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(54) **EXTENDABLE ORIENTING TOOL FOR USE IN WELLS**

AUSZIEHBARES ORIENTIERUNGSWERKZEUG ZUR VERWENDUNG IN BOHRLÖCHERN

OUTIL D'ORIENTATION EXTENSIBLE DESTINÉ À ÊTRE UTILISÉ DANS DES PUITS

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Description

TECHNICAL FIELD

[0001] This disclosure relates generally to equipment utilized and operations performed in conjunction with subterranean wells and, in one example description below, more particularly provides an extendable orienting tool for use in wells.

BACKGROUND

[0002] Space in a wellbore is generally very limited, and so it is desirable to efficiently utilize space in a wellbore. Unfortunately, present orienting tools used to orient structures in wells can take up substantial space and, thus, can limit applicability of the orienting tools.

[0003] It will, therefore, be readily appreciated that improvements are continually needed in the arts of constructing and utilizing orienting tools.

[0004] US 2001/052428 A1 relates to a steerable drilling tool and

[0005] US 2012/106297 A1 relates to a downhole apparatus, device, assembly and method.

[0006] US 2010/0175923 A1 relates to an orientation sensor for a rotary steerable downhole tool.

[0007] A first aspect of the present invention provides an orienting tool as claimed in claim 1. A second aspect of the present invention provides method of orienting a structure as claimed in claim 6.

[0008] A third aspect of the present invention provides a well system as claimed in claim 11.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 is a representative partially cross-sectional view of a well system and associated method which can embody principles of this disclosure.

FIG. 2 is a representative cross-sectional view of the well system and method, wherein an orienting tool has been extended outward.

FIG. 3 is a representative cross-sectional view of one example of the orienting tool.

FIGS. 4-6 are representative cross-sectional views of additional examples of the orienting tool.

DETAILED DESCRIPTION

[0010] Representatively illustrated in FIG. 1 is an orienting system 10 for use with a well, and an associated method, which system and method can embody principles of this disclosure. However, it should be clearly understood that the system 10 and method are merely one example of an application of the principles of this disclosure in practice, and a wide variety of other examples are possible. Therefore, the scope of this disclosure is not limited at all to the details of the system 10 and method described herein and/or depicted in the drawings.

[0011] In the FIG. 1 example, a tubular string 12 is positioned in a wellbore 14. The tubular string 12 is depicted in FIG. 1 as comprising casing, but other types of tubular strings (such as, liner, tubing, screen, etc.) may be used in other examples.

[0012] The wellbore 14 is depicted in FIG. 1 as being generally horizontal and open hole or uncased, but in other examples the wellbore could be generally vertical or inclined, lined with casing, liner, cement, etc. Thus, the scope of this disclosure is not limited to the details of the tubular string 12 and the wellbore 14 as depicted in the drawings or described herein.

[0013] The tubular string 12 includes certain structures for which it is desired to indicate an orientation in the wellbore 14. These structures include a window 16 and an orienting profile 18, in the FIG. 1 example. However, it should be clearly understood that any type of structure may be oriented in a wellbore using the principles described in this disclosure. Other types of structures which could be oriented include, for example, a latch coupling for orienting and anchoring a diverter or whipstock, a perforating gun, a diverter or whipstock, etc. Thus, the scope of this disclosure is not limited to orienting any particular type of structure in a wellbore.

[0014] An orienting tool 20 is also connected in the tubular string 12. The orienting tool 20 indicates an azimuthal orientation of the window 16 and profile 18 relative to the wellbore 14 and gravity by selectively controlling fluid 22 flow between an interior and an exterior of the tool while the fluid is circulated through the tubular string 12.

[0015] In the FIG. 1 example, the fluid 22 flows through an interior flow passage 24 extending longitudinally through the tubular string 12. The fluid 22 exits a distal end (not shown) of the tubular string 12 and returns through an annulus 26 formed between the tubular string and the wellbore 14.

[0016] By selectively opening and closing (or decreasing and increasing flow through) a flow control device 28 of the tool 20, pressure signals can be transmitted to the earth's surface or another remote location having a pressure sensor to detect pressure in the flow passage 24. For example, when the flow control device 28 opens a pressure decrease is caused in the flow passage 24, and when the flow control device closes a pressure increase is caused in the flow passage.

[0017] These pressure manipulations can be used to transmit signals indicative of the orientation in the wellbore 14 of the tool 20, and of structures to which the tool is connected (such as, the window 16 and profile 18, etc.). Suitable techniques for transmitting such signals are described in US Publication No. 2012/0106297, although the scope of this disclosure is not limited to those

techniques.

[0018] For sensing an orientation of the tool 20 and connected structures in the well, the tool includes an orientation sensor 30 (such as, an accelerometer, a gyroscope, etc.), a processor 32 and memory 34. The processor 32 may be programmed to actuate the flow control device 28 in a particular manner (opened, closed, opening and closing at a predetermined rate, a specific pattern of openings and/or closings, etc.) when the orientation sensor 30 indicates that the tool 20 and connected structures are oriented as desired, or are not oriented as desired. Thus, the scope of this disclosure is not limited to any particular technique for transmitting orientation indicating signals to a remote location using the flow control device 28.

[0019] The flow control device 28 may comprise a valve or choke capable of regulating flow between the interior and exterior of a generally tubular body 36 of the tool 20. The flow control device 28, sensor 30, processor 32, memory 34 and batteries 38 may be mounted in a housing 40 that is outwardly extendable through a wall of the body 36.

[0020] Note that it is not necessary for all of the flow control device 28, sensor 30, processor 32, memory 34 and batteries 38 to be contained in the housing 40, or for any of these components to be contained in a housing at all. Thus, the scope of this disclosure is not limited to any particular arrangement or combination of components in the tool 20.

