(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 108 780 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.10.2009 Bulletin 2009/42

(51) Int Cl.:
E21B 7/00 *(2006.01)* ***E21B 17/04*** *(2006.01)*
E21B 19/22 *(2006.01)*

(21) Application number: **08007083.2**

(22) Date of filing: **10.04.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(71) Applicant: **Graham, Robert**
2920 Charlottenlund (DK)

(72) Inventor: **Graham, Robert**
2920 Charlottenlund (DK)

(74) Representative: **Nordic Patent Service**
Pilestræde 58
1112 Copenhagen K (DK)

(54) **Hybrid drilling method**

(57) A method for drilling in which coiled tubing and jointed pipe are combined in a way in which jointed pipe can be rotated with conventional equipment, and in which tripping in and out of the hole can be performed with coiled tubing that is not pressurized. An assembly including crossovers and eventually a swivel for connecting coiled tubing to conventional drill string elements.

It is suggested that Fig. 1 is published with the abstract.

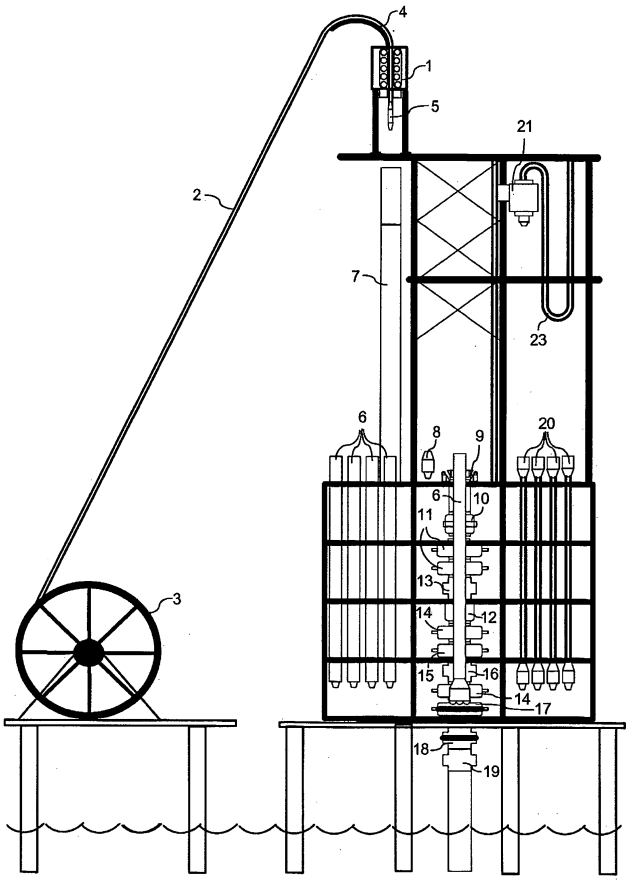

FIG. 1

EP 2 108 780 A1

Description

[0001] The present application relates to drilling methods in which coiled tubing and jointed pipe are used in combination.

BACKGROUND OF THE INVENTION

[0002] New innovations in drilling technology are typically aimed at improving drilling efficiency (cost driver), safety, environmental protection, or a combination of the three. A few of the latest trends in drilling technology development have been underbalanced drilling - typically aimed at the growing number of depleted reservoirs, managed pressure drilling - aimed at reducing drilling problems, and coiled tubing drilling - typically aimed at through tubing re-entry drilling, managed pressure drilling and underbalanced drilling candidates.

[0003] Potential projects are often referred to as "conventional drilling" candidates, "rotary drilling" candidates or "coiled tubing drilling" candidates as a function of the three drivers mentioned above.

[0004] Coiled tubing technology has been around for a long time and is primarily viewed as a live-well intervention tool. Due to the absence of connections and the use of a coiled tubing injector, well intervention can be undertaken with full pipe control at all times, since the coiled tubing system inherently provides full snubbing capabilities. It is for this reason that coiled tubing was an obvious choice for underbalanced drilling.

[0005] Unfortunately, coiled tubing also has the distinct disadvantage of not being capable of pipe rotation, thus restricting horizontal reach and has problems associated with stick-slip friction in the axial direction. It also has a limitation in terms of cycle-fatigue life, which is exponentially proportional to internal pressure when being plastically deformed (i.e., when going over the gooseneck or reel, through the coiled tubing injector or through a pipe-straightener).

[0006] Another challenge associated with coiled tubing - particularly in larger pipe diameters - is the length of pipe that can be transported on a single reel. One solution to this has been the development of spoolable coiled tubing connectors, which facilitate the connection of multiple strings of coiled tubing in the field without the requirement for welding (considered a significant weak point). However, these "spoolable" connectors are not typically designed to withstand high torsional loads normally associated with rotary drill pipe, since coiled tubing is not rotated.

[0007] Rotary drilling technology with jointed drill pipe is seen as a more robust system, with expanded capabilities due to the ability to rotate the pipe and thus, reduce friction. The challenges with rotary drilling, however, include the labour-intensive requirement to make and break connections between the jointed pipes and more costly and complicated snubbing operations in live-well environments. In slim holes (6" nominal and smaller), the drill pipe connections are also a weak-spot and changes in moment of inertia cause stress concentration areas when the drill pipe is in compression or subjected to cyclic stress loads.

[0008] In summary, each system has its strengths and weaknesses. Coiled tubing is seen as a very efficient tripping and snubbing technology and jointed drill pipe is seen as the most efficient and flexible system for drilling - particularly in horizontal wellbores, where long horizontal displacement is desired.

DISCLOSURE OF THE INVENTION

[0009] On this background, it is an object of the present application to provide a marriage of the two technologies with a view to capitalizing on the strength of each, resulting in a "hybrid" drilling technology that can be more efficient, safer and more cost-effective in many drilling applications.

[0010] This object is achieved by providing a method for drilling with coiled tubing in conjunction with jointed drill pipe comprising tripping into the hole to a pre-determined depth with coiled tubing using a coiled tubing injector, then disconnecting the coiled tubing at a spoolable connector in the coiled tubing or by severing the coiled tubing, then crossing-over to jointed drill pipe, then drilling conventionally in open hole, then tripping out of hole to shoe, then re-connecting coiled tubing with a spoolable connector, and then tripping out of hole with coiled tubing.

[0011] This method provides for one low-pressure fatigue cycle per trip (or more depending on configuration or use of pipe-straightener), high-speed tripping and snubbing, less swabbing/surging pressure while tripping, reduced or no requirement for drill collars or heavy-weight drill pipe (coiled tubing more suitable for being run in compression), facilitates use of higher-speed telemetry with capability of running wireline or fiber optics inside coil and requiring a reduced length of expensive wired drill pipe. Further, this method reduces wear and damage to jointed pipe typically run in compression in the lower part of hole. Since no connections are required during the potential "pipe light" tripping operations, the method provides enhanced safety and less manual intervention.

[0012] Further, the method offers potential to use larger diameter coiled tubing due to lack of tool joints. This leads to the possibility to optimize size to provide better weight on bit and potentially longer reach. Further, the method provides for enhanced overpull capability due to lack of tool joints (higher strength-to-weight ratio).

[0013] The method may further comprise lubricating out bottomhole assembly after the step of tripping out of hole with coiled tubing.

[0014] Preferably, there is no internal pressure in the coiled tubing during tripping into hole and tripping out of hole. Without the coiled tubing being pressurized, the effects of fatigue caused by the coiled tubing being plastically deformed over the gooseneck are substantially reduced.

[0015] Preferably, the coiled tubing is disconnected just above the wellhead

[0016] The method may further comprise racking back the coiled tubing injector after disconnecting the coiled tubing and before crossing-over to jointed drill pipe.

[0017] The method may further comprise picking-up coiled tubing injector after tripping out of hole to shoe and before re-connecting coiled tubing with a spoolable connector.

[0018] Preferably, tripping out of hole to shoe or predetermined depth is performed by conventional tripping with jointed drill pipe.

[0019] It is another object of the invention to provide an assembly for releasably connecting coiled tubing to conventional tubing or to bottom-hole-assembly.

[0020] This object is achieved by providing an assembly for releasably connecting coiled tubing to conventional tubing or to bottom-hole-assembly, said assembly comprising a cross-over to coiled tubing and a cross-over to conventional pin or box connection, said cross-over to coiled tubing being connectable to said cross-over to Pin or Box connection without relative rotation between the cross-overs.

[0021] The assembly may further comprise a swivel suitable to be inserted between the cross-over to coiled tubing and the cross-over to conventional tubing for allowing rotation of the cross-overs relative to one another.

[0022] The connection between the cross-overs may be a splined connection or a pressure activated connection or some other connection not requiring rotation of the coiled tubing relative to the conventional tubing.

[0023] Further objects, features, advantages and properties of the method according to the invention will become apparent from the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] In the following detailed portion of the present description, the invention will be explained in more detail with reference to the exemplary embodiments shown in the drawings, in which:

Figs. 1 to 17 are a sequence of diagrammatic representations of a sample drilling operation illustrating a method of drilling according to an embodiment of the invention,

Figs. 18 to 20 illustrate an assembly for connecting coiled tubing to a bottom-hole-assembly, and

Figs. 21 to 23 illustrate an assembly for connecting coiled tubing to a conventional drill pipe.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0025] Fig. 1 illustrates a drilling operation on a drilling platform or rig with coiled tubing and jointed pipe. The drilling platform or rig is provided with a coiled tubing injector 1 (which may also be considered as an integral part of the snubbing unit) and is provided with a coiled tubing high-pressure stripper. The coiled tubing injector 1 includes a pair of tracks for engaging the coiled tubing and providing force to push or pull tubing into or out of the hole respectively.

[0026] The coiled tubing 2 may be of a conventional type and stored on a coiled tubing reel 3 and guided from the reel 3 via a gooseneck 4 to the coiled tubing injector 1. The coiled tubing injector 1 may in an embodiment be provided with a pipe straightener (not shown). A coiled tubing spoolable connector 5 is provided at the free extremity of the coiled tubing. The spoolable connector 5 allows strands of coiled tubing to be connected and disconnected.

[0027] Various parts 6 of a downhole assembly are stored on the platform or drilling rig and can be received inside a high-pressure lubricator 7 (when required to be deployed under pressure). The lowest part 6 of the bottomhole assembly is already inserted into the wellhead assembly or can be deployed with or without the requirement for pressure deployment.

[0028] A coiled tubing to jointed pipe crossover 8 is also present on the platform. The cross-over is designed for rotary drilling torque values. This jointed pipe cross-over 8 in one embodiment may in an embodiment also include a rotational swivel to allow makeup to drill string assembly components using conventional threaded connections.

[0029] The example wellhead assembly includes in this embodiment slips 9, a rotating control device 10 slip rams 11, an annular preventer 12, the primary flow spool 13, blind/shear rams 14, pipe rams 15, a kill spool 16, operational blind rams 17, operational valve 16 and wellhead 18, all disposed on top of the casing 19. This wellhead assembly configuration is only provided as an example embodiment to illustrate an application of the invention but may also exist in other configurations as required to provide well control and pipe control.

[0030] The platform or rig is provided with storage for the jointed drill pipe 20 and in this embodiment with a hydraulic top drive 21 that is connected to a standpipe 23. According to another embodiment (not shown) the invention could also be employed with a rotary table and Kelly and other means of handling the drill pipe, such as drill pipe elevators or tuggers, etc.

[0031] At the start of the operation shown in figure 1, several parts 6 of the bottomhole assembly are ready for insertion into the wellhead. The lowest part 6 of the bottomhole assembly with the drilling bit is already inserted into the wellhead.

[0032] A coiled tubing spoolable connector is provided at the free end of the coiled tubing and a high-pressure lubricator 7 is ready to be used.

[0033] In the next step in figure 2, a high-pressure lubricator is connected to the coiled tubing injector 1 and lifted up.

[0034] In the next step in figure 3, the free end of the coiled tubing is lowered and the coiled tubing to jointed

pipe crossover 8 (with swivel if using conventional threaded connections) is connected to the free end of the coiled tubing 2 and to one of the bottomhole assembly parts 6.

[0035] In the next step in figure 4 the coiled tubing is reeled back and thereby, one of the parts 6 of the bottomhole assembly is lifted into the high-pressure lubricator 7.

[0036] In the next step in figure 5, the coiled tubing injector 1 is moved above the wellhead and the part 6 of the bottomhole assembly in the high-pressure lubricator 7 is lowered onto and connected to the part 6 of the bottomhole assembly that is already in the wellhead.

[0037] In the next step in figure 6, the coiled tubing injector six is lowered.

[0038] The slips 9 are removed prior to connecting the lubricator and equalizing pressure. The wellhead 18 and operational valve 17 are also opened after equalizing pressure between figures 5 and 6.

