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(71) Applicant *(for US only)*: **SCHLUMBERGER TECHNOLOGY CORPORATION** [US/US]; 300 Schlumberger Drive, Sugar Land, Texas 77478 (US).

(71) Applicant *(for CA only)*: **SCHLUMBERGER CANADA LIMITED** [CA/CA]; 125 – 9 Avenue SE, Calgary, Alberta T2G 0P6 (CA).

(71) Applicant *(for FR only)*: **SERVICES PETROLIERS SCHLUMBERGER** [FR/FR]; 42 rue Saint Dominique, 75007 Paris (FR).

(71) Applicant *(for all designated States except CA, FR, US)*: **SCHLUMBERGER TECHNOLOGY B.V.** [NL/NL]; Parkstraat 83, 2514 JG The Hague (NL).

(72) Inventor: **BERRY, Joe Rodney**; 4601 Westway Park Blvd, Houston, Texas 77041 (US).

(74) Agent: **RAYBAUD, Helene** et al.; Schlumberger, 10001 Richmond Avenue, Room 4720, Houston, Texas 77042 (US).

(54) Title: WELL EQUIPMENT ASSEMBLY METHOD USING COMBINED CATWALK AND CRANE

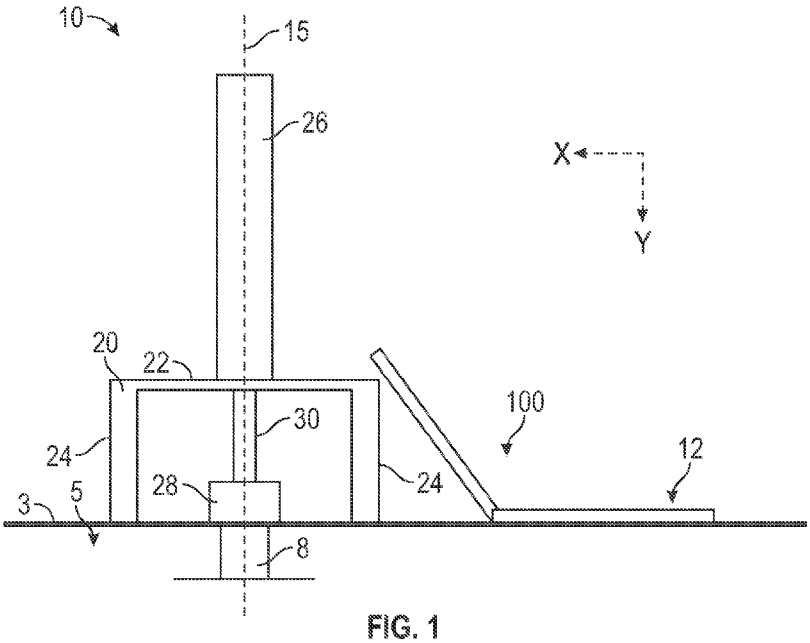

FIG. 1

(57) Abstract: A method for assembling a device for deployment into a wellbore includes lifting a first component using a crane unit coupled to and extensible from a catwalk, positioning the first component over a well center using the crane unit, lowering the first component using the crane unit into a slips assembly, engaging the first component using the slips assembly, lowering a tubular into engagement with the first component while the first component is engaged by the slips assembly, lifting the first component out of the slips assembly, lifting a second component using the crane unit, positioning the second component on the rig floor adjacent to a well center, lowering the first component into engagement with the second component while the second component is positioned adjacent to the well center, lifting the first component and the second component, and deploying the first and second components and the tubular into the wellbore.

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WELL EQUIPMENT ASSEMBLY METHOD USING COMBINED CATWALK AND CRANE

Cross-Reference to Related Applications

[0001] This application claims priority to U.S. Provisional Patent Application having Serial No. 62/833,041, which was filed in April 12, 2019 and is incorporated herein by reference in its entirety.

Background

[0002] Drilling rigs are used to bore wells into the earth and complete the wells, generally first by running drill pipe into the wellbore, and then running one or more additional strings of tubulars (e.g., casing, wireline, etc.). Various well-treatment processes may also be conducted. The end result may be a well system configured for the production of oil and gas.

[0003] In some applications, individual segments or "joints" of drill pipe are transported from a storage area to a rig floor of the drilling rig using a "catwalk". A catwalk is generally a ramp with a skate or another device configured to move a drill pipe from a horizontal configuration on the ground, up to the rig floor, where tubular handling equipment may engage an upper end of the drill pipe and move the drill pipe into a vertical position. From this position, the drill pipe may be connected to drill pipe that has already been lowered partially into the well, or may be positioned in a rack for later deployment. Stands of two or more connected-together drill pipes may be used as well, rather than individual joints, to increase time efficiency during drilling operations.

[0004] In certain applications, equipment not easily transportable via the catwalk machine may called for at the rig floor. This equipment can be located in various places around the drilling rig. In some applications, a separate crane, such as a mobile crane or a drill floor mounted crane, is used to lift and move the equipment vertically from the ground to the rig floor.

Summary

[0005] This summary is provided to introduce a selection of concepts that are further described below in the detailed description. This summary is not intended to identify key or essential features of the claimed subject matter, nor is it intended to be used as an aid in limiting the scope of the claimed subject matter.

[0006] Embodiments of the disclosure may provide a method for assembling a device for deployment into a wellbore. The method includes lifting a first component to above a rig floor

using a crane unit of a transport system coupled to and extensible from a catwalk of the transport system, positioning the first component over a well center using the crane unit, lowering the first component using the crane unit into a slips assembly coupled to the rig floor, engaging the first component using the slips assembly, lowering an oilfield tubular into engagement with the first component while the first component is engaged by the slips assembly, lifting the first component out of the slips assembly by lifting the oilfield tubular, lifting a second component to above the rig floor using the crane unit, positioning the second component on the rig floor adjacent to a well center, lowering the first component into engagement with the second component while the second component is positioned adjacent to the well center, lifting the first component and the second component by lifting the oilfield tubular, and deploying the first component, the second component, and the oilfield tubular into the wellbore.

[0007] Embodiments of the disclosure may also provide a transport unit that includes a catwalk, and a crane coupled to an end of the catwalk. The crane is extensible relative to the catwalk so as to maneuver an object lifted by the crane to a position above a rig floor toward and away from a well center. The crane is configured to position a first component over the well center, and lower the first component using the crane unit into a slips assembly coupled to the rig floor. The slips assembly is configured to engage the first component, and an oilfield tubular is connected to the first component when the first component is engaged in the slips assembly. The crane is further configured to lift a second component to above the rig floor, position the second component on the rig floor adjacent to a well center, and lower the first component into engagement with the second component while the second component is positioned adjacent to the well center.

[0008] Embodiments of the disclosure may further provide a method for assembling a device for deployment into a wellbore. The method includes lifting a stabilizer collar to above a rig floor using a crane unit coupled to and extensible from a catwalk, positioning stabilizer collar over a well center using the crane unit, lowering the stabilizer collar using the crane unit into a slips assembly coupled to the rig floor, engaging the stabilizer collar using the slips assembly, transporting a drill pipe from ground-level and into connection with a top drive coupled to a mast at least partially using the catwalk, lowering the drill pipe into engagement with the stabilizer collar while the stabilizer collar is engaged by the slips assembly, rotating the stabilizer collar relative to the drill pipe using an iron roughneck to connect the stabilizer collar to the drill pipe, lifting the stabilizer collar out of the slips assembly by lifting the drill pipe, lifting a cross-over collar to above the rig floor using the crane unit, positioning the cross-over collar on the rig floor

adjacent to the well center, lowering the stabilizer collar into engagement with the cross-over collar while the cross-over collar is positioned on the rig floor adjacent to the well center, rotating the cross-over collar relative to the stabilizer collar, while the cross-over collar is positioned on the rig floor, to connect together the stabilizer collar and the cross-over collar, lifting the stabilizer collar and the cross-over collar by lifting the drill pipe, lifting a drill bit using the crane unit, positioning the drill bit in the slips assembly, lowering the stabilizer collar and the cross-over collar toward the drill bit by lowering the drill pipe, connecting the drill bit to the cross-over collar, and deploying the stabilizer collar, cross-over collar, drill bit, and drill pipe into the wellbore by lowering the drill pipe.

Brief Description of the Drawings

[0009] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the present teachings and together with the description, serve to explain the principles of the present teachings. In the figures:

[0010] Figure 1 illustrates a side, schematic view of a well system including a drilling rig and a transport system, according to an embodiment.

[0011] Figure 2 illustrates a perspective view of the transport system, according to an embodiment.

[0012] Figure 3 illustrates a side, schematic view of the transport system, according to an embodiment.

[0013] Figures 4, 5, 6, 7, and 8 illustrate side, schematic views of the transport system, depicting an operating sequence thereof, according to an embodiment.

[0014] Figure 9 illustrates a flowchart of a method for assembling a device for deployment into a wellbore using the transport system and the drilling rig, according to an embodiment.

[0015] Figures 10, 11, 12, 13, 14, 15, and 16 illustrate various stages of the transport system and/or drilling rig during execution of the method of Figure 9, according to an embodiment.

Detailed Description

[0016] Reference will now be made in detail to embodiments, examples of which are illustrated in the accompanying drawings and figures. In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the invention. However, it will be apparent to one of ordinary skill in the art that the invention may be practiced without these specific details. In other instances, well-known methods, procedures,

components, circuits, and networks have not been described in detail so as not to unnecessarily obscure aspects of the embodiments.

[0017] It will also be understood that, although the terms first, second, etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first object or step could be termed a second object or step, and, similarly, a second object or step could be termed a first object or step, without departing from the scope of the present disclosure. The first object or step, and the second object or step, are both, objects or steps, respectively, but they are not to be considered the same object or step.

[0018] The terminology used in the description herein is for the purpose of describing particular embodiments and is not intended to be limiting. As used in this description and the appended claims, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will also be understood that the term "and/or" as used herein refers to and encompasses any possible combinations of one or more of the associated listed items. It will be further understood that the terms "includes," "including," "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. Further, as used herein, the term "if" may be construed to mean "when" or "upon" or "in response to determining" or "in response to detecting," depending on the context.

