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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 September 2013 (26.09.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/142017 A1

(51) International Patent Classification:
E21B 21/10 (2006.01) *E21B 10/60* (2006.01)

(21) International Application Number:
PCT/US2013/028014

(22) International Filing Date:
27 February 2013 (27.02.2013)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
13/428,285 23 March 2012 (23.03.2012) US

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(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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, 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, 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, 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, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, 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))*

[Continued on next page]

(54) Title: ONE TRIP TUBULAR CLEANING AND DRILLING ADDITIONAL OPEN HOLE

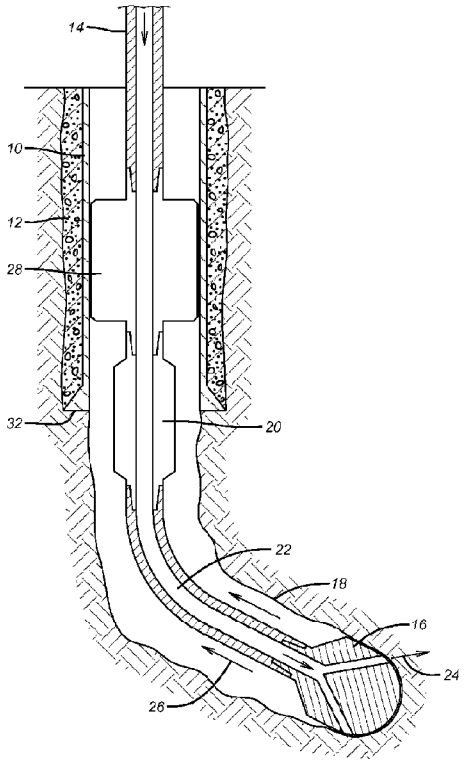


FIG. 1

(57) Abstract: A one trip method for cleaning an existing string while performing testing on the string allows in the same trip the drilling of additional wellbore. The cleanup equipment is retracted after the testing is completed so that it will not impede the advancement of the drill bit at the lower end of the string. The cleanup tools are typically extend for run in through the string and they can be collapsed by a technique such as dropping a ball to shift a sleeve to disable the piston assembly that holds the cleanup tools extended and allows them to be retracted using a return spring or other source of potential energy.

WO 2013/142017 A1

— *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))*

ONE TRIP TUBULAR CLEANING AND DRILLING ADDITIONAL OPEN HOLE

Inventor: Yang Xu

FIELD OF THE INVENTION

[0001] The field of the invention is tubular cleaning in conjunction with performing other testing and more particularly continuing single trip drilling open hole after wellbore cleanup by collapsing the wellbore cleanup tools.

BACKGROUND OF THE INVENTION

[0002] Presently, after casing is run in and cemented, the quality of the cement job is tested with a cement bond log. To ensure the success of such testing the casing or tubular string is cleaned with scrapers and related wellbore cleanup tools. The intent is to continue to make more hole after getting appropriate results from the cement bond log. In the past this has entailed as many as three trips in the hole for wellbore cleanup, testing and then drilling open hole below the string just tested.

[0003] More recently the cement testing run has been combined with the wellbore cleanup run in US Publication 2010/0126718 combines wellbore cleanup tools such as scrapers, mills, and wipers/brushes in conjunction with a cement bond log tool in a single trip as described in paragraph 123.

[0004] The present invention allows for single trip wellbore cleanup coupled with testing with the ability to continue drilling more hole. The wellbore cleanup tool is retracted after the testing in the existing tubular and then normal drilling commences with the cleanup equipment taking flow through itself so that the cuttings can be removed from the drill bit location as more hole is drilled. The cleanup tools in the retracted state do not impede drilling progress. These and other aspects of the method of the present invention will be more readily appreciated by those skilled in the art from a review of the description of the preferred embodiment and the associated drawings while appreciating that the full scope of the invention is to be found in the appended claims.

SUMMARY OF THE INVENTION

[0005] A one trip method for cleaning an existing string while performing testing on the string allows in the same trip the drilling of additional wellbore.