[0039] In the next step in figure 7 the newly assembled portions 6 of the bottomhole assembly are lowered into the wellhead by lowering the coiled tubing 2 and that the action of the coiled tubing injector 1 until the position as shown in figure 8 is reached.

[0040] In figure 8, slip rams 11, annular preventer 12 and pipe rams 15 are activated to provide pipe control and two pressure barriers.

[0041] In the next step shown in figure 9, the coiled tubing to jointed pipe crossover 8 is disconnected from the part 6 of the bottomhole assembly in the wellhead, the coiled tubing 2 is racked back, the coiled tubing injector 1 is raised and moved above the next part 6 of the bottomhole assembly, the coiled tubing 2 is lowered again to connect the coiled tubing to jointed pipe crossover 8 to the next part 6 of the bottomhole assembly and the coiled tubing 2 is reeled back again to raise the next part 6 of the bottomhole assembly into the high-pressure lubricator 7.

[0042] In the next step (not shown), the next part 6 of the bottomhole assembly is moved above the wellhead and lowered onto and connected to the parts 6 of the bottomhole assembly that are already in the wellhead.

[0043] The steps above are repeated until all the required parts 6 of the global assembly are lowered into the wellhead.

[0044] In the next step shown in figures 10 and 11, the tripping operation for lowering bottomhole assembly commences by the operation of the coiled tubing injector 1. The tripping operation is preferably performed whilst the coiled tubing 2 is not pressurized. However, if desired, the operation could be performed pressurized, thereby sacrificing some fatigue life of the coiled tubing.

[0045] The string of coiled tubing 2 may include further spoolable connectors 5.

[0046] As shown in figure 12, the coiled tubing 2 is reeled down until the bottomhole assembly 6 reaches the shoe 29 or some pre-determined depth.

[0047] In the next step shown in figure 13, the coiled tubing is severed (preferably at a spoolable connector 5) and a jointed pipe to coiled tubing crossover 25 is connected to the extremity of the coiled tubing 2 that protrudes from the wellhead. The other portion of the coiled tubing is reeled back with the free extremity with the spoolable connector 5 withdrawn into the high-pressure lubricator 7.

[0048] In the step shown in figure 13 the rotating control device 10, slip rams 11, annular preventer 12 and pipe rams 14 are activated to provide pipe control and pressure control (minimum 2 barriers).

[0049] In the next step shown in figure 14, the hydraulic top drive 21 is an example of a means to pick-up the jointed pipe sections 20 and connects the lower end of the picked the jointed pipe section 20 to the jointed pipe to coiled tubing crossover 25. Then, rotary drilling operations may commence.

[0050] When sufficient progress has been made, as shown in figure 15, it is time to add the next jointed pipe section 20.

[0051] In the next step shown in figure 16, the next section of jointed pipe 20 has been picked up by the rotary drive 21 and has been coupled to the previously deployed jointed pipe section 20.

[0052] Rotary drilling operations continue as long as necessary whilst more and more pipe sections 20 are added to the drill string, as shown in figure 17.

[0053] When rotary drilling is completed, the process is reversed (not shown in figures): the jointed pipe sections 20 are one by one (or stand by stand) tripped out of hole to shoe (or some pre-determined depth). Then the coiled tubing injector 1 is picked up and the coiled tubing 2 is re-connected with a spoolable connector 5 to the portion of the coiled tubing 2 that is still in the hole, followed by tripping out of hole with coiled tubing by the action of the coiled tubing injector 1. Thereafter, the process may continue by lubricating out the bottomhole assembly.

[0054] Figs. 18 to 20 illustrate an assembly for releasably connecting coiled tubing 2 to the bottom-hole-assembly 6.

[0055] Fig. 18 shows the assembly in a disconnected state and Fig. 19 shows the assembly in a connected state.

[0056] The assembly includes a cross-over to coiled tubing 30, a cross-over to conventional pin connection 33 and, if required, also a swivel 35.

[0057] The crossover to coiled tubing 30 includes the male part 32 of a splined connection and a locking ring 31. the male part 32 has around its circumference external spline elements.

[0058] The locking ring 31 can freely rotate relative to the main body of the crossover 30 and the locking ring is provided with internal thread (not shown) that engages external thread (not shown) on the counterpart of the connection.

[0059] The crossover to Pin connection 33 is provided with the female part of the splined connection that includes internal spline grooves for spline engagement with

the external spline elements of the male part of the spline connection. The crossover to Pin connection 33 is also provided with external thread (not shown) to engage a locking ring of a counterpart.

[0060] The splined connection provides for transmission of the rotational forces acting on the connection and the locking rings provide for transmission of the axial (tension or compression) forces acting on the connection.

[0061] The swivel 35, if required, is provided with the female part 35 of the splined connection at one end and with the male part 37 of the splined connection at the other end. The swivel 35 is also provided with a locking ring 36.

[0062] The swivel 35 allows the male part 37 and the female part to be rotated and can still transmit tension.

[0063] The swivel 35 is suitable to be inserted between the cross-over to coiled tubing and the cross-over to conventional tubing for allowing rotation of the cross-overs relative to one another.

[0064] The connection assembly, including the swivel 25, is used for snubbing bottom-hole assembly components.

[0065] The cross-over to coiled tubing 30 can be connected to the cross-over to Pin connection 33 without relative rotation between the cross-overs, as shown in Fig. 20. The connection assembly without the swivel is used for lower drilling where the coiled tubing is directly connected to the bottom-hole-assembly 6.

[0066] Figs. 21 to 23 illustrate an assembly for releasably connecting jointed drill pipe 20 to coiled tubing 2.

[0067] Fig. 21 shows the assembly in a disconnected state, Fig. 22 shows the assembly in a partially assembled state and Fig. 23 shows the assembly in a connected state.

[0068] The assembly includes a cross-over to conventional Box connection 40 and a cross-over to coiled tubing 30.

[0069] The cross-over to conventional Box connection 40 is provided at one of its ends with an internally threaded recess 41 for receiving the externally threaded end portion 38 of jointed drill pipe 20. The other end of the cross-over to conventional Box connection 40 is provided with the female part 40 of a splined connection. The cross-over to conventional Box connection 40 is also provided with an external thread to engage the internal thread of a locking ring of a counterpart.

[0070] The female part 40 is suitable for receiving the male part 32 of the cross-over to jointed pipe 30.

[0071] The splined connection provides for transmission of the rotational forces acting on the connection and the locking rings provide for transmission of the axial (tension or compression) forces acting on the connection.

[0072] The connection assembly shown in Figs. 21-23 is used for rotary drilling with jointed drill pipe 20 with the lower part of the drill string above the bottom-hole-assembly being coiled tubing 2.

[0073] The teaching of this application has numerous advantages. Different embodiments or implementations may yield one or more of the following advantages. It should be noted that this is not an exhaustive list and there may be other advantages which are not described herein. One advantage of the teaching of this application is that it provides for the use of conventional coiled tubing combined with conventional jointed pipe at the same time. Another advantage of the teaching of this application is that it provides for a cross-over from coiled tubing to jointed pipe that is designed for rotary drilling torque values and thereby provides for a potential for use of a more robust connector than a flush spoolable connector for running in hole. Yet another advantage of the teaching of this application is that it provides for rotation of coiled tubing by conventional means. A further advantage of this teaching is that it provides for maximization of coiled tubing cycle fatigue life due to the absence of internal pressure during tripping and the absence of plastic deformation during the drilling phase and open-hole tripping operations. A further advantage of this teaching is that it facilitates the use of larger OD and heavier-walled tubing with minimal economic impact. A further advantage of this teaching is that it provides for use of coiled tubing to provide high-speed snubbing when pipe-light. A further advantage of this teaching is that it enhances safety at higher tripping speed than conventional jointed pipe tripping due to the absence of connections and reduced manual intervention. A further advantage of this teaching is the potential for higher tensile and torsional yield in drill string due to lack of tool joints in lower part of drill string (coiled tubing). A further advantage of this teaching is that there is no requirement for heavy-weight drill pipe due to ability to use coiled tubing in compression with no adverse effects.

[0074] A further advantage of this teaching is that it facilitates safer injection of natural gas in coiled tubing due to no requirement for plastic deformation of drill string while injecting natural gas. This mitigates against the risk of pinholes in coiled tubing when injecting natural gas, as entire coil length is below well control equipment. A further advantage of this teaching is that it can use a larger OD drill string than comparable jointed pipe due to lack of tool joints - enhanced hole cleaning in horizontal and high angle segments of lower wellbore. A further advantage of this teaching is that it can use additional segments of coiled tubing on subsequent trips.

[0075] A further advantage of this teaching is that PWD (pressure while drilling) or other data acquisition sensors can be added in coiled tubing connectors. A further advantage of this teaching is that the coiled tubing can be used to run in and set a packer in casing to facilitate running of liner without requiring a subsurface deployment valve.

A further advantage of this teaching is that higher wellhead pressures can be maintained while tripping (snubbing) out of the hole with coiled tubing due to the absence of tool joints and the higher pressure rating of a coiled tubing stripper versus a rotating control device.

[0076] The various aspects of what is described above

can be used alone or in various combinations. It should be noted that the teaching of this application is not limited to the use of rotary drilling.

[0077] Although the teaching of this application has been described in detail for purpose of illustration, it is understood that such detail is solely for that purpose, and variations can be made therein by those skilled in the art without departing from the scope of the teaching of this application.

[0078] For example, although the teaching of this application has been described in terms of a top rotary drive, it should be appreciated that the invention may also be applied to other types of drives, such as rotary tables and the like. Also, the cross overs and the swivel have been described with reference to a splined connection. However, any other type of suitable connection could be used, such as pressure activated connections. It should also be noted that there are many alternative ways of implementing the methods and apparatuses of the teaching of this application

[0079] The term "comprising" as used in the claims does not exclude other elements or steps. The term "a" or "an" as used in the claims does not exclude a plurality. The single processor or other unit may fulfill the functions of several means recited in the claims.

Claims

1. A method for drilling with coiled tubing and jointed drill pipe comprising:

tripping into shoe or a pre-determined depth with coiled tubing using a coiled tubing injector,
then disconnecting the coiled tubing at a spoolable connector in the coiled tubing or by severing the coiled tubing,
then crossing-over to jointed drill pipe,
then drilling conventionally in open hole,
then tripping out of hole to shoe or pre-determined depth,
then re-connecting coiled tubing with a spoolable connector, and
then tripping out of hole with coiled tubing.

2. The method according to claim 1, further comprising lubricating out bottomhole assembly after the step of tripping out of whole with coiled tubing.

3. The method according to claim 1 or 2, wherein there is no internal pressure in the coiled tubing during tripping into shoe and tripping out of hole.

4. The method according to any of the claims above, wherein the coiled tubing is disconnected just above the wellhead.

5. The method according to any of the claims above, further comprising racking back the coiled tubing injector after disconnecting the coiled tubing and before crossing-over to jointed drill pipe.

6. The method according to any of the claims above, further comprising picking-up coiled tubing injector after tripping out of hole to shoe and before re-connecting coiled tubing with a spoolable connector.

7. Wherein the tripping out of hole to shoe is performed by conventional tripping with jointed drill pipe.

8. An assembly for releasably connecting coiled tubing to conventional tubing or to bottom-hole-assembly, said assembly comprising a cross-over to coiled tubing and a cross-over to conventional pin or box connection, said cross-over to coiled tubing being connectable to said cross-over to Pin or Box connection without relative rotation between the cross-overs.

9. An assembly according to claim 8, further comprising a swivel suitable to be inserted between the cross-over to coiled tubing and the cross-over to conventional tubing for allowing rotation of the cross-overs relative to one another.

10. An assembly according to claim 8 or 9, wherein the connection between the cross-overs is a splined connection or a pressure activated connection.

