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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 May 2019 (31.05.2019)

WIPO | PCT

(10) International Publication Number
WO 2019/100143 A1

(51) International Patent Classification:
E21B 33/068 (2006.01) *E21B 33/03* (2006.01)
E21B 15/00 (2006.01) *E21B 33/06* (2006.01)

(21) International Application Number:
PCT/CA2018/000228

(22) International Filing Date:
23 November 2018 (23.11.2018)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/590,506 24 November 2017 (24.11.2017) US

(72) Inventor; and
(71) Applicant: **FOLWARK, Kevin Edward Peter** [CA/CA]; 223 - 54418 RR #251, Sturgeon County, Alberta T8T 0C7 (CA).

(74) Agent: **SHOHINI, Bagchee**; Field LLP, 2500, 10175 - 101 Street, Edmonton, Alberta T5J 0H3 (CA).

(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, 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,

(54) Title: INTEGRATED SNUBBING OPERATING PLATFORM

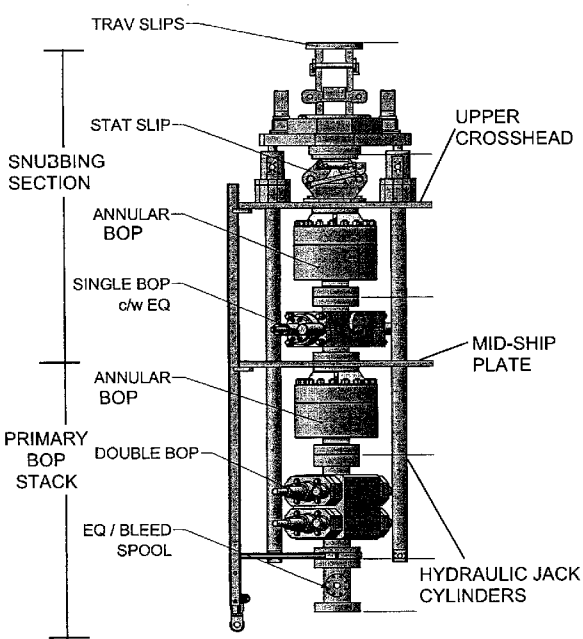


FIGURE 1

(57) Abstract: An integrated snubbing platform is provided that includes a snubbing section including a snubbing jack assembly and a secondary blowout preventer (BOP) connected to the snubbing jack assembly; and a primary BOP section connected directly to the secondary BOP. The integrated snubbing platform is transportable as a single unit and mountable onto a wellhead as a single unit. A method of mounting a snubbing assembly, a secondary BOP unit and a primary BOP stack onto a wellhead is also provided. The method involves first providing an integrated snubbing platform having a snubbing section that includes a snubbing jack assembly and a secondary blowout preventer (BOP) connected to the snubbing jack assembly; and a primary BOP section connected directly to the secondary BOP. The method then involves mounting the integrated snubbing platform onto a wellhead as a single unit.

WO 2019/100143 A1

[Continued on next page]

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:

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

— *of inventorship (Rule 4.17(iv))*

Published:

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

INTEGRATED SNUBBING OPERATING PLATFORM

FIELD

The present invention relates to an integrated snubbing jack assembly which combines the primary blow-out-preventer (BOP) stack with the snubbing jack.

BACKGROUND

Snubbing is the act of putting drillpipe or other rigid tubing into a wellbore when pressure is contained in the well. Snubbing is necessary when tubing, with or without one or more tools on it, needs to be run into a live well which is at high pressure.

There are two main forces that must be overcome in snubbing: the well pressure and the frictional resistance of the blow-out preventer (BOP) through which the drillpipe or tubing is being moved. These pressures can be extreme and will cause several stresses on the drillpipe or tubing as they are inserted into the well bore, including axial stress (compression or tensile), radial stress (burst and collapse), hoop (shear), and torque (rotational stress). Current pipe guiding apparatuses in typical snubbing units make use of one or several telescoping tubes positioned between stationary and traveling snubbing slips.

In a typical snubbing operation, the drillstring or tubing string is made up by connecting multiple threaded drillpipe or tubing joints together and snubbing them into the wellbore.