[0021] As depicted in FIG. 1, the housing 40 is retracted into the body 36. This configuration allows the tool 20 to be displaced through casing strings and other restrictions when the tubular string 12 is being installed in the wellbore 14. After a reduced outer dimension of the tool 20 is no longer needed, the housing 40 can be extended outward from the body 36, as representatively illustrated in FIG. 2.

[0022] In the FIG. 2 configuration, an interior dimension D of the tool 20 is increased, due to the outward extension of the housing 40. This increased interior dimension D allows for displacement of fluids (such as, cement, stimulation fluids, etc.) and objects (such as, a cementing dart 42, other types of tools, etc.) through the passage 24 with less restriction.

[0023] The housing 40 may be displaced outward at any desired point in an orienting procedure. For example, the housing 40 may be displaced outward either before or after the tool 20 is oriented as desired in the wellbore 14, before or after the orientation indicating signals are transmitted by the flow control device 28, etc.

[0024] In one example, the housing 40 may be extended outwardly in response to an object (e.g., the dart 42, a plug, a ball, a probe, etc.) displacing through the body 36 and biasing the housing 40 outward. For example, the dart 42 could apply an outwardly biasing force to the housing 40 when the dart is pumped through the body 36 to initiate a cementing operation.

[0025] Representatively illustrated in FIGS. 3-5 are additional examples of techniques for extending the housing 40 outward. However, it should be understood that these are merely examples of a wide variety of different techniques for displacing the housing 40, and the scope of this disclosure is not limited to use of any particular displacement technique.

[0026] In the FIG. 3 example, a seal 44 is provided between the housing 40 and the body 36, so that a pressure differential can be applied across the housing between the interior and the exterior of the body 36. When a predetermined pressure differential is applied (for example, after landing a plug or cementing dart 42 below), the housing 40 displaces outward through the wall of the body 36. The predetermined pressure differential could be set, for example, by shear pins, other types of shear members, a pressure operated latch, etc. FIG. 3 depicts the housing 40 midway between its retracted and extended configurations.

[0027] In the FIG. 4 example, biasing devices 46 (such as, springs, compressed gas chambers, etc.) apply outwardly biasing forces to the housing 40. The housing 40 may be released for displacement in response to the biasing forces by latches 48. The latches 48 may be controlled by the processor 32.

[0028] In the FIG. 5 example, motors 50 (such as, electrical motors, hydraulic motors, etc.) displace the housing 40 outward. For example, the motors 50 could rotate threaded rods which engage internally threaded components attached to the body 36. Other types of drive mechanisms may be used, as desired.

[0029] Representatively illustrated in FIG. 6 is a cross-sectional view of yet another example of the orienting tool 20. In this example, the housing 40 is extended outward in response to a signal 52 (for example, an electromagnetic or acoustic signal, etc.) transmitted from an object 54 (such as, a ball, dart, plug, etc.) which is displaced (e.g., flowed, dropped, conveyed, etc.) through the passage 24. For example, the object 54 could transmit a radio frequency identification (RFID, e.g., passive and active tagging device technology) signal to the orienting tool 20.

[0030] The tool 20 includes a receiver or sensor 56 which detects the signal 52. The processor 32 may release the latches 48 in the FIGS. 3, 4 & 6 examples, activate the motors 50 in the FIG. 5 example, or otherwise allow the housing 40 to be outwardly extended, in response to receipt of an appropriate signal 52 from the object 54.

[0031] Alternatively, the object 54 may not be used, and the sensor 56 may detect pressure in the passage 24 as manipulated from a remote location. For example, the sensor 56 could comprise a pressure sensor which detects pressure in the passage 24. A particular level and/or pattern of pressure increases and/or decreases may be used as a signal to cause the housing 40 to extend outwardly.

[0032] Any manner of transmitting a signal to the tool 20 to cause the housing 40 to extend outwardly may be

used in keeping with the scope of this disclosure. For example, the signal may be transmitted wirelessly (e.g., by electromagnetic, acoustic, pressure pulse, etc., telemetry) or by use of electric, hydraulic, optical, etc., conductors (e.g., interior to, exterior to, and/or in a wall of the tubular string 12).

[0033] When the signal to extend the housing 40 outwardly has been received, the tool 20 can confirm receipt of the signal by transmitting a confirmation signal back to the remote location, such as, by using the flow control device 28 to selectively control flow between the interior and exterior of the body 36, as described above. When the housing 40 has been extended fully outward, the tool 20 can transmit a signal to the remote location indicating that the tool is in its extended configuration.

[0034] In other examples, the housing 40 could be extended by driving it outward with a drift (e.g., conical or otherwise shaped) displaced through the passage 24. Thus, the scope of this disclosure is not limited to any particular technique used for extending the housing 40 outward.

[0035] Once the housing 40 has been extended outward, it may be locked in that position. In this manner, the passage 24 will not subsequently be restricted by the presence of the housing 40 therein. Any manner of locking the housing 40 in its outwardly extended position may be used, in keeping with the scope of this disclosure.

[0036] It may now be fully appreciated that the above disclosure provides significant advancements to the art of constructing and operating orienting tools. In examples described above, the housing 40 (with or without the flow control device 28, orientation sensor 30, etc. therein) can be retracted while the tool 20 is installed in a well, and then the housing can be extended outward, in order to increase the interior dimension D in the body 36 of the tool, thereby decreasing a restriction in the tool.

[0037] An orienting tool 20 for use in wells is provided to the art by the above disclosure. In one example, the orienting tool 20 can include a flow control device 28 which controls flow between an interior and an exterior of a body 36 of the orienting tool 20 to thereby transmit at least one signal indicative of an orientation of the body 36. The flow control device 28 is outwardly extendable relative to the body 36.

[0038] The body 36 may be generally tubular shaped. The flow control device 28 may be contained in a housing 40 which extends outwardly through a wall of the body 36.

[0039] The outward extension of the flow control device 28 can increase an interior dimension D in the body 36.