[0019] Figure 1 illustrates a schematic view of a well system 10 having well center (or central/longitudinal axis) 15, according to an embodiment. The well system 10 may be configured to bore into the earth and extract hydrocarbons (e.g., oil and/or natural gas), or to inject substances into an earthen formation 5 extending beneath the surface or ground 3 via a well or wellbore 8. In the illustrated embodiment, the central axis 15 extends substantially vertically (e.g., extending substantially parallel to the Y-axis shown in Figure 1) relative to the substantially horizontally or laterally extending (e.g., extending substantially parallel to the X-axis shown in Figure 1) surface 3 (e.g., ground-level). Further, the well system 10 generally includes a rig 20, a wellhead 28, and a catwalk machine or transport system 100. The rig 20 includes a rig floor 22 extending between a pair of lateral sides or ends 24. The rig floor 22 is elevated or vertically spaced from the surface 3. Additionally, in the embodiment shown in Figure 1, the well system 10 also includes a derrick or mast 26 extending vertically along the

central axis 15 from the rig floor 22. The mast 26 is configured to assist in the insertion and removal of tubular members, such as drill pipes, from the wellbore 8.

[0020] The well system 10 further includes a wellhead 28, e.g., including wellhead equipment such as a blowout preventer, rotary seal, etc. The wellbore 8 extends vertically (in this embodiment) downward from the wellhead 28 from surface 3. The wellhead 28 is thus generally configured to control fluid communication between the wellhead 28 and the surrounding environment and to allow for the insertion and removal of a drill string 30 of the well system 10 from the wellbore 8, where the drill string 30 includes a series of tubular members, such as drill pipes, made-up (connected together via meshed threads) end-to-end. For example, when running the drill string 30 into the wellbore 8, an individual drill pipe segment or "joint" may be transported to rig floor 22 and coupled with an upper end of the portion of the drill string 30 extending vertically through a hole in the rig floor 22 that is aligned with the central axis 15 (also known as "well center"). In the embodiment shown in Figure 1, tubular members, such as the drill pipe joints of the drill string 30, or other equipment may be located in a storage area 12 that is vertically and/or horizontally spaced from the rig floor 22 of the rig 20. In the embodiment shown in Figure 1, the transport system 100 of the well system 10 is configured to transport tubular members, including drill pipe joints of drill string 30, between the storage area 12 and the rig floor 22. Additionally, as will be described further herein, transport system 100 is also configured to transport equipment other than tubular members between the rig floor 22 and locations vertically and horizontally spaced from the rig floor 22.

[0021] Figure 2 illustrates a raised, perspective view of the transport system 100, according to an embodiment. Figure 3 illustrates a side, schematic view of the transport system 100, according to an embodiment. Referring to both Figures 2 and 3, the transport system 100 (also referred to as a catwalk and crane system, or catwalk machine with crane) includes a catwalk 130 and crane unit 160. The catwalk 130 includes a substructure or support frame 132 with hydraulic moving feet 134, a first pair of moveable or retractable tubular support arms 136 extending from a first lateral side of support frame 132, and a second pair of moveable or retractable tubular support arms 138 extending from a second, opposing lateral side of support frame 132. The support frame 132 of the catwalk 130 includes a first end 132A and a second end 132B longitudinally spaced from first end 132 A. The feet 134 engage the surface 3 to support the catwalk 130 from each end 132A and 132B of the support frame 132. Second support arms 138 of the catwalk 130 may be positioned proximal the storage area 12 of the well system 10. In some embodiments, the catwalk 130 of the transport system 100 may include a storage platform

that stores a plurality of tubular members or drill pipe joints 32 for loading into the catwalk 130. The catwalk 130 also includes a pipe transporter or catwalk skate 140 having rollers 142 and 144 disposed at opposing longitudinal ends thereof and a tubular support surface 146 extending between the longitudinal ends of the skate 140.

[0022] The crane unit 160 includes a ramp or directing frame 162 and a telescopic member or crane 172 moveably or telescopically (e.g., extensibly) mounted within the directing frame 162. A pivot joint 166 connects the directing frame 162 to the catwalk 130. For example, the directing frame 162 has a first longitudinal end 162A and a second longitudinal end 162B. The second end 162B of the directing frame 162 is pivotally coupled to the first end 132A of the support frame 132 at a pivotal coupling or joint 166. Additionally, the crane unit 160 includes a pair of adjustable struts 168. A first longitudinal end of each strut 168 pivotally couples to a lateral side of directing frame 162 at a first pivotal coupling or joint 168A, and a second longitudinal end of each strut 168 pivotally couples to an actuator or extension cylinder 170 at a second pivotal coupling or joint 168B.

[0023] The first pivot joints 168A of the struts 168 are longitudinally spaced from the ends 162A and 162B of the directing frame 162, and the extension cylinders 170 are coupled to the support frame 132 of the catwalk 130 proximal to, but longitudinally spaced from, the first end 132A of the support frame 132. Each extension cylinder 170 is configured to extend and retract in a substantially horizontal direction (e.g., in a direction substantially parallel with the X-axis shown in Figure 1) such that extension/retraction of the extension cylinders 170 induces rotation of the directing frame 162 about the pivot joint 166 via the connection provided between the extension cylinders 170 and the directing frame 162 by the struts 168. Additionally, an actuatable hydraulic cylinder or actuator 169 is mounted within each of the struts 168 to adjust the struts 168 and cause luffing of the directing frame 162. Particularly, each cylinder 169 may be configured to extend or retract a corresponding strut 168, thereby rotating the directing frame 162 about the pivot joint 166.

[0024] During operation, the skate 140 is configured to transport a tubular member, such as drill pipe joints 32, relative to the support frame 132 of the catwalk 130 and the crane unit 160 when the tubular member is transported between the storage area 12 and the rig floor 22. For example, the skate 140 may be configured to receive or physically support a tubular member and may be moved or transported between the support frame 132 and the frame 162 via rollers 142 and 144, and a drive mechanism or actuator (not shown). In some embodiments, the drive

mechanism includes a chain or cable drive. In other embodiments, the drive mechanism may comprise various other drives known to be used for catwalk skates.

[0025] In an embodiment, the crane 172 is received at least partially within directing frame 162 and is configured to telescopically extend and retract from the first end 162A of directing frame 162. In this arrangement, the crane unit 160 has a longitudinal distance or length extending between a first or outer end 172 A of the crane 172 and the second end 162B of directing frame 162, where the longitudinal distance between outer end 172A of crane 172 and the second end 162B of directing frame 162 may be adjusted or altered by extending or retracting crane 172. As shown particularly in Figure 3, a hydraulic cylinder or actuator 173 is received in and coupled with directing frame 162. The hydraulic cylinder 173 is also coupled to a second or inner end 172B of the crane 172 and is configured to displace the crane 172 telescopically, or otherwise extensibly, (indicated by arrow 177 in Figure 3) along a central or longitudinal axis 165 of crane unit 160 relative to directing frame 162. In this arrangement, the hydraulic cylinder 173 is configured to extend and retract the crane 172 from the first end 162A of the directing frame 162.

[0026] In the embodiment shown in Figures 2 and 3, the crane unit 160 also includes a winch 176 mounted proximal the second end 162B of directing frame 162 that controls a cable or line 178 extending from the winch 176, through or around a sheave 174 mounted to the first end 162A of the directing frame 162, and to a releasable connector 180, such as a hook for threaded tubular. In this arrangement, the sheave 174 is configured to the support cable 178 and facilitate the retraction and extension of the cable 178 from the winch 176. The cable 178 is configured to support the weight of equipment 182 suspended from connector 180 while winch 176 is configured to extend and retract cable 178, which thereby vertically lowers and raises connector 180 relative to the surface 3. In this manner, the vertical position of the equipment 182 (e.g., position of the equipment 182 along a vertical axis parallel to the Y-axis shown in Figure 1) suspended from the connector 180 may be adjusted in isolation. In other words, actuating the winch 176 allows an operator of the transport system 100 to adjust the vertical position of the equipment 182 independently. In some applications, the ability to independently adjust the position of the equipment 182 suspended from transport system 100 along only a single axis (e.g., a vertical axis relative surface 3) may simplify and/or provide greater flexibility in the operation of the transporting equipment 182 via the transport system 100.

[0027] Referring to Figures 4-8, a general example of an operation of transport system 100 will now be described in view of the embodiment of transport system 100 shown in Figures 4-8.

A more specific implementation of this operation, used to build a device for deployment into the wellbore, such as a bottom-hole assembly, using the transport system 100, is described in detail below. The crane unit 160 may be in an initial or retracted position 190, as shown in Figure 4, in which the frame 162 is disposed substantially horizontally adjacent to the support frame 132. In the retracted position 190, the extension cylinders 170 may be actuated to react against the struts 168 and thereby rotate the struts 168 about the pivot joints 168B and in-turn rotate the directing frame 162 about the pivot joint 166 (via the connection formed between the struts 168 and directing the frame 162 at the pivot joints 168A) until the crane unit 160 is disposed in a second or intermediate position 192 (shown in dashed lines in Figure 4). In the intermediate position 192, the extension cylinders 170 may continue to actuate and thereby rotate the struts 168 about the pivot joints 168B and the frame 162 about the pivot joint 166 until the crane unit 160 is disposed in an extended or operating position 194 (shown also in dashed lines in Figure 4). In the operating position 194, the cylinders 169 disposed in the struts 168 may be actuated to luff, or lift and lower by rotation, the directing frame 162.

[0028] Figure 5 illustrates transport system 100 with the crane unit 160 in the operating position 194. As shown, prior to coupling the connector 180 with the equipment 182, crane unit 160 is disposed in the operating position 194 and cable 178 is retracted until connector 180 is disposed in a first or retracted position proximal sheave 174 and distal the surface 3. With the connector 180 disposed in the retracted position shown in Figure 5, the equipment 182 to be transported from a position at or proximal to the surface 3 to the rig floor 22 of the drilling rig 20 may be positioned proximal to the transport system 100, as shown in Figure 6. Following the positioning of the equipment 182 proximal to the transport system 100, the winch 176 may be actuated to lower the cable 178 and the connector 180 to a second or extended position where the connector 180 is disposed proximal to the surface 3. In the position shown in Figure 6, connector 180 may be releasably coupled with equipment 182 disposed at the surface 3.

