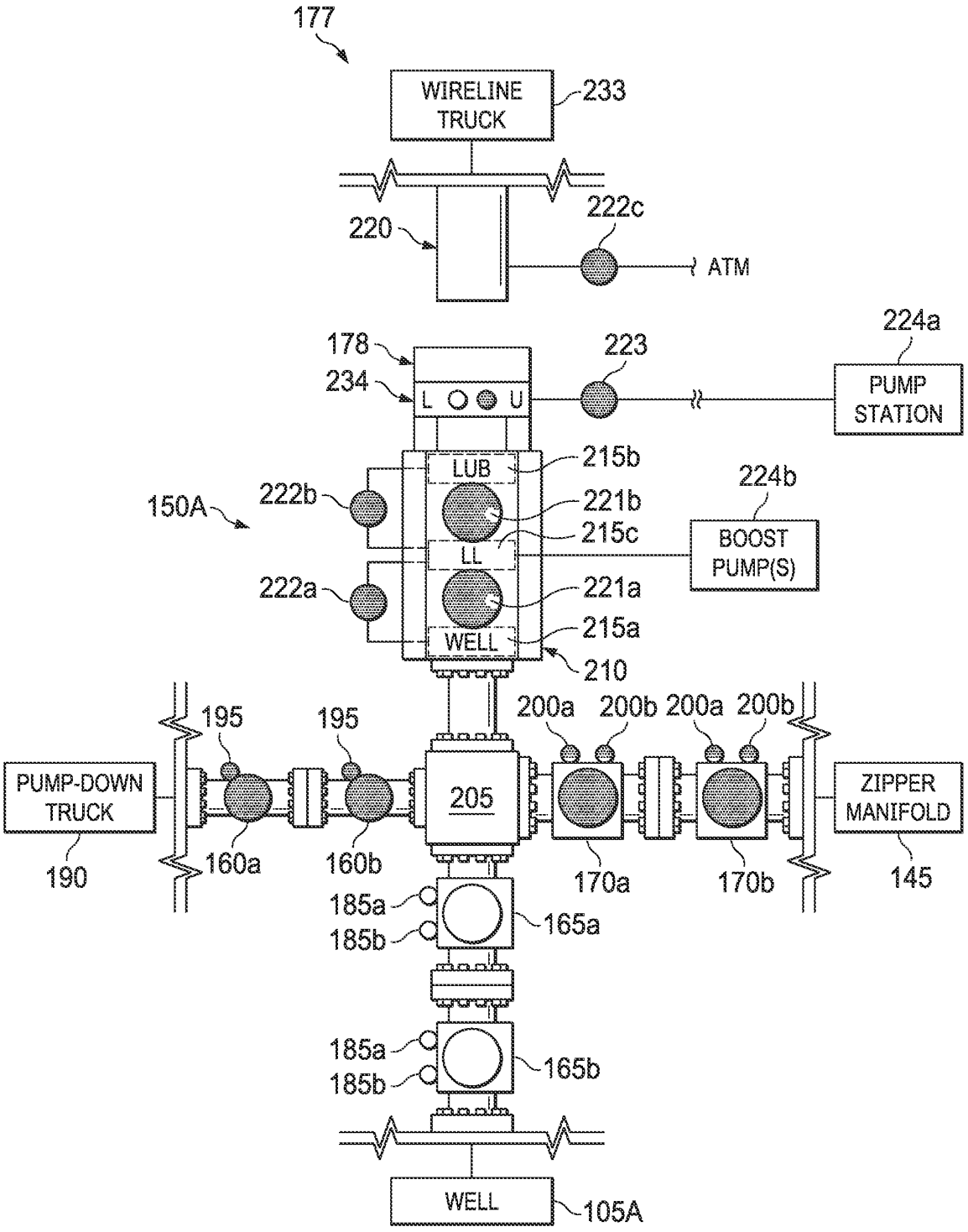

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
234
223
L
U
PUMP STATION
LUB
215b
224b
150A
222b
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105A

FIG. 7I

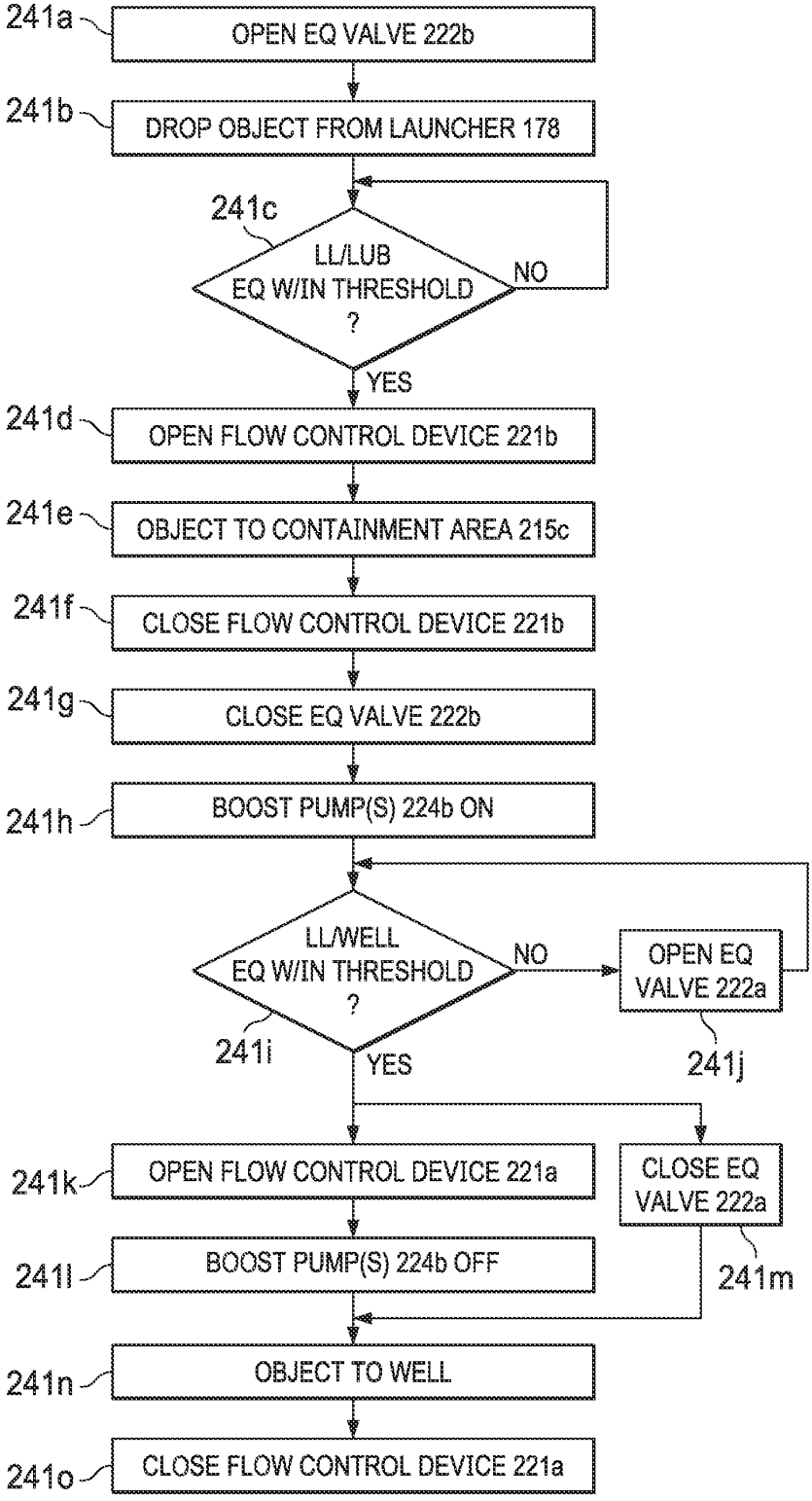

241a
OPEN EQ VALVE 222b
241b
DROP OBJECT FROM LAUNCHER 178
241c
LL/LUB EQ W/IN THRESHOLD ?
NO
YES
241d
OPEN FLOW CONTROL DEVICE 221b
241e
OBJECT TO CONTAINMENT AREA 215c
241f
CLOSE FLOW CONTROL DEVICE 221b
241g
CLOSE EQ VALVE 222b
241h
BOOST PUMP(S) 224b ON
LL/WELL EQ W/IN THRESHOLD ?
NO
OPEN EQ VALVE 222a
241i
YES
241j
241k
OPEN FLOW CONTROL DEVICE 221a
CLOSE EQ VALVE 222a
241l
BOOST PUMP(S) 224b OFF
241m
241n
OBJECT TO WELL
241o
CLOSE FLOW CONTROL DEVICE 221a

FIG. 8

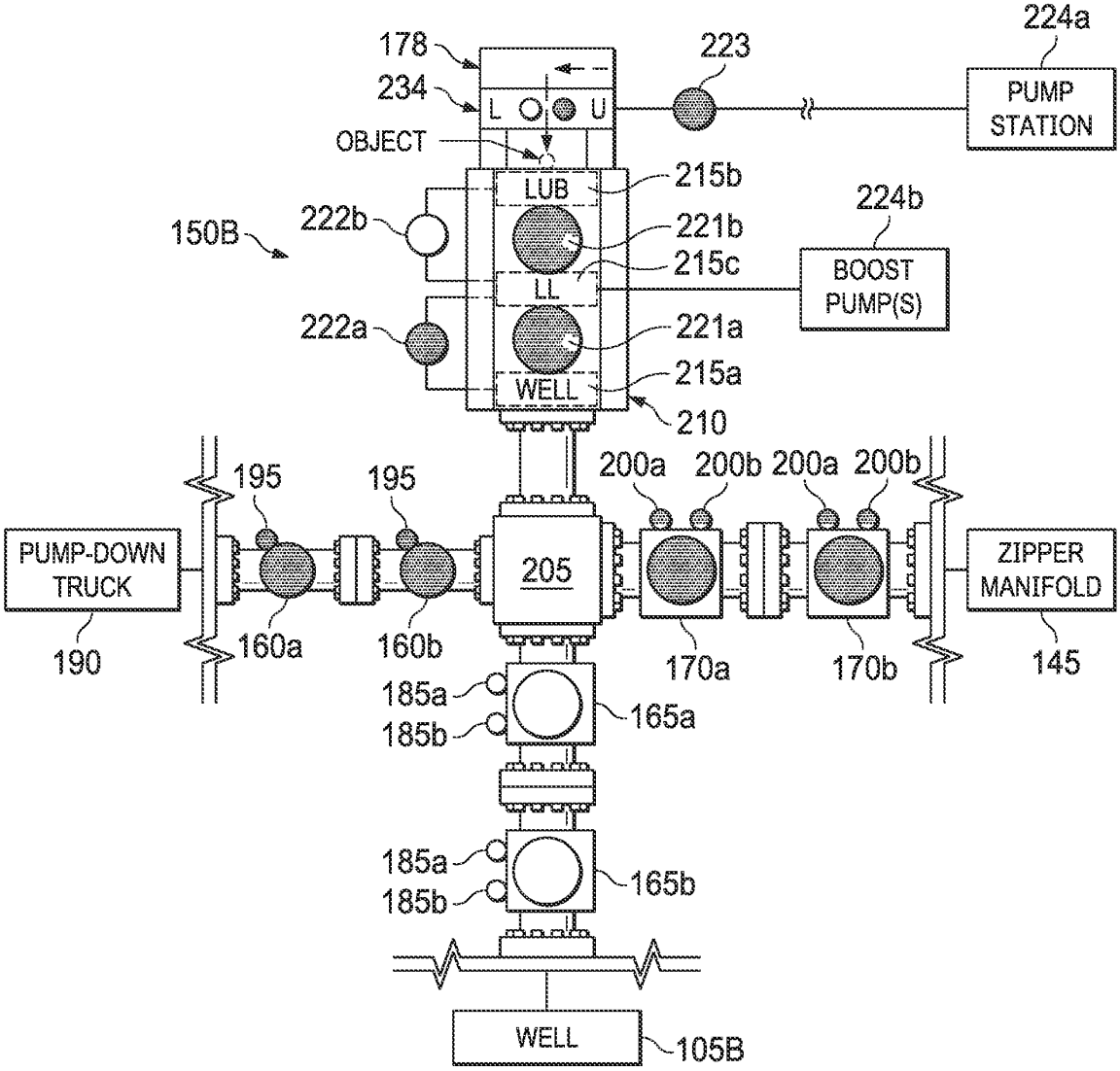

178
234
L
U
OBJECT
223
224a
PUMP STATION
LUB
215b
150B
222b
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105B

FIG. 9A

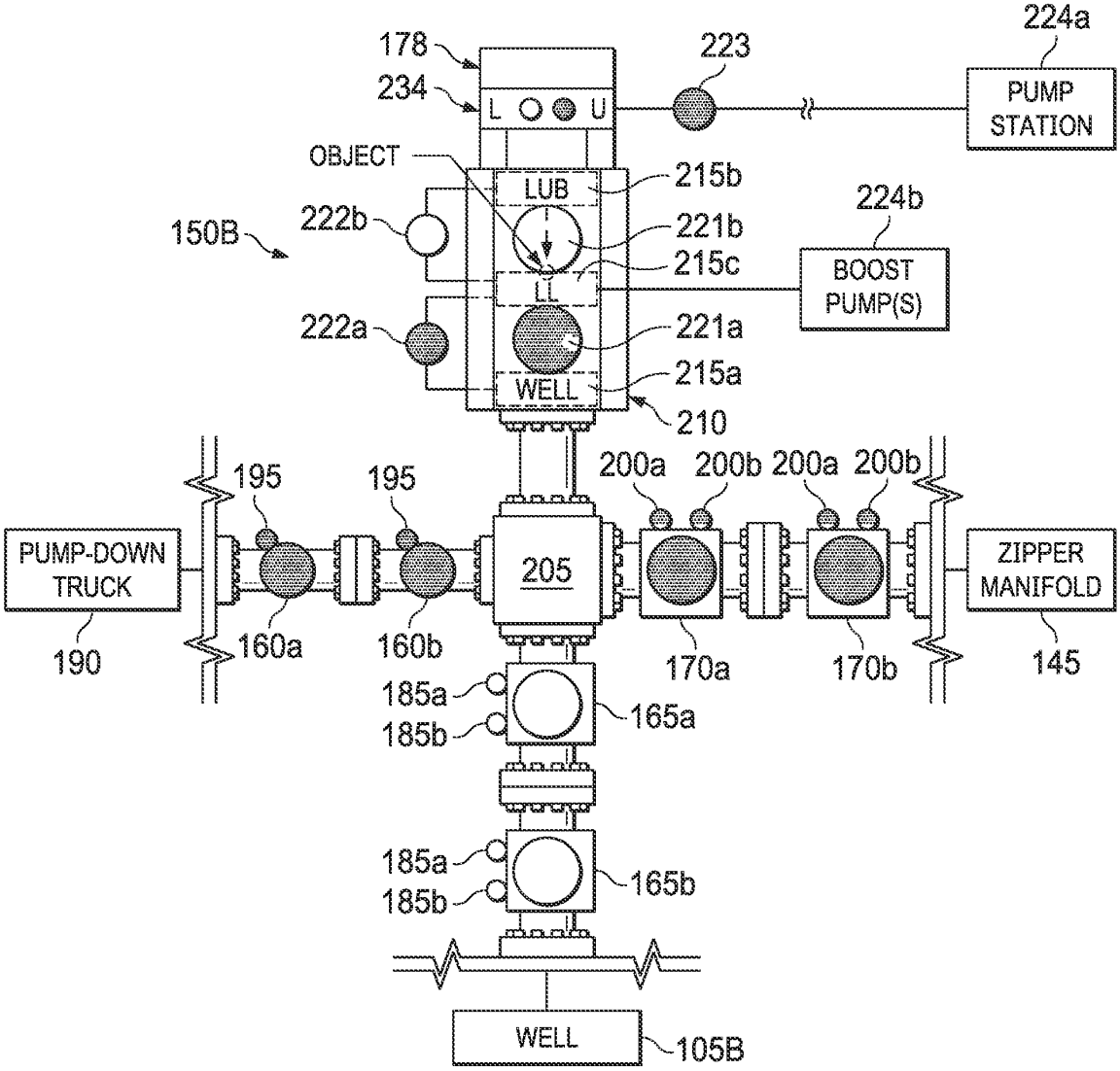

178
234
L
U
223
224a
PUMP STATION
OBJECT
LUB
215b
150B
222b
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105B