A typical snubbing assembly comprises a gin pole mast that is raised and lowered to pick up joints of tubing or drillpipe and position them for making up the drillstring; a work basket at the top of the snubbing assembly; a rotary jackplate, travelling slips; a hydraulic assembly including hydraulic jack cylinders, a set of stationary slips and a secondary blowout preventer (BOP).

The snubbing assembly is then mounted on top of a separate primary BOP stack that may comprise any number of annular and ram-style BOP's, as well as one or more equalization or bleed spools to isolate and bleed of sections.

The primary BOP stack, being a separate unit to the snubbing assembly, is typically operated by one set of operators, and the snubbing unit is operated by another.

Communication between the two sets of crews is presently the only way to coordinate operation and control of these units, which is needed for successful snubbing operations.

The rotary jackplate and travelling slips are typically supported and moved by the hydraulic jack cylinders. In this sense, in addition to extending and retracting to lift and lower the jackplate and travelling slips, the hydraulic jack cylinders must also provide anti-rotation resistance and support to the assembly. Hydraulic jack cylinders are limited to certain load limits that determine how much a cylinder can be extended or retracted in operation, depending on the loads needed to be supported and moved by the cylinders.

Snubbing assemblies and primary BOP stacks are traditionally assembled in a number of stages and parts, due to the number of components involved.

Erecting snubbing assemblies and connecting with the primary BOP stack is therefore time consuming and complex. Multiple components and multiple assembly personal also increase risks to workplace safety.

It is to be understood that other aspects of the present invention will become readily apparent to those skilled in the art from the following detailed description, wherein various embodiments of the invention are shown and described by way of illustration. As will be realized, the invention is capable for other and different embodiments and its several details are capable of modification in various other respects, all without departing from the spirit and scope of the present invention. Accordingly the drawings and detailed description are to be regarded as illustrative in nature and not as restrictive.

SUMMARY

An integrated snubbing platform is provided comprising a snubbing section including a snubbing jack assembly and a secondary blowout preventer (BOP) connected to the snubbing jack assembly; and a primary BOP section connected directly to the secondary BOP. The integrated snubbing platform is transportable as a single unit and mountable onto a wellhead as a single unit.

A method of mounting a snubbing assembly, a secondary BOP unit and a primary BOP stack onto a wellhead is also provided. The method comprises first providing an integrated snubbing platform comprising a snubbing section comprising a snubbing jack assembly and a secondary blowout preventer (BOP) connected to the snubbing jack assembly; and a primary BOP section connected directly to the secondary BOP. The method then comprises mounting the integrated snubbing platform onto a wellhead as a single unit.

BRIEF DESCRIPTION OF THE DRAWINGS

A further, detailed, description of the invention, briefly described above, will follow by reference to the following drawings of specific embodiments of the invention. The drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. In the drawings:

Figure 1 is an elevation view of a first embodiment of an integrated snubbing and blow out preventer unit according the present invention, in a retracted position;

Figure 2 is an elevation view of a second embodiment of an integrated snubbing and blow out preventer unit according the present invention, in a retracted position;

Figure 3 is an elevation view of a third embodiment of an integrated snubbing and blow out preventer unit according the present invention, in a retracted position;

Figure 4 is an elevation view of the integrated snubbing and blow out preventer unit of Figure 1, in an extended position;

Figure 5 is an elevation view of the integrated snubbing and blow out preventer unit of Figure 2, in an extended position; and

Figure 6 is an elevation view of the integrated snubbing and blow out preventer unit of Figure 3, in an extended position.

The drawing is not necessarily to scale and in some instances proportions may have been exaggerated in order more clearly to depict certain features.

DETAILED DESCRIPTION OF VARIOUS EMBODIMENTS

The description that follows and the embodiments described therein are provided by way of illustration of an example, or examples, of particular embodiments of the principles of various aspects of the present invention. These examples are provided for the purposes of explanation, and not of limitation, of those principles and of the invention in its various aspects.

The present invention integrated snubbing operating platform combines a primary BOP and a snubbing jack assembly with its secondary BOP. The integrated snubbing platform does not require additional assembling steps of traditional snubbing units which must be mounted to the primary BOP stack. The integrated snubbing operating platform can also be transport as a single unit to site.

