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(54) Title: A THREAD SHEAR WIRELINE ADAPTER KIT AND BOREHOLE TOOL SETTING ARRANGEMENT AND METHOD

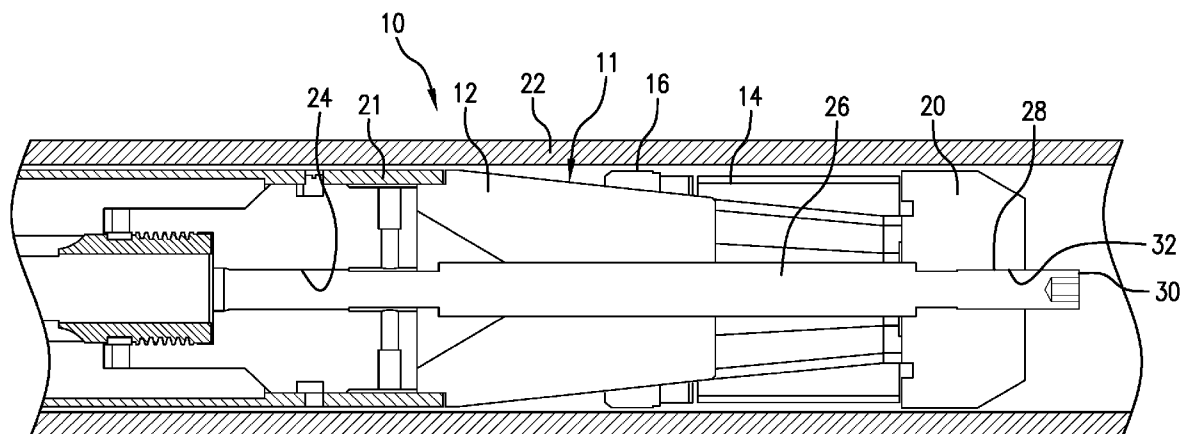


FIG. 1

(57) Abstract: A thread shear based wireline adapter kit and downhole tool setting arrangement including a downhole tool having an inside diameter flow path extending therethrough after setting of the downhole tool, a wireline adapter kit disposed in the flow path, a member disposed at a downhole end of the downhole tool, the member having a threadform therein, the threadform threaded to the wireline adapter kit, the threadform shearable to release the wireline adapter kit from the downhole tool after setting leaving the flow path open. A method for setting a downhole tool including pulling a wireline adapter kit (WLAK) that is secured to a downhole tool by a threadform, loading the threadform axially to set the tool, further loading the threadform to axially shear the threadform, releasing the WLAK from the downhole tool leaving a flow path through the downhole tool.



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))*

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

A THREAD SHEAR WIRELINE ADAPTER KIT AND BOREHOLE TOOL SETTING ARRANGEMENT AND METHOD

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Application No. 15/448190, filed on March 2, 2017, which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] In the drilling and completions resource recovery and carbon dioxide sequestration industries, those of ordinary skill in the art will recognize that there are many arrangements and methods to set tools in the downhole environment but will be equally well versed in the knowledge that new exploratory and completions methods often present new challenges rendering prior art arrangements and methods either unsuitable of use or unfavorable for use thereby driving the industry to be open to improved and different arrangements and methods that address new issues or bring greater efficiency or both, for example.

SUMMARY

[0003] A thread shear based wireline adapter kit and downhole tool setting arrangement including a downhole tool having an inside diameter flow path extending therethrough after setting of the downhole tool, a wireline adapter kit disposed in the flow path, a member disposed at a downhole end of the downhole tool, the member having a threadform therein, the threadform threaded to the wireline adapter kit, the threadform shearable to release the wireline adapter kit from the downhole tool after setting leaving the flow path open.