FIG. 9B

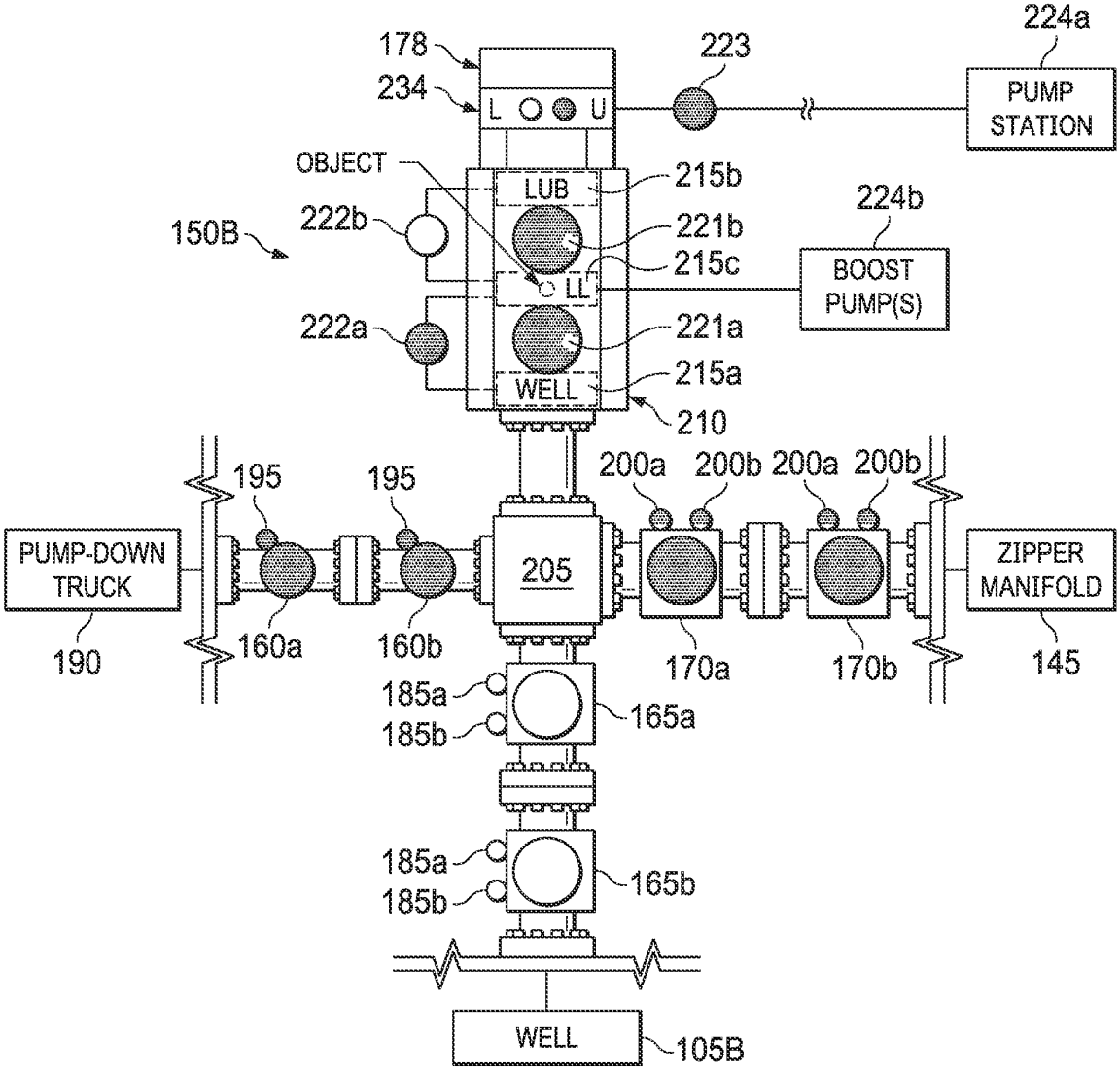

178
234
L
U
223
224a
PUMP STATION
OBJECT
LUB
215b
222b
150B
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105B

FIG. 9C

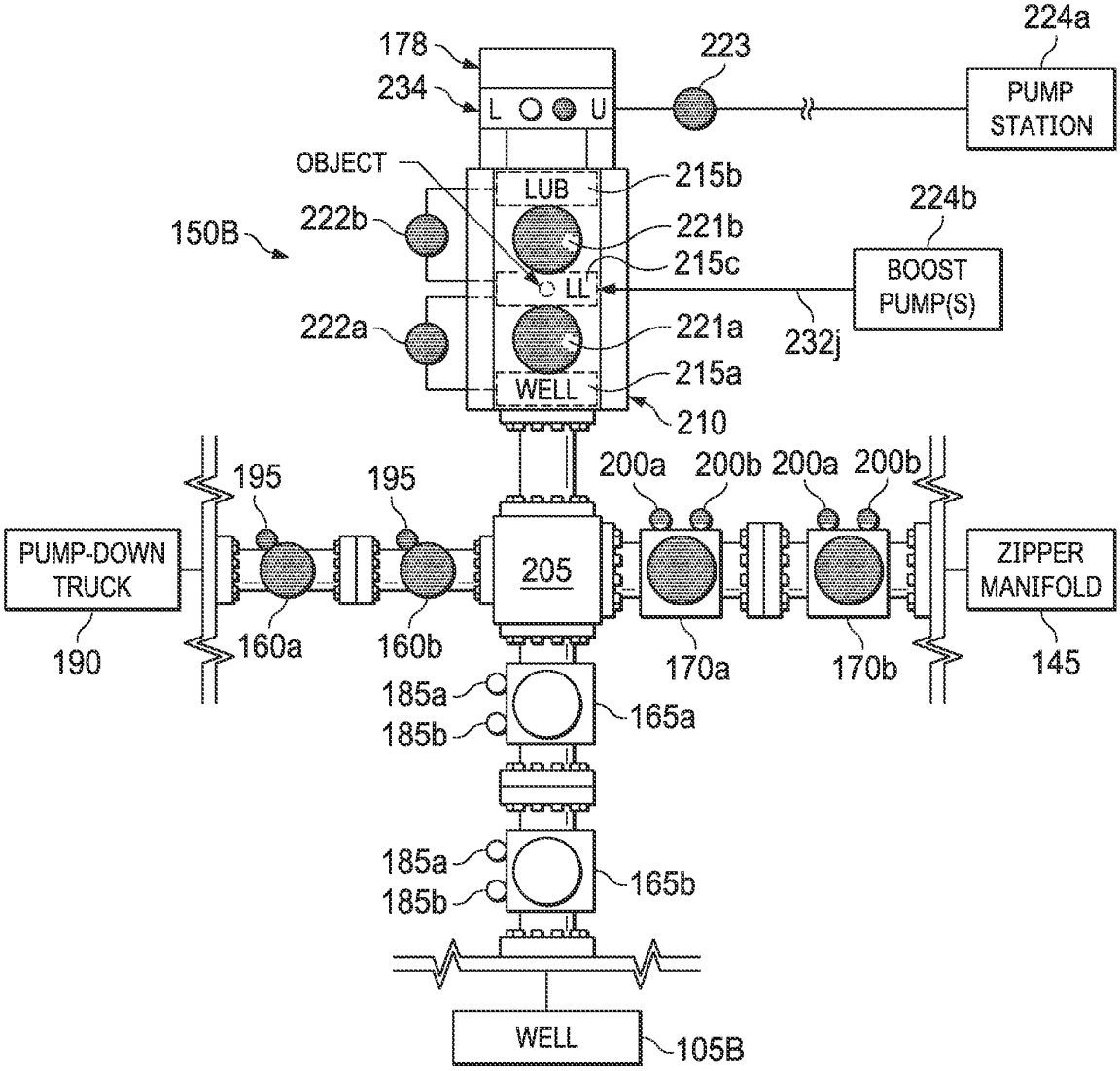

178
234
L
U
223
224a
PUMP STATION
OBJECT
LUB
215b
150B
222b
221b
215c
LL
224b
BOOST PUMP(S)
232j
222a
221a
215a
WELL
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105B

FIG. 9D

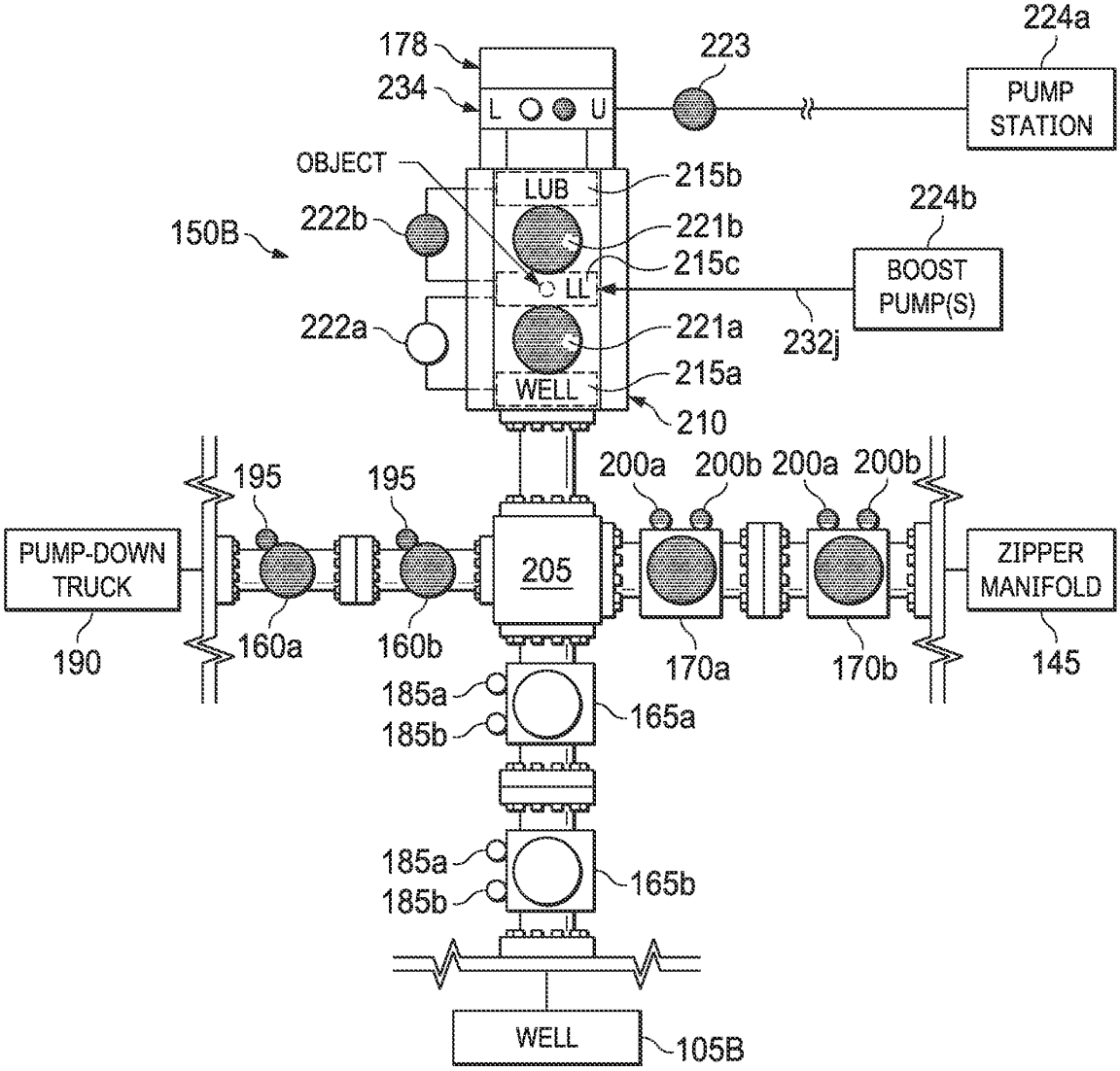

178
234
L
U
223
224a
PUMP STATION
OBJECT
LUB
215b
150B
222b
221b
215c
LL
224b
BOOST PUMP(S)
232j
222a
221a
215a
WELL
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105B