[0040] The flow control device 28 may extend outwardly in response to a biasing force applied by an object (such as the dart 42) which displaces in the body 36, in response to application of a predetermined pressure to an interior of the body 36, in response to application of a predetermined pressure pattern to the tool 20, in response to application of a predetermined pressure differential to the tool 20, in response to a signal 52 transmitted by an object 54 which displaces in the body 36, or in response to transmission of a predetermined signal to the tool 20.

[0041] The orienting tool 20 may include a sensor 56 which receives a signal 52 transmitted by an object 54 in the body 36.

[0042] The orienting tool 20 may include a motor 50 and/or a biasing device 46 which displaces the flow control device 28.

[0043] A method of orienting a structure (such as, the window 16, the orienting profile 18, etc.) in a subterranean well is also described above. In one example, the method can comprise transmitting at least one signal from an orienting tool 20, the signal being indicative of an orientation of the orienting tool 20 in the well; and displacing a housing 40 of the orienting tool 20 outward relative to a generally tubular body 36 of the orienting tool 20.

[0044] The method can include connecting the orienting tool 20 at a known orientation relative to the structure, and positioning the structure and the orienting tool 20 in the well.

[0045] The step of displacing the housing 40 may be performed after the step of positioning the structure and the tool 20 in the well.

[0046] The transmitting step can include a flow control device 28 controlling flow between an interior and an exterior of the body 36 to thereby transmit the signal.

[0047] The flow control device 28 may be contained in the housing 40.

[0048] The displacing step can include increasing an interior dimension D in the body 36.

[0049] The displacing step may be performed in response to a biasing force applied by an object which displaces in the body 36, in response to application of a predetermined pressure to an interior of the body 36, in response to application of a predetermined pressure pattern to the tool 20, in response to application of a predetermined pressure pattern to the tool 20, in response to transmission of a signal by an object 54 which displaces in the body 36, or in response to application of a predetermined pressure differential to the tool 20.

[0050] A well system 10 is also described above. In one example, the well system can include an orienting tool 20 connected to a structure (e.g., the window 16, the orienting profile 18, etc.) and positioned in a wellbore 14, the orienting tool 20 including a housing 40 which is outwardly extendable relative to a generally tubular body 36, the orienting tool 20 being configured to transmit at least one signal indicative of an orientation of the structure.

[0051] Although various examples have been described above, with each example having certain features, it should be understood that it is not necessary for a particular feature of one example to be used exclusively with that example. Instead, any of the features described above and/or depicted in the drawings can be combined with any of the examples, in addition to or in substitution for any of the other features of those examples. One ex-

ample's features are not mutually exclusive to another example's features. Instead, the scope of this disclosure encompasses any combination of any of the features.

[0052] Although each example described above includes a certain combination of features, it should be understood that it is not necessary for all features of an example to be used. Instead, any of the features described above can be used, without any other particular feature or features also being used.

[0053] It should be understood that the various embodiments described herein may be utilized in various orientations, such as inclined, inverted, horizontal, vertical, etc., and in various configurations, without departing from the principles of this disclosure. The embodiments are described merely as examples of useful applications of the principles of the disclosure, which is not limited to any specific details of these embodiments.

[0054] In the above description of the representative examples, directional terms (such as "above," "below," "upper," "lower," etc.) are used for convenience in referring to the accompanying drawings. However, it should be clearly understood that the scope of this disclosure is not limited to any particular directions described herein.

[0055] The terms "including," "includes," "comprising," "comprises," and similar terms are used in a non-limiting sense in this specification. For example, if a system, method, apparatus, device, etc., is described as "including" a certain feature or element, the system, method, apparatus, device, etc., can include that feature or element, and can also include other features or elements. Similarly, the term "comprises" is considered to mean "comprises, but is not limited to."

[0056] Of course, a person skilled in the art would, upon a careful consideration of the above description of representative embodiments of the disclosure, readily appreciate that many modifications, additions, substitutions, deletions, and other changes may be made to the specific embodiments, and such changes are contemplated by the principles of this disclosure. For example, structures disclosed as being separately formed can, in other examples, be integrally formed and *vice versa*. Accordingly, the foregoing detailed description is to be clearly understood as being given by way of illustration and example only.

Claims

1. An orienting tool (20) for use in wells, the orienting tool comprising:
   a housing (40), said housing containing: an orientation sensor (30), a processor (32) and a flow control device (28); the processor being configured to actuate the flow control device (28) based on indications of the orientation sensor, and the flow control device (28) controlling flow between an interior and an exterior of a body (36) of the orienting tool to thereby transmit at least one signal indicative of an orientation of the body, the housing being outwardly extendable relative to the body.

2. The orienting tool of claim 1, wherein the body is generally tubular shaped, and the housing (40) extends outwardly through a wall of the body.

3. The orienting tool of claim 1, wherein outward extension of the housing increases an interior dimension in the body.

4. The orienting tool of claim 1, wherein the housing extends outwardly in response to:

   (a) a biasing force applied by an object (42) which displaces in the body; or
   (b) application of a predetermined pressure to an interior of the body; or
   (c) application of a predetermined pressure pattern to the tool; or
   (d) application of a predetermined pressure differential to the tool; or
   (e) a signal transmitted by an object (54) which displaces in the body; or
   (f) transmission of a signal from a remote location to the tool.

5. The orienting tool of claim 1, further comprising:

   (a) a sensor (56) which receives a signal transmitted by an object in the body; or
   (b) a motor (50) which displaces the housing; or
   (c) a biasing device (46) which displaces the housing.

6. A method of orienting a structure in a subterranean well, the method comprising:
   providing an orienting tool (20), said orienting tool comprising:

   a housing (40) containing: an orienting sensor (30) and a processor (32); the housing containing a flow control device (28); and the processor being configured to actuate the flow control device (28) based on indications of the orientation sensor, the flow control device (28) controlling flow between an interior and an exterior of a generally tubular body (36) of the orienting tool to thereby transmit at least one signal indicative of an orientation of the generally tubular body;
   the method further comprising transmitting at least one signal from said orienting tool (20), the signal being indicative of an orientation of the orienting tool in the well, and displacing the housing (40) of the orienting tool outward relative to the generally tubular body of the orienting tool.

