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[Continued on next page]

(54) Title: WELL HEAD TUBING HANGER CONVERSION CONFIGURATION AND METHOD FOR COMPLETING A WELL USING THE SAME

(57) Abstract: A wellhead adapter configuration includes a body configured and dimensioned to attach to a wellhead. An inside dimension sufficient to allow through passage of a casing hanger. A method for preparing a borehole.

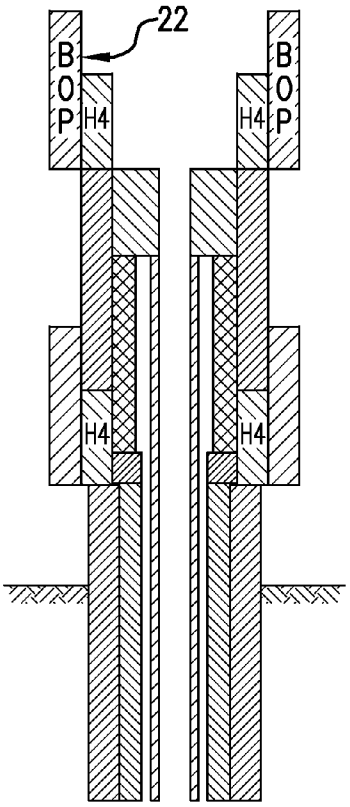


FIG.4

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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))*

WELL HEAD TUBING HANGER CONVERSION CONFIGURATION AND METHOD FOR COMPLETING A WELL USING THE SAME

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Application No. 14/592212 filed on January 8, 2015, which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] Boreholes into the subsurface environment of a planet such as earth, whether for hydrocarbon exploration and recovery, carbon dioxide sequestration, etc., employ borehole capping structures known colloquially as well heads. Well heads serve to hang various casing strings and provide mounting locations for other accessories such as Christmas trees, blow out preventers, etc. Commonly, the manufacturer of the wellhead will configure the same to receive a tubing hanger supplied by the same manufacturer. This is, of course, supportive of that manufacturers interest in selling more equipment but does not necessarily support the interests of the well operator, who might prefer to run another manufacturer's tubing hanger for a host of reasons.

[0003] In view hereof, the industry has created a tool known colloquially as a wellhead adapter. The tool is fittable into the top of the well head and provides for the use of another manufacturer's tubing hanger. These work well to allow the well operator to use tubing hangers from whatever manufacturer having features in which the owner has a particular interest for the particular well or whatever manufacture's tubing hanger that the well operator happens to have in stock. The ability to run a selected tubing hanger also enables the well owner to commoditize the tubing hangers in order to buy in bulk. These benefits of the wellhead adapters make them popular and have for a long time obscured the costs of actually running a wellhead adaptor. To use the adapter, several trips are needed that generally take about 3 weeks of running time in various runs before the operation is complete. Costs can run into the millions of dollars but because of commodity purchasing of the various wellhead components, the industry has had no difficulty with the current state of affairs.

[0004] Despite the industry acceptance of the paradigm noted above, it is always receptive to the ruminations of intrepid souls who conceive and devise new methods and configurations that reduce time and expenditure in the completion of borehole systems.

BRIEF DESCRIPTION

[0005] A wellhead adapter configuration includes a body configured and dimensioned to attach to a wellhead; an inside dimension sufficient to allow through passage of a casing hanger.

[0006] A method for preparing a borehole includes running a wellhead adapter either with or subsequent to the running of a wellhead, the wellhead adapter having an inside dimension sufficient to allow through passage of a casing hanger; running a casing and casing hanger to the wellhead through the wellhead adapter; running a tubing and tubing hanger and landing shoulder into the wellhead adapter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The following descriptions should not be considered limiting in any way. With reference to the accompanying drawings, like elements are numbered alike:

[0008] Figure 1 is a schematic cross section view of a wellhead and a tubing hanger conversion configuration;

[0009] Figure 2 adds a casing, a casing hanger and a BOP to the image of Figure 1;

[0010] Figure 3 adds a spacer/landing shoulder and a tubing and tubing hanger to the image of Figure 2;

[0011] Figure 4 illustrates the above components in a landed position;

[0012] Figure 5–8 are a repeat of Figures 1-4 with changes related to a second embodiment

DETAILED DESCRIPTION

[0013] 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.