FIG. 9E

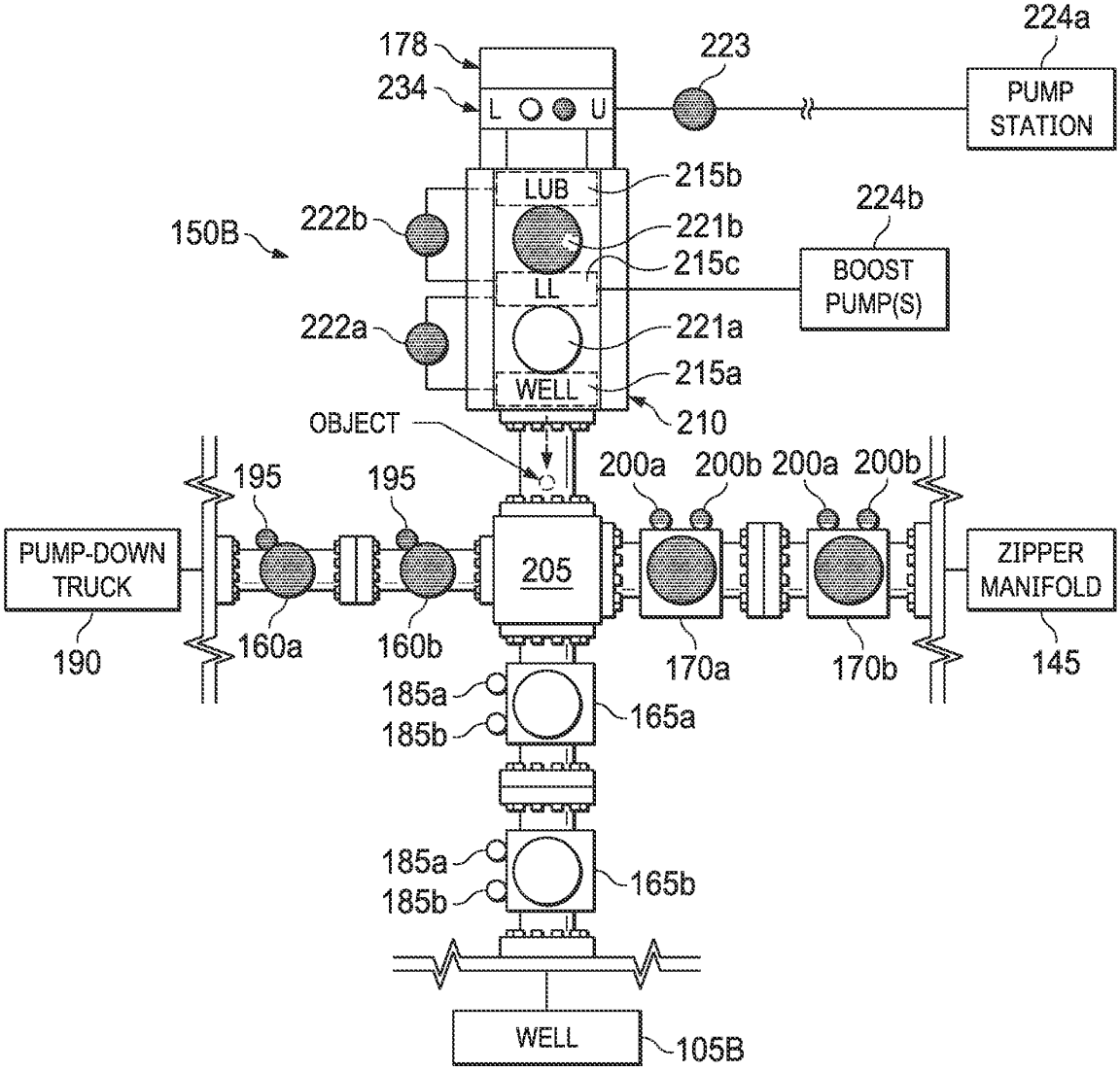

178
234
L
U
223
224a
PUMP STATION
LUB
215b
150B
222b
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
OBJECT
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105B

FIG. 9F

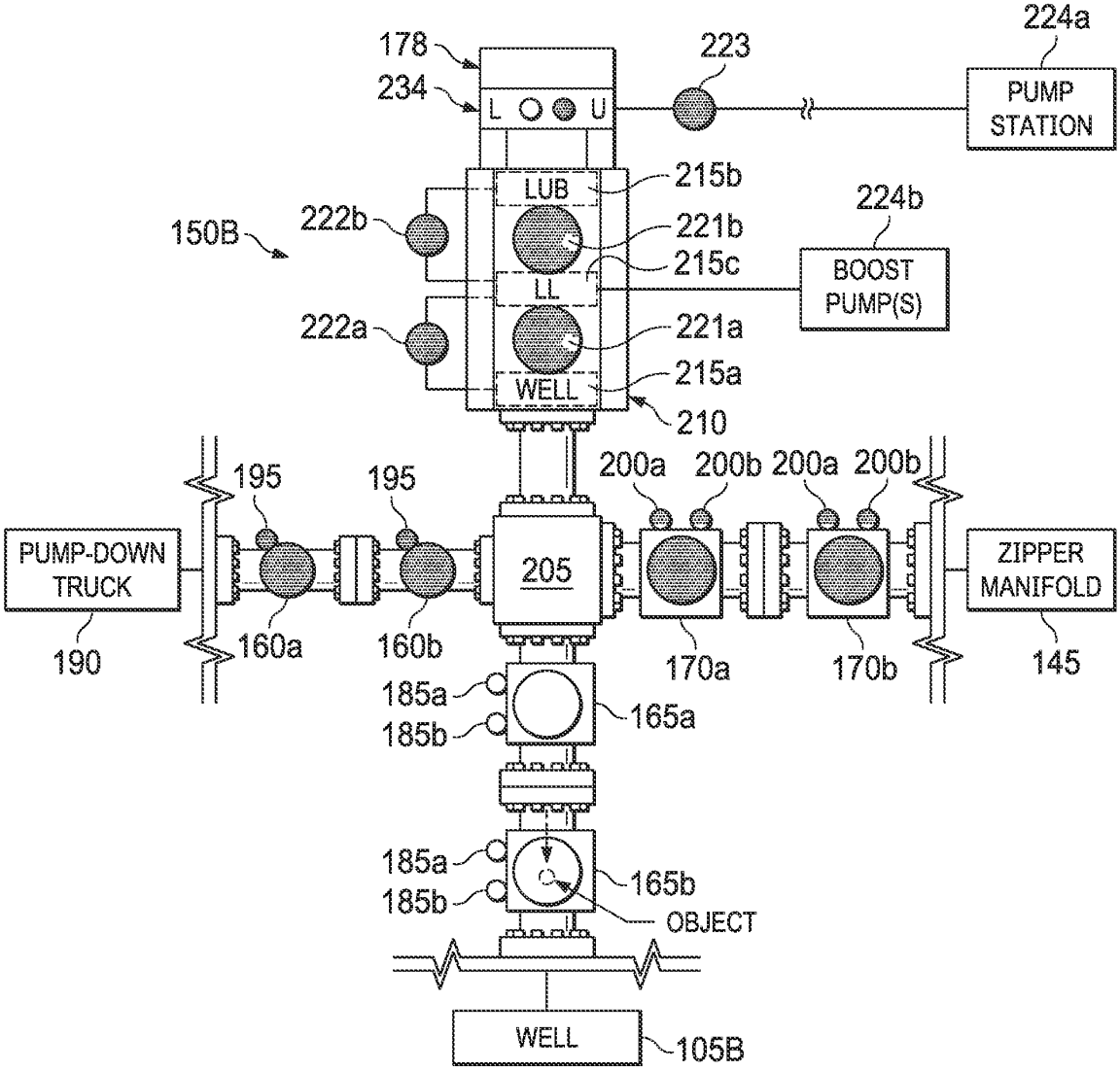

178
234
L
U
223
224a
PUMP STATION
LUB
215b
150B
222b
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
OBJECT
WELL
105B

FIG. 9G

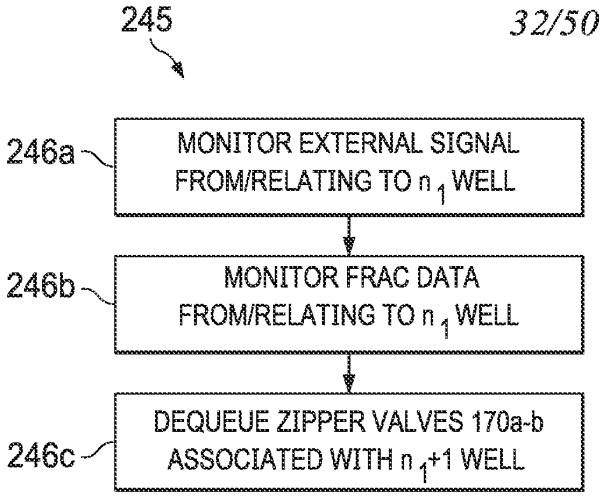


FIG. 10

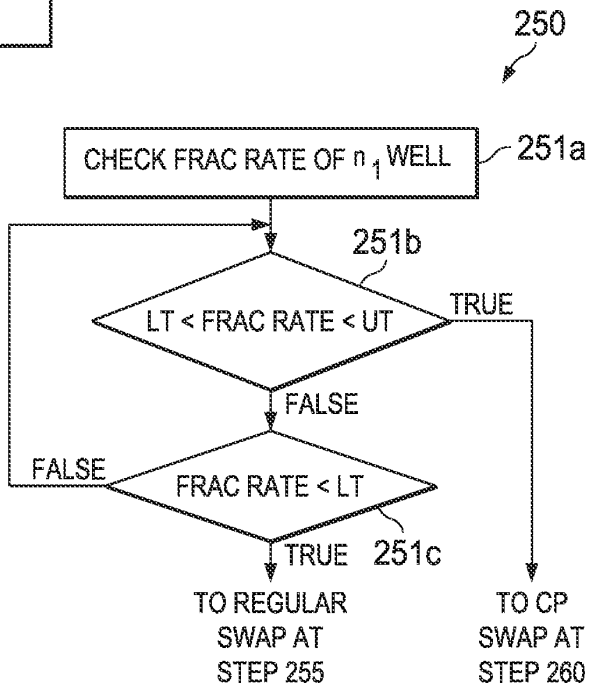


FIG. 12

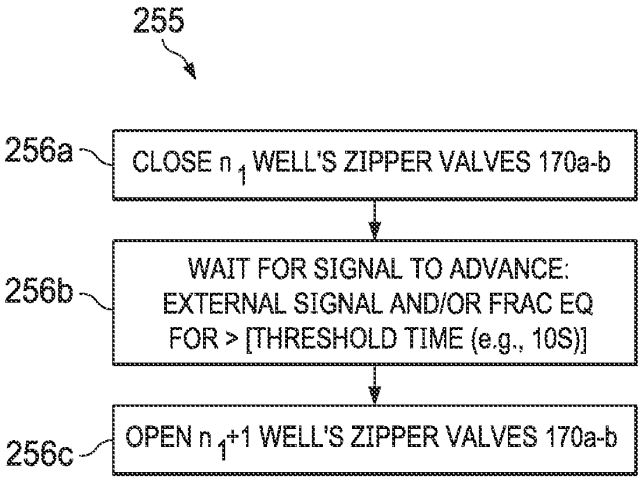


FIG. 13

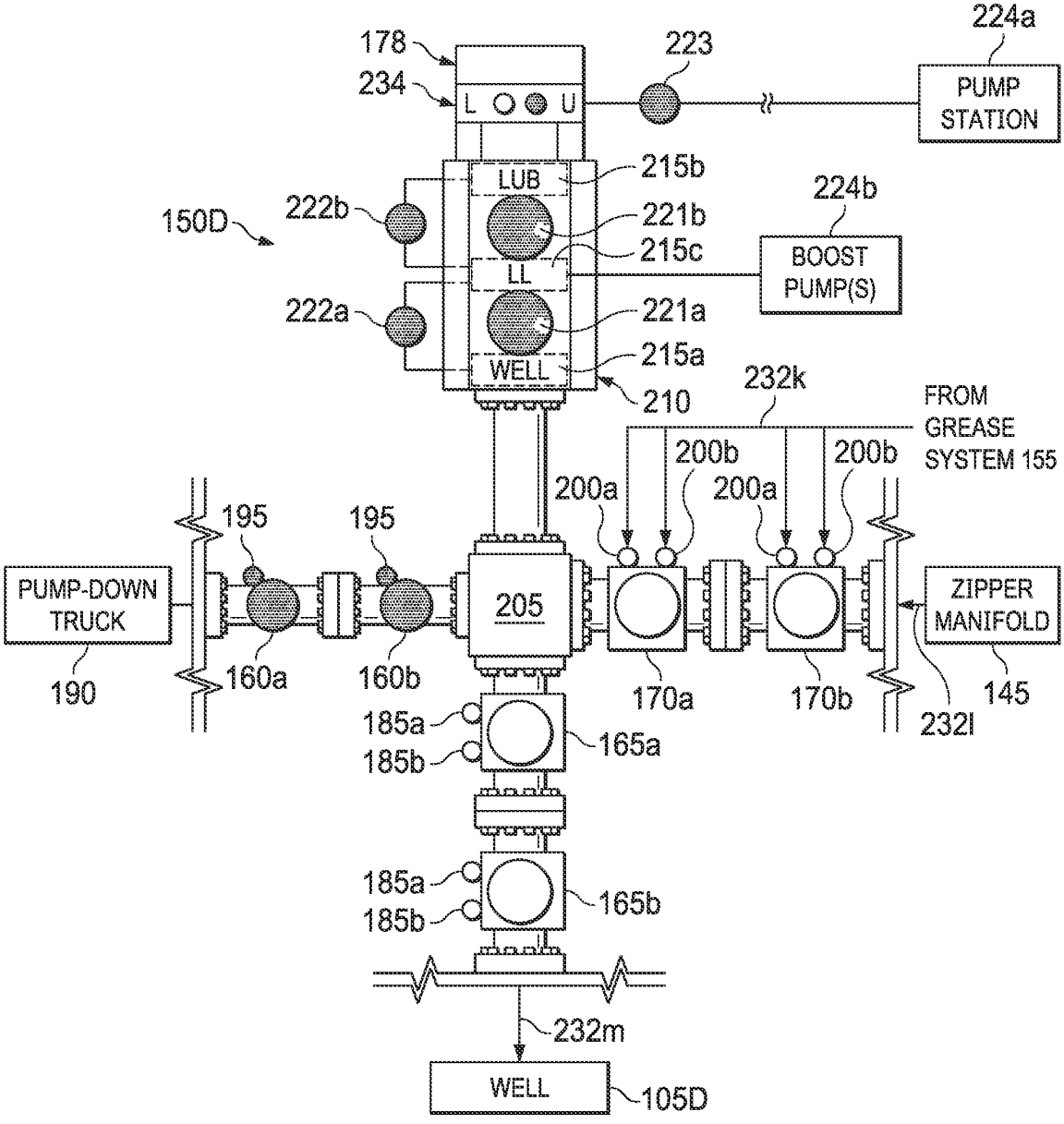

178
234
L
U
223
224a
PUMP STATION
LUB
215b
150D
222b
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
232k
FROM GREASE SYSTEM 155
200b
200a
200a
200b
195
195
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
232l
185a
185b
165a
185a
185b
165b
232m
WELL
105D