[0029] Following the coupling of the equipment 182 with the connector 180, the equipment 182 may be lifted from the surface 3 via the cable 178, as shown in Figure 7. Particularly, in the embodiment shown in Figures 4-8, the cylinder 173 is actuated to telescopically extend the crane 172 along the central axis 165 from the first end 162A of directing frame 162. Since, in an embodiment, the central axis 165 of the crane unit 160 is disposed at an angle relative the vertical and horizontal axes (the Y-axis and X-axis shown in Figure 1, respectively), the extension of the crane 172 along the central axis 165 transports the equipment 182 both vertically from surface 3 and horizontally towards the rig floor 22.

[0030] In some embodiments, either prior to, during, or following the actuation of the cylinder 173, the winch 176 may be actuated to retract the cable 178 and the connector 180 to thereby vertically lift the equipment 182. In embodiments in which the winch 176 and cylinder 173 are not operated simultaneously, the winch 176 allows the transport system 100 to transport the equipment 182 in a single direction. Particularly, actuation of the winch 176 may be configured to transport the equipment 182 solely in a vertical direction (e.g., along an axis parallel with the Y-axis shown in Figure 1). In some embodiments, the winch 176 may be used to lift the equipment 182 to a position above the rig floor 22 prior to the equipment 182 being transported horizontally (e.g., in a direction parallel with the X-axis shown in Figure 1) towards the rig floor 22 of the drilling rig 20. In some applications, vertically lifting the equipment 182 to a position vertically above the rig floor 22 prior to transporting the lifting equipment 182 in a horizontal direction may reduce the possibility of the equipment 182 colliding with a lateral side 24 of the rig 20 during a transport operation.

[0031] The equipment 182 may be lifted via the winch 176 and/or the cylinder 173 until it occupies an upper or elevated position vertically elevated from (but horizontally spaced from) the rig floor 22. Once the equipment 182 is disposed in the elevated position, the equipment 182 may be transported in a horizontal direction towards the rig floor 22, as shown in Figures 7 and 8. For example, the cylinders 169 of the struts 168 may be actuated to rotate the directing frame 162 about the pivot joint 166 to thereby transport the equipment 182 until it is disposed over the rig floor 22 (e.g., until the equipment 182 is no longer horizontally spaced from the rig floor 22) and lower the equipment 184 onto rig floor 22, as shown in Figure 8. In other embodiments, rotation of the directing frame 162 via actuation of the cylinders 169 may place the equipment 182 vertically over the rig floor 22, and actuation of the winch 176 may be used to vertically lower cable 178 until equipment 182 is placed or landed against rig floor 22. Furthermore, in the operating position 194 of the crane unit 160 shown in Figure 8, the skate 140 of the transport system 100 may be actuated to transport a tubular member (e.g., a pipe joint 32, etc.) from the storage area 12 to the rig floor 22 with the first end 172A of the crane 172 disposed vertically over the rig floor 22.

[0032] The embodiment of transport system 100 shown in Figures 2-8 may be retracted to the various positions described above by reversing the actuation and order of the components and steps previously described. Thus, in some embodiments, the transport system 100 provides a catwalk machine with an integrated or combined crane that extends from the adjustable directing

frame to transport loads to and from the drill floor and to provide support to the catwalk skate for delivering drill pipe from a pipe storage area to a rig floor and back again.

[0033] Figure 9 illustrates a flowchart of a method 900 for assembling a well system device using a catwalk and crane system, such as provided by the transport system 100 discussed above, according to an embodiment. Examples of the configuration of the rig 20 and the transport system 100 at various stages of the method 900 are shown in Figures 10-16, and thus the method 900 will be described with additional reference thereto, where appropriate.

[0034] The method 900 may include connecting the crane unit 160 to a stabilizer collar (e.g., a "first component"), as at 902. This may generally occur with the stabilizer collar positioned on the ground (e.g., the surface 3, as discussed above). The stabilizer collar may then be hoisted vertically from the ground to above the rig floor and maneuvered horizontally over the well center 15, as at 904. This may proceed consistent with the depiction of the general hoisting and luffing operation discussed above. An example of the crane unit 160 coupled to a stabilizer collar 1000 and positioned over well center 15 is shown in Figure 10. Also visible in Figure 10, is a slips assembly 1002, which is positioned in the rig floor 22. The slips assembly 1002 may receive slips or other gripping devices that are configured to hold a tubular received therethrough and transfer the weight thereof to the rig floor 22. As can also be seen, the connector 180 that connects the crane unit 160 to the stabilizer collar 1000 may be a threaded connector, which may be received into and connected to the stabilizer collar 1000 by rotating the connector 180 relative to the stabilizer collar 1000.

[0035] Once the stabilizer collar 1000 has been moved over well center 15 by lifting and horizontally moving the stabilizer collar 1000 using the crane unit 160, the stabilizer collar 1000 may be lowered into the slips assembly 1002, as at 906. The slips assembly 1002 may then engage the stabilizer collar 1000, and the crane unit 160 may be disconnected from the stabilizer collar 1000, as at 908, e.g. by rotating the connector 180 relative to the collar 1000.

[0036] A drill pipe (or any other type of oilfield tubular as the application may dictate) may then be lowered into connection with the stabilizer collar 1000, as at 910. This is shown in Figure 11, where a drill pipe 1100 is connected to the stabilizer collar 1000. The drill pipe 1100, in this embodiment, is supported, e.g., by a top drive, a tubular delivery arm, an elevator, or another device attached to the mast 26. For example, a tubular delivery arm may be configured to swing laterally with respect to the mast 26, thereby enabling the tubular delivery arm to support the drill pipe 1100 across a range of horizontal positions (e.g., including coaxial with well center 15 and a range of positions offset therefrom). Additional details regarding an

example of a tubular delivery arm are discussed in U.S. Patent Publication No. 2018/0087331, which is incorporated herein by reference, to the extent not inconsistent with the present disclosure. The drill pipe 1100 is further illustrated received through a stabbing guide 1103. An iron roughneck 1104, which may include rollers, tongs, or other implements configured to rotate two tubulars relative to one another, is shown connecting together the drill pipe 1100 and the stabilizer collar 1000. Once connected together and adequately torqued, the drill pipe 1100 and the stabilizer collar 1000 may be hoisted upwards, out of the slips assembly 1002, as at 912, such that the drill pipe 1100 and the stabilizer collar 1000 are positioned vertically above the rig floor 22, e.g., out of the way for other components to be brought onto the rig floor 22.

[0037] Accordingly, the next component for the well system device may be brought onto the rig floor 22 using the transport system 100, e.g., the crane unit 160 thereof. In particular, a cross-over collar (e.g., a "second component") may be connected to the crane unit 160 via the connector 180, while the cross-over collar is positioned on the ground (surface 3), as at 914. The cross-over collar may then be lifted and luffed into position over the rig floor 22, as at 916, and consistent with the embodiment of the transport system 100 operation discussed with reference to Figures 4-8.

[0038] Figure 12 illustrates an example of a cross-over collar 1200 being hoisted over the rig floor 22 by the crane unit 160. Again, the connector 180 is a threaded connector, but other types of connectors 180 may be used. Instead of setting the cross-over collar 1200 on well center 15, e.g., in the slips assembly 1002, the cross-over collar 1200 may be rested on the rig floor 22, adjacent to the well center 15/slips assembly 1002. An operator employing a wrench, or tongs or other mechanized systems, may then be employed to disconnect the connector 180 from the cross-over collar 1200, as shown in Figure 13.

[0039] The drill pipe 1100 and the stabilizer collar 1000 connected thereto, may then be maneuvered to a position coaxial to the cross-over collar 1200 (e.g., not coaxial to the well center 15, but horizontally offset therefrom), and then lowered toward the rig floor 22, such that the stabilizer collar 1000 engages the cross-over collar 1200, as at 918. As shown in Figure 14, an operator with a wrench 1400 may rotate the cross-over collar 1200 relative to the stabilizer collar 1000, connecting the two together.

[0040] As shown in Figure 15, the connected-together drill pipe 1100, stabilizer collar 1000, and cross-over collar 1200 may then be lifted from the rig floor 22, as at 920 (Figure 9). At the same time (or before or after action 916), a drill bit 1500 in a bit breaker 1502 (e.g., both may be considered part of a "third component") may be connected to the crane unit 160, as at 922, and

then hoisted and positioned at well center 15, above the rig floor, as at 924. The drill bit 1500 and bit breaker 1502 may be set down on the rig floor 22, e.g., at well center 15 and on top of the slips assembly 1002. The drill pipe 1100, stabilizer collar 1000, and cross-over collar 1200 may then be moved over well center 15 and lowered, such that the cross-over collar 1200 engages the drill bit 1500. The iron roughneck 1104 may then connect together the drill bit 1500 and the cross-over collar 1200, e.g., by rotating the drill bit 1500 with the bit breaker 1502 still attached thereto, relative to the cross-over collar 1200, as at 926. Next, the drill bit 1500 may be lifted out of the bit breaker 1502, and the bit breaker 1502 may be removed, as at 928.

[0041] Additional components (e.g., mud motors, measuring- or logging-while-drilling collars, etc.) may be attached between the drill pipe 1100 and the drill bit 1500, generally proceeding in this same manner of raising the connected portions, setting the new component either in slips or on the rig floor 22, and then lowering the connected portions and connecting them to the new component. The end result may be a completed bottom-hole assembly 1600, as shown in Figure 16. The bottom-hole assembly 1600 may be lowered through the slips assembly 1102 and ultimately deployed into the bore 8 (e.g., Figure 1) in order to advance the construction of the bore, as at 930.