[0014] Referring to Figure 1-4 a first embodiment is illustrated. Figure 1 schematically illustrates earth surface 10 with a wellhead 12 penetrating to the subsurface environment. Attached to the wellhead 12 is a wellhead adapter 14. The wellhead adapter14 and wellhead 12 are connected together by, for example, an H4 connector (commercially available from Aker Solutions Incorporated, Houston Texas). The combination is then run to position together (although in other embodiments, running the wellhead adapter after the wellhead is run is contemplated). It is important to note that an inside dimension 16 of the wellhead adapter 14 maintains the inside dimension of the wellhead 12. This allows for

running of a casing 18 and casing hanger 20 through the wellhead adapter 14 which has not heretofore been possible. This is significant because it allows for the above noted running of the wellhead adapter with the well head in a single run. In the art, such would have taken at least 4 runs as one of skill in the art will readily recognize, configurations that eliminate runs are economically beneficial to the art.

[0015] Figure 2 illustrates a casing 18 hung from casing hanger 20 in the wellhead 12. Further a BOP 22 is illustrated atop the conversion configuration 14 in this Figure. The BOP (Blowout Preventer) is run and connected atop the wellhead adapter (via another connector 13 such as an H4 connector, in a single run. The BOP 22, casing 18 and casing hanger 20 are run during the drilling operation, which as one of skill in the art knows will naturally have to occur during the sequence of preparing the borehole for its intended end use.

[0016] Referring to Figure 3, and in another run, tubing 24 and tubing hanger 26 are illustrated while being conveyed into the wellhead adapter 14 and the wellhead 12. Further a spacer 28 is positioned at the tubing hanger to space the tubing hanger 26 from the casing hanger 20 (previously installed) by a selected distance. In Figure 4, all components are illustrated in a landed position.

[0017] In another embodiment, referring to Figures 5-8, and wherein like elements carry the same numerals as above and similar elements to those above are referred to with one hundred series numerals of the numerals used above, the wellhead adapter 114 is provided additionally with a profile 130 therein that is configured to be engaged by a landing shoulder 132 run in subsequently with the tubing hanger 126. The profile 130 extends generally radially outwardly from a wall 131 of the wellhead adapter that defines the inside dimension of the wellhead adapter. The landing shoulder 132 may comprise a snap ring, collet or other expanding configuration with the capability of expanding into profile 130 in wellhead adapter 114 to lock the landing shoulder 132 in place. The profile 130 may comprise any selected shape from a simple snap ring groove to a complex profile configuration and anything in between with the caveat that once the landing shoulder 132 engages therewith, the shoulder will be located sufficiently to support adequate positioning of the tubing hanger 26. With this embodiment, there is no need for spacer 28 illustrated in conjunction with the previously described embodiment. In other respects this embodiment is identical to that of the previous embodiment.

[0018] Through the teachings hereof, the following method is enabled: running a first manufacturer's wellhead either with a wellhead adapter as described above or prior to running the wellhead adapter as described above, connecting the wellhead adapter to the

wellhead; running a casing and casing hanger through the wellhead adapter to land in the wellhead; and running a tubing and tubing hanger from a manufacturer different than the first manufacturer to land in the wellhead adapter. Also enabled is the method of providing a landing shoulder for the tubing hanger either by a spacer landing upon the casing hanger or by a profile engaged by an enlarging configuration such as a snap ring or collet.

[0019] Great benefit to the art is realized by the teachings herein in that different OEM equipment may be used for the wellhead and the tubing hanger while substantially cutting down the number of runs and time needed to accomplish the conversion.