[0004] A method for setting a downhole tool including pulling a wireline adapter kit (WLAK) that is secured to a downhole tool by a threadform, loading the threadform axially to set the tool, further loading the threadform to axially shear the threadform, releasing the WLAK from the downhole tool leaving a flow path through the downhole tool.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The following descriptions should not be considered limiting in any way. With reference to the accompanying drawings, like elements are numbered alike:

[0006] FIG. 1 is a schematic cross section view of a downhole tool with a wireline adapter kit disposed therein and attached by a shearable threaded connection to a bottom sub of the downhole tool, the figure showing the arrangement in a run in position;

[0007] FIG. 2 is a schematic cross section view of a downhole tool with a wireline adapter kit disposed therein and attached by a shearable threaded connection to a ring adjacent a bottom sub of the downhole tool, the figure showing the arrangement in a set position but not sheared; and

[0008] FIG. 3 is a schematic cross section view of a downhole tool with a wireline adapter kit disposed therein that is intended to illustrate a condition after shearing of the threads for either of FIGs 1 or 2 by either viewing the drawing as shown (for Fig 2) or viewing the drawing while ignoring the existence of the ring (for Fig 1).

DETAILED DESCRIPTION

[0009] A detailed description of one or more embodiments of the disclosed apparatus and method are presented herein by way of exemplification and not limitation with reference to the Figures.

[0010] Referring to FIG. 1, an embodiment of a thread shear based wireline adapter kit and downhole tool setting arrangement 10 is illustrated. The downhole tool 11 illustrated is a seal tool comprising a cone 12, a slip 14, a seal 16 and a bottom sub 20 but it is to be understood that these are merely by way of example in order to convey to the reader the invention disclosed herein and could be substituted by other tools that are settable in the downhole environment. All of these components are illustrated within a tubular 22 such as a casing. The particular embodiment illustrated is settable by pulling the bottom sub 20 in the uphole direction while holding the cone 12 in a relatively fixed position by sleeve 21. This will cause the slip(s) 14 to ride up the cone 12 and expand radially outwardly into biting contact with the tubular 22 thereby anchoring the tool to the tubular 22. While the slip(s) 14 move up the cone 12, the seal 16 is urged radially outwardly as well and hence ultimately creates a pressure tight annular seal between the cone 12 and the tubular 22. It will also be appreciated that the tool as illustrated provides an inside diameter flow path 24 therethrough post setting and withdrawal of a wireline adapter kit (WLAK) 26 that is used as the setting tool.

[0011] The WLAK 26 includes a threadform 28 at a downhole end 30 thereof. The threadform 28 will be engaged with a complementary threadform in a member (e.g. threadform 32 in the bottom sub 20 of Figure 1 or threadform 36 in a ring 34 of Figure 2) of

the arrangement. The threadforms are used as a shear release mechanism to provide sufficient energy to set the downhole tool and then shear at a predictable level to withdraw the WLAK 26. In the embodiment of Figure 1, the threadform 28 is engaged for run in with the complementary threadform 32 in the bottom sub 20 whereas in the embodiment of Figure 2, the threadform 28 is engaged for run in with the complementary thread 36 in ring 34. Specifically, the threadform 32 is effectively moved from the position of Figure 1 to a different position in Figure 2, where it is assigned numeral 36 for differentiation.

[0012] The tool 11 is set by pulling the WLAK 26 in an uphole direction while holding the cone 12 with the sleeve 21. This loads the threadforms in the axial direction, axial being defined by considering the helix of the threadform having a central axis about which the thread is helically wound. Upon fully setting the tool 11 by loading the threadform 28/32, 36 to a tensile rating sufficient to set the tool, the threadform 28/32, 36 is loaded to a higher tensile force to cause the threadform 28/32, 36 to shear in the axial direction at the predetermined tensile rating. The WLAK 26 will then be withdrawn through the downhole tool 11 leaving a flow path through the downhole tool. Relative movement of the WLAK 26 in withdrawal is illustrated in Figure 3 though it is not fully withdrawn. Upon full withdrawal, the flow path 24 will be open through the tool 11.

[0013] It is to be understood that Figure 3 is intended to illustrate the sheared position for both of the embodiments illustrated in Figures 1 and 2. Figure 3 directly illustrates the condition of the arrangement just after shearing for Figure 2 and provides the appearance of the embodiment of Figure 1 just after shearing by simply ignoring the ring 34 in Figure 3 since that ring does not exist in the embodiment of Figure 1. It will be understood that any type of downhole tool that uses a similar motion to set may be actuated as taught herein.