[0042] Although the method 900 is described in terms of constructing a bottom-hole assembly, it will be appreciated that the crane unit 160 may be employed to construct various other types of equipment. For example, a master bushing may be engaged by the crane, and lifted out of well center, e.g., for maintenance purposes. While the master bushing is out, tubular running operations may continue using the crane unit 160 to lift and lower slips into place to grip the pipe at the rig floor. Further, a test mandrel may be lowered into a wellhead using the crane unit 160. In other embodiments, other equipment that may benefit from being hoisted and brought over or away from well center may be put into place by the crane unit 160 on the catwalk 130.

[0043] The foregoing description, for purpose of explanation, has been described with reference to specific embodiments. However, the illustrative discussions above are not intended to be exhaustive or to limit the disclosure to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings. Moreover, the order in which the elements of the methods described herein are illustrate and described may be re-arranged, and/or two or more elements may occur simultaneously. The embodiments were chosen and described in order to explain at least some of the principals of the disclosure and their practical applications, to thereby enable others skilled in the art to utilize the disclosed methods and

systems and various embodiments with various modifications as are suited to the particular use contemplated.

CLAIMS

What is claimed is:

1. A method for assembling a device for deployment into a wellbore, the method comprising:

lifting a first component to above a rig floor using a crane unit of a transport system coupled to and extensible from a catwalk of the transport system;

positioning the first component over a well center using the crane unit;

lowering the first component using the crane unit into a slips assembly coupled to the rig floor;

engaging the first component using the slips assembly;

lowering an oilfield tubular into engagement with the first component while the first component is engaged by the slips assembly;

lifting the first component out of the slips assembly by lifting the oilfield tubular;

lifting a second component to above the rig floor using the crane unit;

positioning the second component on the rig floor adjacent to a well center;

lowering the first component into engagement with the second component while the second component is positioned adjacent to the well center;

lifting the first component and the second component by lifting the oilfield tubular; and

deploying the first component, the second component, and the oilfield tubular into the wellbore.

2. The method of claim 1, wherein the first component comprises a stabilizer collar, and wherein the second component comprises a cross-over collar.

3. The method of claim 1, wherein the oilfield tubular comprises one or more drill pipes.

4. The method of claim 3, further comprising transporting the one or more drill pipes from ground-level into a vertical orientation on the rig floor using the transport system, and wherein lowering the oilfield tubular comprises lowering a top drive coupled to a mast extending upwards from the rig floor.

5. The method of claim 1, further comprising rotating the first component relative to the oilfield tubular using an iron roughneck.

6. The method of claim 1, further comprising rotating the second component relative to the rig floor, while the second component is positioned on the rig floor, to connect together the first and second components.

7. The method of claim 1, further comprising:
lifting a third component to a position above the rig floor using the crane unit;
positioning the third component on top of the slips assembly; and
lowering the second component into engagement with the third component.

8. The method of claim 7, wherein the third component comprises a drill bit.

9. The method of claim 8, wherein the third component further comprises a bit breaker, the method further comprising removing the bit breaker after lowering the second component into engagement with the third component.

10. The method of claim 9, further comprising rotating the third component relative to the second component, wherein the bit breaker rotates on the slips assembly when rotating the third component.

11. The method of claim 8, wherein the third component is lifted from ground-level to above the rig floor using the crane unit.

12. The method of claim 8, wherein the first component, the second component, and at least a portion of the third component together form at least a portion of a bottom-hole assembly.

13. The method of claim 1, wherein the first component is lifted from ground-level to above the rig floor using the crane unit, and wherein the second component is lifted from ground-level to above the rig floor using the crane unit.

14. The method of claim 1, wherein the crane unit comprises a threaded connector configured to engage the first component, the second component, or both by rotating the threaded connector relative to the first component or the second component.

15. A transport unit, comprising:

a catwalk; and

a crane coupled to an end of the catwalk, wherein the crane is extensible relative to the catwalk so as to maneuver an object lifted by the crane to a position above a rig floor toward and away from a well center, wherein the crane is configured to:

position a first component over the well center;

lower the first component using the crane unit into a slips assembly coupled to the rig floor, wherein the slips assembly is configured to engage the first component, wherein an oilfield tubular is connected to the first component when the first component is engaged in the slips assembly;

lift a second component to above the rig floor;

position the second component on the rig floor adjacent to a well center; and

lower the first component into engagement with the second component while the second component is positioned adjacent to the well center.

16. The transport unit of claim 15, wherein the crane unit comprises a threaded connector configured to engage the first component, the second component, or both by rotating the threaded connector relative to the first component or the second component.

17. The transport unit of claim 15, wherein the catwalk is configured to transport the oilfield tubular from the ground to the rig floor.

18. The transport unit of claim 15, wherein the first component and the second component together form at least a portion of a bottom-hole assembly.

19. The transport unit of claim 15, wherein the crane unit is configured to lift the first component from ground-level to above the rig floor.

20. A method for assembling a device for deployment into a wellbore, the method comprising:

lifting a stabilizer collar to above a rig floor using a crane unit coupled to and extensible from a catwalk;

positioning stabilizer collar over a well center using the crane unit;

lowering the stabilizer collar using the crane unit into a slips assembly coupled to the rig floor;

engaging the stabilizer collar using the slips assembly;

transporting a drill pipe from ground-level and into connection with a top drive coupled to a mast at least partially using the catwalk;

lowering the drill pipe into engagement with the stabilizer collar while the stabilizer collar is engaged by the slips assembly;

rotating the stabilizer collar relative to the drill pipe using an iron roughneck to connect the stabilizer collar to the drill pipe;

lifting the stabilizer collar out of the slips assembly by lifting the drill pipe;

lifting a cross-over collar to above the rig floor using the crane unit;

positioning the cross-over collar on the rig floor adjacent to the well center;

lowering the stabilizer collar into engagement with the cross-over collar while the cross-over collar is positioned on the rig floor adjacent to the well center;

rotating the cross-over collar relative to the stabilizer collar, while the cross-over collar is positioned on the rig floor, to connect together the stabilizer collar and the cross-over collar;

lifting the stabilizer collar and the cross-over collar by lifting the drill pipe;

lifting a drill bit using the crane unit;

positioning the drill bit in the slips assembly;

lowering the stabilizer collar and the cross-over collar toward the drill bit by lowering the drill pipe;

connecting the drill bit to the cross-over collar; and

deploying the stabilizer collar, cross-over collar, drill bit, and drill pipe into the wellbore by lowering the drill pipe.