[0020] 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(s) 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. Moreover, the use of the terms first, second, etc. do not denote any order or importance, but rather the terms first, second, etc. are used to distinguish one element from another. Furthermore, the use of the terms a, an, etc. do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced item.

CLAIMS:

1. A wellhead adapter (14) configuration comprising:

a body configured and dimensioned to attach to a wellhead (12);

an inside dimension sufficient to allow through passage of a casing hanger (20).

2. The wellhead adapter (14) as claimed in claim 1 further comprising a profile extending generally radially outwardly from a wall (131) of the wellhead adapter (114) that defines the inside dimension of the wellhead adapter (114).

3. The wellhead adapter (14) as claimed in claim 2 wherein the profile is a snap ring groove.

4. The wellhead adapter (14) as claimed in claim 2 wherein the profile is a complex shape.

5. The wellhead adapter (14) as claimed in claim 2 wherein the profile is a thread.

6. A method for preparing a borehole comprising:

running a wellhead adapter (114) either with or subsequent to the running of a wellhead (12), the wellhead adapter (114) having an inside dimension sufficient to allow through passage of a casing hanger (20);

running a casing (18) and casing hanger (20) to the wellhead (12) through the wellhead adapter (14);

running a tubing (24) and tubing hanger (126) and landing shoulder (132) into the wellhead adapter (114).

7. The method as claimed in claim 6 wherein the running of the casing (18) and casing hanger (20) occurs with a drilling run.

8. The method as claimed in claim 6 wherein the running of the landing shoulder (132) includes a radially outward expanding of the landing shoulder (132) into a profile of the wellhead adapter (114), the profile extending generally radially outwardly from a wall (131) of the wellhead adapter (114) that defines the inside dimension of the wellhead adapter (114).

9. The method as claimed in claim 6 wherein the running of the tubing hanger (126) includes positioning a spacer atop a casing hanger (20) to position the tubing hanger(126) and tubing (24)within the wellhead adapter (114).

10. A method comprising:

running a first manufacturer's wellhead (12) either with a wellhead adapter (114) as claimed in claim 1 or prior to running the wellhead adapter (14) as claimed in claim 1;

connecting the wellhead adapter (14) to the wellhead (12);

running a casing (18) and casing hanger (20) through the wellhead adapter (14) to land in the wellhead (12); and

running a tubing (24) and tubing hanger (26) from a manufacturer different than the first manufacturer to land in the wellhead adapter (14).