[0014] In addition to the foregoing, it is further disclosed herein that although a common single start thread may be employed for the threadforms 28 and 32 or 36 discussed herein, it has been discovered by the inventors hereof that employing a multistart threadform provides greater specificity of tensile shear ratings for the tool. Contemplated are two start, three start and four start threadforms, each of which exhibit a greater tensile specificity. For a two start, the tensile specificity is +/- 10%; for a three start, the tensile specificity is +/- 5%; and for a four start, the tensile specificity is +/- 3%. While even greater numbers of starts are also contemplated, practicality begins to reduce efficiency.

[0015] In some embodiments hereof, the bottom sub 20 (Figure 1 embodiment) or the ring 34 (and possibly both the bottom sub 20 and the ring) (Figure 2 embodiment) are constructed of a degradable material such as a controlled electrolytic metallic material

available from Baker Hughes Incorporated, Houston Texas. In such cases, the portions of the tool that are sheared from the WLAK 26 will dissolve and not be an impediment to any other downhole operations.

[0016] Set forth below are some embodiments of the foregoing disclosure:

[0017] Embodiment 1: A thread shear based wireline adapter kit and downhole tool setting arrangement including a downhole tool having an inside diameter flow path extending therethrough after setting of the downhole tool, a wireline adapter kit disposed in the flow path, a member disposed at a downhole end of the downhole tool, the member having a threadform therein, the threadform threaded to the wireline adapter kit, the threadform shearable to release the wireline adapter kit from the downhole tool after setting leaving the flow path open.

[0018] Embodiment 2: The arrangement as in any prior embodiment wherein the member is a bottom sub of the downhole tool.

[0019] Embodiment 3: The arrangement as in any prior embodiment wherein the member is a ring disposed adjacent and downhole of a bottom sub of the downhole tool.

[0020] Embodiment 4: The arrangement as in any prior embodiment wherein the threadform is a multistart threadform.

[0021] Embodiment 5: The arrangement as in any prior embodiment wherein the multistart threadform is a three start threadform.

[0022] Embodiment 6: The arrangement as in any prior embodiment wherein the multistart threadform is a four start threadform.

[0023] Embodiment 7: The arrangement as in any prior embodiment wherein the member is constructed of a degradable material.

[0024] Embodiment 8: The arrangement as in any prior embodiment wherein the degradable material is a controlled electrolytic metallic material.

[0025] Embodiment 9: A method for setting a downhole tool including pulling a wireline adapter kit (WLAK) that is secured to a downhole tool by a threadform, loading the threadform axially to set the tool, further loading the threadform to axially shear the threadform, releasing the WLAK from the downhole tool leaving a flow path through the downhole tool.

[0026] The use of the terms “a” and “an” and “the” and similar referents in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. Further, it should further be noted that the terms “first,”

“second,” and the like herein do not denote any order, quantity, or importance, but rather are used to distinguish one element from another. The modifier “about” used in connection with a quantity is inclusive of the stated value and has the meaning dictated by the context (e.g., it includes the degree of error associated with measurement of the particular quantity).

[0027] The teachings of the present disclosure may be used in a variety of well operations. These operations may involve using one or more treatment agents to treat a formation, the fluids resident in a formation, a wellbore, and / or equipment in the wellbore, such as production tubing. The treatment agents may be in the form of liquids, gases, solids, semi-solids, and mixtures thereof. Illustrative treatment agents include, but are not limited to, fracturing fluids, acids, steam, water, brine, anti-corrosion agents, cement, permeability modifiers, drilling muds, emulsifiers, demulsifiers, tracers, flow improvers etc. Illustrative well operations include, but are not limited to, hydraulic fracturing, stimulation, tracer injection, cleaning, acidizing, steam injection, water flooding, cementing, etc.