7. The method of claim 6, further comprising connecting the orienting tool at a known orientation relative to the structure, and positioning the structure and the orienting tool in the well, preferably wherein the displacing is performed after the positioning.

8. The method of claim 6, wherein the displacing further comprises:

(a) increasing an interior dimension in the body; or
(b) a motor (50) displacing the housing; or
(c) a biasing device (46) displacing the housing.

9. The method of claim 6, wherein the displacing is performed in response to:

(a) a biasing force applied by an object (42) which displaces in the body; or
(b) application of a predetermined pressure to an interior of the body; or
(c) application of a predetermined pressure pattern to the tool; or
(d) application of a predetermined pressure differential to the tool; or
(e) transmission of a signal by an object (54) which displaces in the body; or
(f) transmission of a signal from a remote location to the tool.

10. The method of claim 6, further comprising a sensor (56) the orienting tool receiving a signal transmitted by an object in the body.

11. A well system, comprising:
an orienting tool (20) connected to a structure (16,18) and positioned in a wellbore, the orienting tool configured to transmit at least one signal indicative of an orientation of the structure, wherein the orienting tool includes a housing (40) which contains a processor (32) and an orientation sensor (30); wherein the housing is outwardly extendable relative to a generally tubular body (36) of the orienting tool, and wherein the housing contains a flow control device (28) which controls flow between an interior and exterior of the body to thereby transmit said at least one signal; the processor being configured to actuate the flow control device (28) based on indications of the orientation sensor.

12. The well system of claim 11, wherein outward extension of the housing increases an interior dimension in the body.

13. The well system of claim 11, wherein the housing extends outwardly in response to:

(a) a biasing force applied by an object (42) which displaces in the body; or
(b) application of a predetermined pressure to an interior of the body; or
(c) application of a predetermined pressure pattern to the tool; or
(d) application of a predetermined pressure differential to the tool; or
(e) a signal transmitted by an object (54) which displaces in the body; or
(f) transmission of a predetermined signal from a remote location to the tool.

14. The well system of claim 11, wherein the orienting tool further includes a motor (50) which displaces the housing.

15. The well system of claim 11, wherein the orienting tool further includes a biasing device (46) which displaces the housing.

Patentansprüche

1. Orientierungswerkzeug (20) zur Verwendung in Bohrlöchern, wobei das Orientierungswerkzeug Folgendes umfasst:
ein Gehäuse (40), wobei das Gehäuse Folgendes enthält: einen Orientierungssensor (30), einen Prozessor (32) und eine Strömungssteuerungsvorrichtung (28); wobei der Prozessor dazu konfiguriert ist, die Strömungssteuerungsvorrichtung (28) auf Grundlage von Anzeigen des Orientierungssensors zu betätigen, und wobei die Strömungssteuerungsvorrichtung (28) eine Strömung zwischen einem Inneren und einem Äußeren eines Körpers (36) des Orientierungswerkzeugs steuert, um dadurch mindestens ein Signal, das eine Orientierung des Körpers anzeigt, zu übertragen, wobei das Gehäuse in Bezug auf den Körper nach außen ausziehbar ist.

2. Orientierungswerkszeug nach Anspruch 1, wobei der Körper im Allgemeinen rohrförmig ist und sich das Gehäuse (40) durch eine Wand des Körpers nach außen erstreckt.

3. Orientierungswerkzeug nach Anspruch 1, wobei ein Ausziehen des Gehäuses nach außen eine Innenabmessung des Körpers erhöht.

4. Orientierungswerkzeug nach Anspruch 1, wobei sich das Gehäuse als Reaktion auf Folgendes nach außen erstreckt:

(a) eine Vorspannungskraft, die durch ein Objekt (42) aufgebracht wird, das sich in dem Körper verschiebt; oder
(b) Aufbringen eines vorbestimmten Drucks auf ein Inneres des Körpers; oder

(c) Aufbringen eines vorbestimmten Druckverlaufs auf das Werkzeug; oder
(d) Aufbringen eines vorbestimmten Druckunterschieds auf das Werkzeug; oder
(e) ein Signal, das durch ein Objekt (54) übertragen wird, das sich in dem Körper verschiebt; oder
(f) Übertragen eines Signals von einem von dem Werkzeug entfernten Ort.

5. Orientierungswerkzeug nach Anspruch 1, ferner umfassend:

(a) einen Sensor (56), der ein Signal empfängt, das durch ein Objekt in dem Körper übertragen wird; oder
(b) einen Motor (50), der das Gehäuse verschiebt; oder
(c) eine Vorspannvorrichtung (46), die das Gehäuse verschiebt.

6. Verfahren zum Orientieren einer Struktur in einem unterirdischen Bohrloch, wobei das Verfahren Folgendes umfasst: Bereitstellen eines Orientierungswerkzeugs (20), wobei das Orientierungswerkzeug Folgendes umfasst:

ein Gehäuse (40), das Folgendes enthält: einen Orientierungssensor (30) und einen Prozessor (32);
wobei das Gehäuse eine Strömungssteuerungsvorrichtung (28) enthält; und wobei der Prozessor dazu konfiguriert ist, die Strömungssteuerungsvorrichtung (28) auf Grundlage von Anzeigen des Orientierungssensors zu betätigen, wobei die Strömungssteuerungsvorrichtung (28) eine Strömung zwischen einem Inneren und einem Äußeren eines im Allgemeinen rohrförmigen Körpers (36) des Orientierungswerkzeugs steuert, um dadurch mindestens ein Signal, das eine Orientierung des im Allgemeinen rohrförmigen Körpers anzeigt, zu übertragen;
wobei das Verfahren ferner das Übertragen von mindestens einem Signal von dem Orientierungswerkzeug (20), wobei das Signal eine Orientierung des Orientierungswerkzeugs in dem Bohrloch anzeigt, und ein Verschieben des Gehäuses (40) des Orientierungswerkzeugs in Bezug auf den im Allgemeinen rohrförmigen Körper des Orientierungswerkzeugs nach außen umfasst.