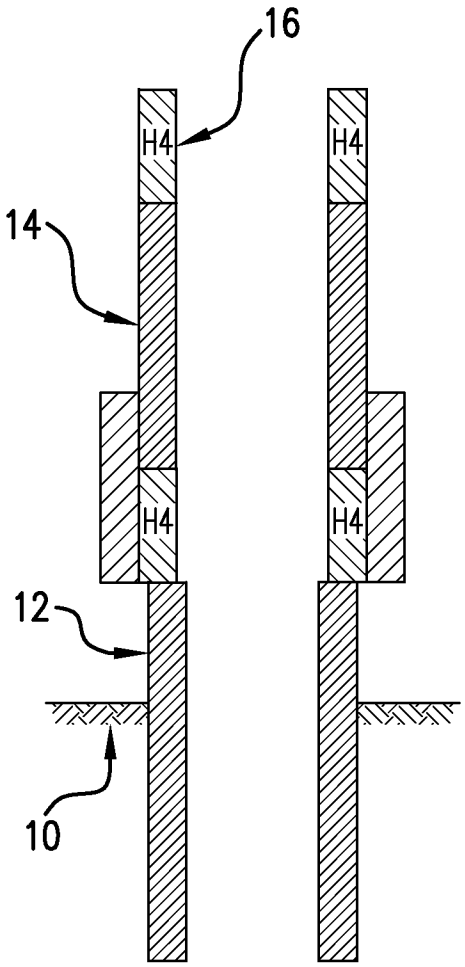


FIG.1

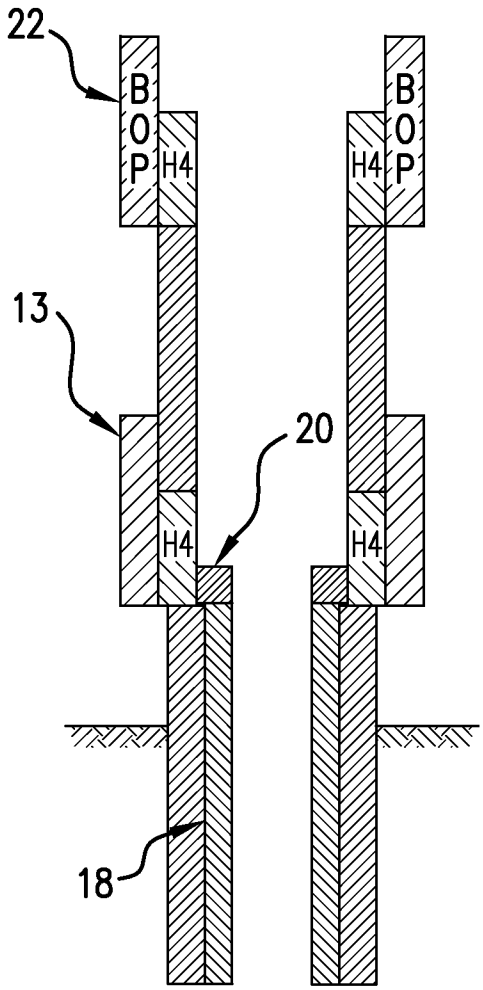


FIG.2

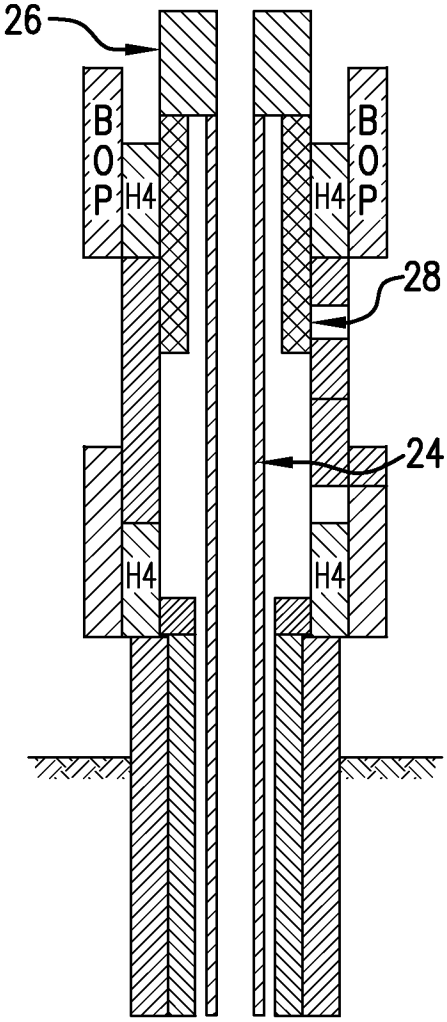


FIG.3

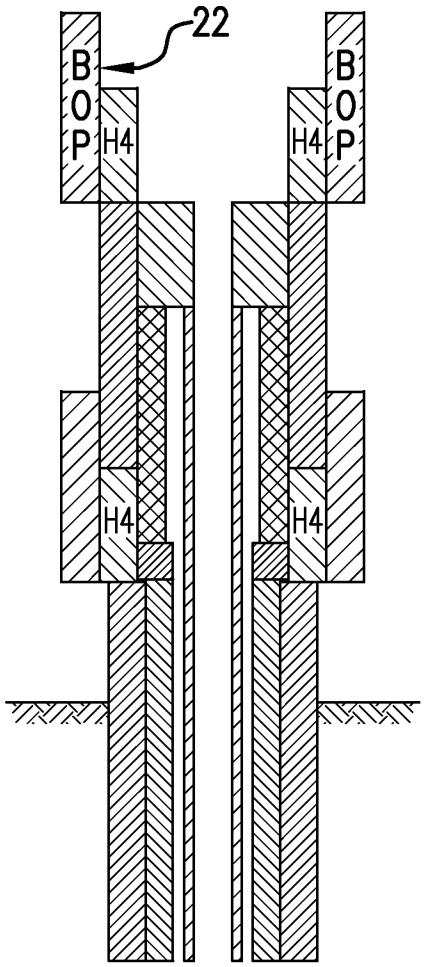


FIG.4

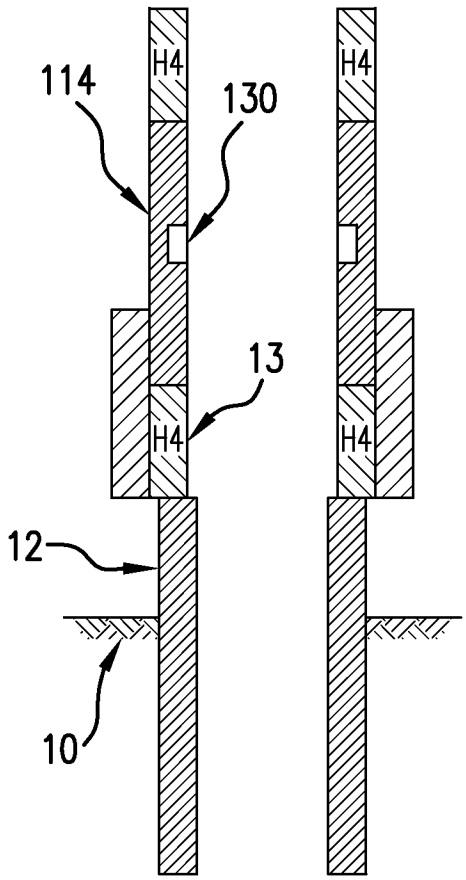


FIG.5

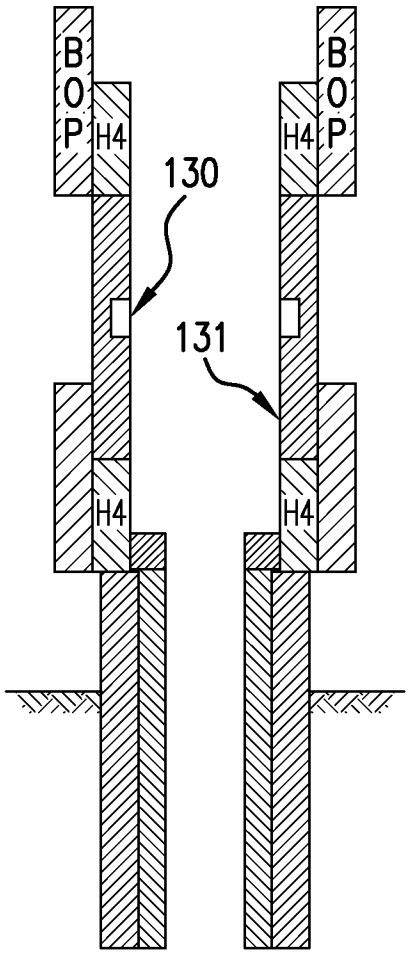


FIG.6

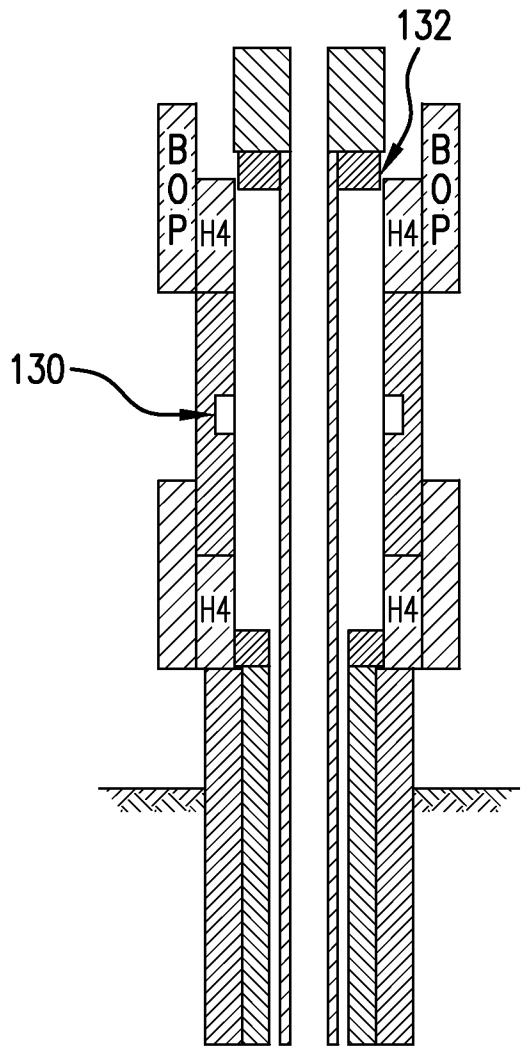


FIG.7

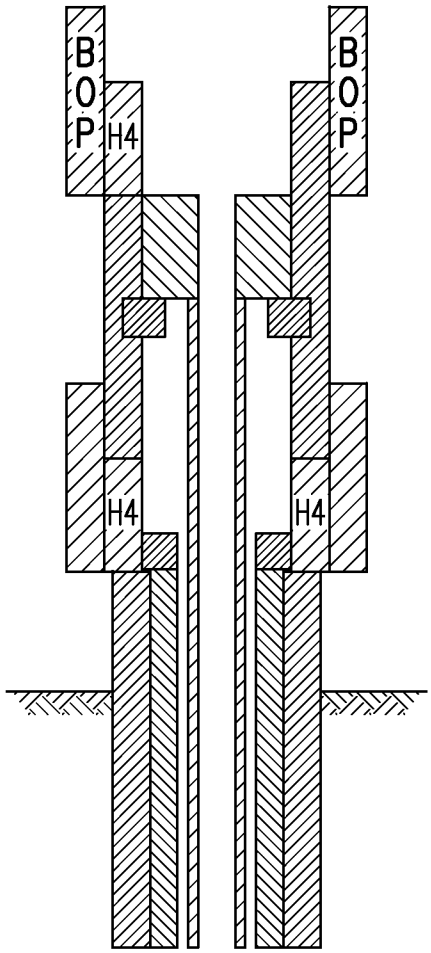


FIG.8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/063225

A. CLASSIFICATION OF SUBJECT MATTER

E21B 33/03(2006.01)i, E21B 33/04(2006.01)i, E21B 33/06(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 33/03; E21B 33/04; E21B 34/04; E21B 33/035; E21B 33/06

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: wellhead, adaptor, casing, tubing, hanger

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5725056 A (THOMSON, KENNETH) 10 March 1998 See column 1, line 7 - column 2, line 4; column 3, line 21 - column 4, line 5; column 5, line 60 - column 6, line 35; and figures 1-2, 5.	1-10
Y	US 2010-0101800 A1 (JUNE et al.) 29 April 2010 See paragraphs [0008], [0019], [0025]; and figures 1, 4.	1-10
A	US 2008-0006412 A1 (FORD, DAVID L.) 10 January 2008 See paragraphs [0024]-[0033]; and figures 1-2, 3A-3B.	1-10
A	US 2003-0136556 A1 (CORNELSSEN et al.) 24 July 2003 See paragraphs [0027]-[0038]; and figures 1-3.	1-10
A	WO 2008-098006 A1 (STREAM-FLO U.S.A. et al.) 14 August 2008 See paragraphs [0015]-[0017]; and figures 1A-1C.	1-10

☐ 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
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Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2015/063225

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