[0028] While the invention has been described with reference to an exemplary embodiment or embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the claims. Also, in the drawings and the description, there have been disclosed exemplary embodiments of the invention and, although specific terms may have been employed, they are unless otherwise stated used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention therefore not being so limited.

CLAIMS

What is claimed is:

1. A thread shear based wireline adapter kit and downhole tool setting arrangement (10) comprising:
 - a downhole tool (11) having an inside diameter flow path (24) extending therethrough after setting of the downhole tool (11);
 - a wireline adapter kit (26) disposed in the flow path (24);
 - a member disposed at a downhole end (30) of the downhole tool (11), the member having a threadform therein, the threadform (32,36) threaded to the wireline adapter kit (26), the threadform (32,36) shearable to release the wireline adapter kit (26) from the downhole tool (11) after setting leaving the flow path (24) open.
2. The arrangement (10) as claimed in claim 1 wherein the member is a bottom sub (20) of the downhole tool (11).
3. The arrangement (10) as claimed in claim 1 wherein the member is a ring (34) disposed adjacent and downhole of a bottom sub (20) of the downhole tool (11).
4. The arrangement (10) as claimed in claim 1 wherein the threadform (28) is a multistart threadform.
5. The arrangement (10) as claimed in claim 4 wherein the multistart threadform (28) is a three start threadform.
6. The arrangement (10) as claimed in claim 1 wherein the multistart threadform (28) is a four start threadform.
7. The arrangement (10) as claimed in claim 1 wherein the member (20) (34) is constructed of a degradable material.
8. The arrangement (10) as claimed in claim 7 wherein the degradable material is a controlled electrolytic metallic material.
9. A method for setting a downhole tool (11) comprising:
 - pulling a wireline adapter kit (WLAK) (26) that is secured to a downhole tool (11) by a threadform (28);
 - loading the threadform (28) axially to set the tool (11);
 - further loading the threadform (28) to axially shear the threadform (28);
 - releasing the WLAK (26) from the downhole tool (11) leaving a flow path (24) through the downhole tool (11).