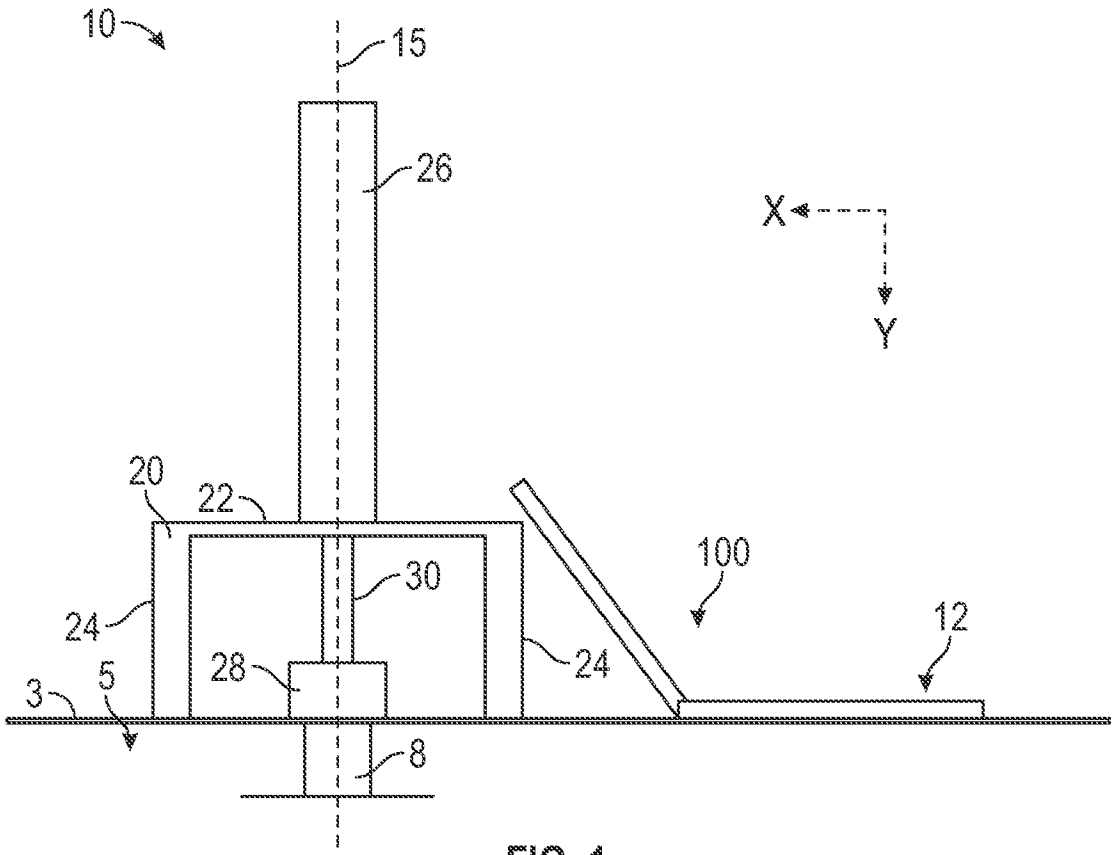

FIG. 1

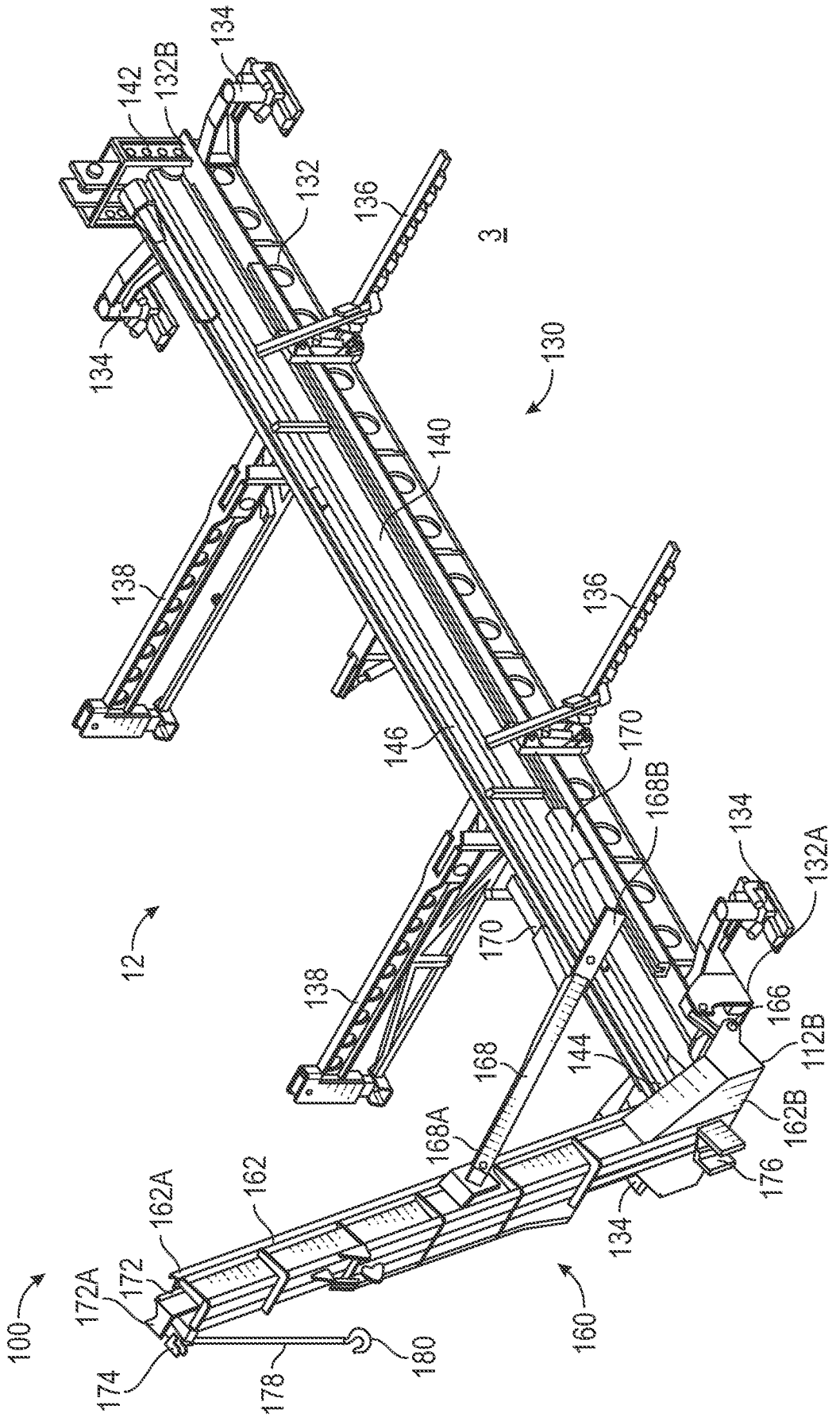
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FIG. 2

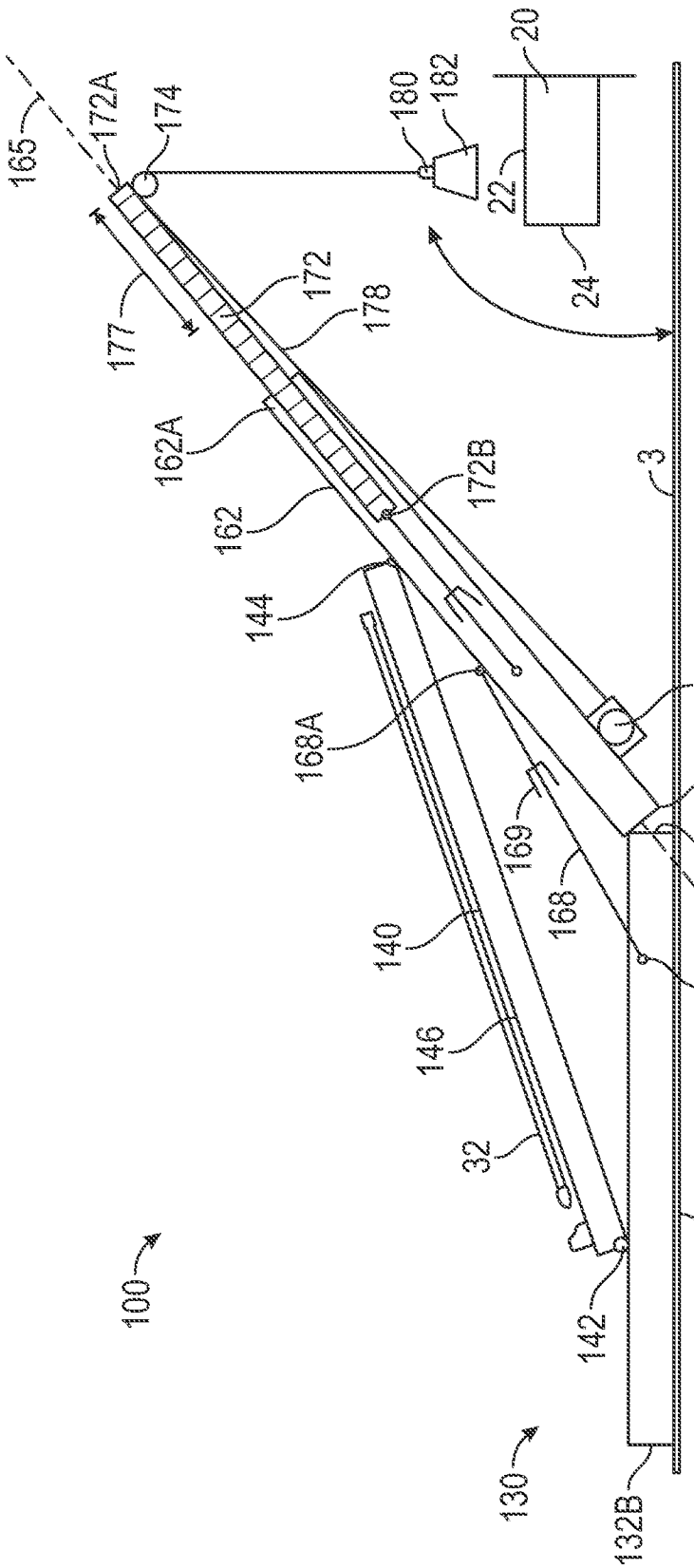
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FIG. 3

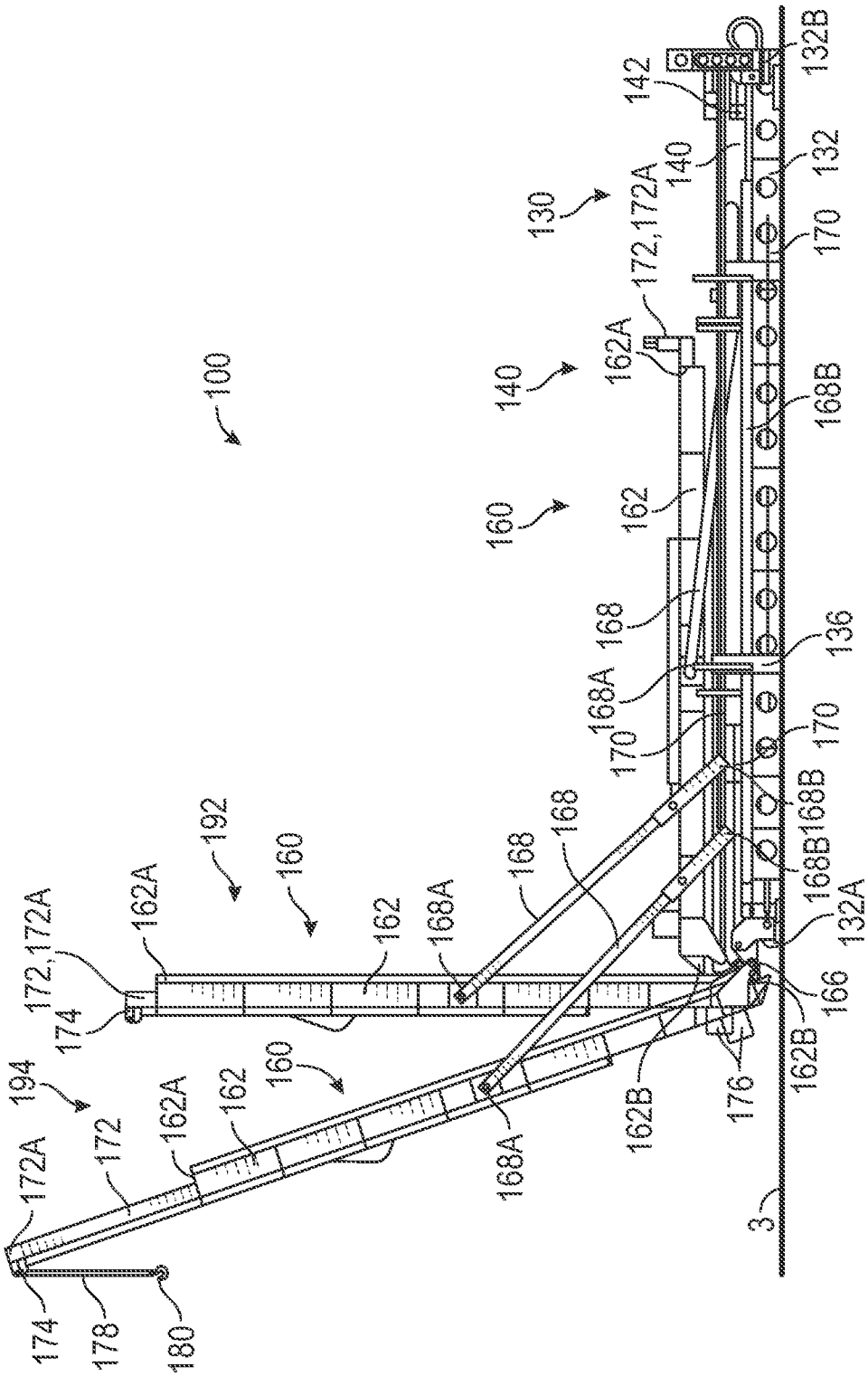
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FIG. 4