FIG. 11

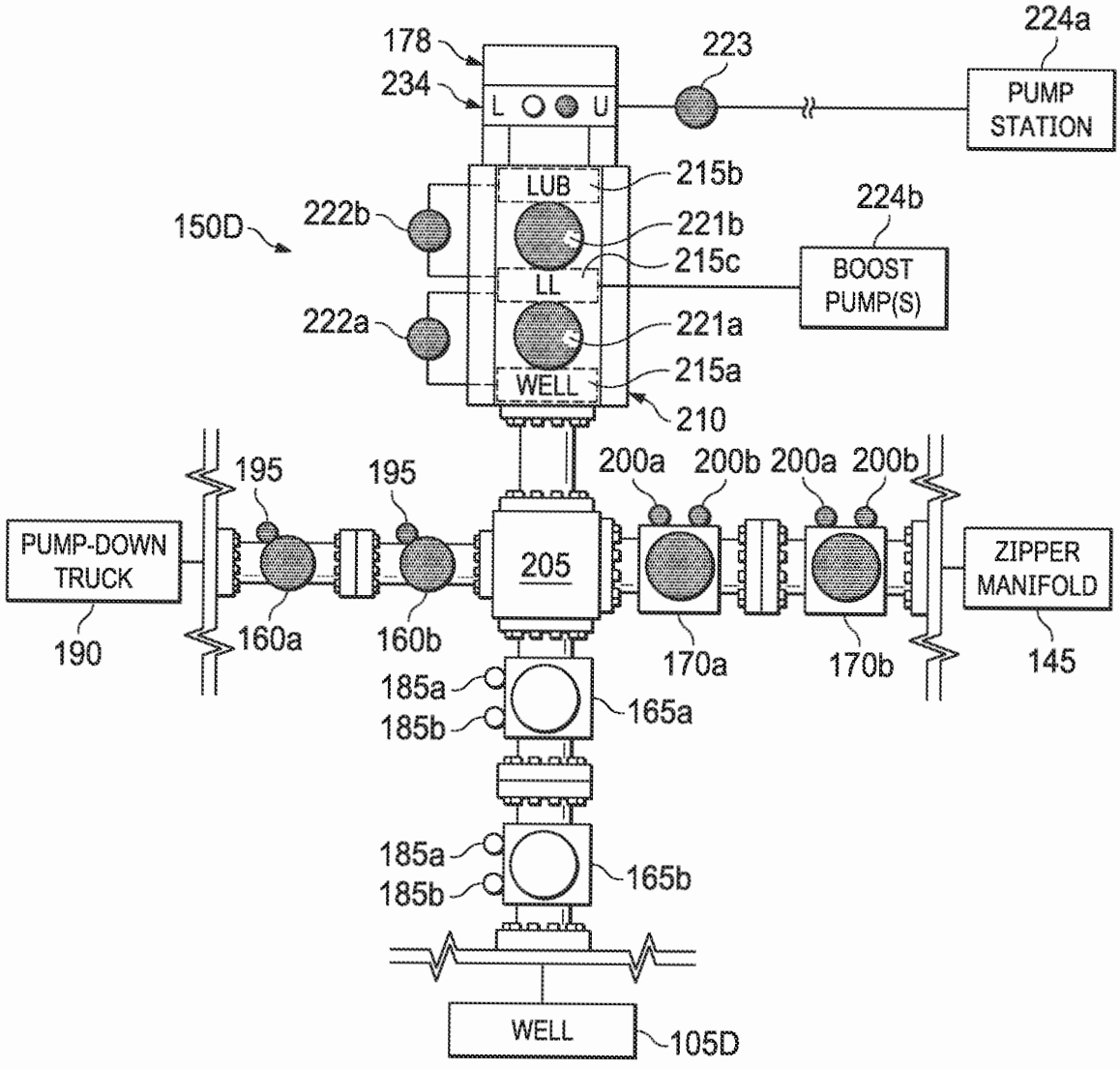

178
234
L
U
223
224a
PUMP STATION
LUB
215b
150D
222b
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105D

FIG. 14A

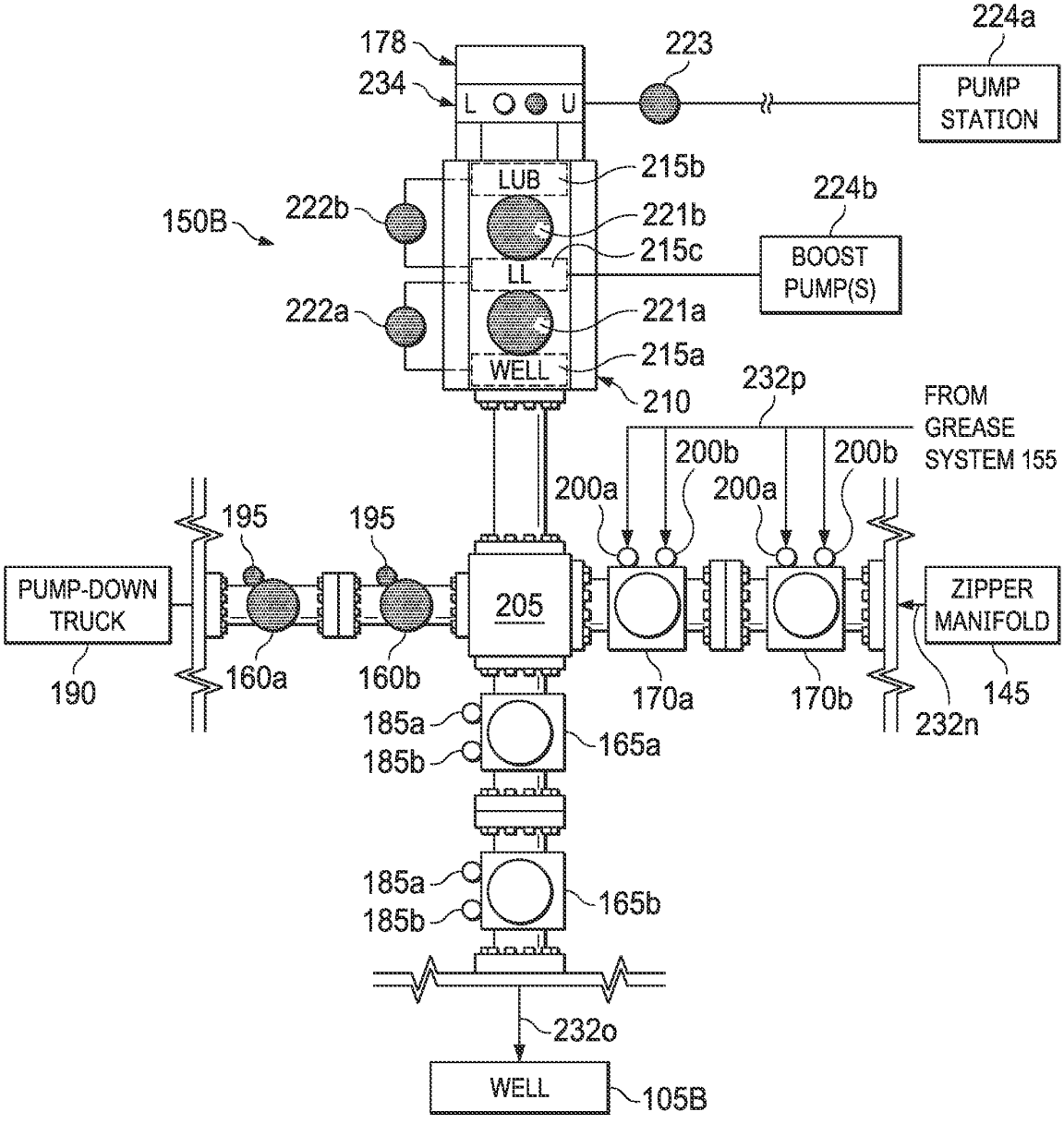

178
234
L
U
223
224a
PUMP STATION
LUB
215b
150B
222b
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
232p
FROM GREASE SYSTEM 155
200b
200a
200a
200b
195
195
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
232n
185a
185b
165a
185a
185b
165b
232o
WELL
105B

FIG. 14B

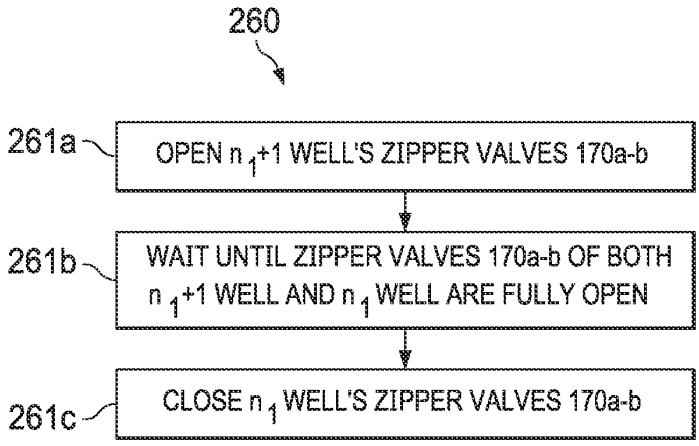


FIG. 15

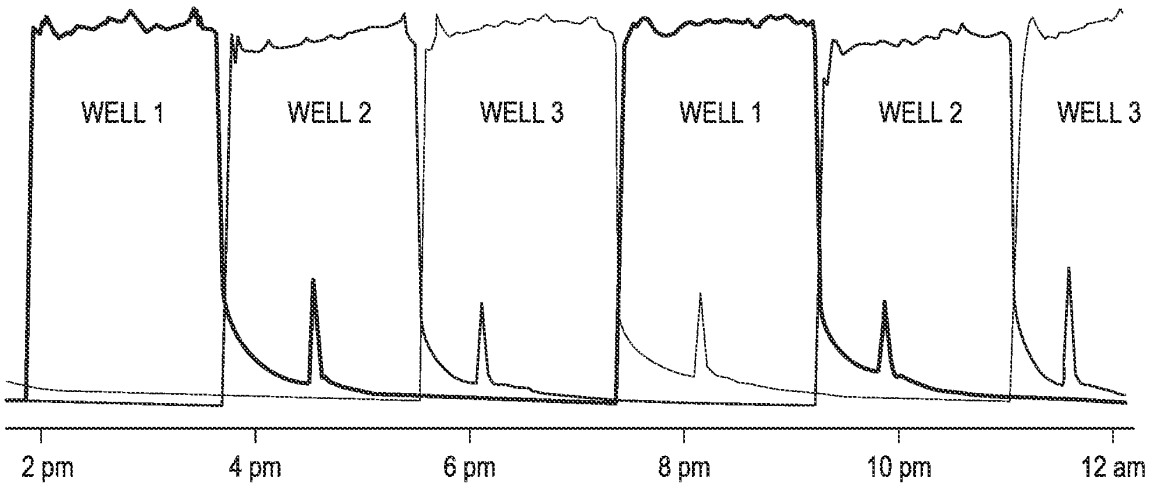


FIG. 16D

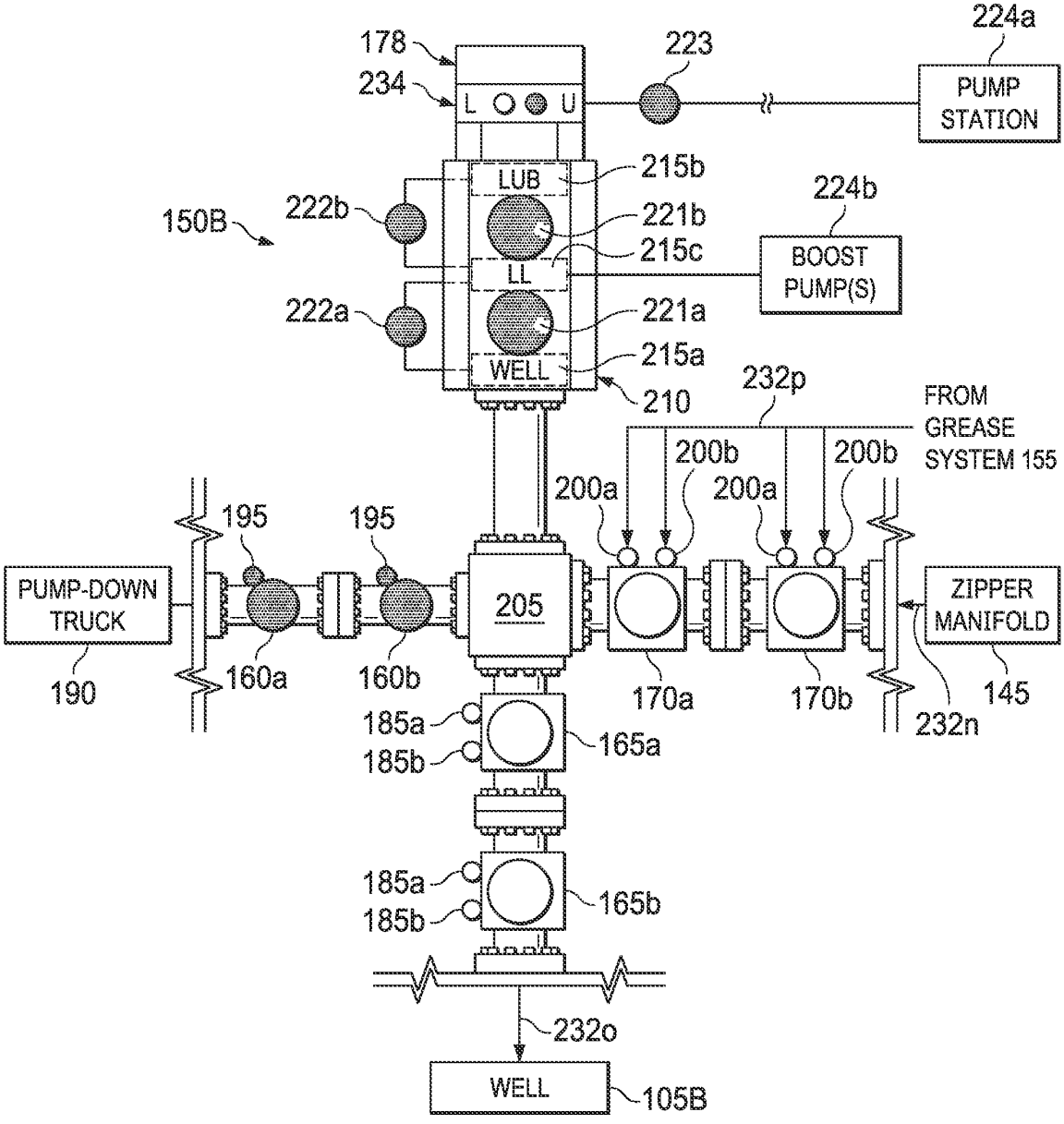

178
234
L
U
223
224a
PUMP STATION
LUB
215b
150B
222b
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
232p
FROM GREASE SYSTEM 155
200b
200a
200a
200b
195
195
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
232n
185a
185b
165a
185a
185b
165b
232o
WELL
105B