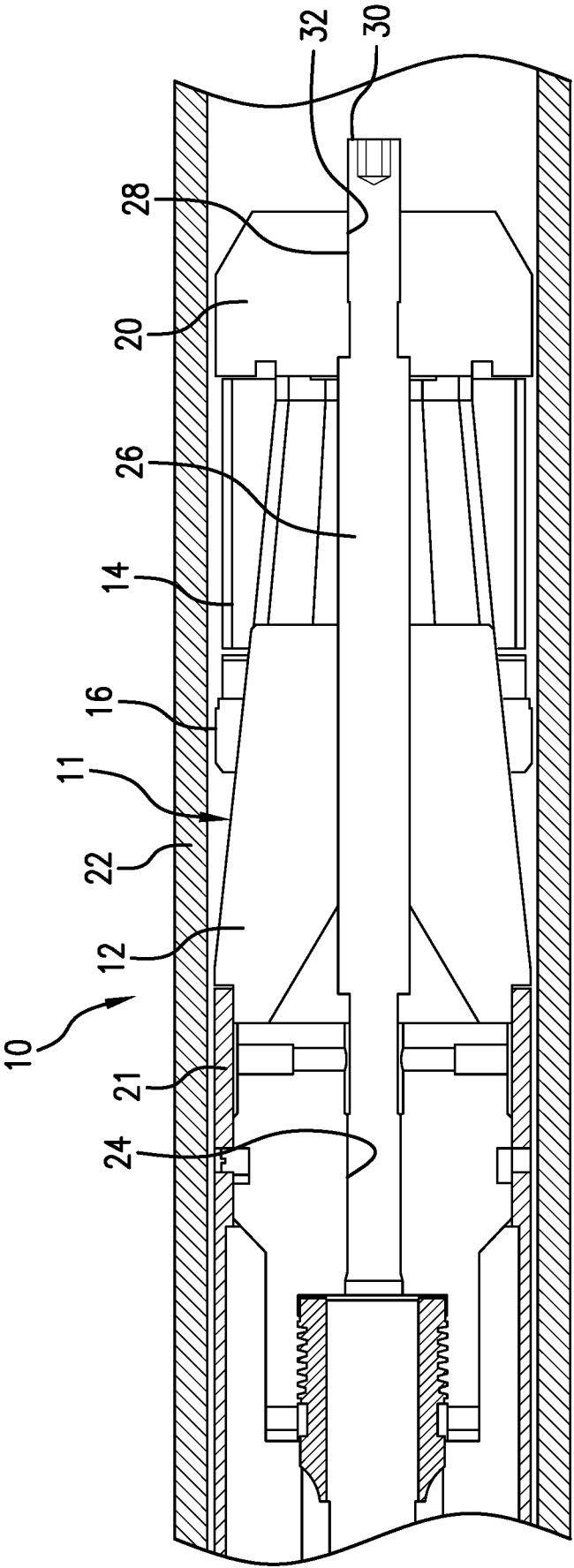


FIG. 1

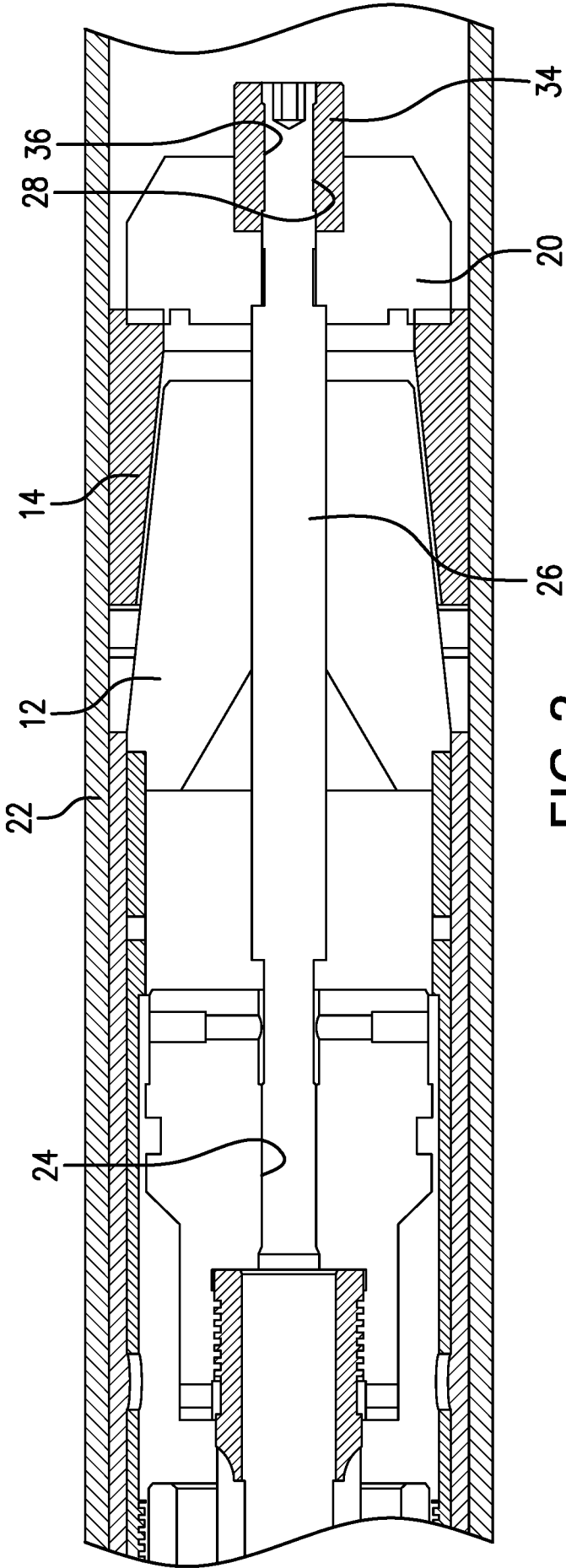


FIG.2

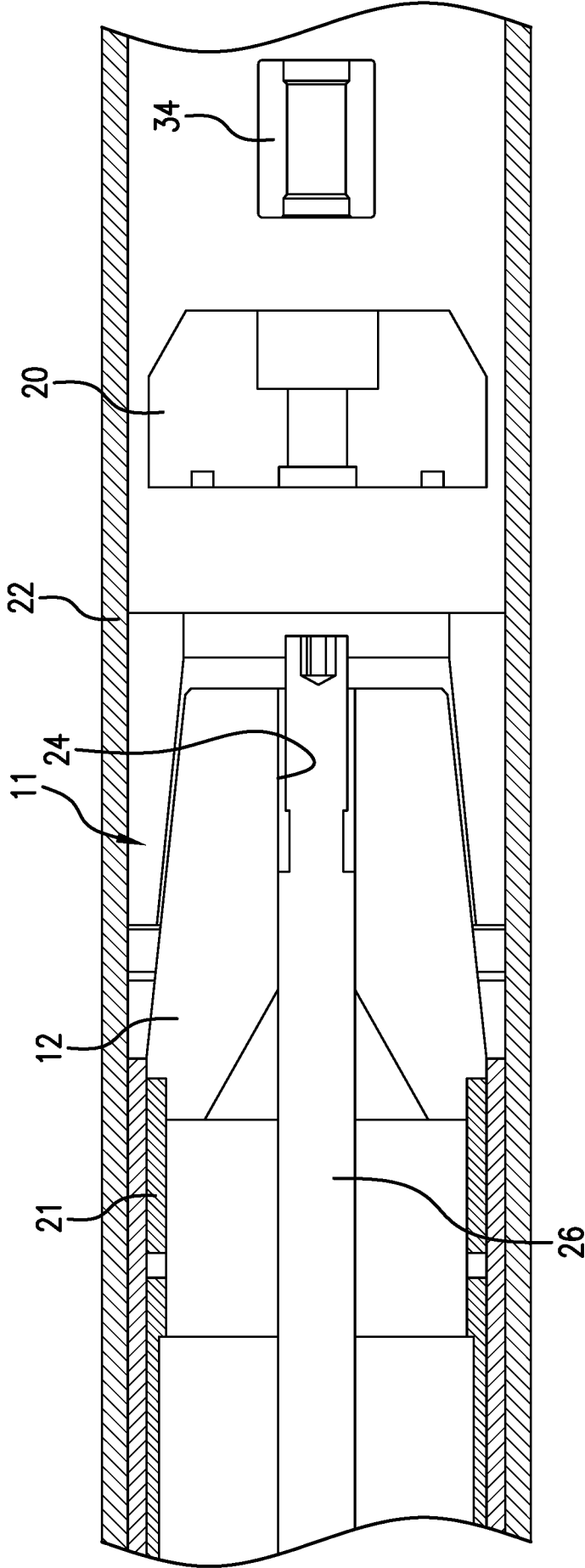


FIG.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2018/016411**A. CLASSIFICATION OF SUBJECT MATTER****E21B 23/01(2006.01)i, E21B 23/14(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 23/01; E21B 33/134; E21B 23/06; E21B 33/12; E21B 23/00; E21B 33/129; E21B 43/11; E21B 23/14

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: wireline adapter kit, seal, slip, thread, shear, release, sleeve

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2007-0151722 A1 (LEHR et al.) 05 July 2007 See paragraphs [0007], [0039]-[0040], [0053]-[0055] and figures 1, 4A-4C.	1-9
Y	US 2016-0376869 A1 (WEATHERFORD TECHNOLOGY HOLDINGS, LLC) 29 December 2016 See paragraphs [0071]-[0078] and figures 1A-1B.	1-9
Y	US 9359855 B2 (MAGNUM OIL TOOLS INTERNATIONAL, LTD.) 07 June 2016 See column 3, lines 19-34, column 4, lines 46-53 and figures 1-5.	3
A	US 7779926 B2 (TURLEY et al.) 24 August 2010 See claim 1 and figure 2.	1-9
A	US 2002-0189820 A1 (SLUP et al.) 19 December 2002 See abstract, claim 1, and figures 22-27.	1-9



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"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

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Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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