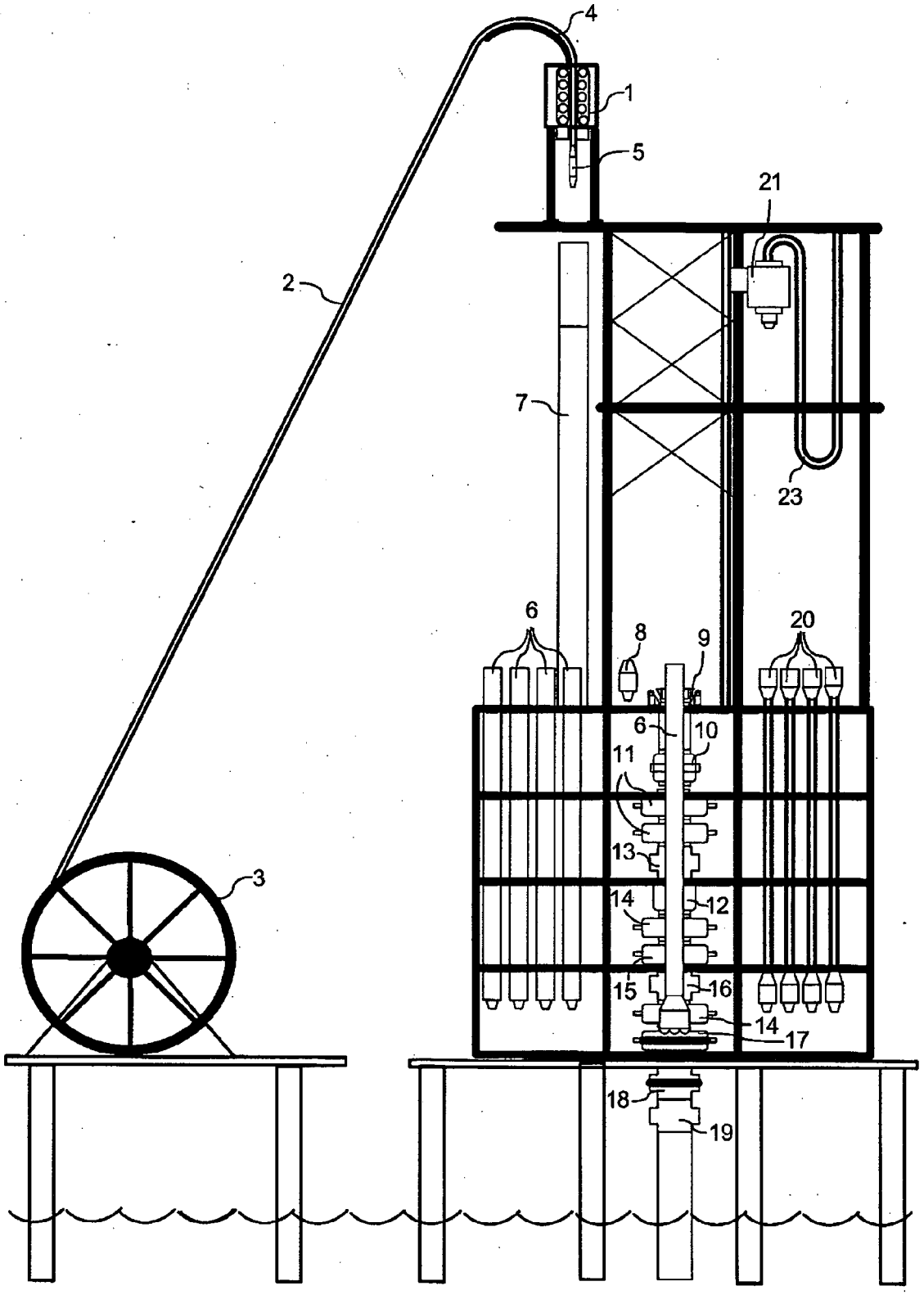

FIG. 1

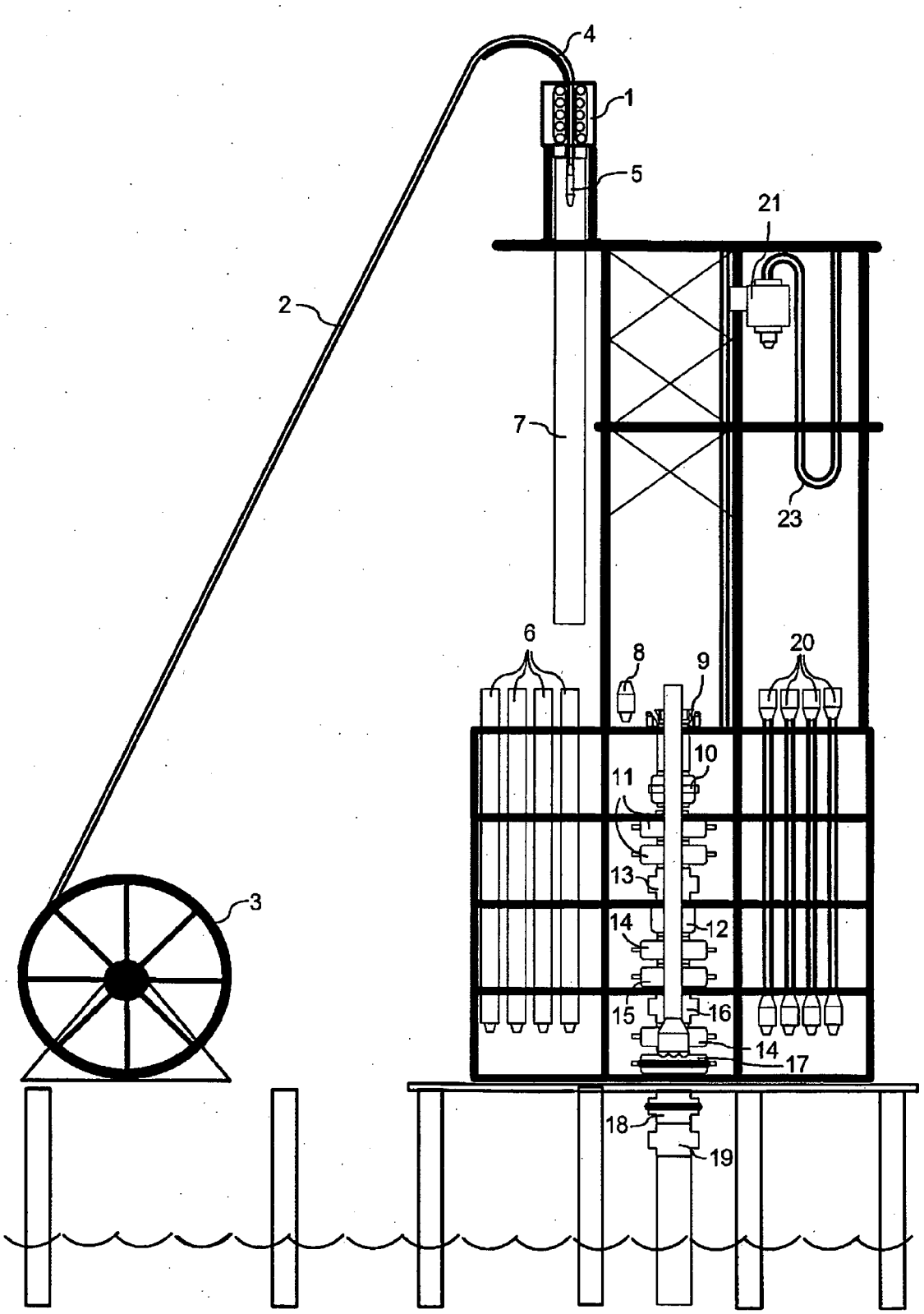

FIG. 2

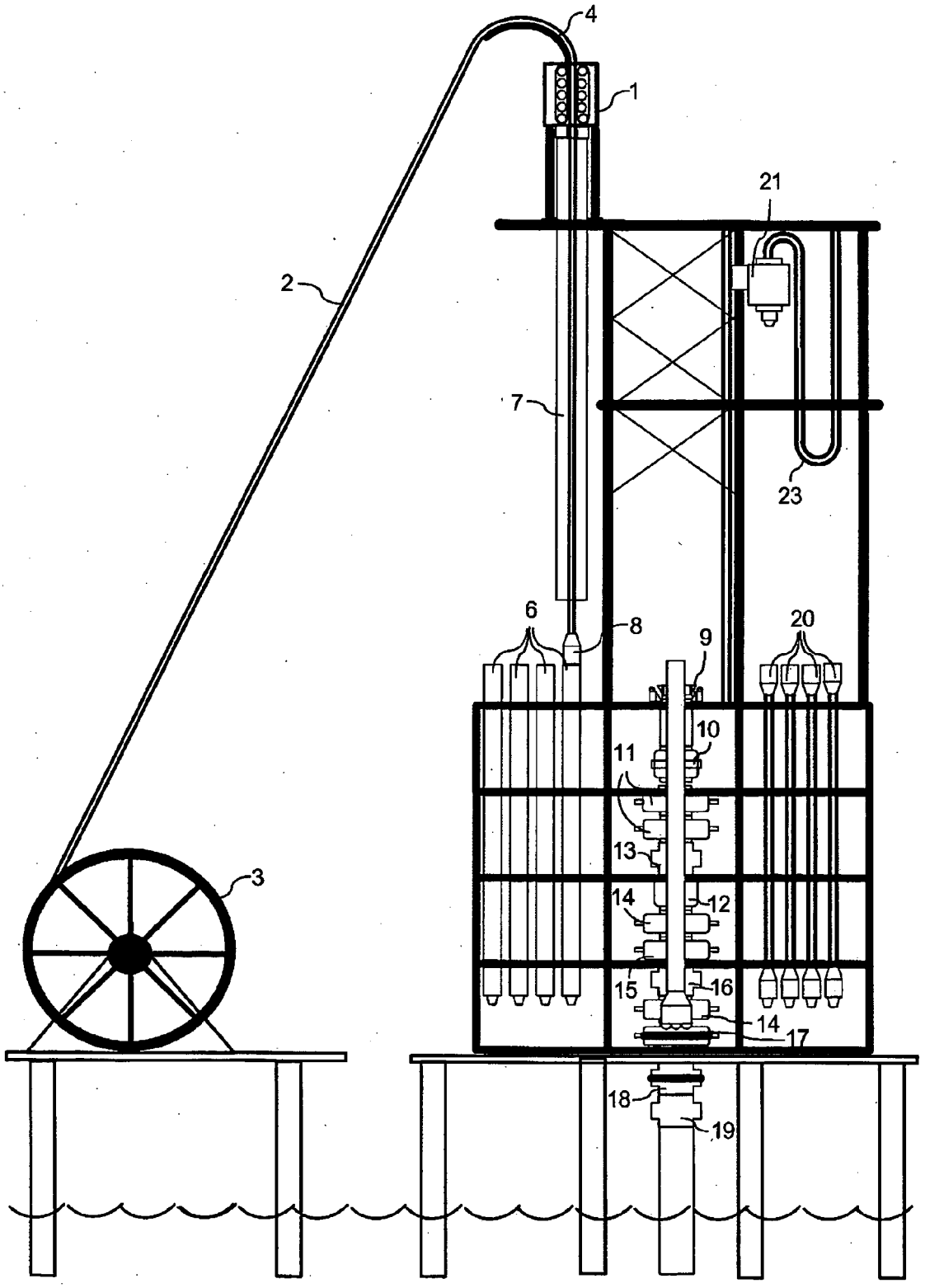

FIG. 3

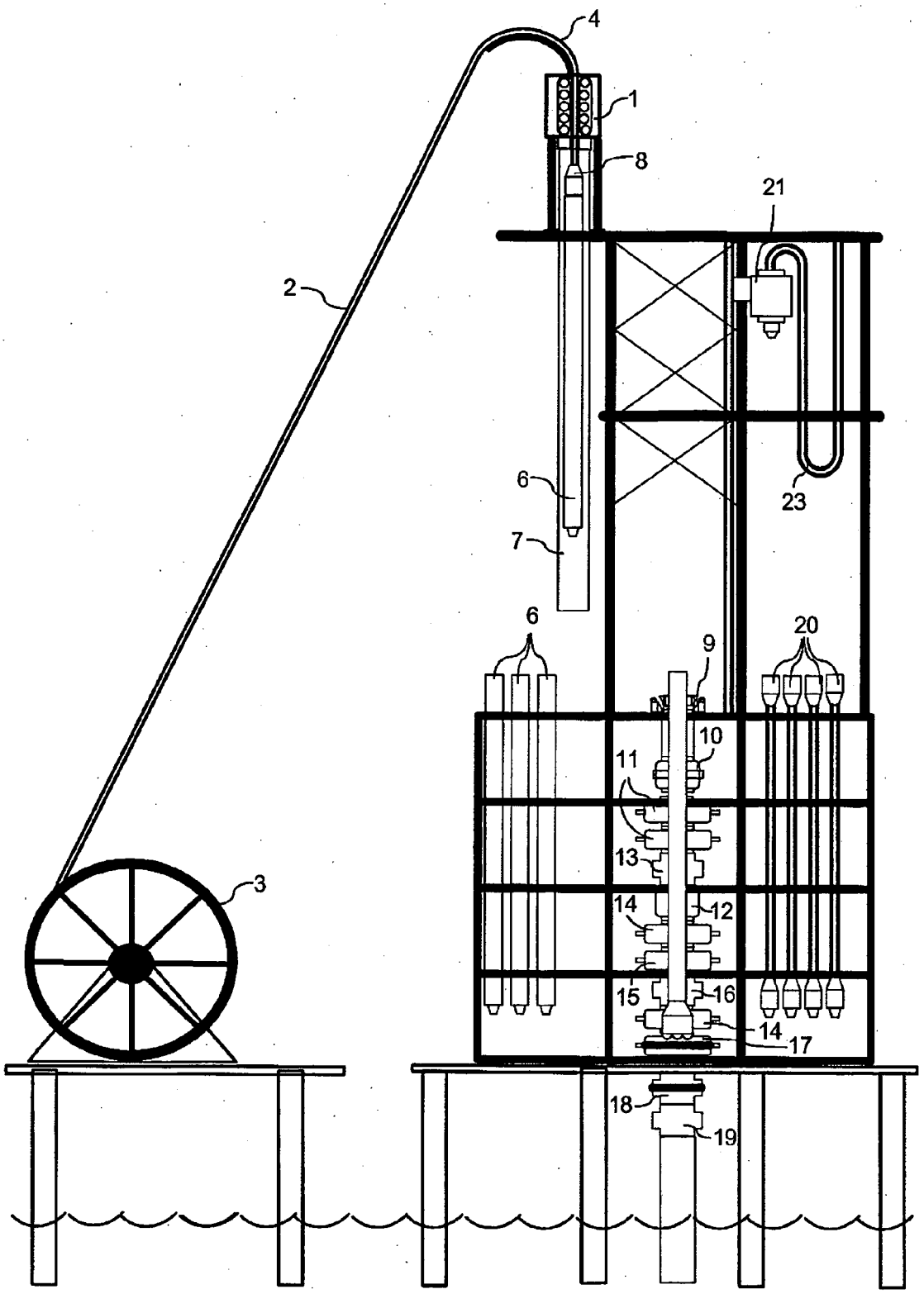

FIG. 4

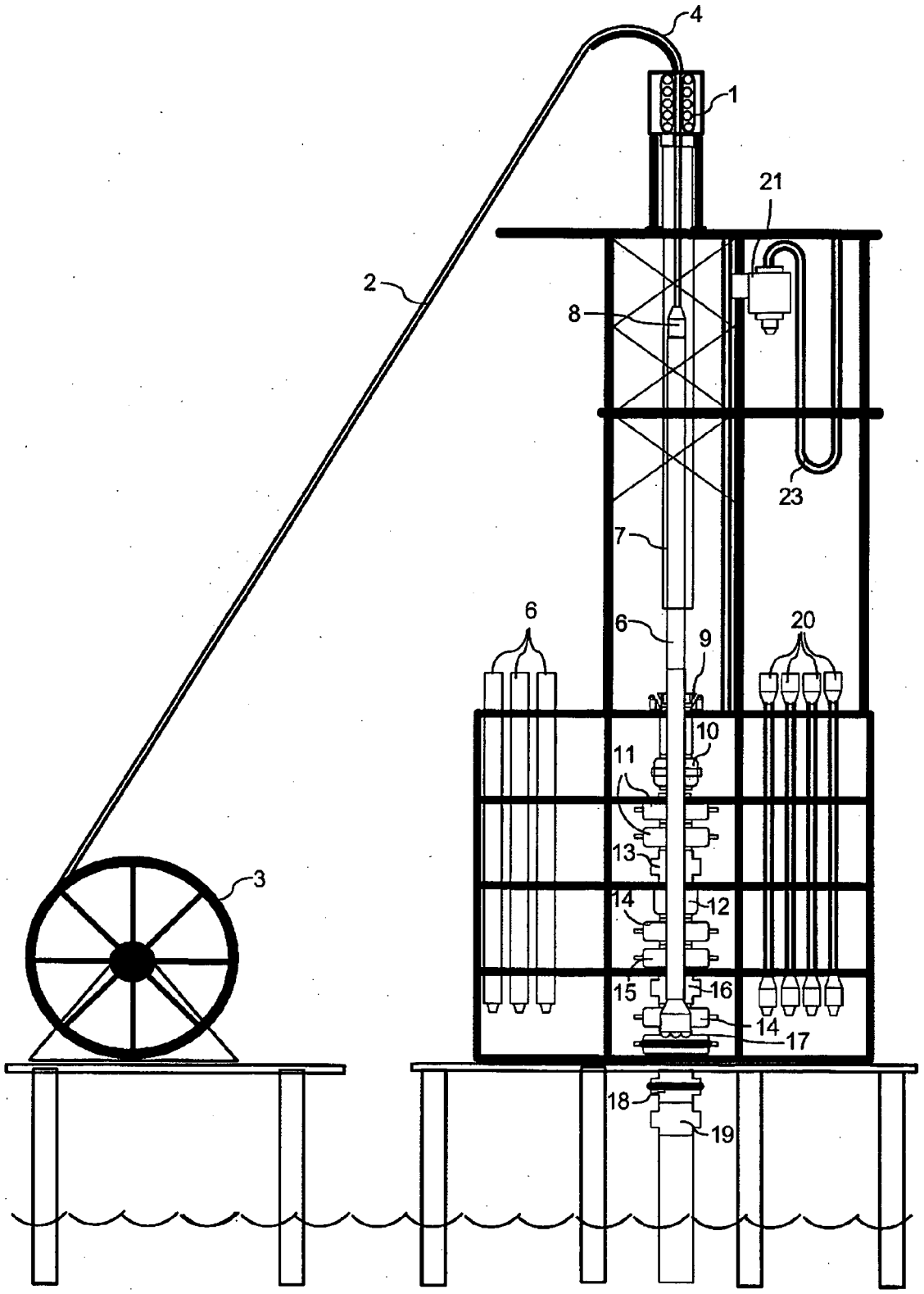

FIG. 5

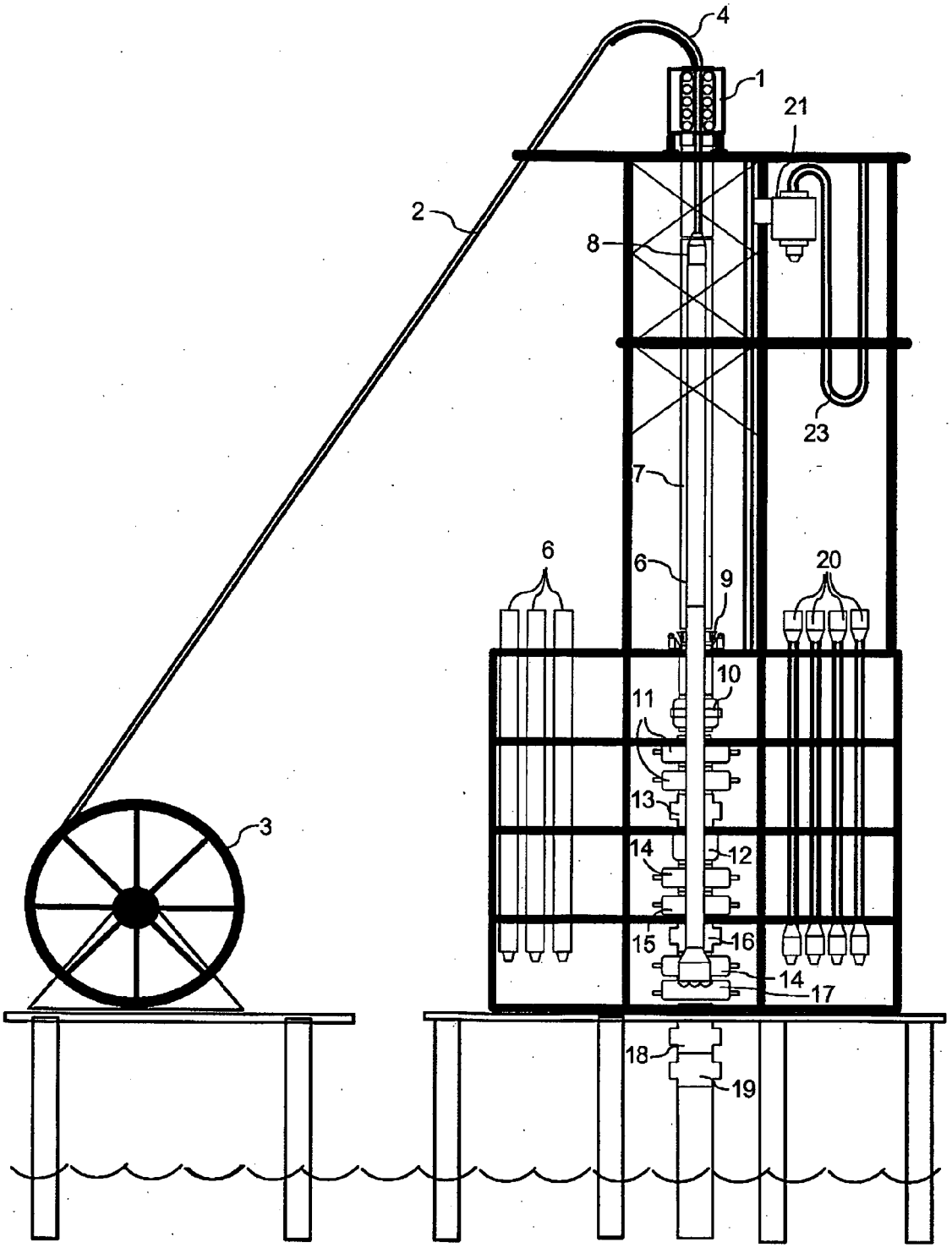

FIG. 6

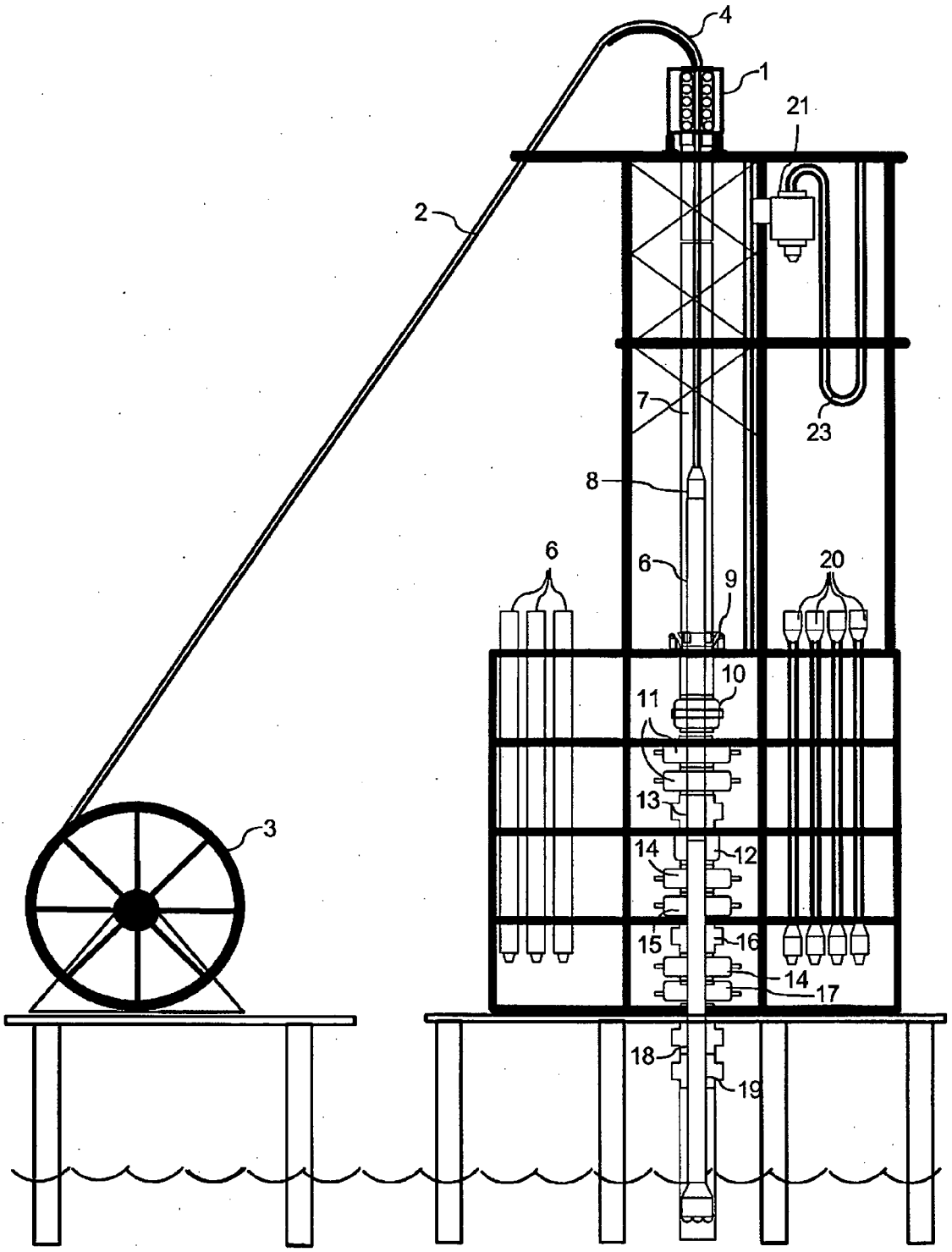

FIG. 7

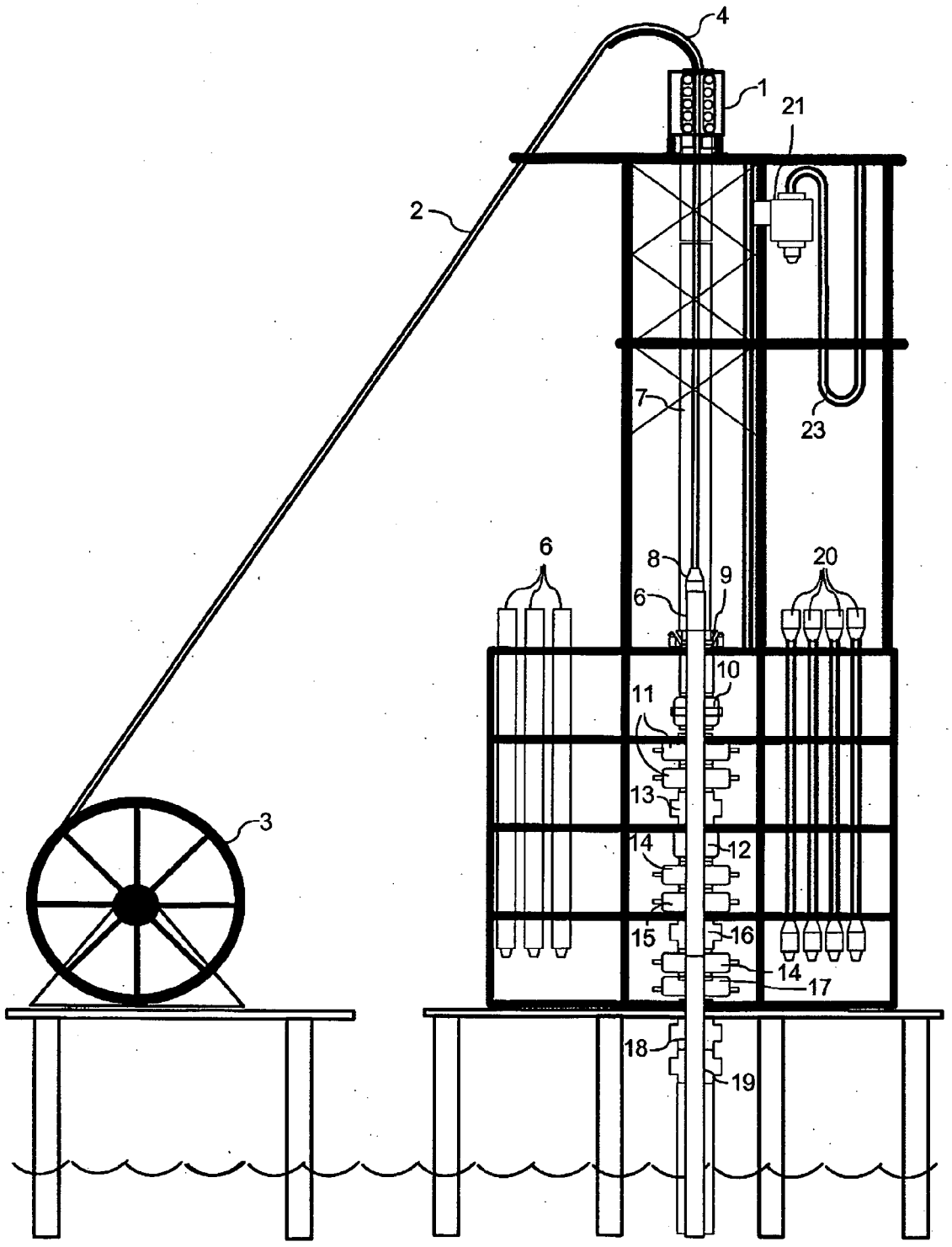

FIG. 8

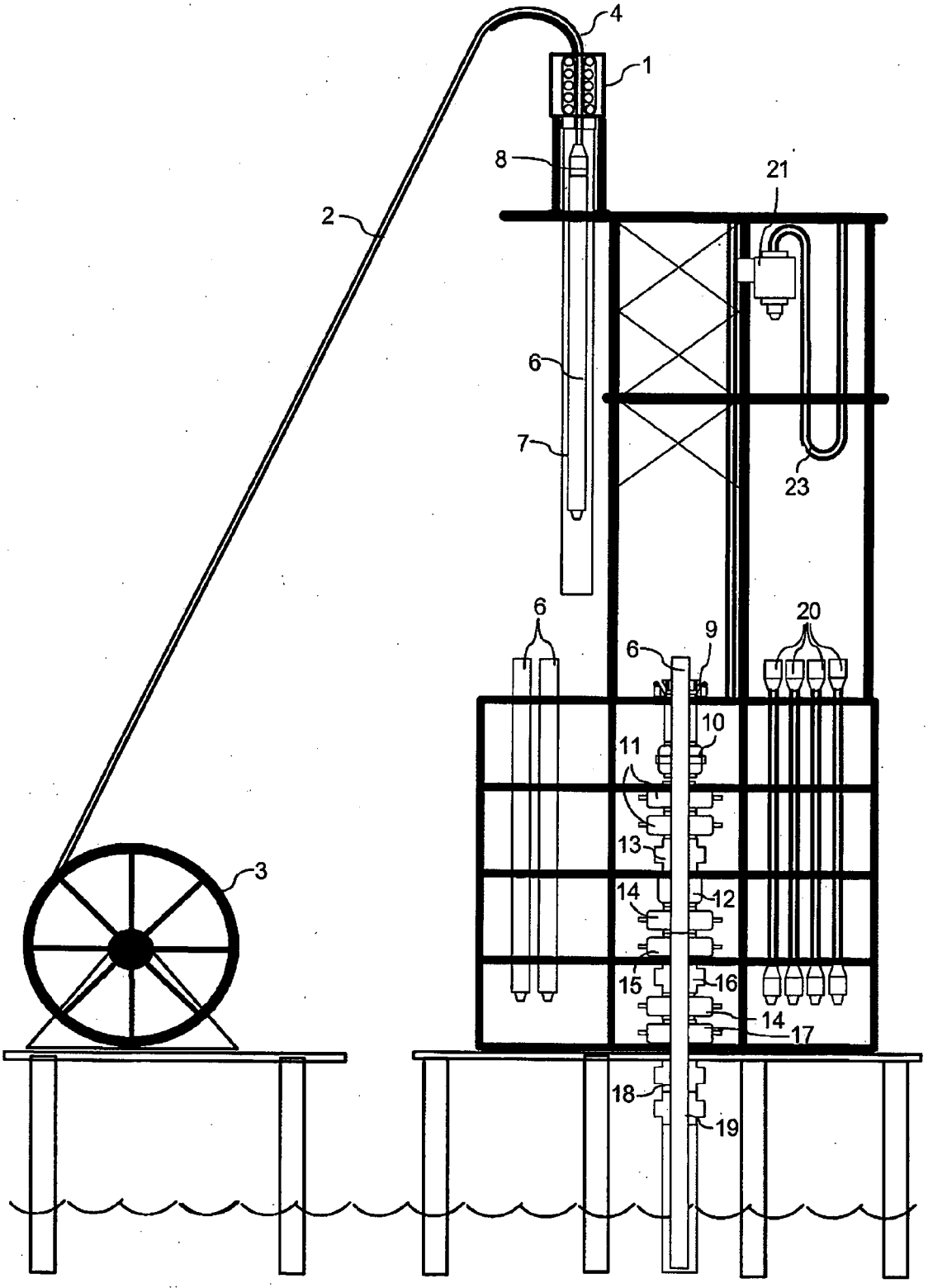

FIG. 9

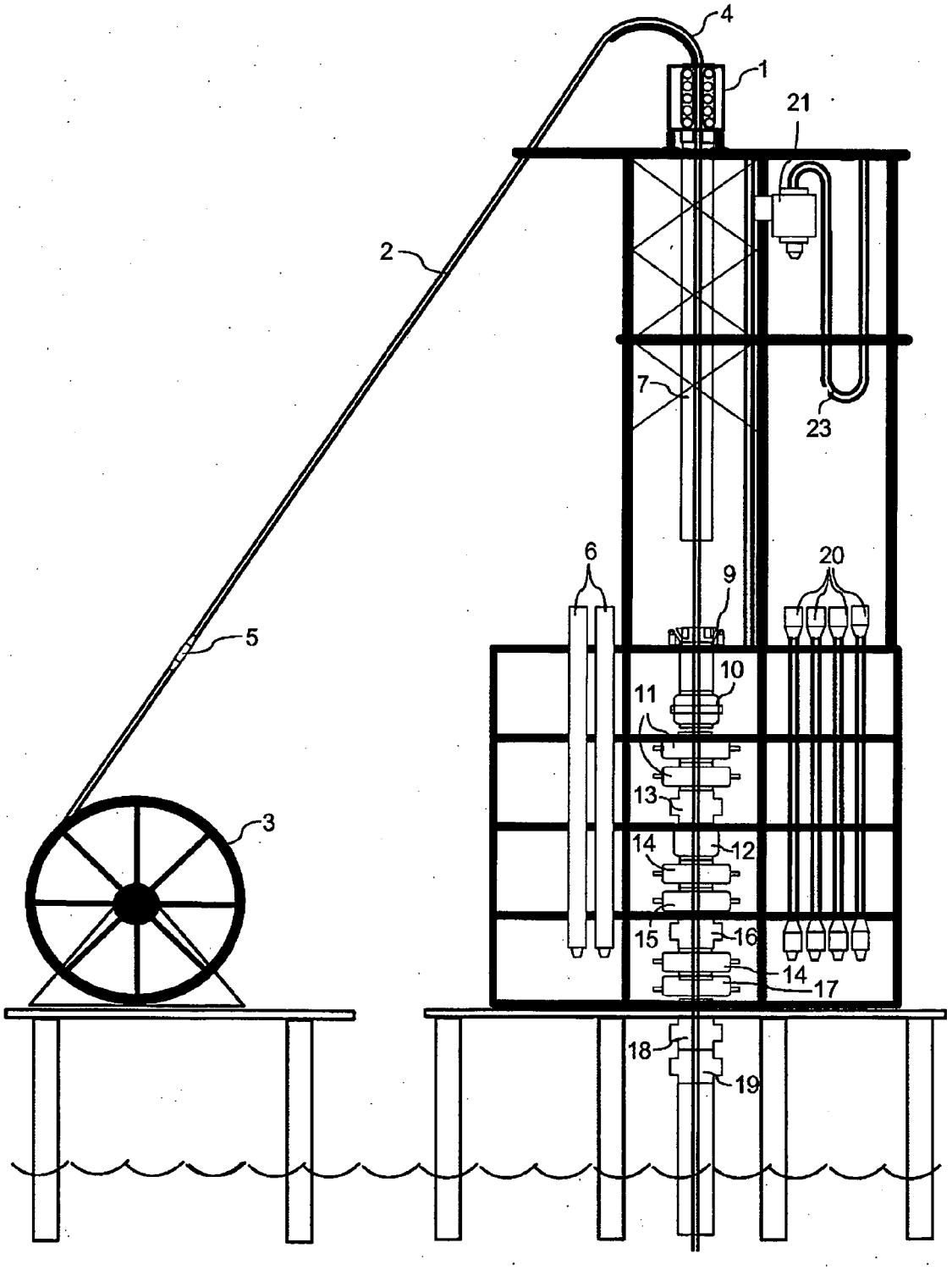

FIG. 10

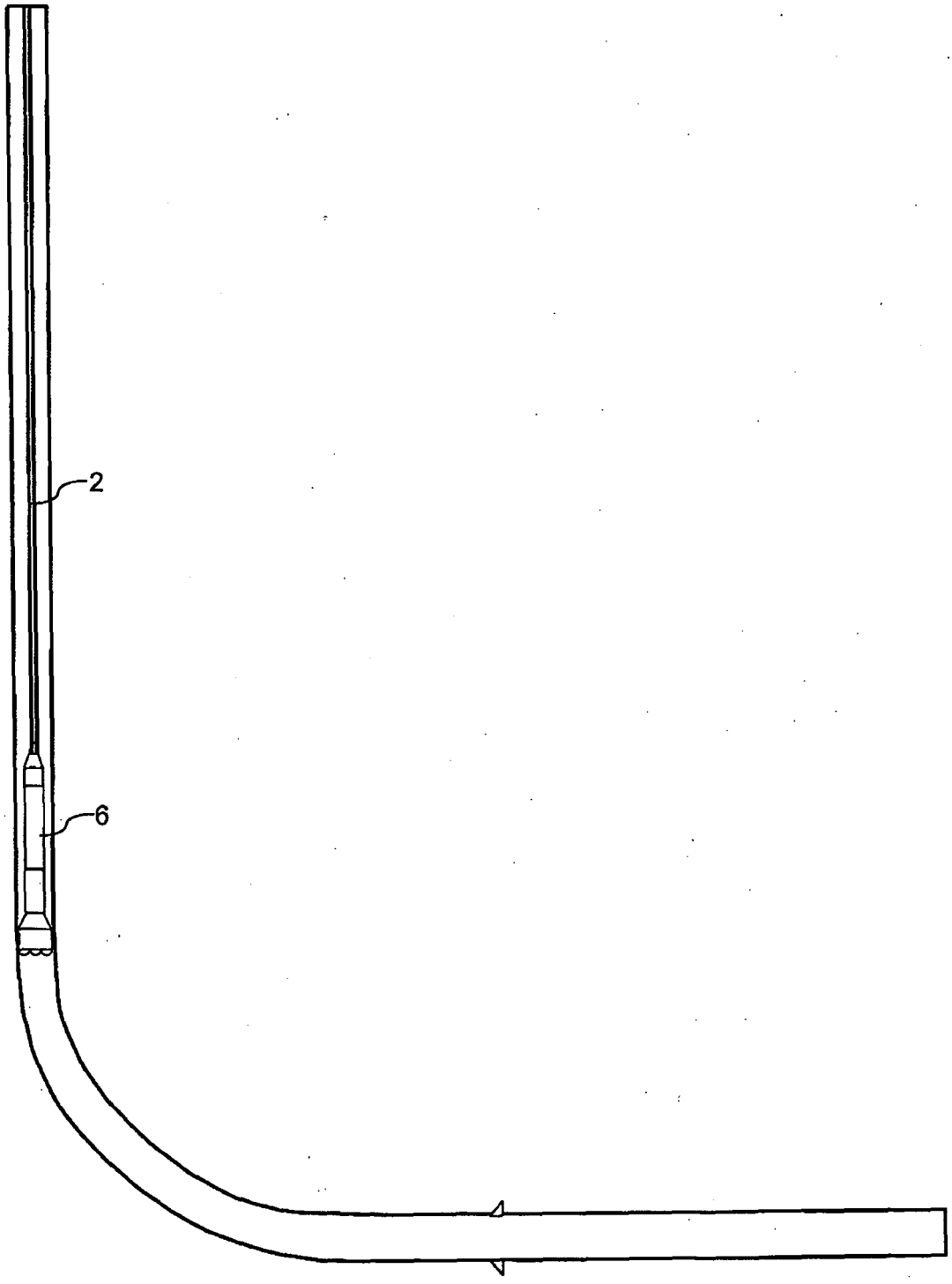