7. Verfahren nach Anspruch 6, ferner umfassend das Verbinden des Orientierungswerkzeugs bei einer bekannten Orientierung in Bezug auf die Struktur, und das Positionieren der Struktur und des Orientierungswerkzeugs in dem Bohrloch, wobei das Verschieben vorzugsweise nach dem Positionieren durchgeführt wird.

8. Verfahren nach Anspruch 6, wobei das Verschieben ferner Folgendes umfasst:

(a) Erhöhen einer Innenabmessung in dem Körper; oder
(b) einen Motor (50), der das Gehäuse verschiebt; oder
(c) eine Vorspannvorrichtung (46), die das Gehäuse verschiebt.

9. Verfahren nach Anspruch 6, wobei das Verschieben als Reaktion auf Folgendes durchgeführt wird:

(a) eine Vorspannungskraft, die durch ein Objekt (42) aufgebracht wird, das sich in dem Körper verschiebt; oder
(b) Aufbringen eines vorbestimmten Drucks auf ein Inneres des Körpers; oder
(c) Aufbringen eines vorbestimmten Druckverlaufs auf das Werkzeug; oder
(d) Aufbringen eines vorbestimmten Druckunterschieds auf das Werkzeug; oder
(e) Übertragen eines Signals durch ein Objekt (54), das sich in dem Körper verschiebt; oder
(f) Übertragen eines Signals von einem von dem Werkzeug entfernten Ort.

10. Verfahren nach Anspruch 6, ferner umfassend, dass ein Sensor (56) des Orientierungswerkzeugs ein Signal empfängt, das durch ein Objekt in dem Körper übertragen wird.

11. Bohrlochsystem, das Folgendes umfasst:

ein Orientierungswerkzeug (20), das mit einer Struktur (16, 18) verbunden und in einem Bohrloch positioniert ist, wobei das Orientierungswerkzeug dazu konfiguriert ist, mindestens ein Signal, das eine Orientierung der Struktur anzeigt, zu übertragen, wobei das Orientierungswerkzeug ein Gehäuse (40) beinhaltet, das einen Prozessor (32) und einen Orientierungssensor (30) enthält;
wobei das Gehäuse in Bezug auf einen im Allgemeinen rohrförmigen Körper (36) des Orientierungswerkzeugs ausziehbar ist, und wobei das Gehäuse eine Strömungssteuerungsvorrichtung (28) enthält, die eine Strömung zwischen einem Inneren und einem Äußeren des Körpers steuert, um dadurch das mindestens eine Signal zu übertragen; wobei der Prozessor dazu konfiguriert ist, die Strömungssteuervorrichtung (28) auf Grundlage von Anzeigen des Orientierungssensors zu betätigen.

12. Bohrlochsystem nach Anspruch 11, wobei das Ausziehen des Gehäuses nach außen eine Innenabmessung des Körpers erhöht.

13. Bohrlochsystem nach Anspruch 11, wobei sich das Gehäuse als Reaktion auf Folgendes nach außen erstreckt:

(a) eine Vorspannungskraft, die durch ein Objekt (42) aufgebracht wird, das sich in dem Körper verschiebt; oder
(b) Aufbringen eines vorbestimmten Drucks auf ein Inneres des Körpers; oder
(c) Aufbringen eines vorbestimmten Druckverlaufs auf das Werkzeug; oder
(d) Aufbringen eines vorbestimmten Druckunterschieds auf das Werkzeug; oder
(e) ein Signal, das durch ein Objekt (54) übertragen wird, das sich in dem Körper verschiebt; oder
(f) Übertragen eines vorbestimmten Signals von einem von dem Werkzeug entfernten Ort.

14. Bohrlochsystem nach Anspruch 11, wobei das Orientierungswerkzeug ferner einen Motor (50) beinhaltet, der das Gehäuse verschiebt.

15. Bohrlochsystem nach Anspruch 11, wobei das Orientierungswerkzeug ferner eine Vorspannvorrichtung (46) beinhaltet, die das Gehäuse verschiebt.

Revendications

1. Outil d'orientation (20) destiné à être utilisé dans des puits, l'outil d'orientation comprenant :
un boîtier (40), ledit boîtier contenant : un capteur d'orientation (30), un processeur (32) et un dispositif de contrôle de flux (28) ; le processeur étant configuré pour actionner le dispositif de contrôle de flux (28) sur la base d'indications du capteur d'orientation, et le dispositif de contrôle de flux (28) contrôlant le flux entre un intérieur et un extérieur d'un corps (36) de l'outil d'orientation afin de transmettre ainsi au moins un signal indiquant une orientation du corps, le boîtier pouvant être étendu vers l'extérieur par rapport au corps.

2. Outil d'orientation selon la revendication 1, dans lequel le corps est de forme généralement tubulaire et le boîtier (40) s'étend vers l'extérieur à travers une paroi du corps.

3. Outil d'orientation selon la revendication 1, dans lequel l'extension vers l'extérieur du boîtier augmente une dimension intérieure dans le corps.

4. Outil d'orientation selon la revendication 1, dans lequel le boîtier s'étend vers l'extérieur en réponse à :

(a) une force de sollicitation appliquée par un objet (42) qui se déplace dans le corps ; ou
(b) une application d'une pression prédéterminée à un intérieur du corps ; ou
(c) une application d'un motif de pression prédéterminé à l'outil ; ou
(d) une application d'un différentiel de pression prédéterminé à l'outil ; ou
(e) un signal transmis par un objet (54) qui se déplace dans le corps ; ou
(f) une transmission d'un signal d'un emplacement distant à l'outil.