With reference to Figures 1 to 3, which show three different possible embodiments of the present invention, the present integrated snubbing operating platform comprises a snubbing section and a primary BOP stack section. The snubbing section comprises a jack plate or jack structure supporting one or more traveling slips (TRAV SLIPS), one or more stationary slips (STAT SLIPS), an annual BOP, optionally a single, ram-style BOP (figures 1 and 3) or in alternative, an equalizer or bleed spool with ports that allow equalization or bleed off section of the snubbing section. The snubbing unit also comprises a hydraulic assembly including hydraulic jack cylinders. The rotary jackplate and travelling slips are supported by the hydraulic jack cylinders and the jack cylinders extend and retract to lift and lower the jackplate and travelling slips. The hydraulic jack cylinders also provide anti-rotation resistance and support to the assembly. The snubbing section ends at the mid-ship plate and the primary BOP stack section begins there below.

The optional single BOP is often also called a stripping BOP or a sealing BOP. These stripping BOPs are used to allow pipe to move through the BOP when it is engaged and can preferably be made with hard rubber interior components. This is in contrast to the primarily BOP's which are only used in emergencies to shutdown flow in the pipe to prevent a blow out. The stripping BOP may optionally be manufactured from Teflon on

all interior and optionally exterior surfaces to handle wear when the drillpipe is snubbed therethrough.

The primary BOP stack section comprises one or more double, ram-style BOP's and a further equalizer or bleed spool. Optionally, as in Figures 1 and 2 the primary BOP stack section also comprises a further annular BOP above the double, ram-style BOP. Arrangement of the primary BOP stack will depend on the class of rigging unit and application, based on well pressure and well composition, such as content of sour gas.

In integrating the current snubbing and secondary BOP unit with the primary BOP stack, only one sealing gasket must be opened at site; that between the present primary BOP stack and the wellhead. This also leads to less pressure testing of made up sections on site.

The hydraulic jack cylinders of the present integrated snubbing operation platform are unique in the fact that they extend the full length of both the snubbing and primary BOP sections of the platform. Preferably, the hydraulic jack cylinders are also suspended or anchored and supported from the upper crosshead. More preferably, the hydraulic jack cylinders are accommodated through the mid-ship plate so as to be able to float in the mid-ship plate. This allows movement of the hydraulic jack cylinders and also allow for capacity when there is a need to change the one or more annular BOP's.

The snubbing section and primary BOP section can both be powered from hydraulics found at the main rig. Furthermore, the integrated snubbing operating platform can be operated by a remote umbilical control panel operated by a single operator. This allows for control, and coordination of the two sections as an integrated service rather than needing the communication and coordination of two separate operators and service providers.

The present design provides for a unit that is more compact, saves space, improves operator sightlines and improves safety.

The previous description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the present invention. Various modifications to

those embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without departing from the spirit or scope of the invention. Thus, the present invention is not intended to be limited to the embodiments shown herein, but is to be accorded the full scope consistent with the claims, wherein reference to an element in the singular, such as by use of the article "a" or "an" is not intended to mean "one and only one" unless specifically so stated, but rather "one or more". All structural and functional equivalents to the elements of the various embodiments described throughout the disclosure that are known or later come to be known to those of ordinary skill in the art are intended to be encompassed by the elements of the claims. Moreover, nothing disclosed herein is intended to be dedicated to the public regardless of whether such disclosure is explicitly recited in the claims. No claim element is to be construed under the provisions of 35 USC 112, sixth paragraph, unless the element is expressly recited using the phrase "means for" or "step for".

Claims:

1. An integrated snubbing platform comprising:
    a. a snubbing section comprising:
        i. a snubbing jack assembly; and
        ii. a secondary blowout preventer (BOP) connected to the snubbing jack assembly; and
    b. a primary BOP section connected directly to the secondary BOP;

wherein the integrated snubbing platform is transportable as a single unit and mountable onto a wellhead as a single unit.

2. The integrated snubbing platform of claim 1, wherein the integrated snubbing platform is mountable onto a wellhead by opening only one sealing gasket.

3. The integrated snubbing platform of claim 1 wherein the snubbing section comprises a jackplate housing one or more traveling slips, a hydraulic assembly, one or more stationary slips, an annual BOP and a single stripping BOP.