The cleanup equipment is retracted after the cleanup is completed so that it will not impede the advancement of the drill bit at the lower end of the string. The cleanup tools are typically extended for run in and they can be collapsed by a technique such as dropping a ball to shift a sleeve to disable the piston assembly that holds the cleanup tools extended and allows them to be retracted using a return spring or other source of potential energy.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 shows running in with the cleanup tools actuated and performing a test downhole;

[0007] FIG. 2 is the view of FIG. 1 with the cleanup tools retracted and the string advancing to make more hole after retracting the wellbore cleanup tools;

[0008] FIGS. 3a and 3b respectively show a wellbore cleanup tool in the extended run in position and in the retracted position when advanced into newly drilled open hole.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0009] FIG. 1 illustrates casing **10** that has been cemented **12** and a drill string **14** that supports a drill bit **16** that drills open hole **18**. Further up the string **14** from the bit **16** is an instrumentation package **20** that can include one or more instruments such as a cement bond logging tool and a directional drilling tool that accommodate flow through the passage **22** to the nozzles schematically represented by arrows **24** that direct cuttings back uphole as illustrated schematically by arrow **26**.

[0010] The wellbore cleanup package **28** can be one or more tools that remove debris from the wall of the casing **10** by mechanical or other means where the tool has a capability of radial extension to reach the wall of the casing or other tubular **10**. These tools can be run in already extended and ready to clean up or they can be actuated such as when fluid circulates through passage **22** for other purposes and raises the internal pressure which powers a piston to extend a linkage or mechanism to get contact with the wall of the casing **10** but it should also be noted that pressure or circulation is not needed to maintain these tools in wellbore cleaning mode. As long as the cleanup tools are within the casing **10** it is desirable to keep them in casing contact to

do their job properly. These tools **28** can be mills with extending blades, brushes, scrapers and the like.

[0011] Ideally shortly before making an exit from the casing **10** the cleanup tools are retracted so that they do not extend to engage the newly drilled open hole **18**, which would then impede the progress of the bit **16**. This is the position shown in FIG. 2. The retraction feature can be manual or automatic. For example, a dropped or pumped ball can land on a seat and shift a sleeve to de-energize a energy resource such as a spring to allow the extended components to the retracted position of FIG. 2 so that the bit **16** can advance to extend the open hole **18** with the assembly **28** having a clearance to the open hole wall despite a deviation **30** in the open hole **18**.

[0012] The cleanup assembly can also be automatically retracted when close to the end **32** of the casing **10**. This can be done by using a casing collar locator as part of the instrument package **20** which then can trigger a component to move in the cleanup tool assembly **28** in a way to de-energize an energy resource which originally keep the tool at extended position or that the pressure of the flowing fluid no longer can drive an extension piston for the extendable component so that a stored potential energy force can then retract any extending members on the assembly **28** and continue to retain the wellbore cleanup equipment **28** in a retracted position. As an added precaution, there can be a locking feature to hold the retracted position separate from the potential energy source. Alternatively, by redirection of fluid pressure to opposed sides of a double acting piston pressure can be positively used to hold such components as extendable blades from mills or scraper support arms in a retracted position so that in a single trip the open hole **18** can be drilled to the desired depth and orientation before the assembly of FIG. 2 is pulled out of the hole. Again, it is worth noting that internal pressure is not mandatory for the working position of the cleanup equipment **28** as it can be run into the hole ready to use and later be collapsed by a variety of techniques.

[0013] It should be noted that because of the one trip system, the passage **22** needs to remain open so that the bit **16** can continue to drill. Thus the pressure in passage **22** cannot just simply be turned off to get the components to retract. Flow and pressure in passage **22** need to continue to support

drilling. If a ball is dropped or pumped to a seat to allow reconfiguration of the cleanup tool assembly into the retracted position where such assembly then needs to remain as it traverses the open hole just drilled, then a feature that gets the seated ball out of the passage **22** needs to be provided. This can be done in a variety of ways such as dissolving the ball and its associated seat or blowing the ball through a collapsing seat and into a ball catcher to keep the ball out of the bit nozzles **24**. Alternatively the ball can be directed to a side pocket after being pumped through a seat that collapses under pressure applied to the ball when still seated. Alternatively an orifice associated with a sleeve that is responsive to developed backpressure can be used to reconfigure the cleanup tool assembly to the retracted position in response to pressure in passage **22**. The sleeve itself can be displaced to a wider portion of the passage **22** after its movement has already reconfigured the assembly **28** so that pressure resumption or continuation in passage **22** actually now holds the assembly **28** retracted rather than extended as before.