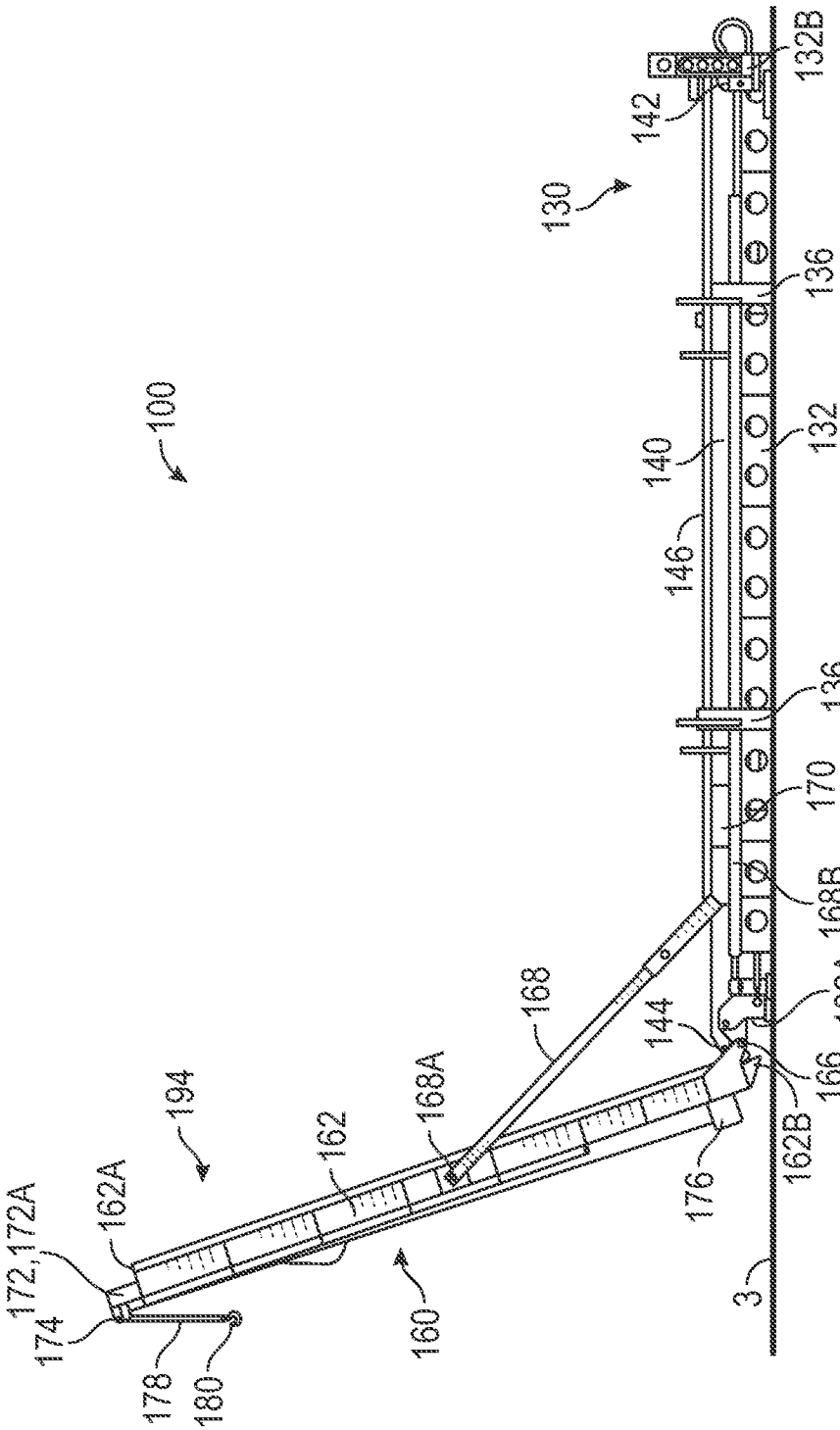
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FIG. 5

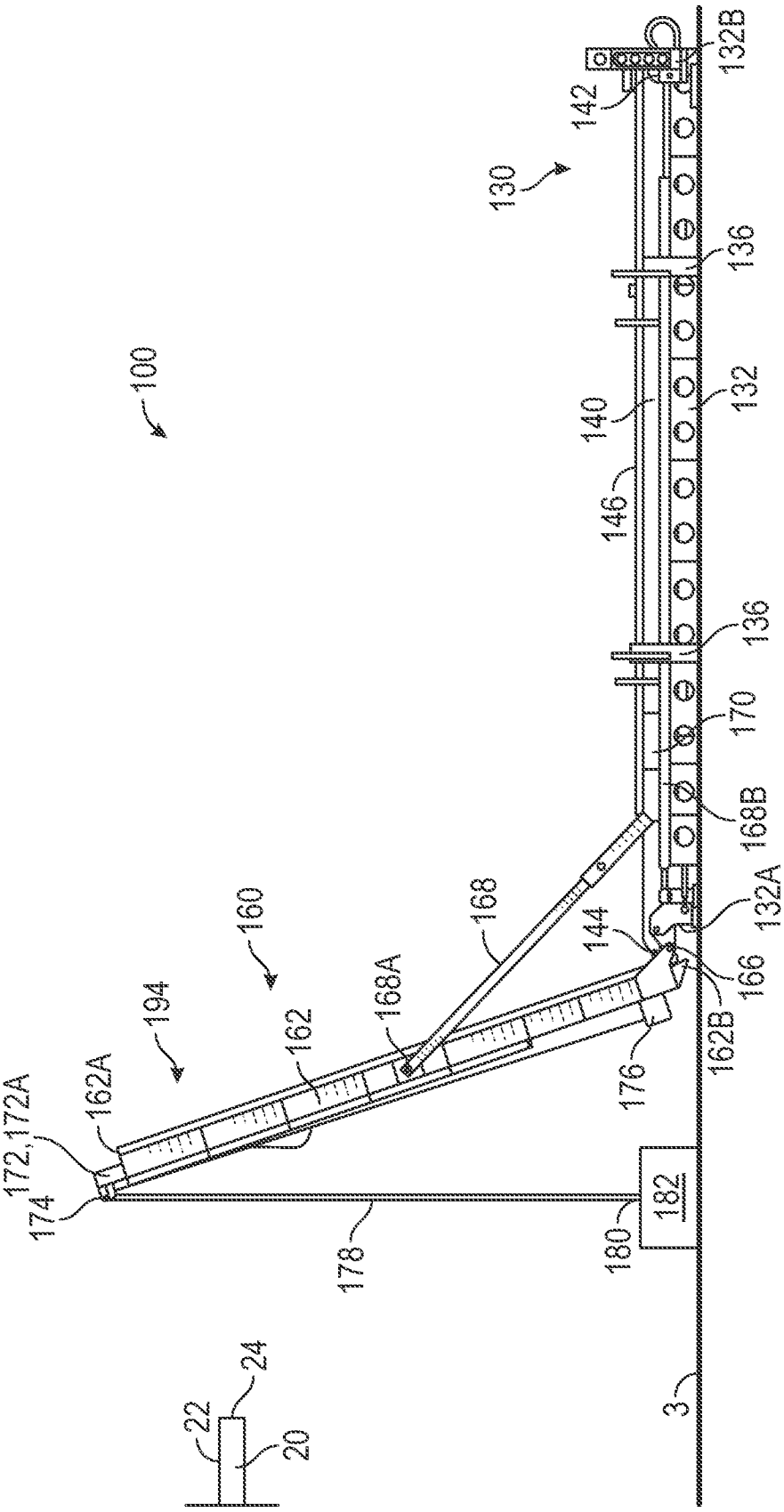
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FIG. 6

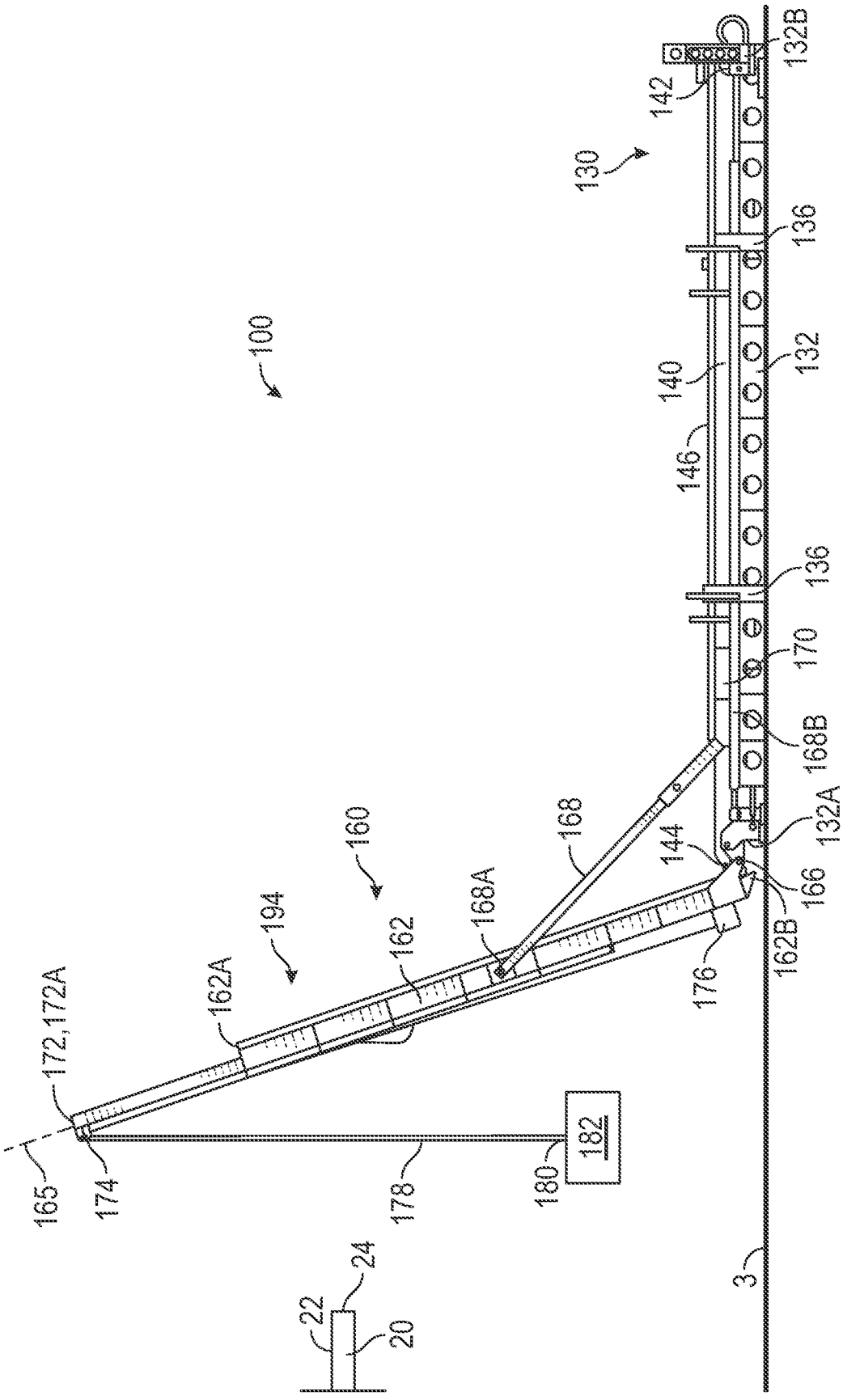
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FIG. 7