4. The integrated snubbing platform of claim 1, wherein the snubbing section comprises one or more traveling slips, one or more stationary slips, an annual BOP and an equalizer spool, said equalizer spool comprising one or more ports for allowing for bleed off and pressure equalization of the snubbing section.

5. The integrated snubbing platform of claim 3, wherein the stripping BOP comprises hardened rubber interior components.

6. The integrated snubbing platform of claim 3, wherein the stripping BOP comprises Teflon interior components.

7. The integrated snubbing platform of claim 1, wherein the primary BOP stack section comprises one or more double BOP's and a further equalizer spool.

8. The integrated snubbing platform of claim 7, wherein the primary BOP stack section further comprises an annular BOP above the double BOP.

9. The integrated snubbing platform of claim 3, wherein the hydraulic assembly comprises one or more hydraulic jack cylinders that extend a full length of both the snubbing and primary BOP sections of the platform.

10. The integrated snubbing platform of claim 9, wherein the hydraulic jack cylinders are anchored and supported from an upper crosshead located between the stationary slips and the annual BOP of the snubbing section.

11. The integrated snubbing platform of claim 10, wherein the hydraulic jack cylinders are accommodated through a mid-ship plate located between the snubbing section and the primary BOP section, so as to be floatable through the mid-ship plate.

12. The integrated snubbing operating platform of claim 1, wherein snubbing section and primary BOP section are powerable by a central hydraulics system.

13. The integrated snubbing operating platform of claim 12, wherein the integrated snubbing platform can be operated by a remote control panel operated by a single operator.

14. A method of assembly a snubbing assembly, a secondary BOP unit and a primary BOP stack onto a wellhead, said method comprising the steps of:

a. providing an integrated snubbing platform comprising a snubbing section comprising a snubbing jack assembly and a secondary blowout preventer (BOP) connected to the snubbing jack assembly; and a primary BOP section connected directly to the secondary BOP; and
b. mounting the integrated snubbing platform onto a wellhead as a single unit.