FIG. 11

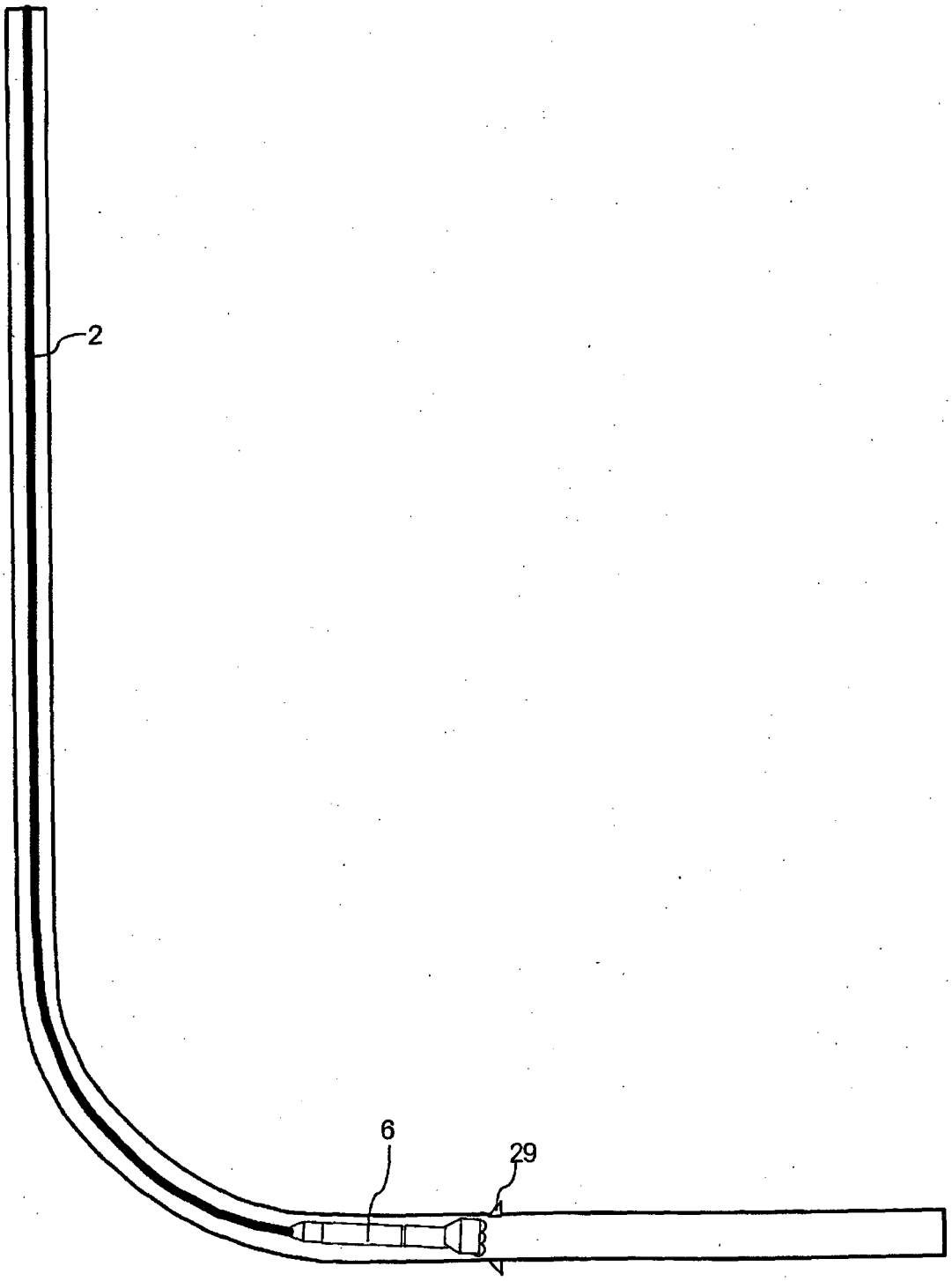

FIG. 12

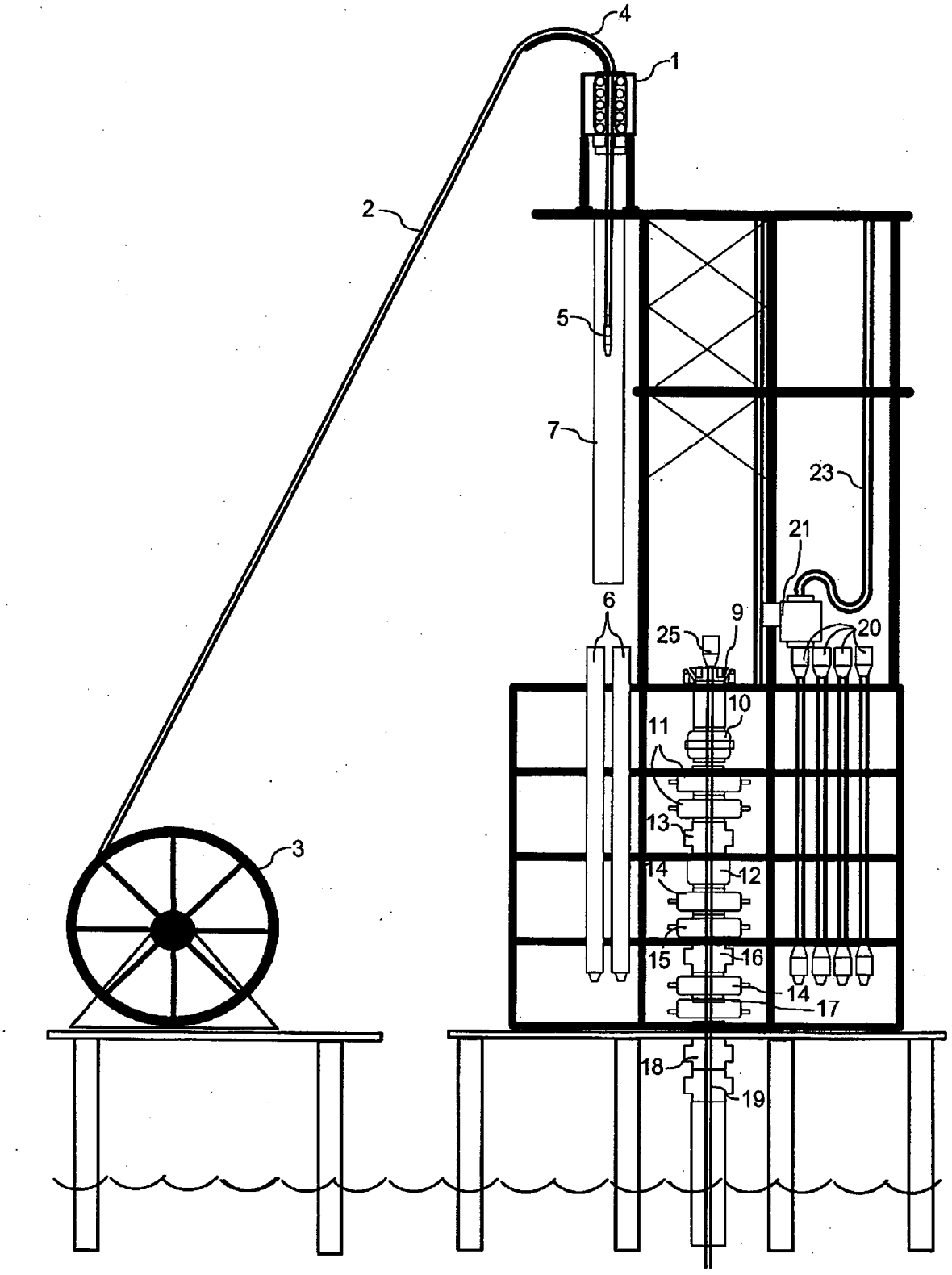

FIG. 13

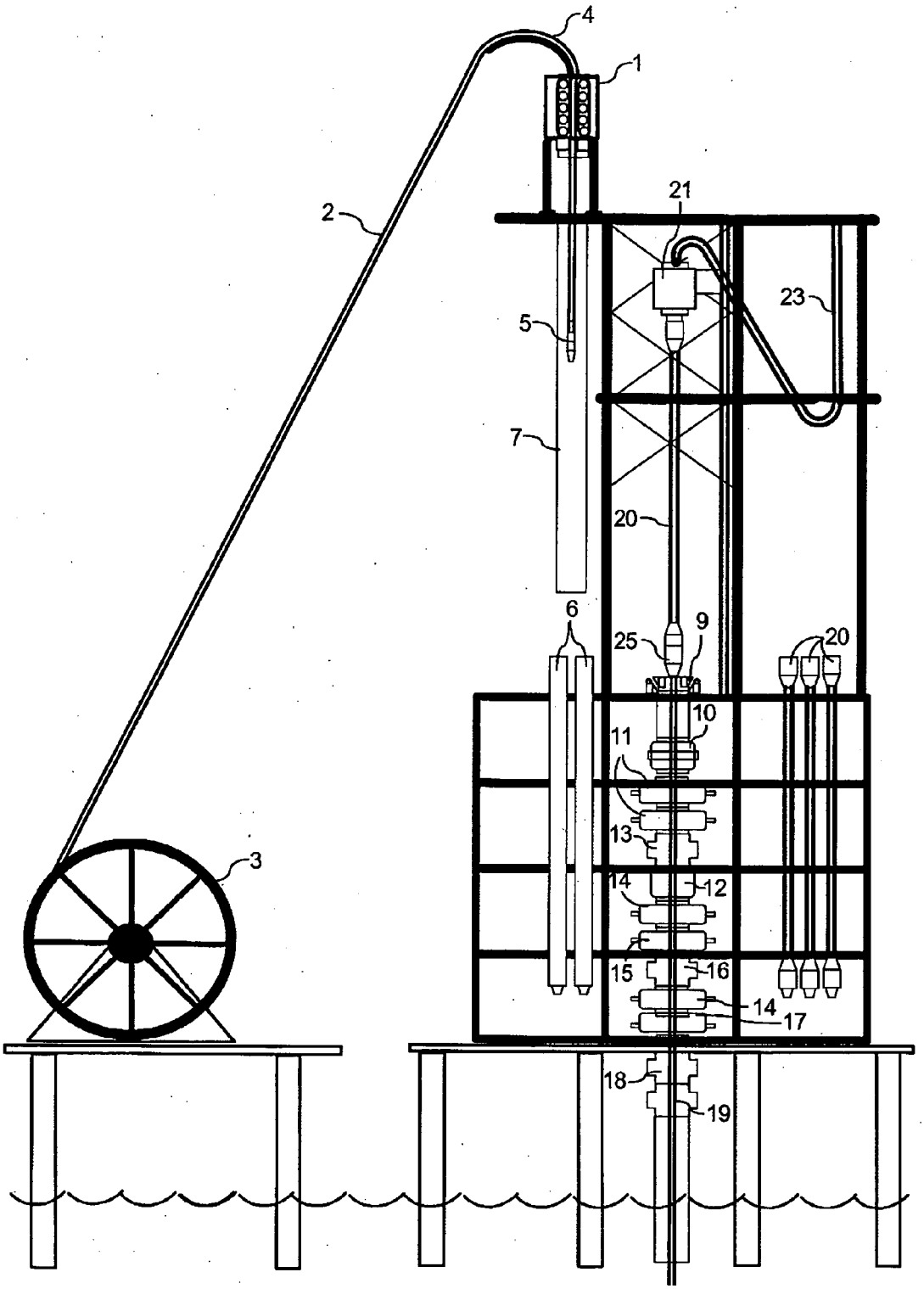

FIG. 14

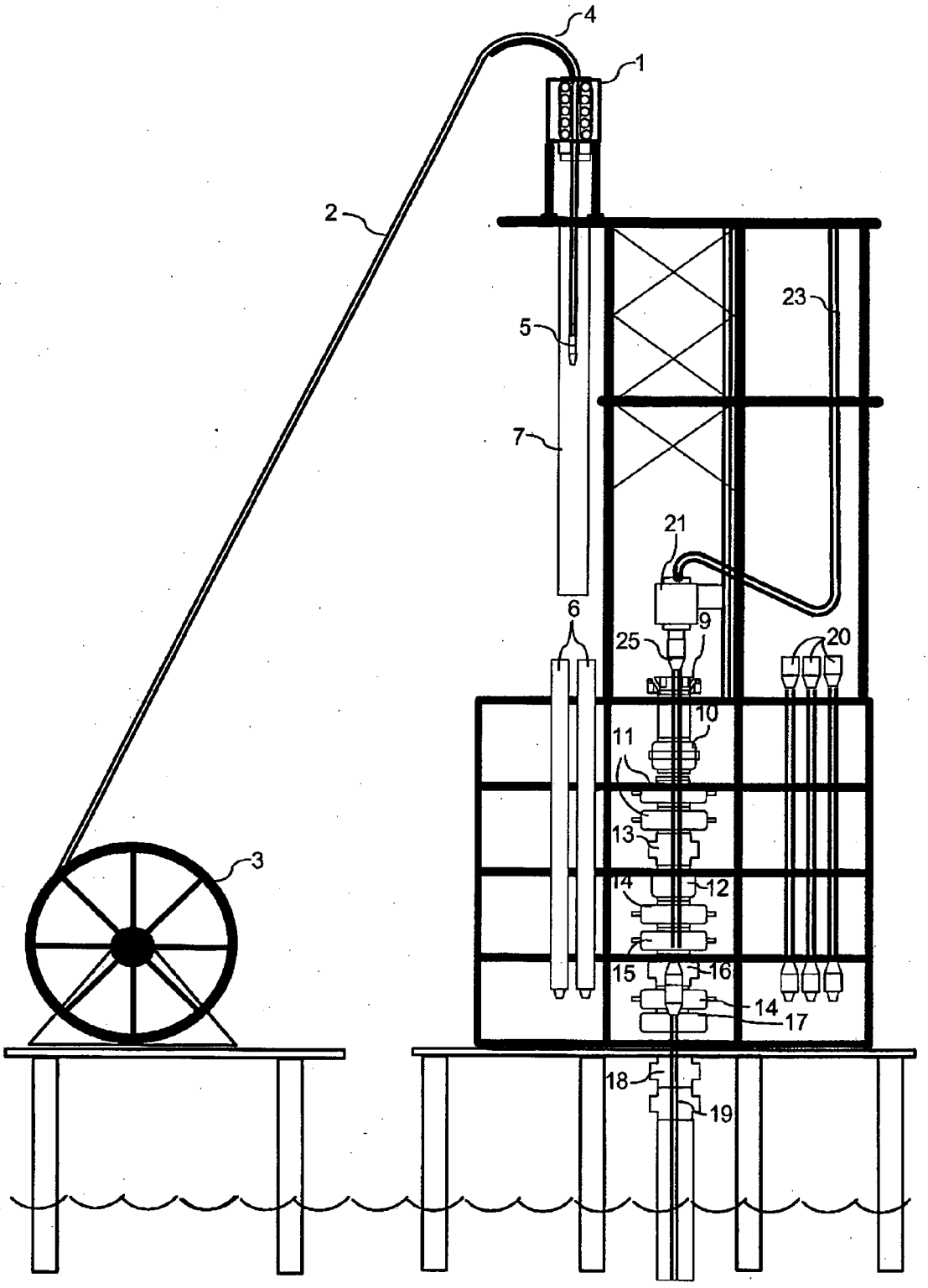

FIG. 15

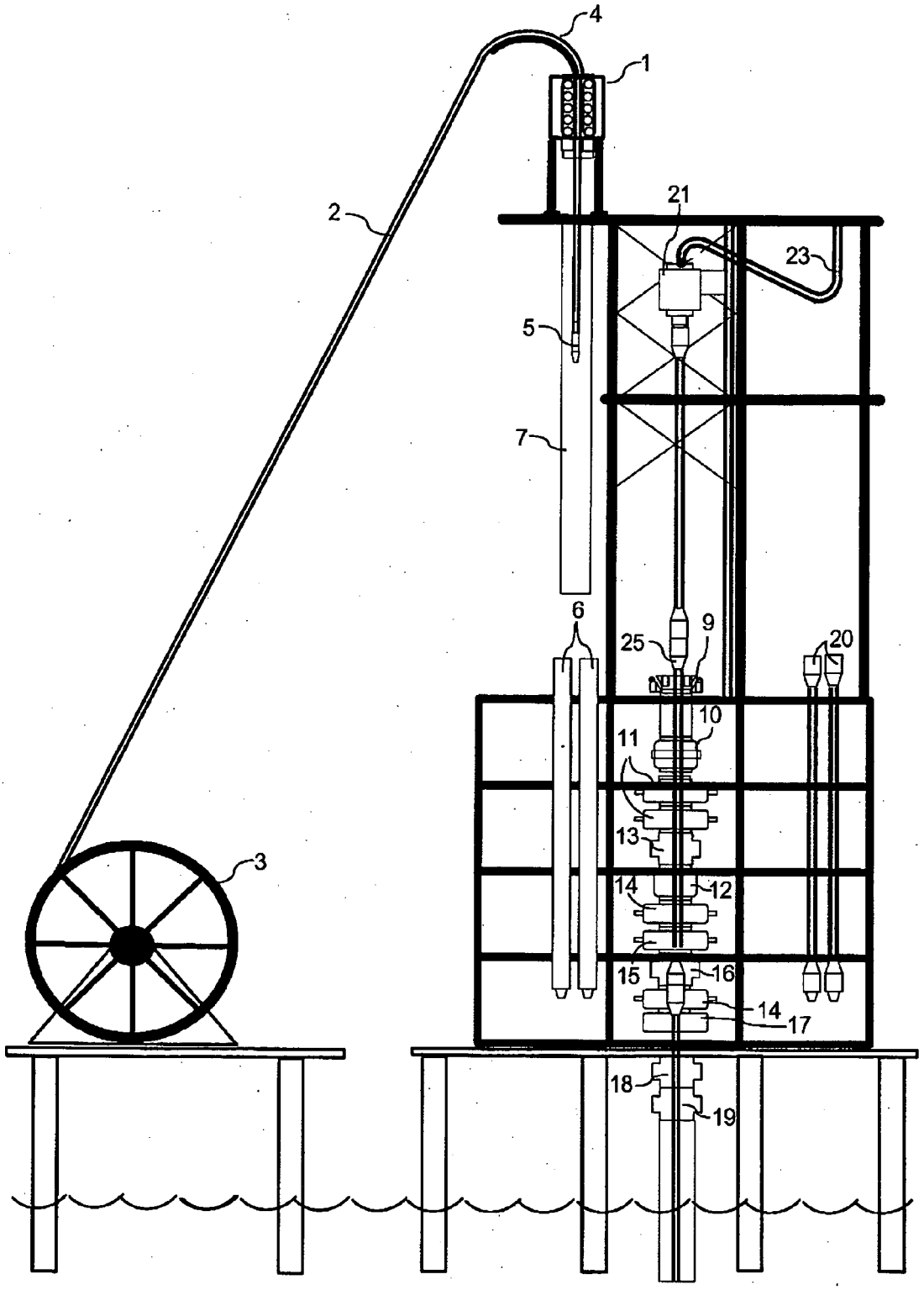

FIG. 16

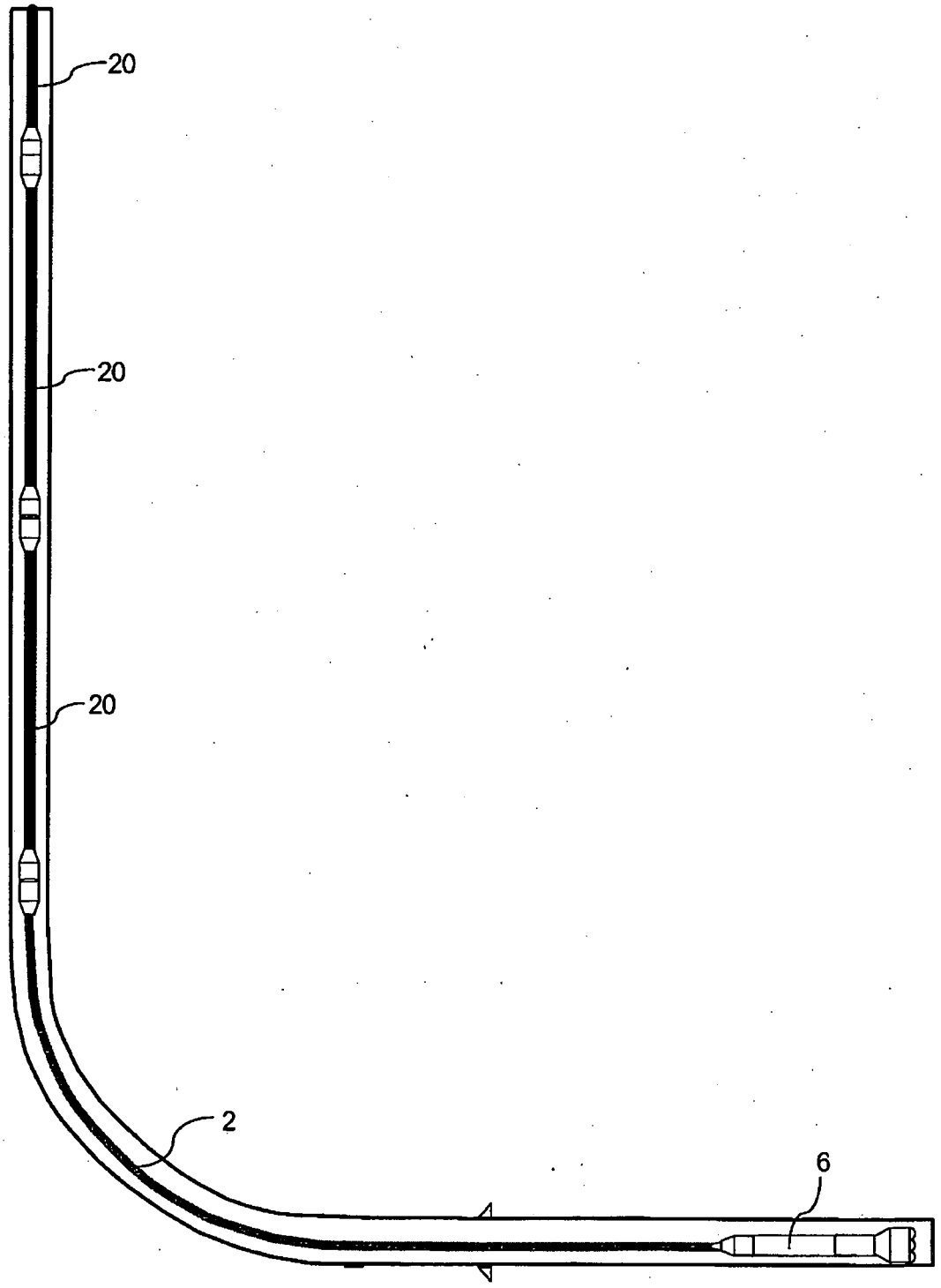

FIG. 17

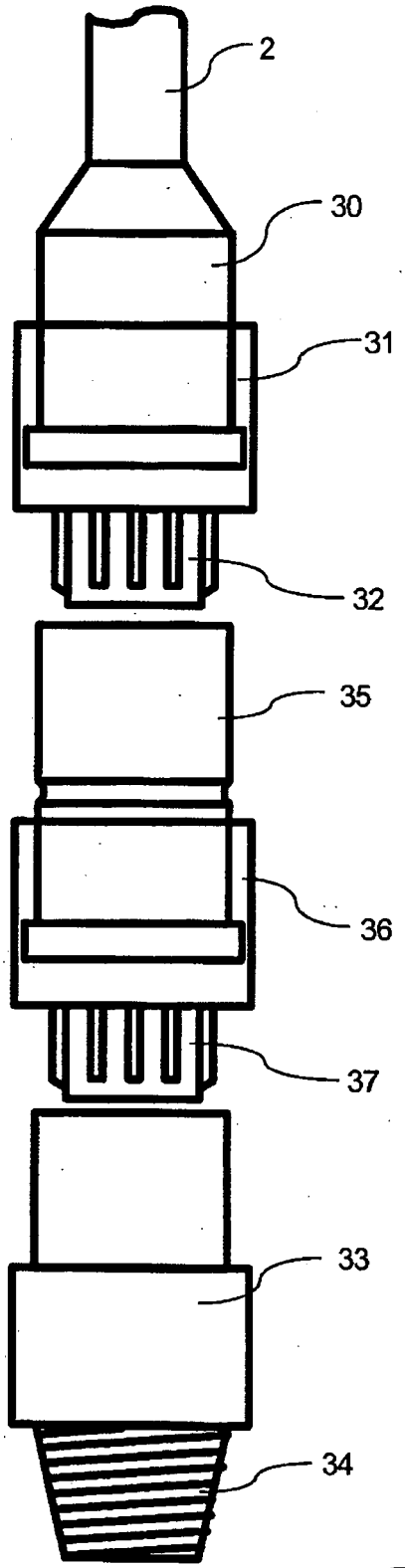

FIG. 18

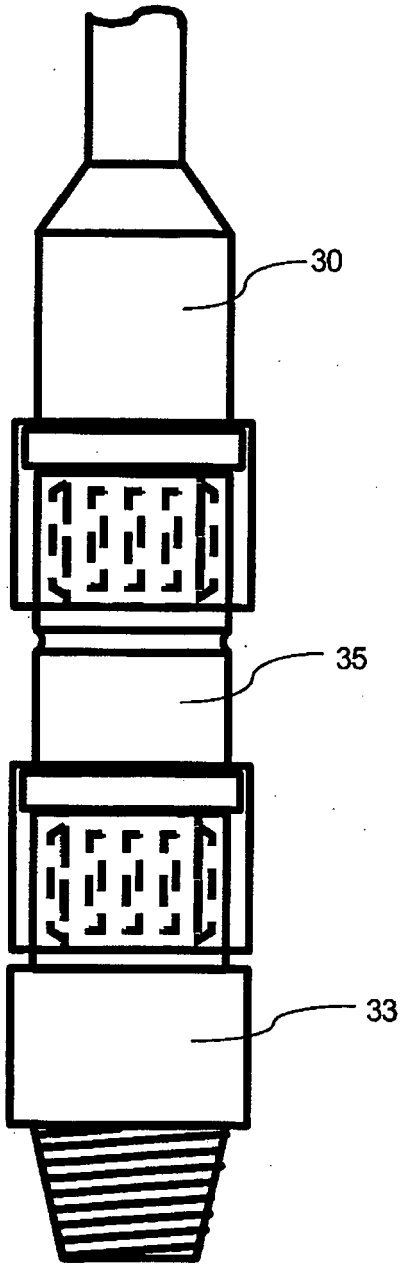

FIG. 19

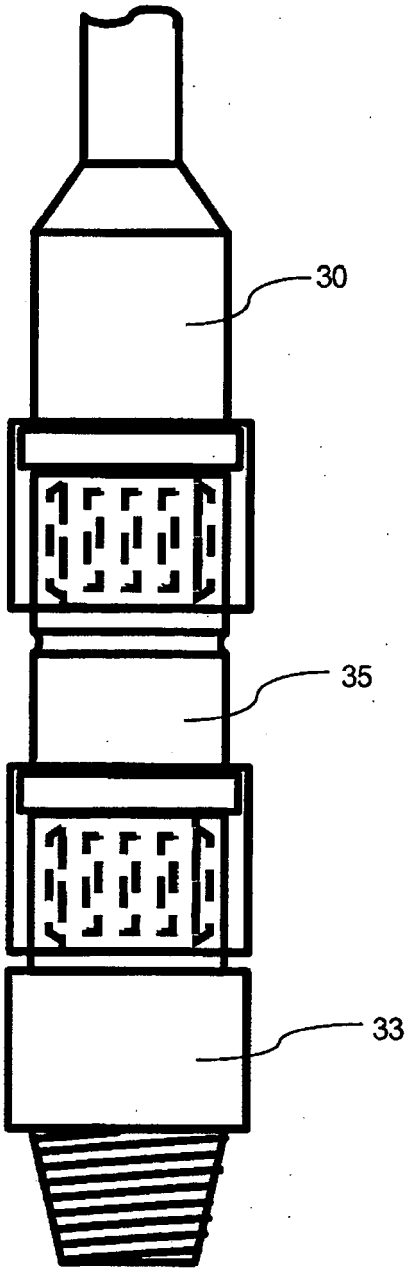

FIG. 20

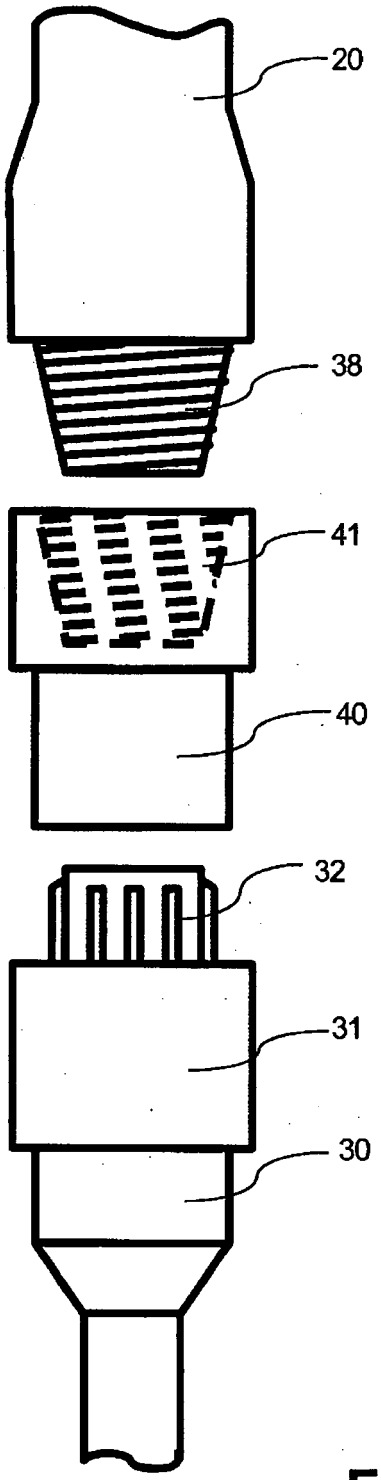