FIG. 16A

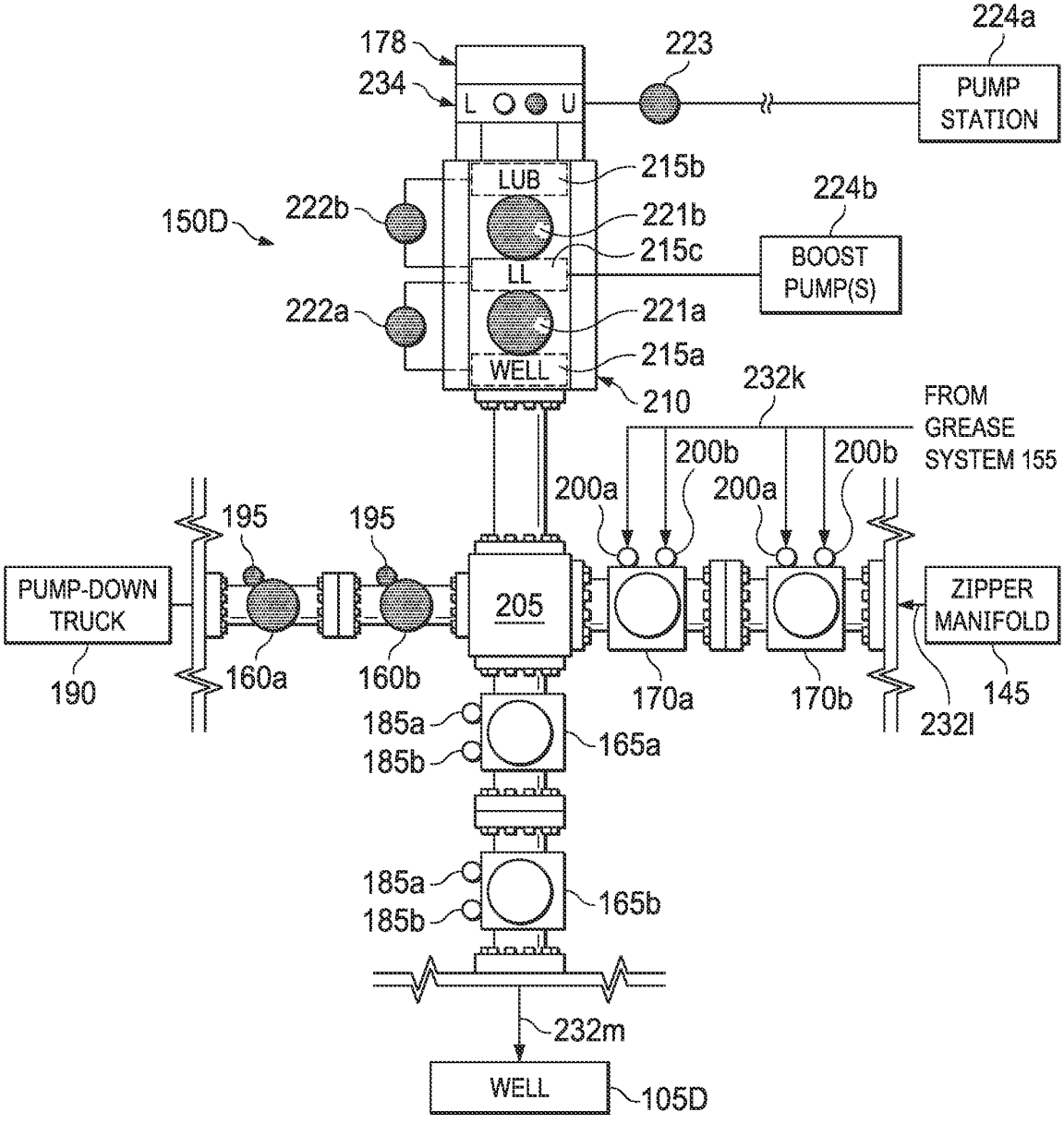

178
234
L
U
223
224a
PUMP STATION
LUB
215b
150D
222b
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
215a
WELL
210
232k
FROM GREASE SYSTEM 155
200b
200a
200a
200b
195
195
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
232l
185a
185b
165a
185a
185b
165b
232m
WELL
105D

FIG. 16B

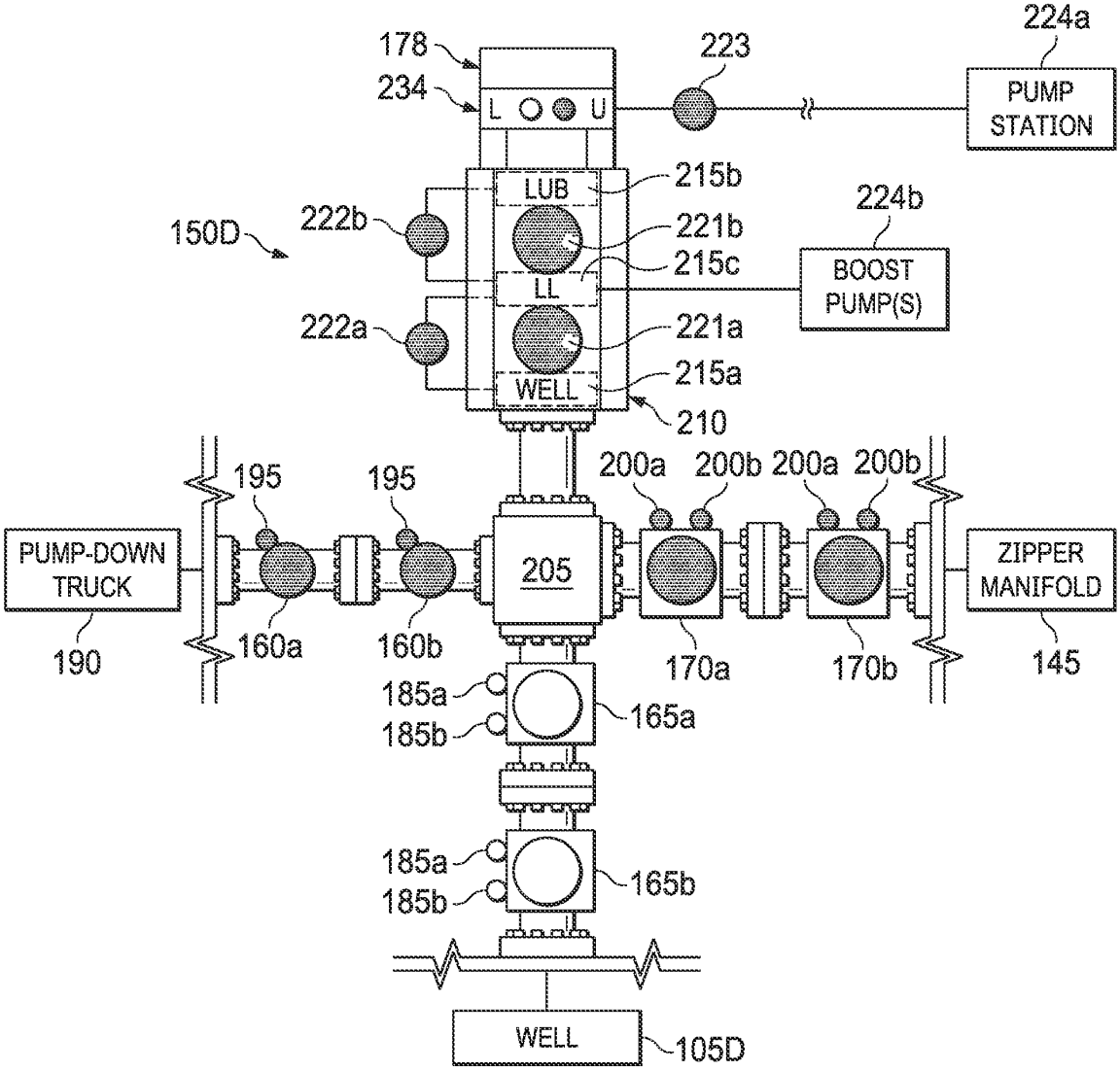

178
234
L
U
223
224a
PUMP STATION
LUB
215b
150D
222b
221b
215c
224b
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105D

FIG. 16C

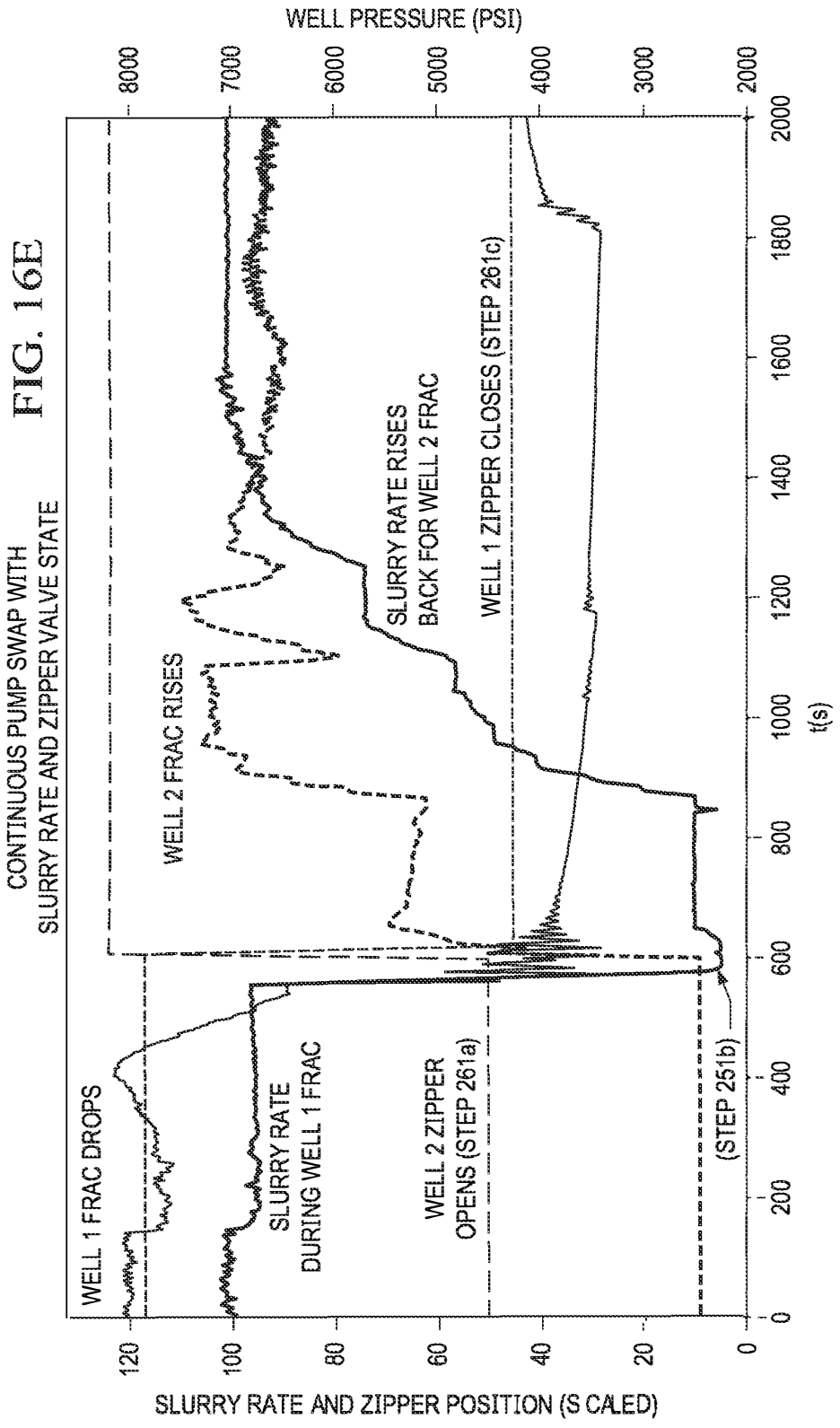

CONTINUOUS PUMP SWAP WITH
SLURRY RATE AND ZIPPER VALVE STATE
WELL PRESSURE (PSI)
8000
7000
6000
5000
4000
3000
2000
WELL 1 FRAC DROPS
SLURRY RATE
DURING WELL 1 FRAC
WELL 2 FRAC RISES
WELL 2 ZIPPER
OPENS (STEP 261a)
(STEP 251b)
SLURRY RATE RISES
BACK FOR WELL 2 FRAC
WELL 1 ZIPPER CLOSES (STEP 261c)
120
100
80
60
40
20
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
t(s)
SLURRY RATE AND ZIPPER POSITION (S CALED)

FIG. 16E

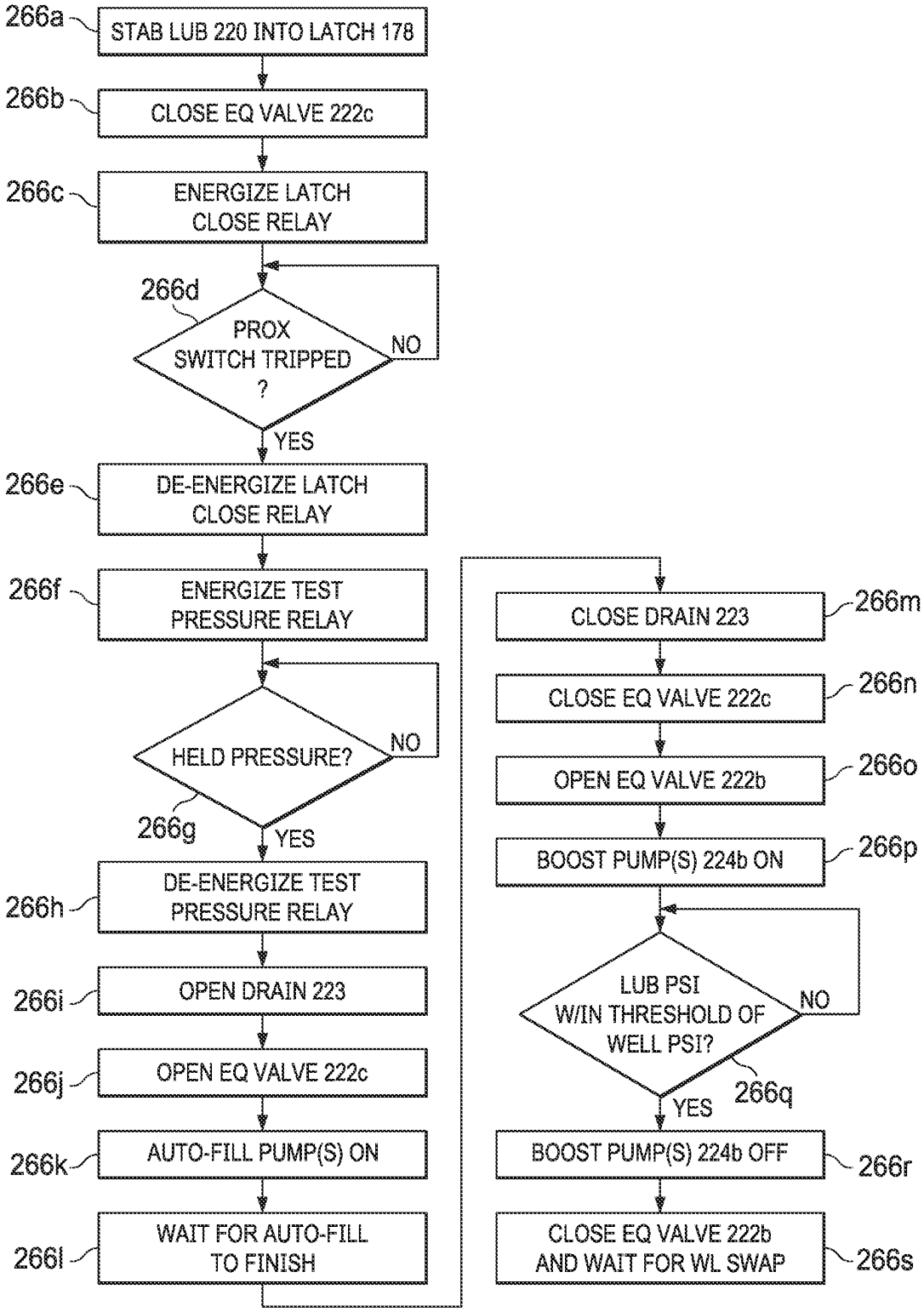

266a
STAB LUB 220 INTO LATCH 178
266b
CLOSE EQ VALVE 222c
266c
ENERGIZE LATCH CLOSE RELAY
266d
PROX SWITCH TRIPPED ?
NO
YES
266e
DE-ENERGIZE LATCH CLOSE RELAY
266f
ENERGIZE TEST PRESSURE RELAY
HELD PRESSURE?
NO
266g
YES
266h
DE-ENERGIZE TEST PRESSURE RELAY
266i
OPEN DRAIN 223
266j
OPEN EQ VALVE 222c
266k
AUTO-FILL PUMP(S) ON
266l
WAIT FOR AUTO-FILL TO FINISH
CLOSE DRAIN 223
266m
CLOSE EQ VALVE 222c
266n
OPEN EQ VALVE 222b
266o
BOOST PUMP(S) 224b ON
266p
LUB PSI W/IN THRESHOLD OF WELL PSI?
NO
266q
YES
BOOST PUMP(S) 224b OFF
266r
CLOSE EQ VALVE 222b AND WAIT FOR WL SWAP
266s