[0014] Those skilled in the art will appreciate that at least one trip in the hole is eliminated with the present invention by virtue of being able to retract the cleanup tools as they get to the lower end of the tubular that for example has been cemented. In that way in a single trip a cement bond log can occur as the cleanup tools **28** that can be mounted above or below the instrumentation tools **20** can be retracted and optionally locked in that position so that the bit **16** that is already there at the lower end of the string **14** can keep on drilling without interference of the cleanup tools in the newly made open hole. Those skilled in the art will appreciate that string **14** can be rigid pipe or coiled tubing with a downhole motor so that the bit **16** can make hole. The retraction of the cleanup tools can be accomplished manually or automatically with the retracted position maintained with mechanical locking or with the use of a potential energy source such as a closure spring or internal fluid pressure redirected to a piston to draw in the extendable components.

[0015] The above description is illustrative of the preferred embodiment and many modifications may be made by those skilled in the art without departing from the invention whose scope is to be determined from the literal and equivalent scope of the claims below:

I claim:

1. A subterranean borehole drilling method, comprising:

providing a first string in an already drilled borehole;

running an assembly on a second string through said first string where said assembly comprises at least one retractable cleanup device, at least one measurement tool and a bit at the lower end of said second string;

cleaning up said existing string with said cleanup device;

obtaining information using said measurement tool;

advancing said bit and said cleanup device beyond said first string to make more hole.

2. The method of claim **1**, comprising:

performing said running, cleaning up, obtaining information and advancing said bit in a single trip.

3. The method of claim **2**, comprising:

running said cleanup device through said first string in an extended position to clean said first string.

4. The method of claim **3**, comprising:

retracting said cleanup device before said cleanup device is moved out of said first string.

5. The method of claim **4**, comprising:

performing said retracting manually or automatically.

6. The method of claim **5**, comprising:

locking said cleanup device after retracting said cleanup device.

7. The method of claim **5**, comprising:

providing a passage through said assembly that ends adjacent at least one nozzle at said bit;

using pressure in said passage to selectively extend and retract said cleanup device.

8. The method of claim **7**, comprising:

reconfiguring said cleanup device from extending in response to passage pressure to retracting in response to passage pressure by changing pressure in said passage to a predetermined level.

9. The method of claim **7**, comprising:

leaving said passage open to flow after said reconfiguring.

10. The method of claim **5**, comprising:

using a potential energy source on said cleanup device to retain cleanup device in said retracted position.

11. The method of claim **4**, comprising:

retracting said cleanup device to a smaller dimension than the open hole made by said bit.

12. The method of claim **1**, comprising:

performing a cement bond log of said first string with said measurement tool.

13. The method of claim **5**, comprising:

sensing with said measurement tool the location of said cleanup device with respect to a lower end of said first string;

retracting said cleanup device before said cleanup device exits into an open hole drilled by said bit.

14. The method of claim **13**, comprising:

counting casing collars with said measurement tool to perform said sensing.

15. The method of claim **1**, comprising:

providing a directional drilling tool as said measurement tool.

16. The method of claim **1**, comprising:

using as said cleanup device at least one of a mill, scraper tool, and brushes.

17. The method of claim **1**, comprising:

said cleanup device is located further from said bit than said measurement tool.

18. The method of claim **1**, comprising:

said cleanup device is located closer to said bit than said measurement tool.