5. Outil d'orientation selon la revendication 1, comprenant en outre :

(a) un capteur (56) qui reçoit un signal transmis par un objet dans le corps ; ou
(b) un moteur (50) qui déplace le boîtier ; ou
(c) un dispositif de sollicitation (46) qui déplace le boîtier.

6. Procédé d'orientation d'une structure dans un puits souterrain, le procédé comprenant :
la fourniture d'un outil d'orientation (20), ledit outil d'orientation comprenant :

un boîtier (40) contenant : un capteur d'orientation (30) et
un processeur (32) ;
le boîtier contenant un dispositif de contrôle de flux (28) ;
et le processeur étant configuré pour actionner le dispositif de contrôle de flux (28) sur la base d'indications du capteur d'orientation, le dispositif de contrôle de flux (28) contrôlant le flux entre un intérieur et un extérieur d'un corps généralement tubulaire (36) de l'outil d'orientation pour transmettre ainsi au moins un signal indiquant une orientation du corps généralement tubulaire ;
le procédé comprenant en outre la transmission d'au moins un signal dudit outil d'orientation (20), le signal indiquant une orientation de l'outil d'orientation dans le puits, et le déplacement du boîtier (40) de l'outil d'orientation vers l'extérieur par rapport au corps généralement tubulaire de l'outil d'orientation.

7. Procédé selon la revendication 6, comprenant en outre le raccordement de l'outil d'orientation dans une orientation connue par rapport à la structure et le positionnement de la structure et de l'outil d'orientation dans le puits, de préférence dans lequel le déplacement est effectué après le positionnement.

8. Procédé selon la revendication 6, dans lequel le déplacement comprend en outre :

(a) l'augmentation d'une dimension intérieure dans le corps ; ou
(b)un moteur (50) déplaçant le boîtier ; ou
(c)un dispositif de sollicitation (46) déplaçant le boîtier.

9. Procédé selon la revendication 6, dans lequel le déplacement est effectué en réponse à :

(a) une force de sollicitation appliquée par un objet (42) qui se déplace dans le corps ; ou
(b)une application d'une pression prédéterminée à un intérieur du corps ; ou
(c) une application d'un motif de pression prédéterminé à l'outil ; ou
(d) une application d'un différentiel de pression prédéterminé à l'outil ; ou
(e) une transmission d'un signal par un objet (54) qui se déplace dans le corps ; ou
(f) transmission d'un signal d'un emplacement distant à l'outil.

10. Procédé selon la revendication 6, comprenant en outre un capteur (56) de l'outil d'orientation recevant un signal transmis par un objet dans le corps.

11. Système de puits, comprenant :
un outil d'orientation (20) raccordé à une structure (16, 18) et positionné dans un puits de forage, l'outil d'orientation étant configuré pour transmettre au moins un signal indiquant une orientation de la structure, dans lequel l'outil d'orientation comprend un boîtier (40) qui contient un processeur (32) et un capteur d'orientation (30) ; dans lequel le boîtier est extensible vers l'extérieur par rapport à un corps généralement tubulaire (36) de l'outil d'orientation, et dans lequel le boîtier contient un dispositif de contrôle de flux (28) qui contrôle le flux entre un intérieur et un extérieur du corps pour transmettre ainsi ledit au moins un signal ; le processeur étant configuré pour actionner le dispositif de contrôle de flux (28) sur la base d'indications du capteur d'orientation.

12. Système de puits selon la revendication 11, dans lequel l'extension vers l'extérieur du boîtier augmente une dimension intérieure dans le corps.

13. Système de puits selon la revendication 11, dans lequel le boîtier s'étend vers l'extérieur en réponse à :

(a) une force de sollicitation appliquée par un objet (42) qui se déplace dans le corps ; ou
(b)une application d'une pression prédéterminée à un intérieur du corps ; ou
(c) une application d'un motif de pression prédéterminé à l'outil ; ou
(d) une application d'un différentiel de pression prédéterminé à l'outil ; ou
(e) un signal transmis par un objet (54) qui se déplace dans le corps ; ou
(f) une transmission d'un signal prédéterminé d'un emplacement distant à l'outil.

14. Système de puits selon la revendication 11, dans lequel l'outil d'orientation comprend en outre un moteur (50) qui déplace le boîtier.

15. Système de puits selon la revendication 11, dans lequel l'outil d'orientation comprend en outre un dispositif de sollicitation (46) qui déplace le boîtier.