FIG. 21

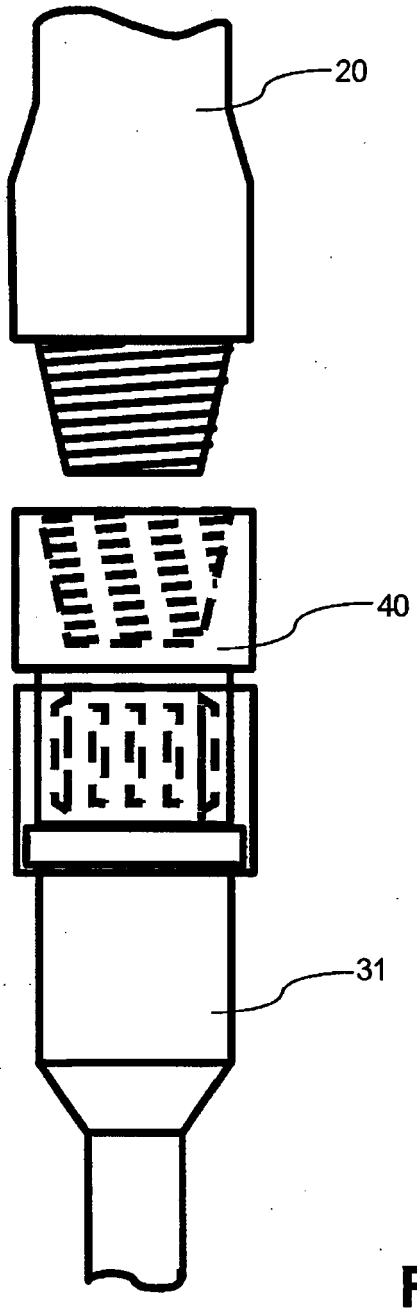

FIG. 22

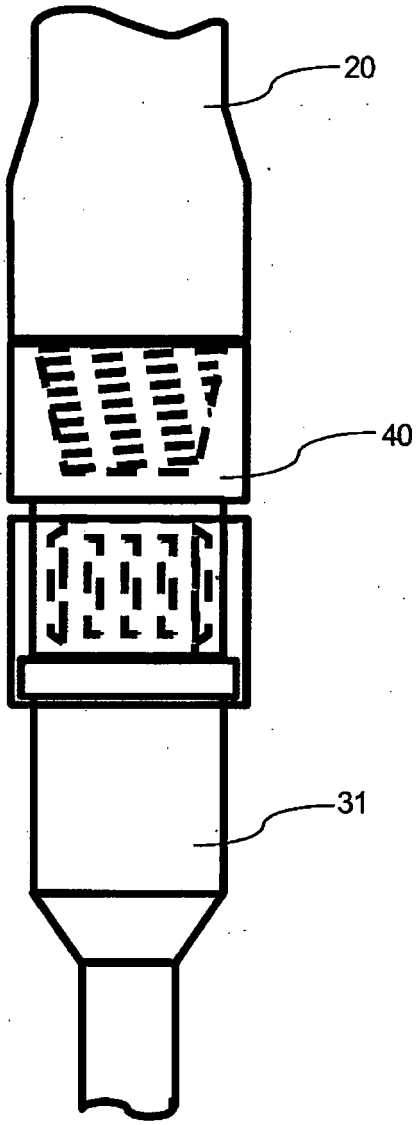

FIG. 23

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 08 00 7083

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 515 220 A (SIZER PHILLIP S [US] ET AL) 7 May 1985 (1985-05-07) * column 1, lines 34-40 * * column 3, lines 36-40 * * column 5, line 44 - column 6, line 4 * * claims 20,24-27 * * figures 2-4 * -----	1-7	INV. E21B7/00 E21B17/04 E21B19/22