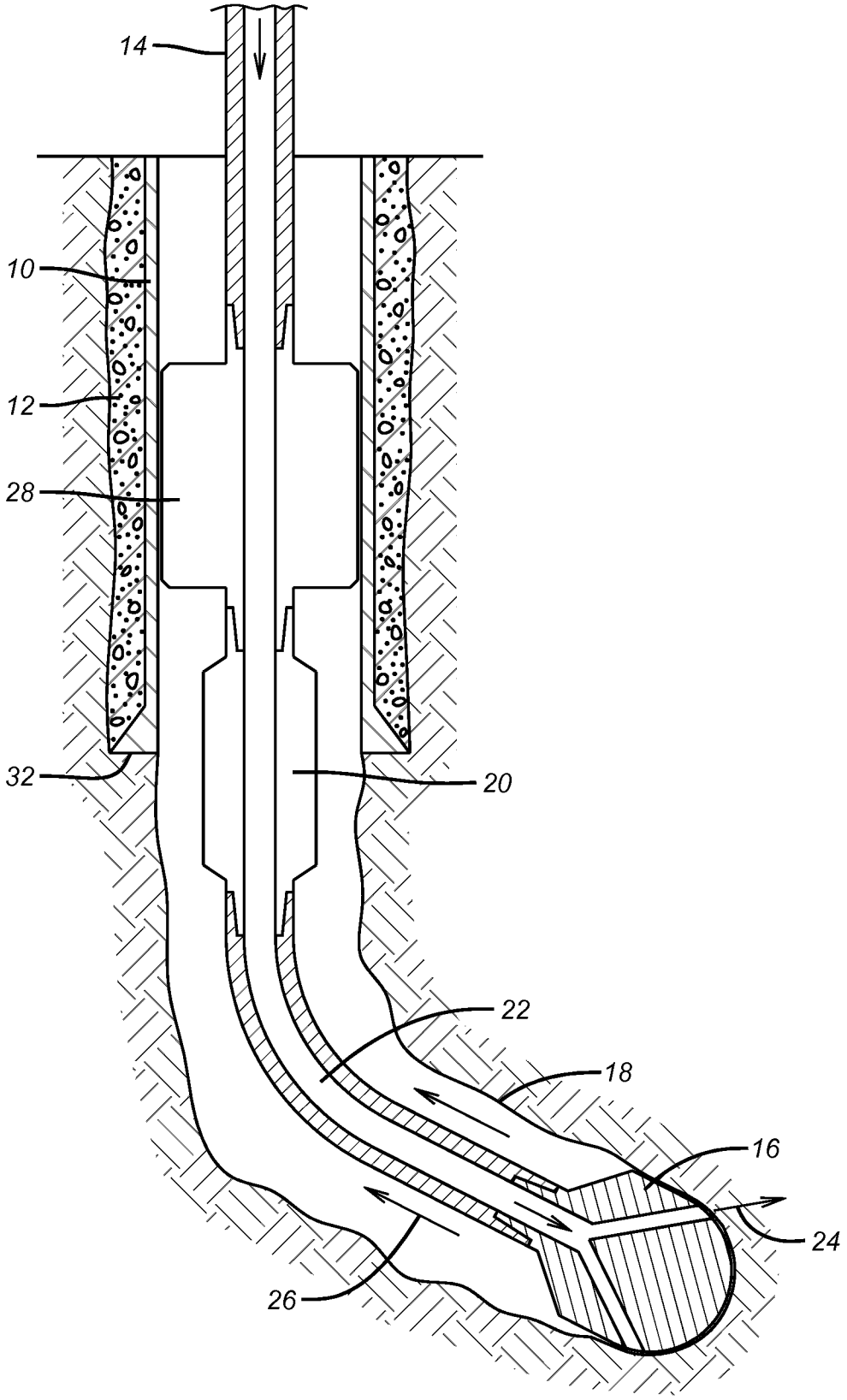


FIG. 1

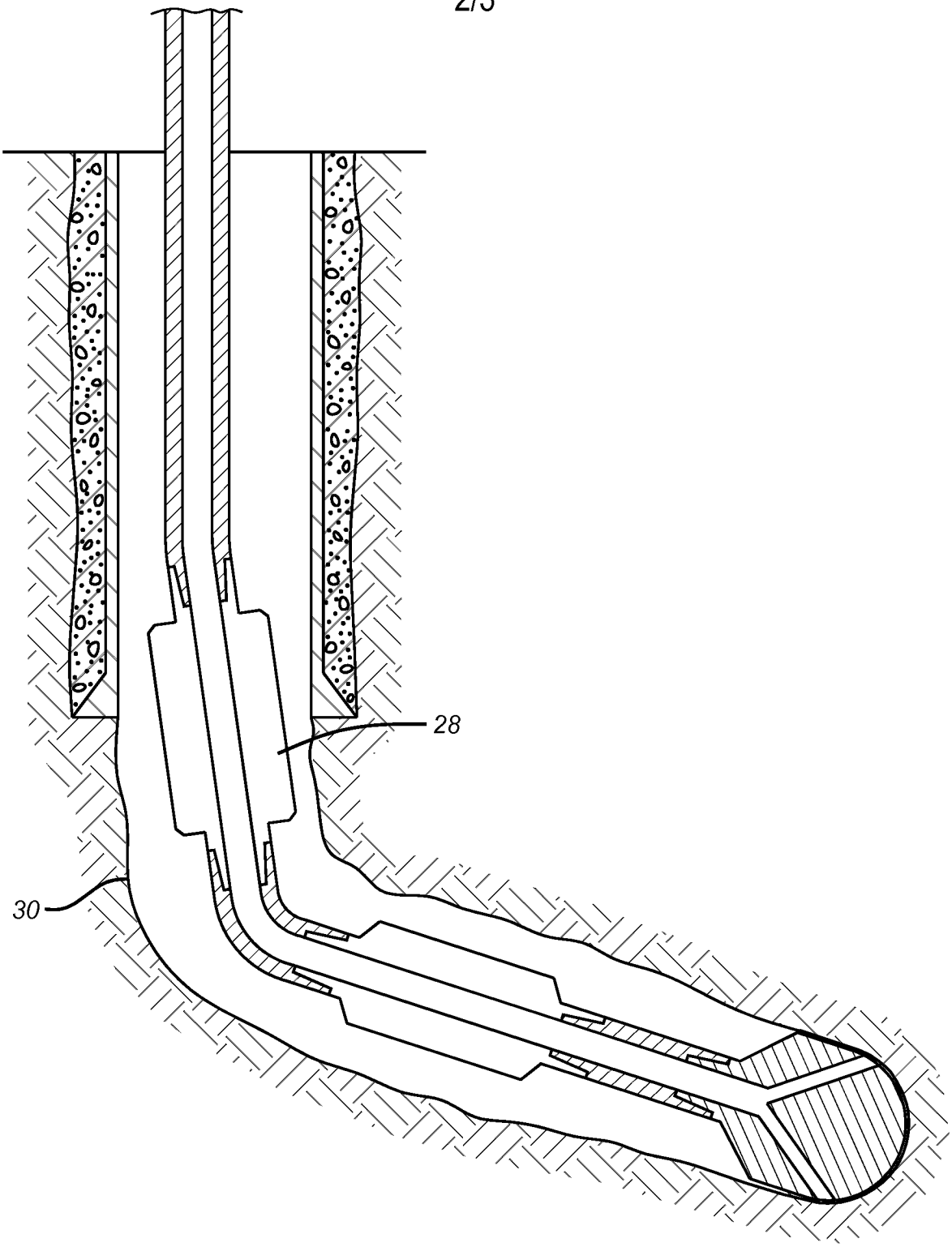


FIG. 2

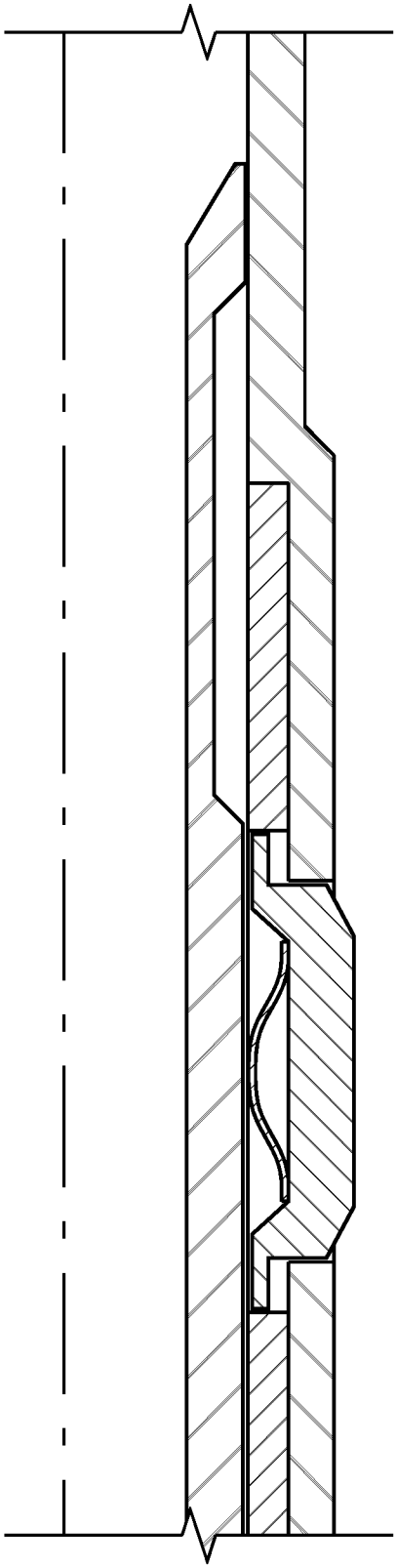


FIG. 3a

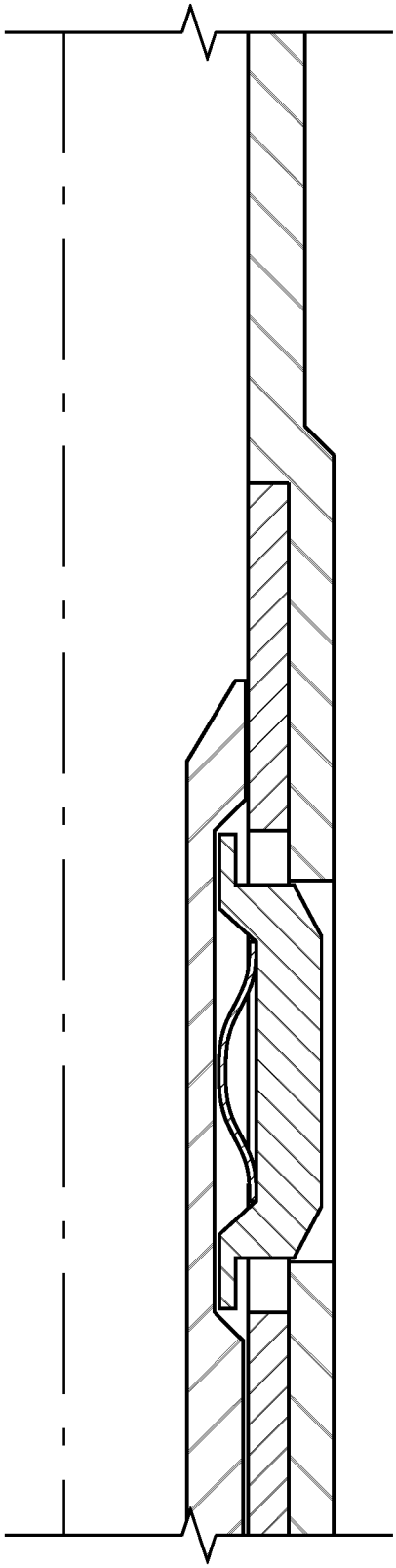


FIG. 3b

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/028014

A. CLASSIFICATION OF SUBJECT MATTER

E21B 21/10(2006.01)i, E21B 10/60(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 21/10, E21B 10/60, E21B 47/00, E21B 37/02, E21B 29/00, E21B 37/08

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: clean, measure, cement, rertracted position, and string

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010-0126718 A1 (LILLEY, IAN JAMES) 27 May 2010 See abstract, paragraphs [0111],[0120],[0123], claims 1,5, and figures 1,4.	1-18
A	US 6152221 A (CARMICHAEL et al.) 28 November 2000 See abstract, column 2, lines 50-62, and figure 2.	1-18
A	US 2007-0284106 A1 (KALMAN et al.) 13 December 2007 See abstract and claims 1,15-20.	1-18
A	US 6460617 B1 (ALLEN, ANTHONY) 08 October 2002 See abstract, column 3, lines 16-28, and figure 2.	1-18
A	US 2005-0022995 A1 (MARTIN et al.) 03 February 2005 See abstract, paragraph [0031], and figure 4.	1-18

☐ 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
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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

Date of the actual completion of the international search	Date of mailing of the international search report
14 June 2013 (14.06.2013)	**17 June 2013 (17.06.2013)**

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Facsimile No. 82-42-472-7140	Telephone No. 82-42-481-3360

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2013/028014

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