FIG. 17

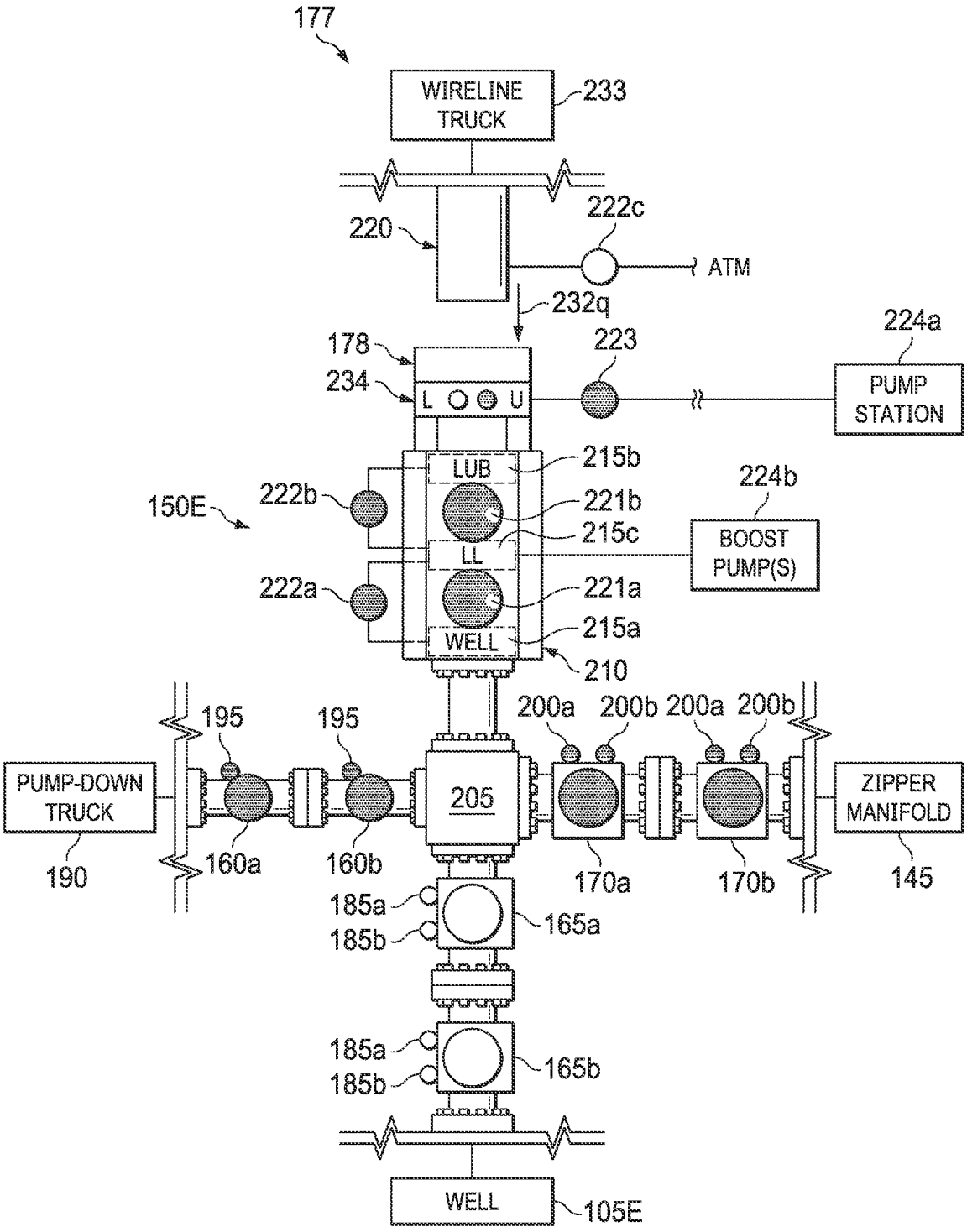

177
WIRELINE TRUCK
233
222c
220
ATM
232q
224a
178
223
234
L
U
PUMP STATION
LUB
215b
224b
150E
222b
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105E

FIG. 18A

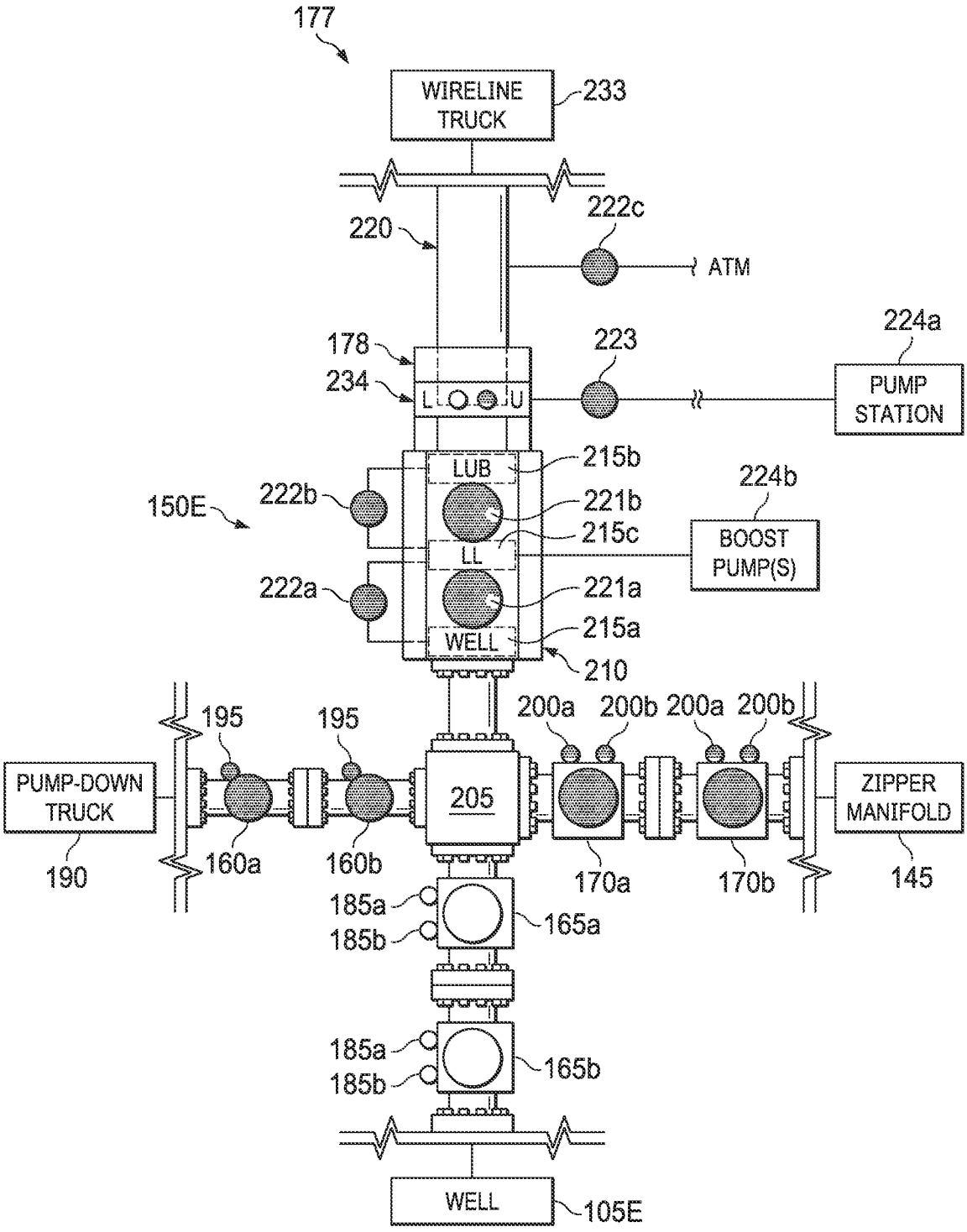

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
222b
150E
221b
215c
BOOST PUMP(S)
LL
222a
221a
215a
WELL
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105E

FIG. 18B

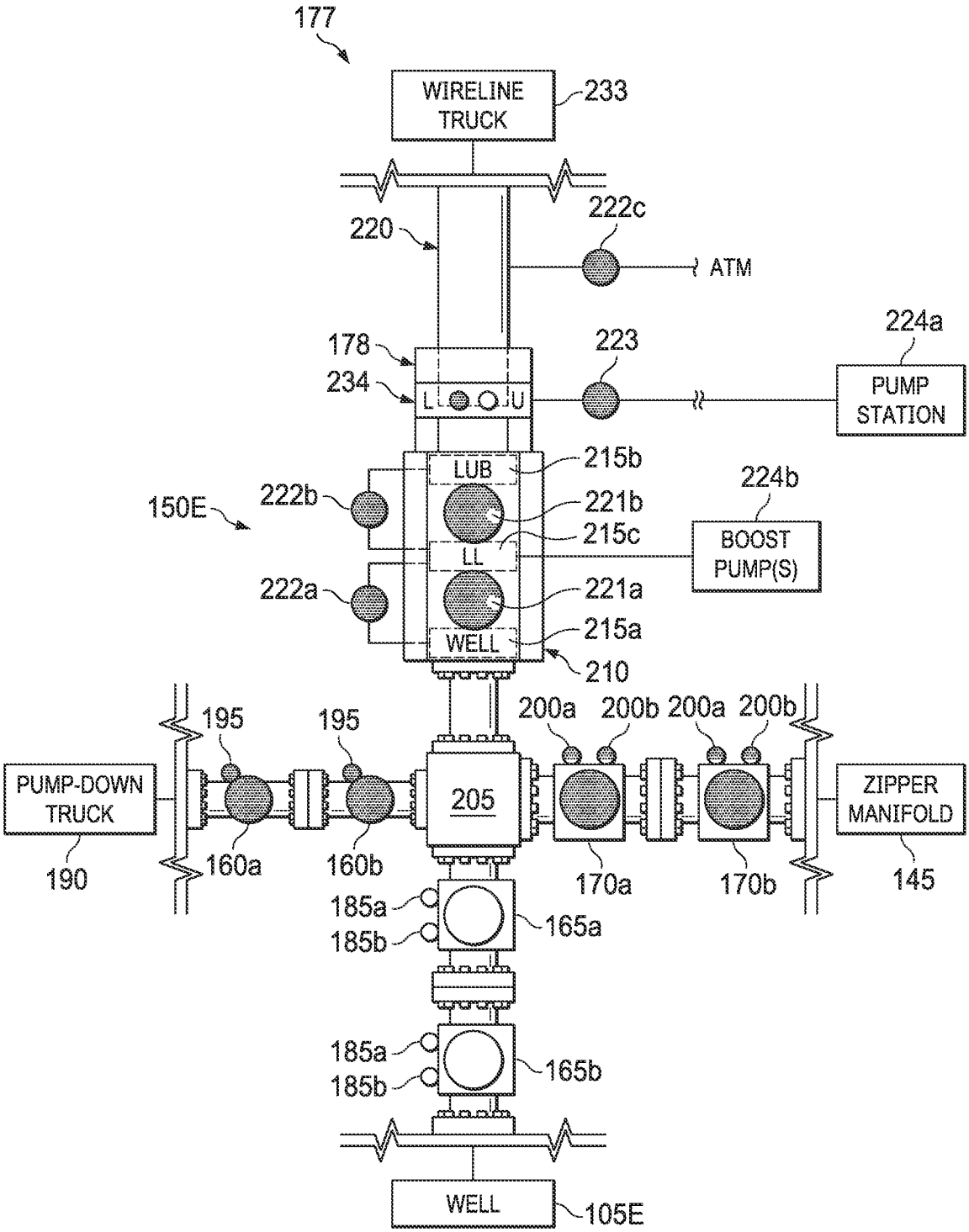

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
222b
150E
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105E