A	US 6 158 516 A (SMITH MICHAEL L LEE [US] ET AL) 12 December 2000 (2000-12-12) * claim 19 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

E21B

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	24 September 2008	Schouten, Adri

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

4

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application Number
EP 08 00 7083

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

see additional sheet(s)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

Europäisches Patentamt
European Patent Office
Office européen des brevets

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 08 00 7083

The Search Division considers that the present European patentapplication does not comply with the requirements of unity of invention and relates to severalinventions or groups of inventions, namely:

1. claims: 1-7

   A method for drilling with coiled tubing and jointed drill pipe.

   ---

2. claims: 8-10

   An assembly for releasably connecting coiled tubing to conventional tubing or to bottom-hole-assembly.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 00 7083

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

24-09-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4515220 A	07-05-1985	AU 585490 B2	22-06-1989
		AU 3652084 A	20-06-1985
		CA 1220418 A1	14-04-1987
		GB 2151278 A	17-07-1985
		GB 2186609 A	19-08-1987
		GB 2187489 A	09-09-1987
		JP 60133190 A	16-07-1985
		NO 844211 A	13-06-1985
US 6158516 A	12-12-2000	CA 2419650 A1	21-02-2002
		MX PA03001424 A	19-04-2005
		WO 0214648 A1	21-02-2002

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82