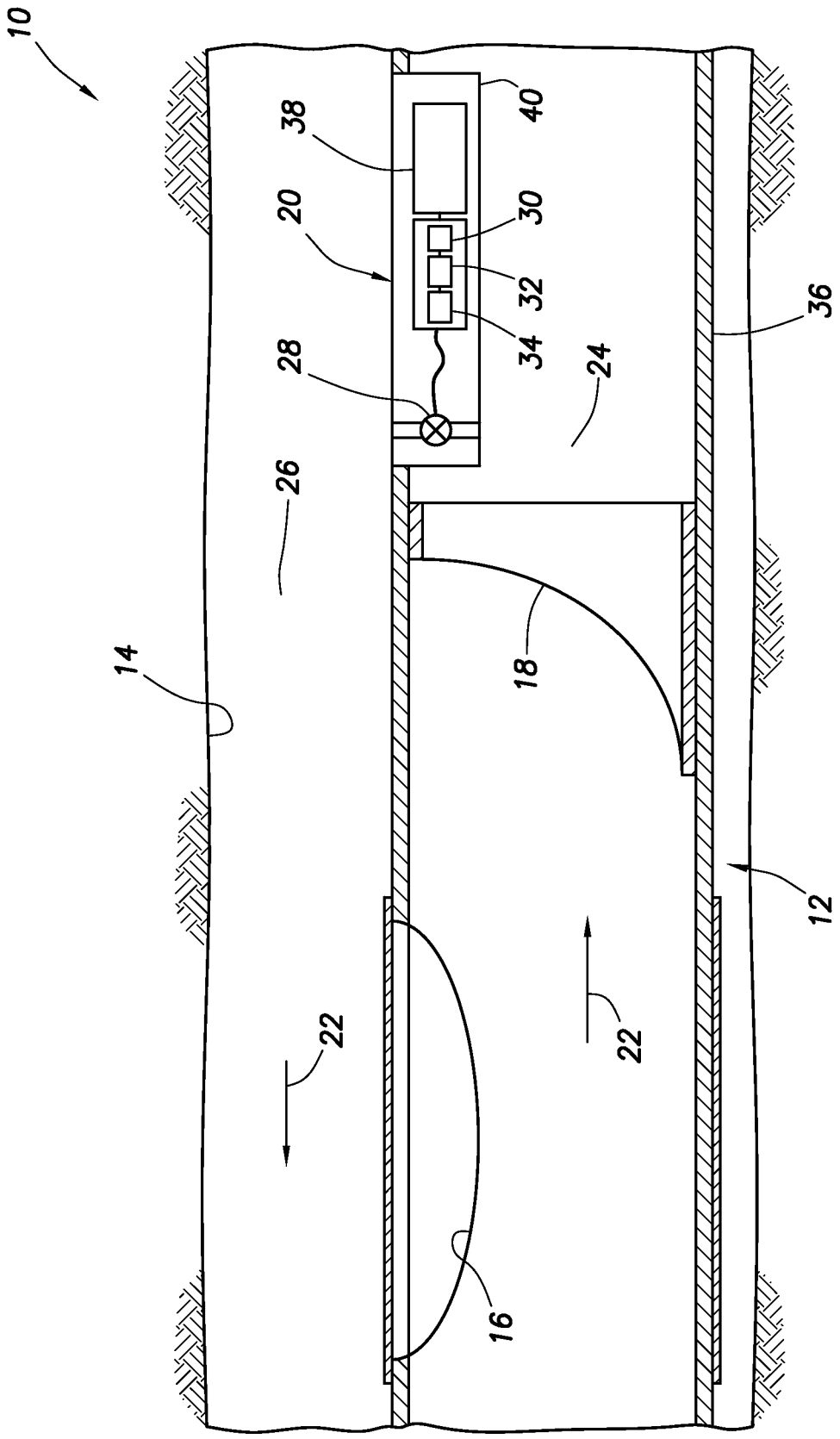

FIG. 1

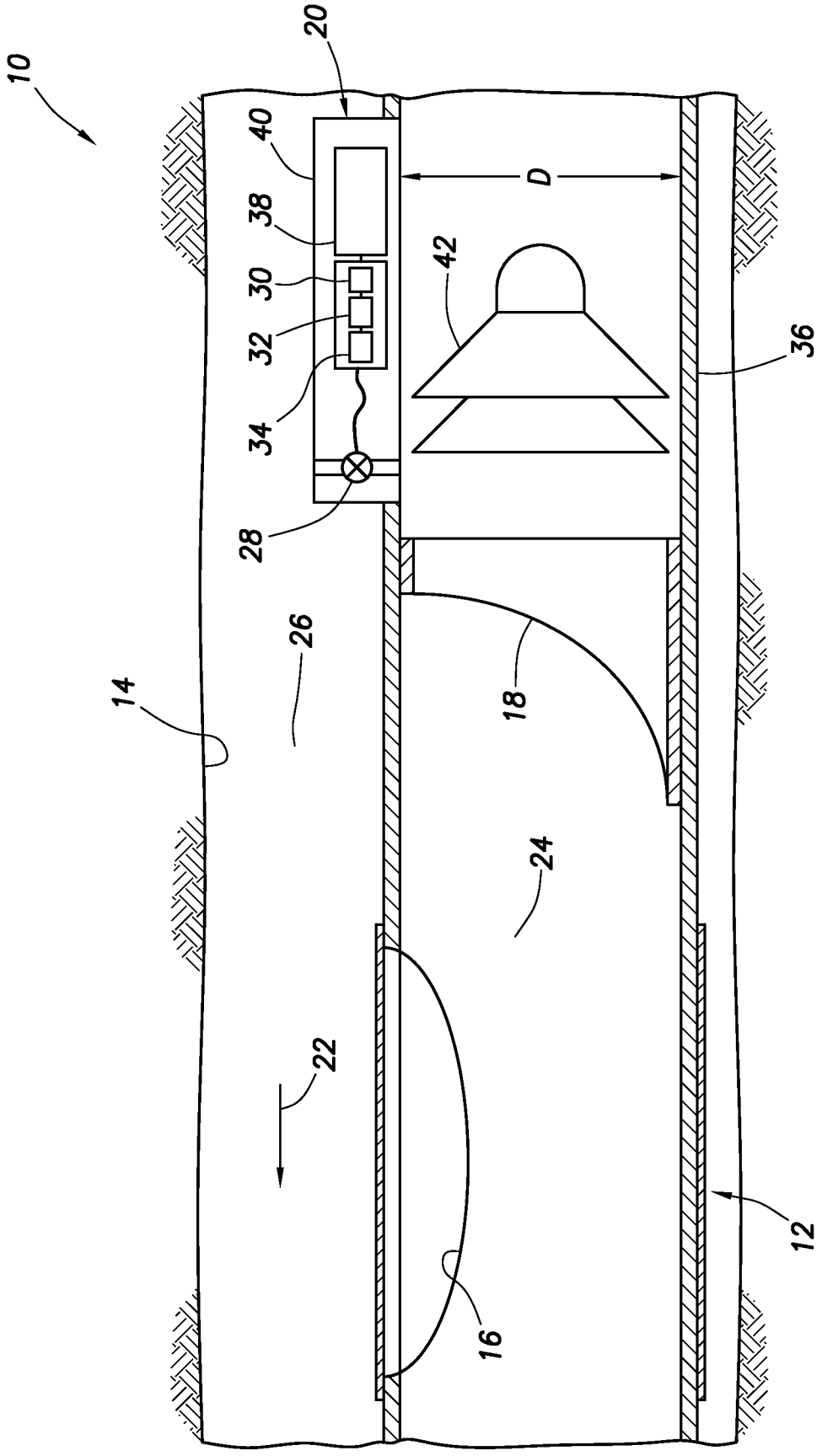

FIG.2

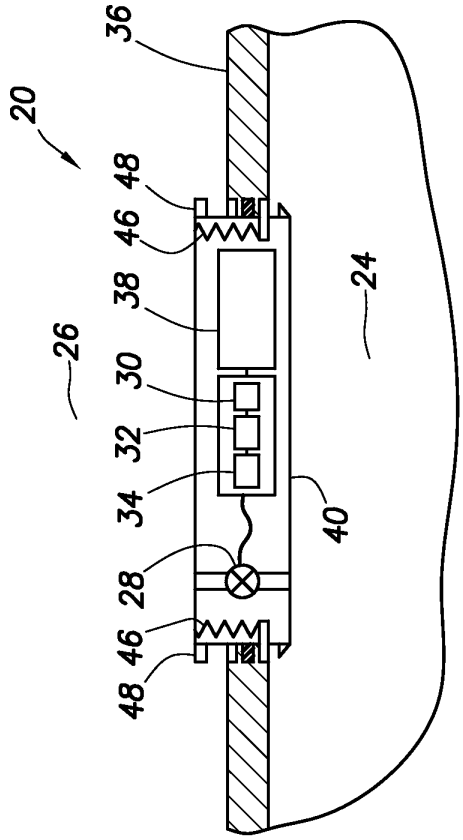

FIG.4

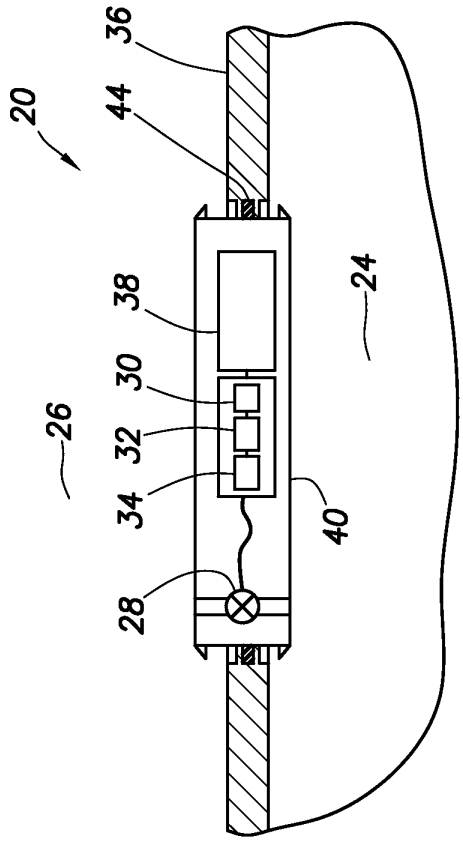