FIG. 18C

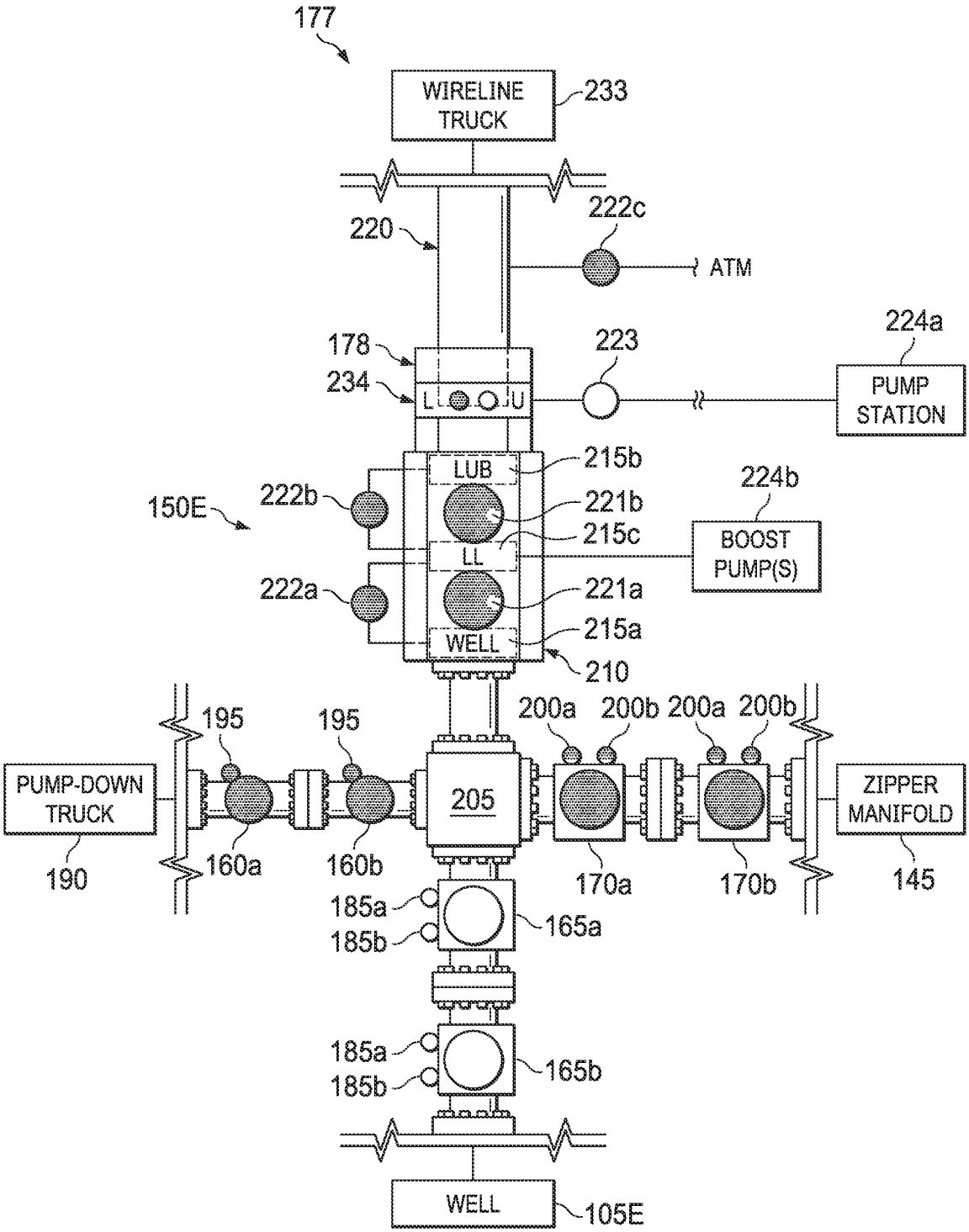

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
LUB
215b
224b
222b
150E
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105E

FIG. 18D

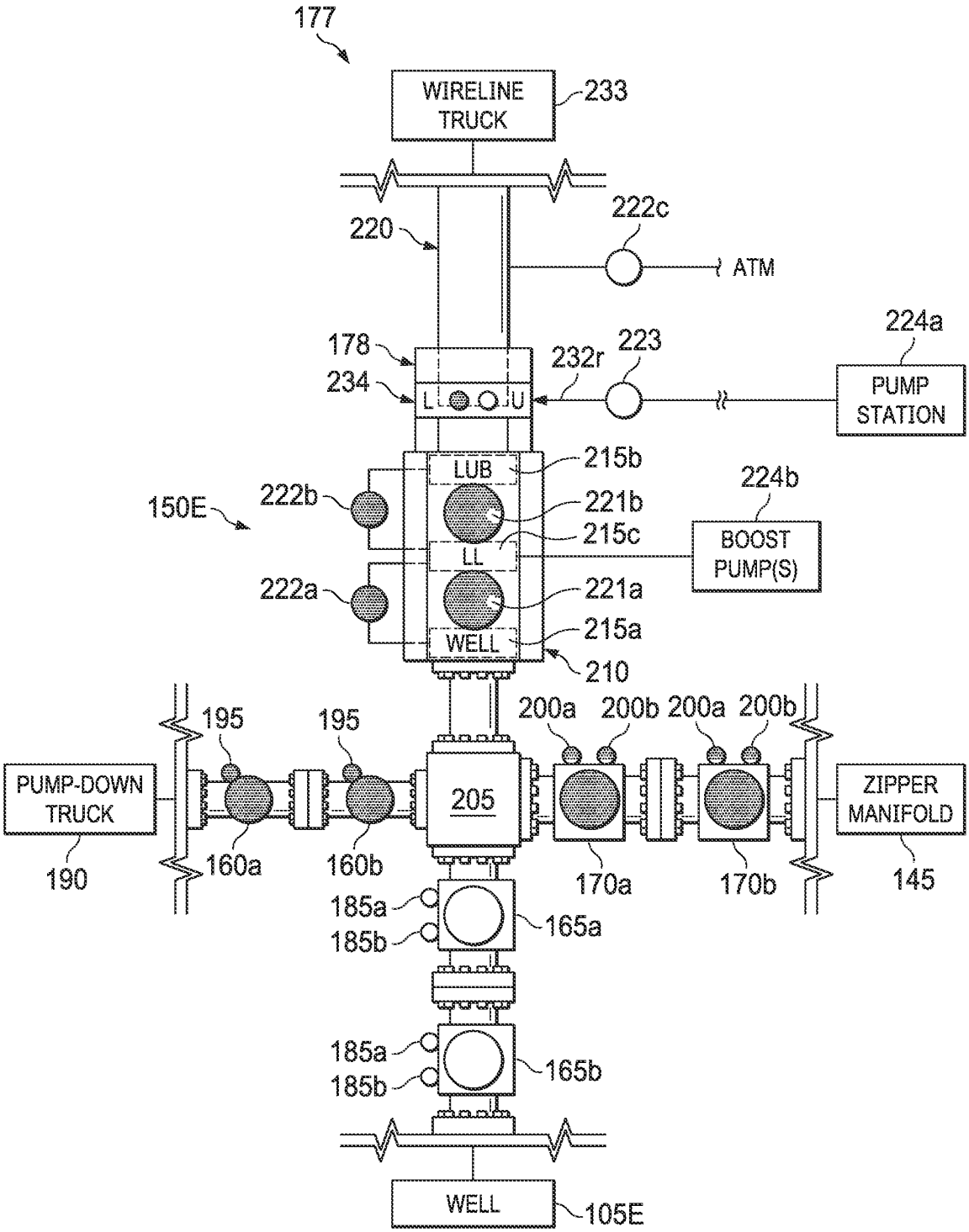

177
WIRELINE TRUCK
233
220
222c
ATM
224a
PUMP STATION
178
234
232r
223
L
U
LUB
215b
224b
150E
222b
221b
215c
BOOST PUMP(S)
LL
222a
221a
WELL
215a
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105E

FIG. 18E

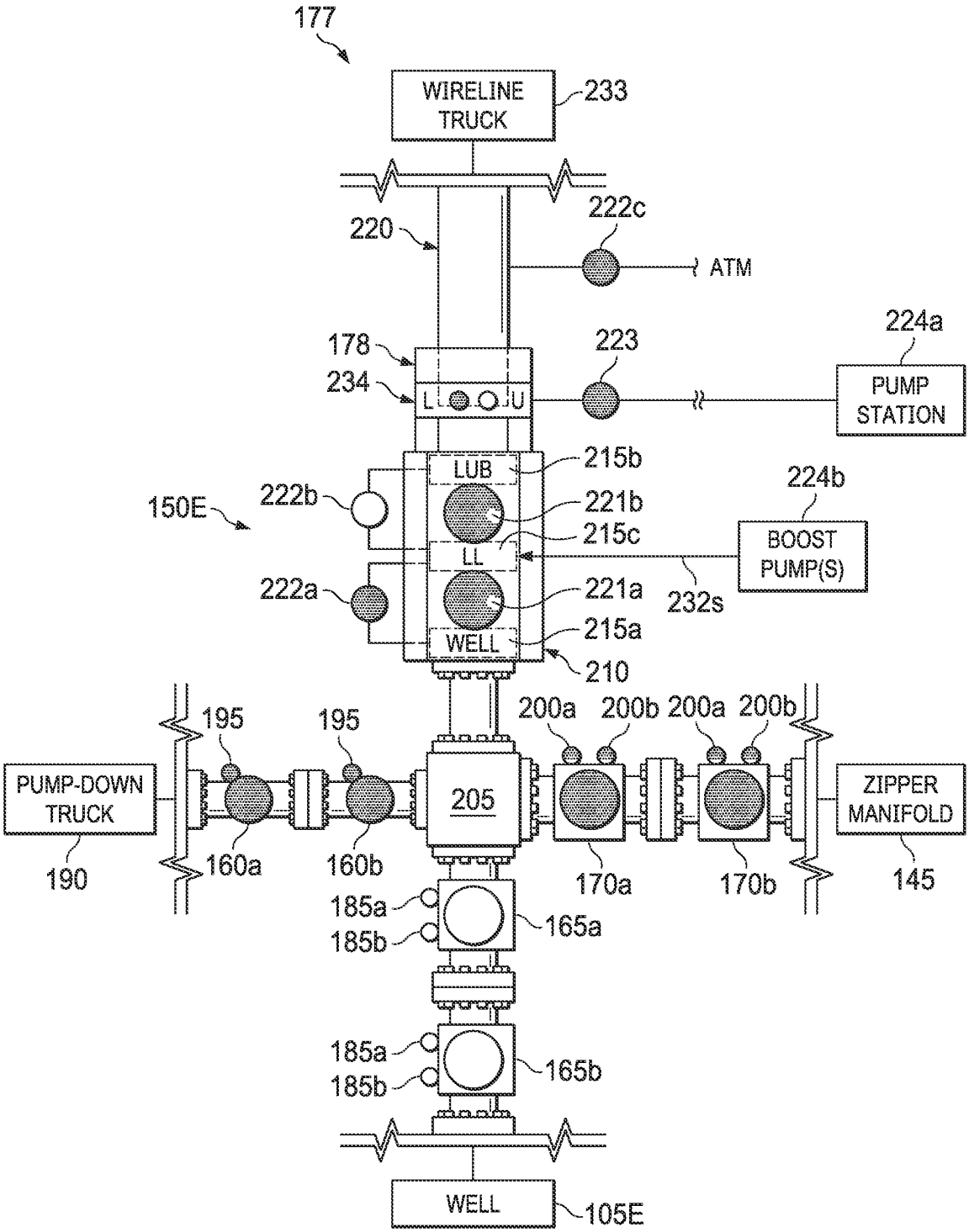

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
L
U
PUMP STATION
LUB
215b
224b
150E
222b
221b
215c
LL
BOOST PUMP(S)
222a
221a
232s
215a
WELL
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105E

FIG. 18F

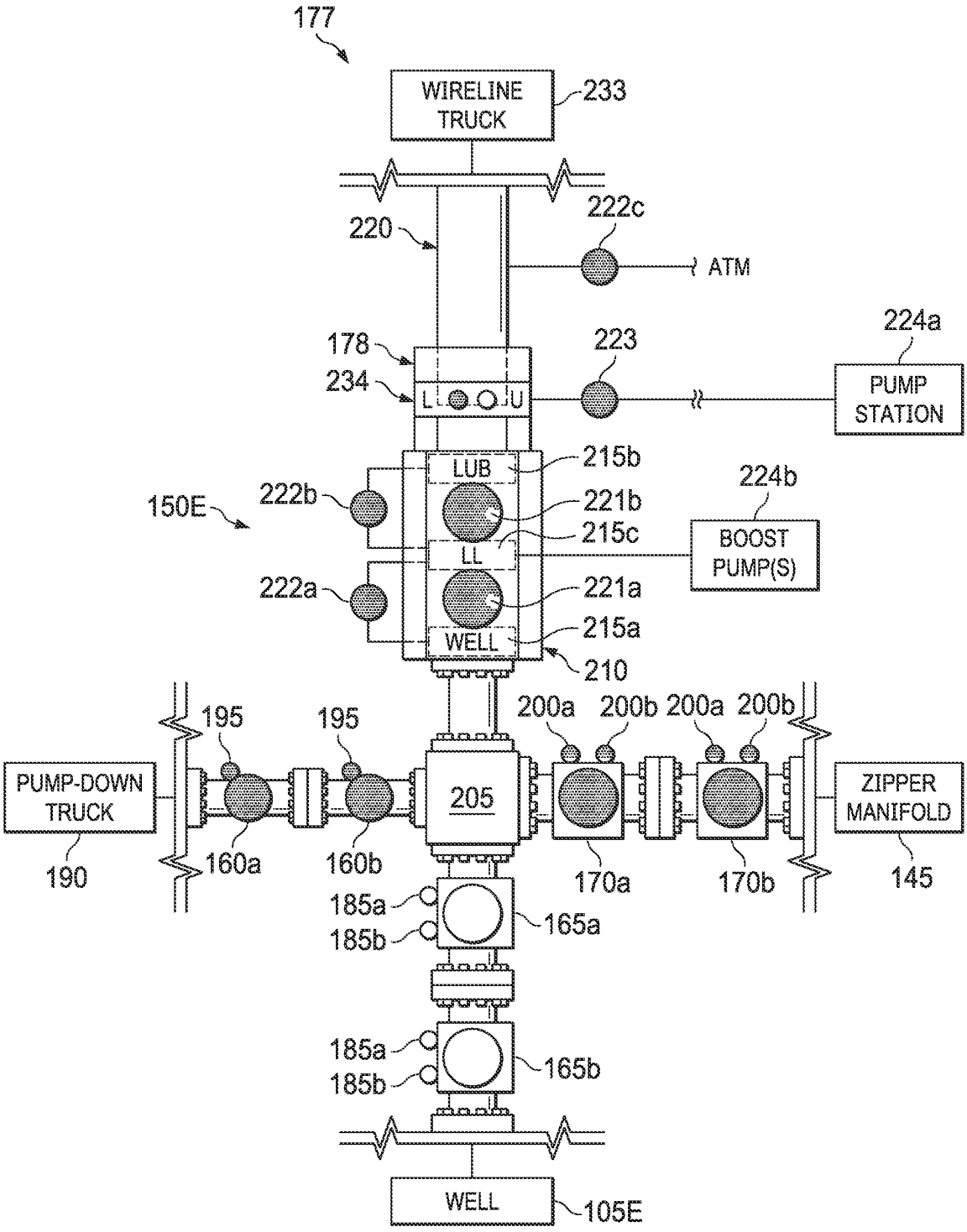

177
WIRELINE TRUCK
233
222c
220
ATM
224a
178
223
234
PUMP STATION
215b
LUB
224b
222b
150E
221b
215c
BOOST PUMP(S)
LL
222a
221a
215a
WELL
210
195
195
200a
200b
200a
200b
PUMP-DOWN TRUCK
205
ZIPPER MANIFOLD
190
160a
160b
170a
170b
145
185a
185b
165a
185a
185b
165b
WELL
105E