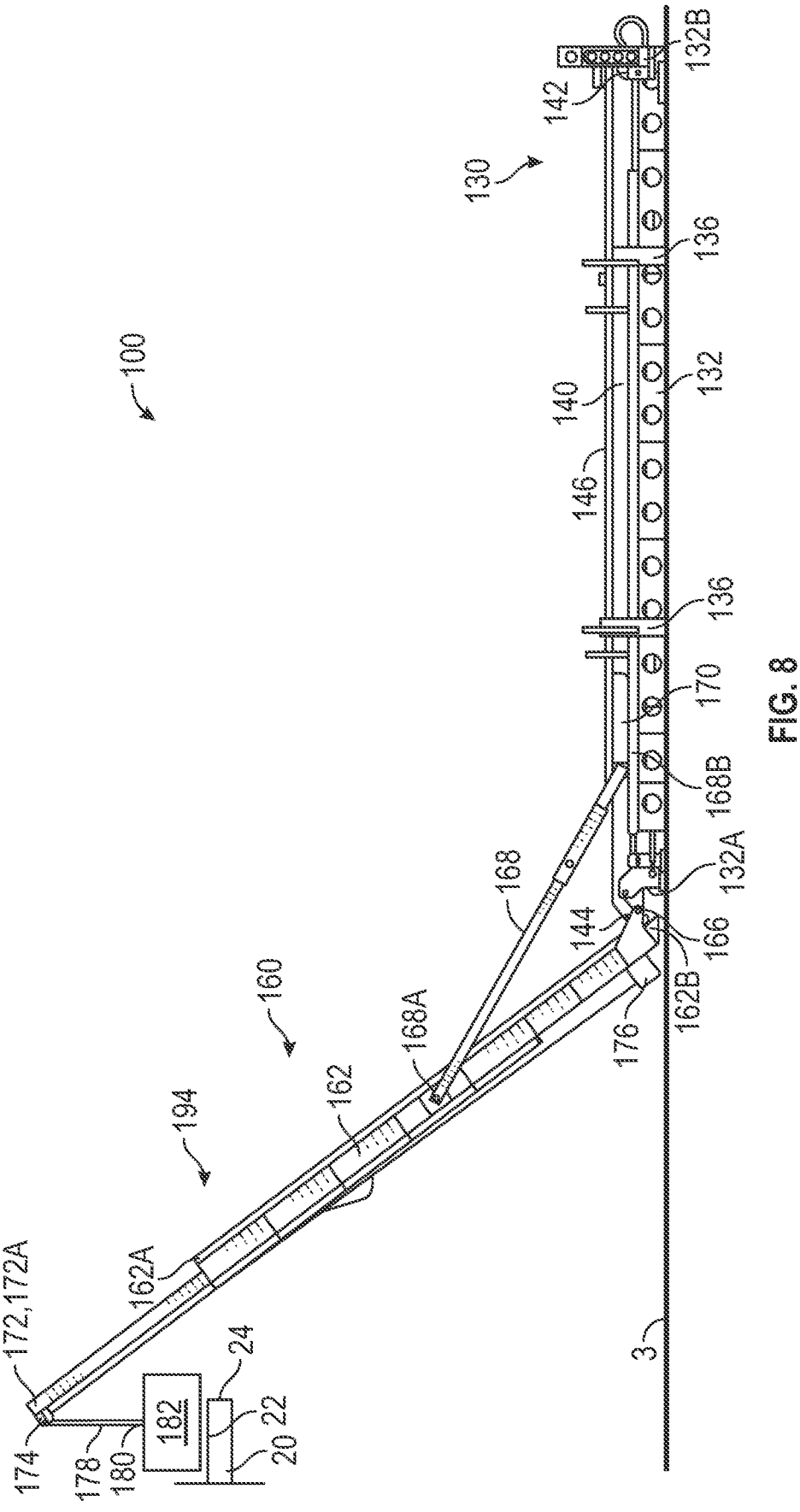
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FIG. 8

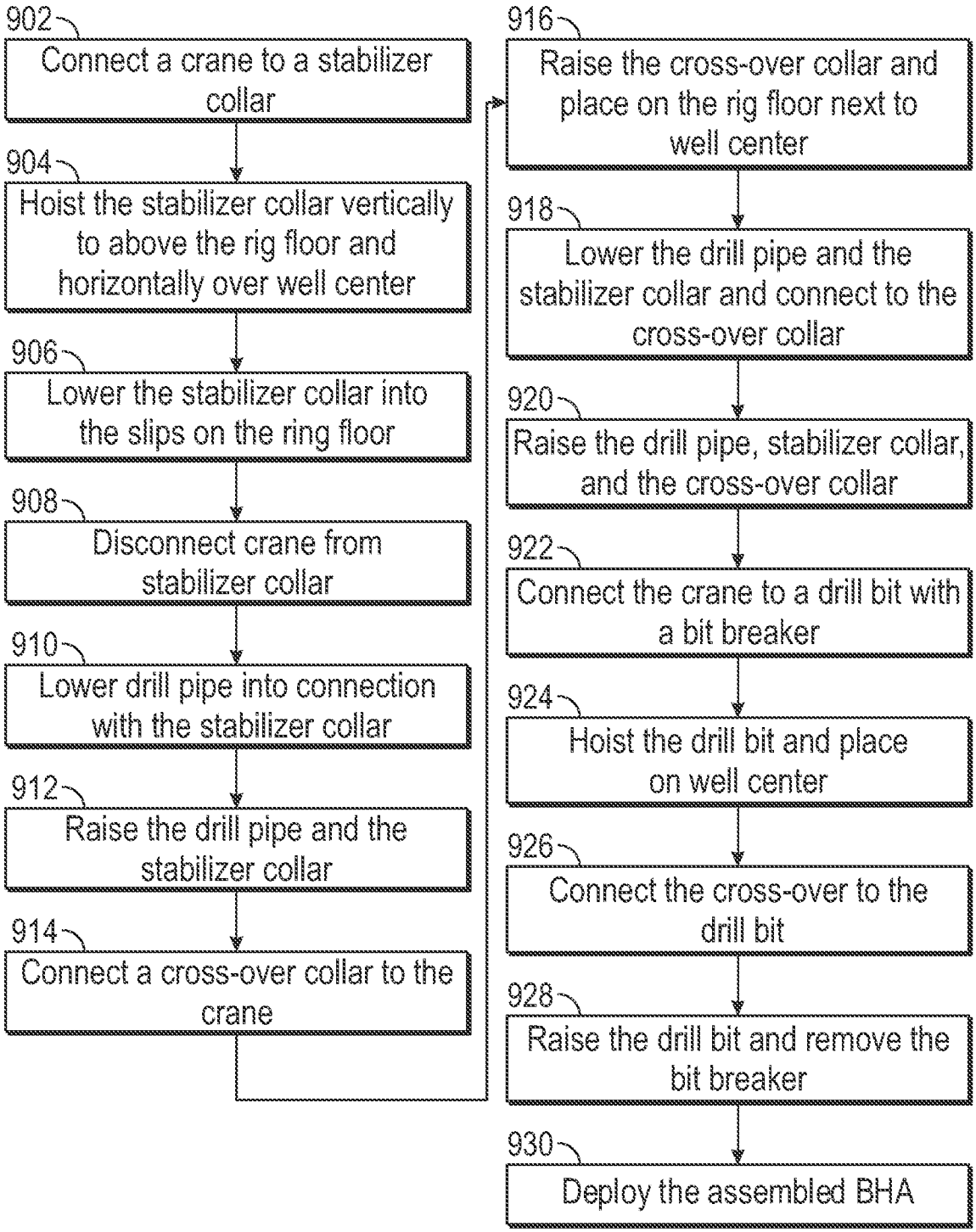
902
Connect a crane to a stabilizer collar
904
Hoist the stabilizer collar vertically to above the rig floor and horizontally over well center
906
Lower the stabilizer collar into the slips on the ring floor
908
Disconnect crane from stabilizer collar
910
Lower drill pipe into connection with the stabilizer collar
912
Raise the drill pipe and the stabilizer collar
914
Connect a cross-over collar to the crane
916
Raise the cross-over collar and place on the rig floor next to well center
918
Lower the drill pipe and the stabilizer collar and connect to the cross-over collar
920
Raise the drill pipe, stabilizer collar, and the cross-over collar
922
Connect the crane to a drill bit with a bit breaker
924
Hoist the drill bit and place on well center
926
Connect the cross-over to the drill bit
928
Raise the drill bit and remove the bit breaker
930
Deploy the assembled BHA