FIG.3

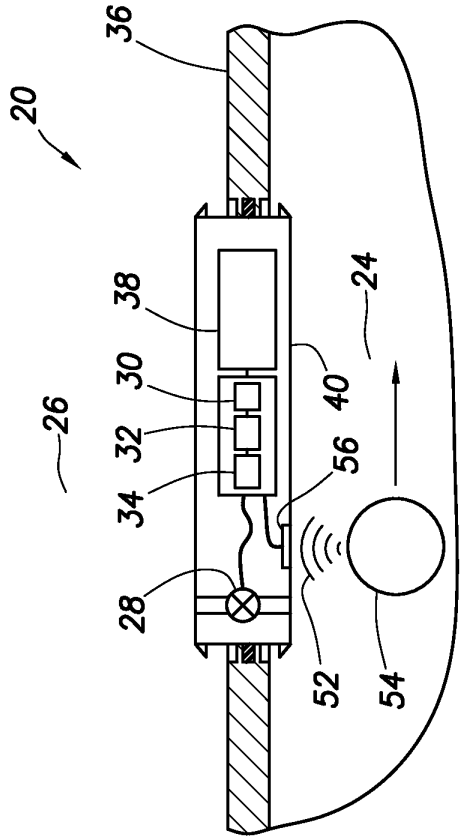

FIG.6

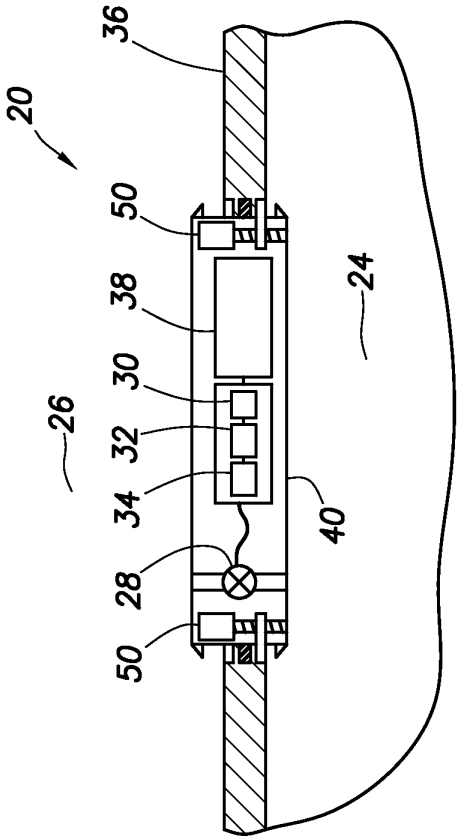

FIG.5

REFERENCES CITED IN THE DESCRIPTION

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