FIG. 18G

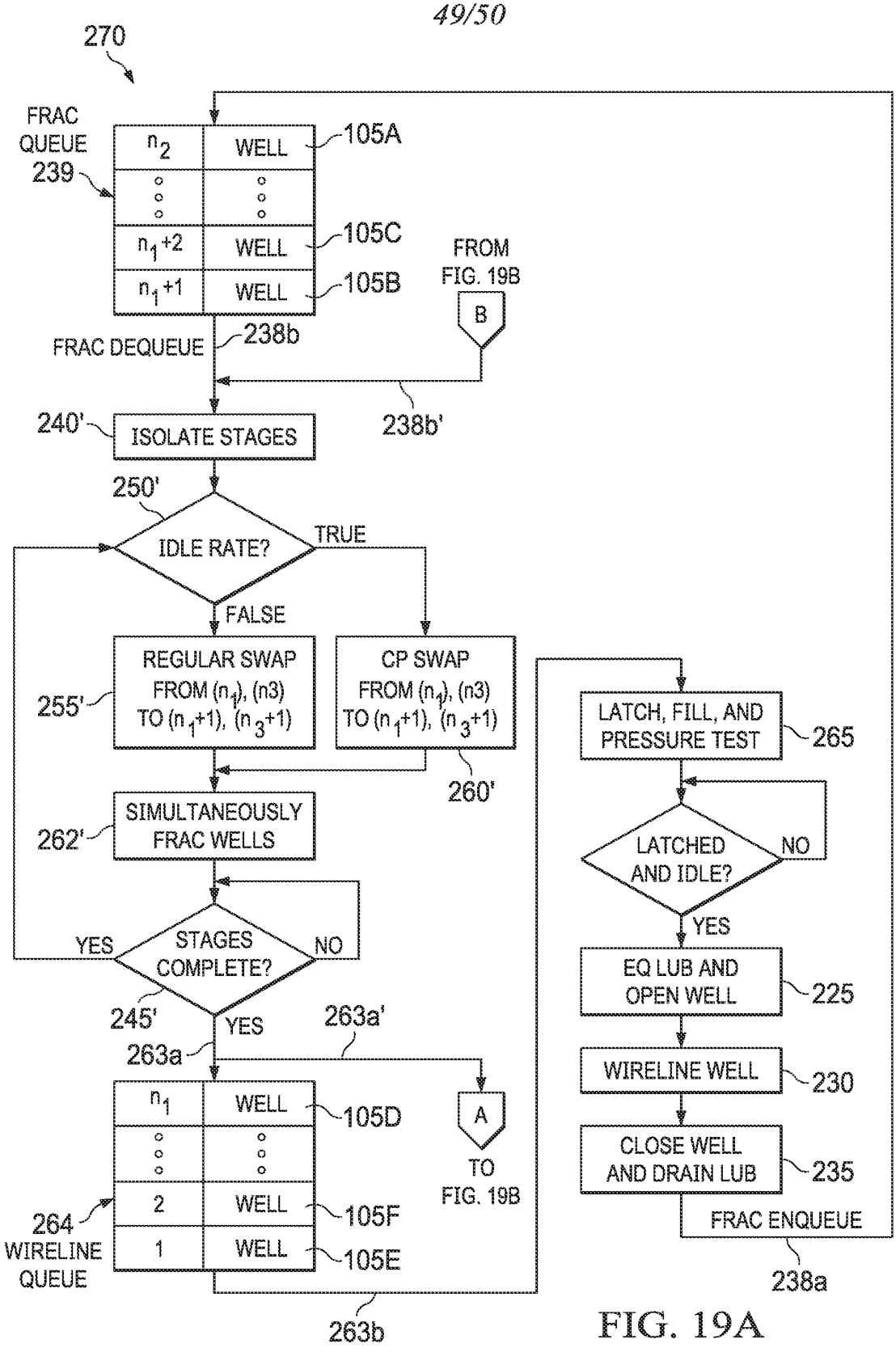

270
FRAC QUEUE 239
n_2 WELL 105A
n_1+2 WELL 105C
n_1+1 WELL 105B
FRAC DEQUEUE 238b
FROM FIG. 19B
B
238b'
240' ISOLATE STAGES
250' IDLE RATE?
TRUE
FALSE
255' REGULAR SWAP FROM (n_1), (n3) TO (n_1+1), (n_3+1)
CP SWAP FROM (n_1), (n3) TO (n_1+1), (n_3+1)
260'
262' SIMULTANEOUSLY FRAC WELLS
YES STAGES COMPLETE? NO
245'
YES
263a
263a'
n_1 WELL 105D
2 WELL 105F
1 WELL 105E
264 WIRELINE QUEUE
A
TO FIG. 19B
263b
LATCH, FILL, AND PRESSURE TEST 265
LATCHED AND IDLE? NO
YES
EQ LUB AND OPEN WELL 225
WIRELINE WELL 230
CLOSE WELL AND DRAIN LUB 235
FRAC ENQUEUE
238a

FIG. 19A

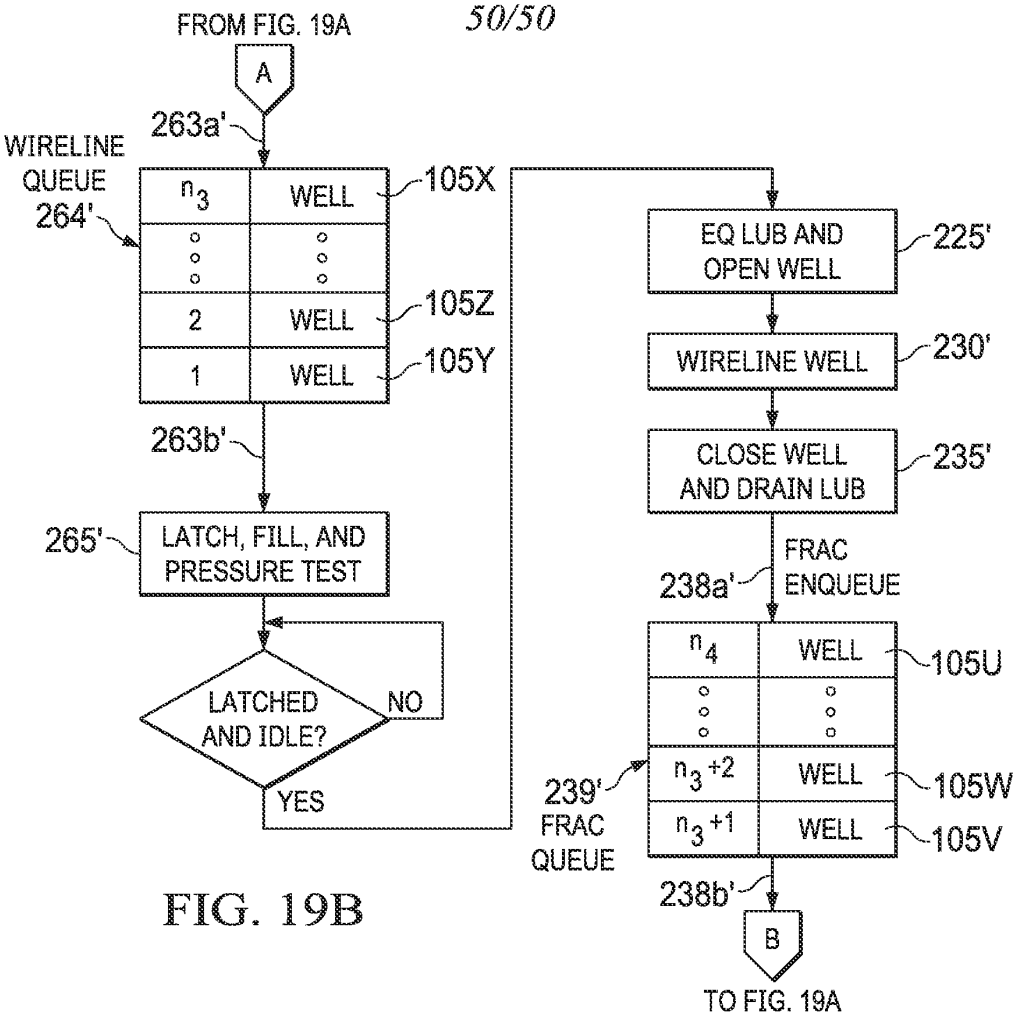


FIG. 19B

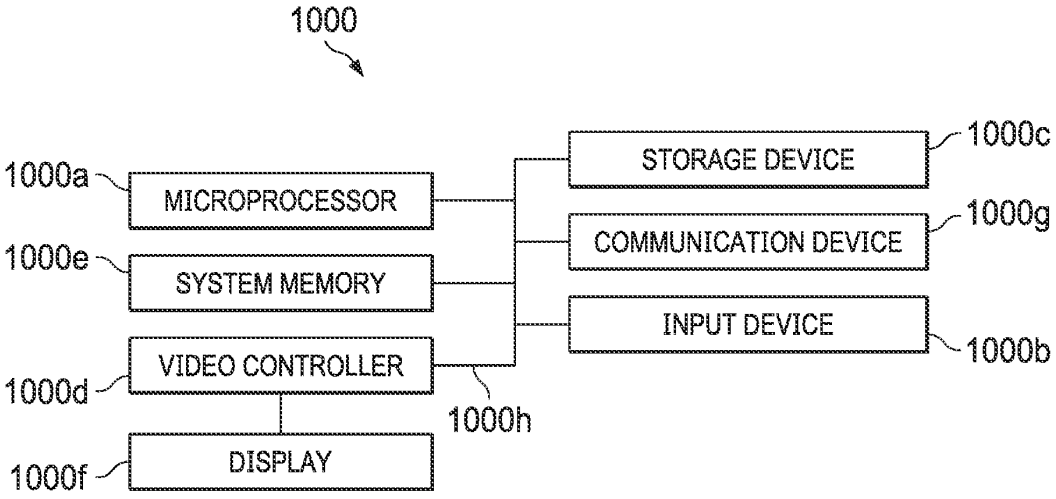


FIG. 20

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/158,122	01/23/2023 03:27:36 PM ET	57959.12US03

Title of Invention

HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	1469	FILED BY	Q Dismuke
PATENT CENTER #	61477174	AUTHORIZED BY	Zachary Halbur
CUSTOMER #	27683	FILING DATE	-
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Jordan Kuehn

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 1103	E20231MF30253128	Q Dismuke

PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY
081394	37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees)

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2111	UTILITY PATENT APPL. SEARCH FEE	280.00	1	280.00
4011	BASIC FILING FEE- UTILITY	64.00	1	64.00
2311	EXAMINATION OF ORIGINAL PATENT APPLICATION	320.00	1	320.00
2202	EACH CLAIM IN EXCESS OF 20	40.00	1	40.00
			TOTAL AMOUNT:	$704.00

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 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/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	57959.12US03
	Application Number	
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	

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

Secrecy Order 37 CFR 5.2:

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

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jordan		Kuehn	

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

City	Forest Park	State/Province	IL	Country of Residence	US

Mailing Address of Inventor:

Address 1	3528 S.W. 2nd Street		
Address 2			
City	Oklahoma City	State/Province	OK
Postal Code	73128	Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Austin		Johnson	

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

City	Edmond	State/Province	OK	Country of Residence	US

Mailing Address of Inventor:

Address 1	3528 S.W. 2nd Street		
Address 2			
City	Oklahoma City	State/Province	OK
Postal Code	73128	Country	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ronnie	B.	Beason	

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

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	57959.12US03
	Application Number	
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	

City	Lexington	State/Province	OK	Country of Residence	US

Mailing Address of Inventor:

Address 1	3528 S.W. 2nd Street		
Address 2			
City	Oklahoma City	State/Province	OK
Postal Code	73128	Country	US

Inventor 4 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Nicholas	J.	Cannon	

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

City	Washington	State/Province	OK	Country of Residence	US

Mailing Address of Inventor:

Address 1	3528 S.W. 2nd Street		
Address 2			
City	Oklahoma City	State/Province	OK
Postal Code	73128	Country	US

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

Correspondence Information:

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

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

Customer Number	27683		
Email Address	ipdocketing@haynesboone.com	Add Email	Remove Email

Application Information:

Title of the Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME		
Attorney Docket Number	57959.12US03	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	50	Suggested Figure for Publication (if any)	

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	57959.12US03
	Application Number	
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	

Filing By Reference:

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

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

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

Publication Information:

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

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

Representative Information:

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

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	27683		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim 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" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	17/878493	2022-08-01

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	57959.12US03
	Application Number	
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17/878493	Continuation of	17/388716	2021-07-29	11401779	2022-08-02
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
17/388716	Claims benefit of provisional	63/189663	2021-05-17		
Prior Application Status	Pending				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
17/388716	Continuation in part of	17/319854	2021-05-13		
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17/319854	Continuation in part of	16/855749	2020-04-22	11480027	2022-10-25
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
16/855749	Claims benefit of provisional	62/836761	2019-04-22		
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/855749	Continuation in part of	16/248648	2019-01-15	10724682	2020-07-28
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
16/248648	Claims benefit of provisional	62/617443	2018-01-15		
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/855749	Continuation in part of	16/803156	2020-02-27	11242724	2022-02-08
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/803156	Continuation in part of	16/248633	2019-01-15	10584552	2020-03-10

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	57959.12US03
	Application Number	
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/248633	Claims benefit of provisional	62/617438	2018-01-15
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/803156	Continuation in part of	16/436623	2019-06-10	11208856	2021-12-28

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/436623	Claims benefit of provisional	62/755170	2018-11-02
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/803156	Continuation in part of	16/100741	2018-08-10	10689938	2020-06-23

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/100741	Claims benefit of provisional	62/638688	2018-03-05
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/100741	Claims benefit of provisional	62/638681	2018-03-05
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/100741	Claims benefit of provisional	62/637220	2018-03-01
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/100741	Claims benefit of provisional	62/637215	2018-03-01
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/100741	Claims benefit of provisional	62/598914	2017-12-14

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

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	57959.12US03
	Application Number	
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	

Foreign Priority Information:

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

Remove

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

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

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.

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	57959.12US03
	Application Number	
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is 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 State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	57959.12US03
	Application Number	
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	

Applicant Information:

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

Applicant 1 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	Downing Wellhead Equipment, LLC		
Mailing Address Information For Applicant:			
Address 1	8528 S.W. 2nd Street		
Address 2			
City	Oklahoma City	**State/Province**	OK
Country	US	Postal Code	73128
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 substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	57959.12US03
	Application Number	
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	

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. ☐

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

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

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

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Zachary A. Halbur/			Date (YYYY-MM-DD)	2023-01-23
First Name	Zachary A.	Last Name	Halbur	Registration Number	68500

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

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	57959.12US03
	Application Number	
Title of Invention	HYDRAULIC FRACTURING PLAN AND EXECUTION OF SAME	

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 CooperationTreaty.

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.