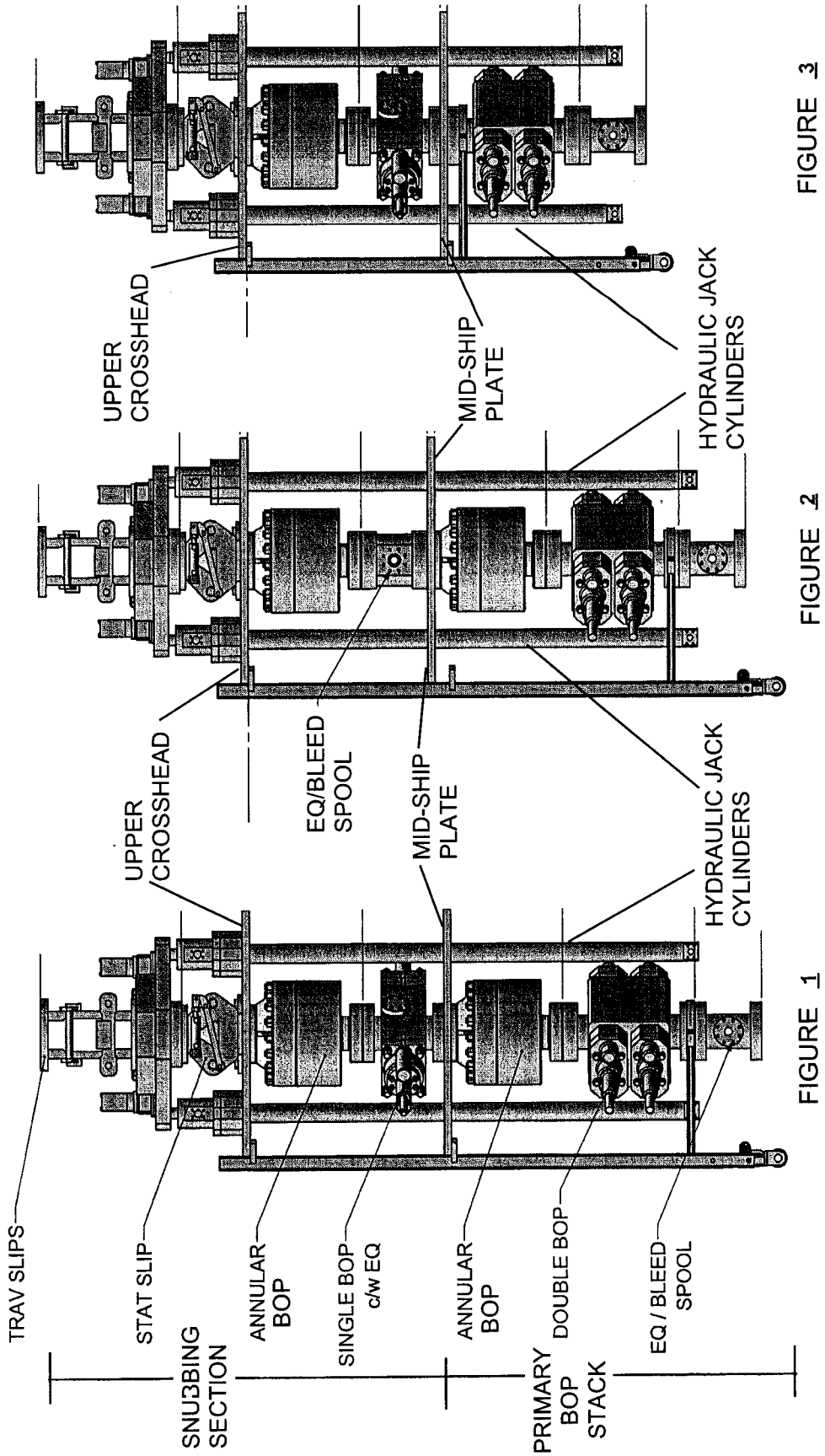


FIGURE 1

FIGURE 2

FIGURE 3

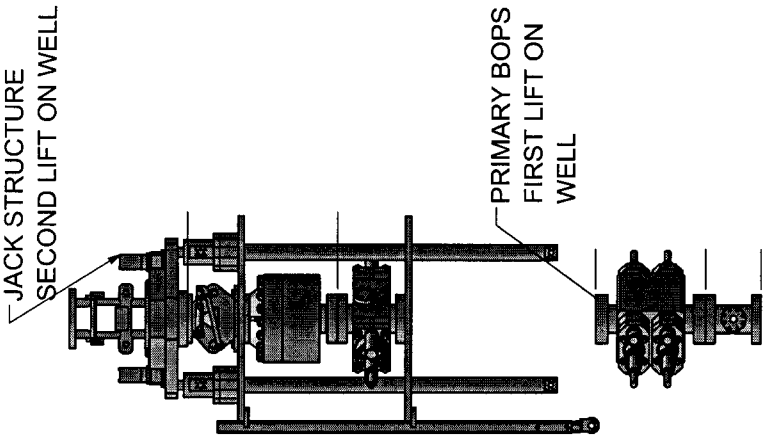


FIGURE 6

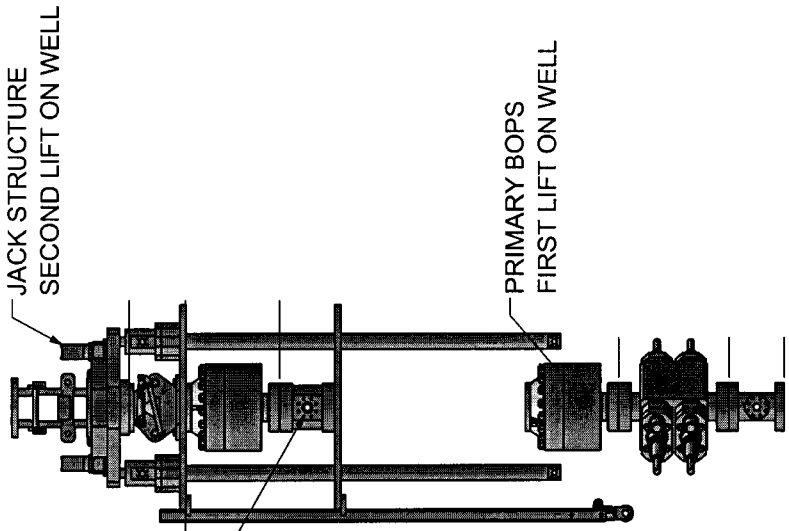


FIGURE 5

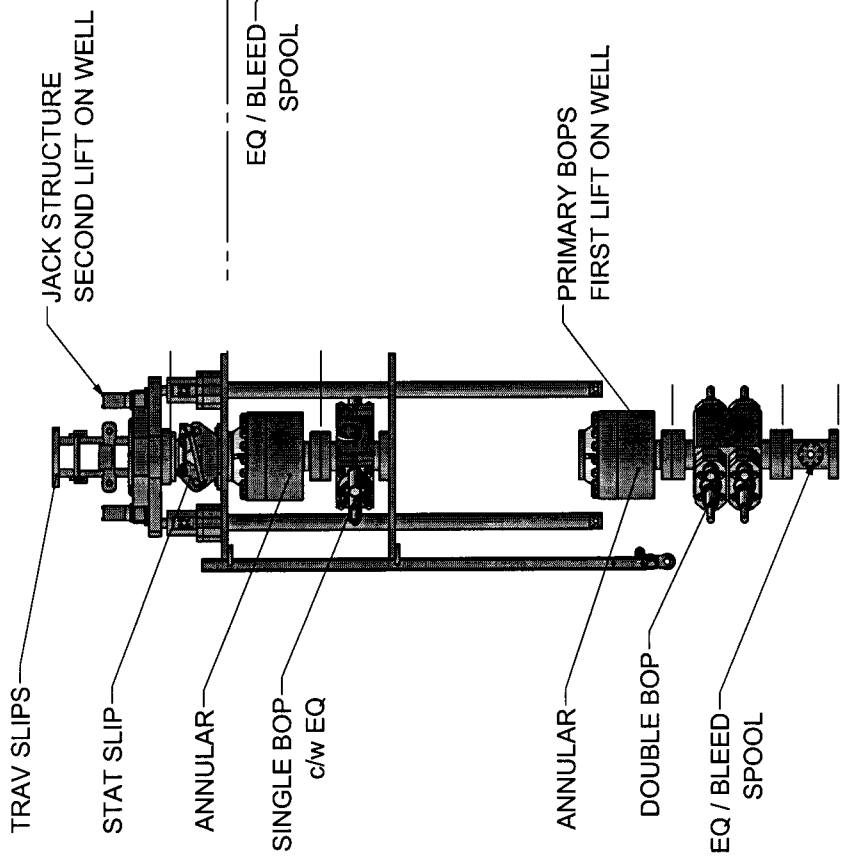


FIGURE 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2018/000228

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***E21B 33/068*** (2006.01) , ***E21B 15/00*** (2006.01) , ***E21B 33/03*** (2006.01) , ***E21B 33/06*** (2006.01)

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)
IPC: ***E21B 33/068*** (2006.01) , ***E21B 15/00*** (2006.01) , ***E21B 33/03*** (2006.01) , ***E21B 33/06*** (2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Questral Orbit

Keywords: Snubbing, BOP, Blowout, Blow Out, Hydraulic

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 9422784 B2 (SHAH, J.) 23 August 2016 (23-08-2016) * Figure 1; Column 2, line 47 to Column 3, line 17 ; Column 4, lines 3-32 *	1-14
Y	US 2012006565 A1 (MCKINNON S. et al.) 12 January 2012 (12-01-2012) * Figure 1, Paragraphs [0023]-[0026] *	1-14
Y	US 4553591 (MITCHELL, R.) 19 November 1985 (19-11-1985) * Figure 1, Column 3, lines 14-28 *	1-14

☐ 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 03 January 2019 (03-01-2019)	Date of mailing of the international search report 21 February 2019 (21-02-2019)
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 819-953-2476	Authorized officer Allison Blundon (819) 639-5517

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2018/000228

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US2012006565A1	12 January 2012 (12-01-2012)	US2012006565A1	12 January 2012 (12-01-2012)
		CA2709255A1	08 January 2012 (08-01-2012)
		CN102312658A	11 January 2012 (11-01-2012)
US4553591A	19 November 1985 (19-11-1985)	None	
US9422784B2	23 August 2016 (23-08-2016)	US2014209299A1	31 July 2014 (31-07-2014)
		US9422784B2	23 August 2016 (23-08-2016)
		CA2832777A1	13 May 2014 (13-05-2014)
		CA2832777C	06 June 2017 (06-06-2017)