FIG. 9

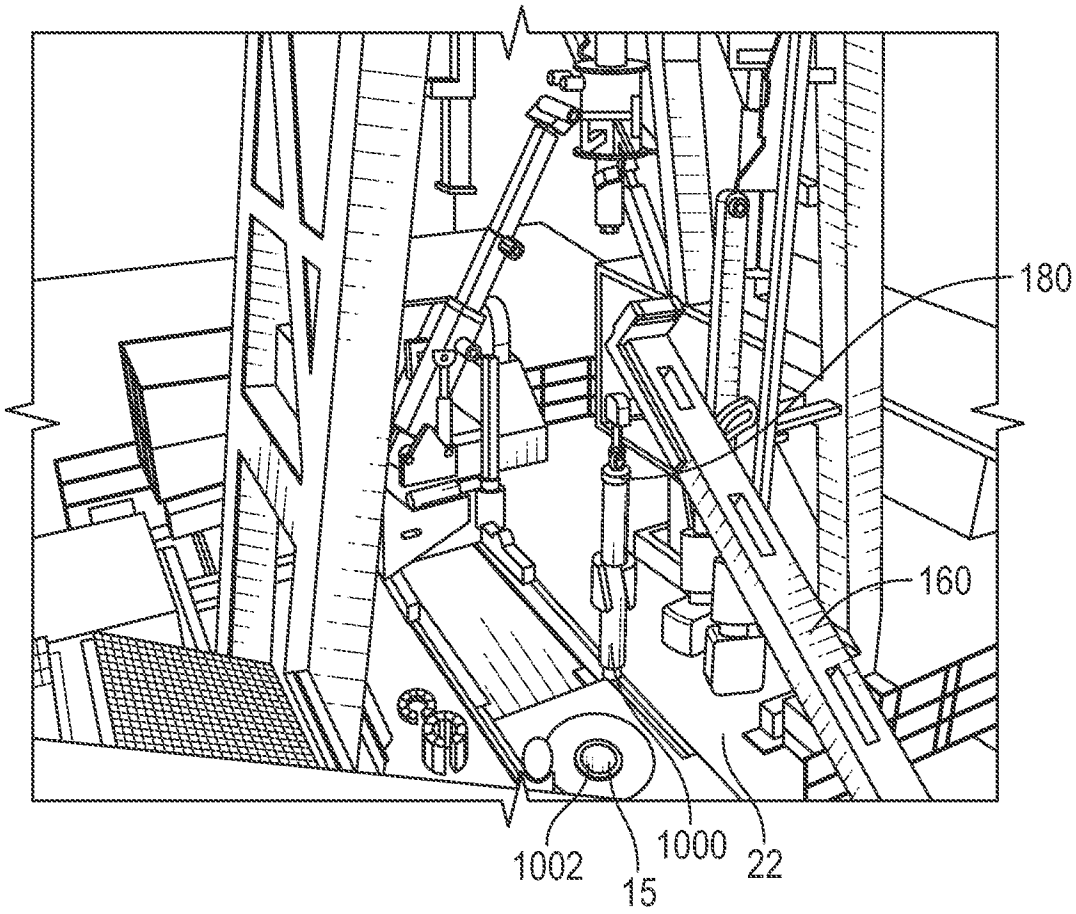

FIG. 10

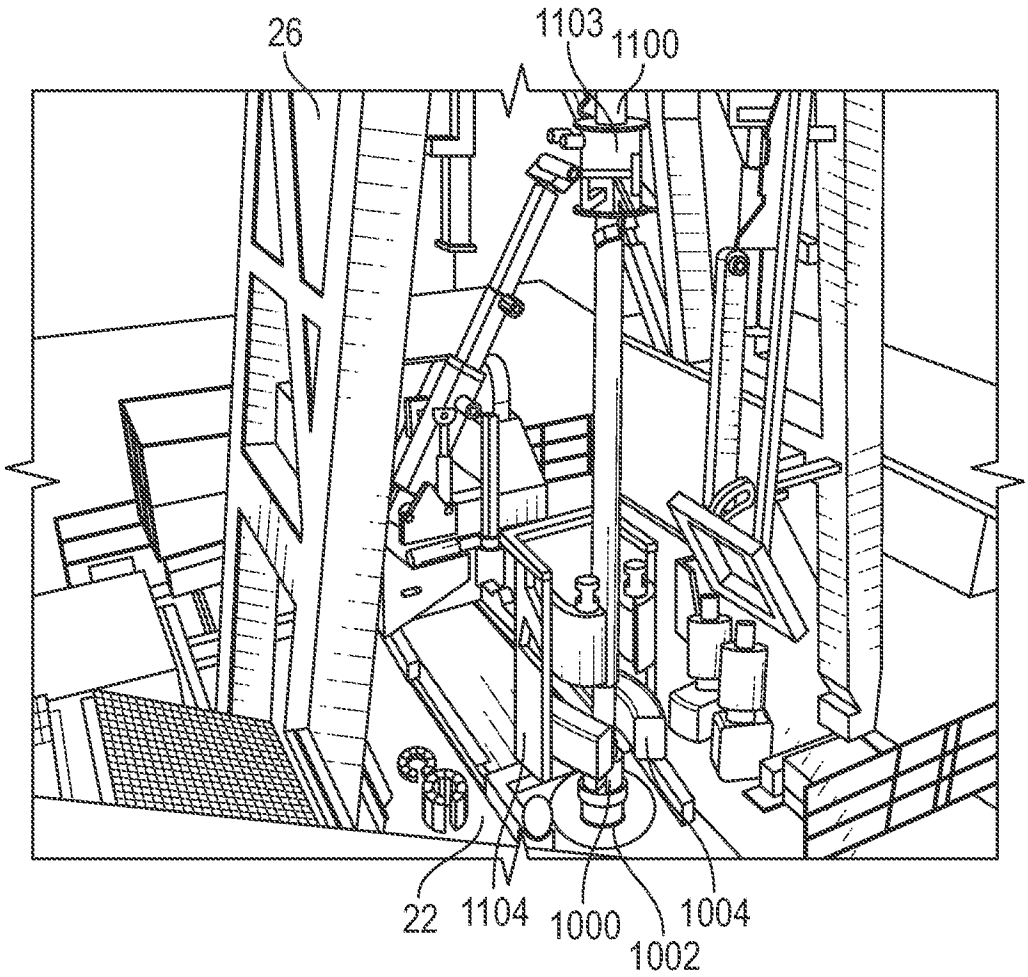

FIG. 11

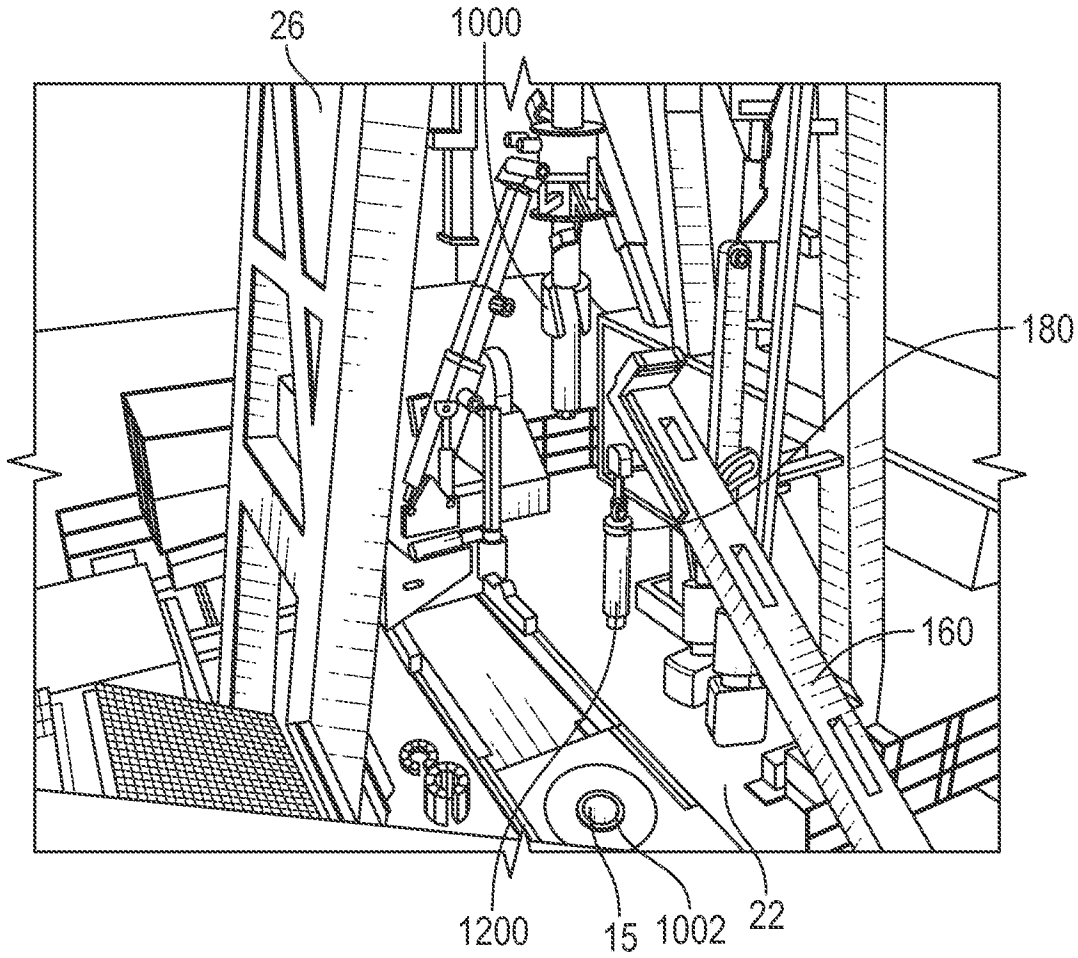

FIG. 12

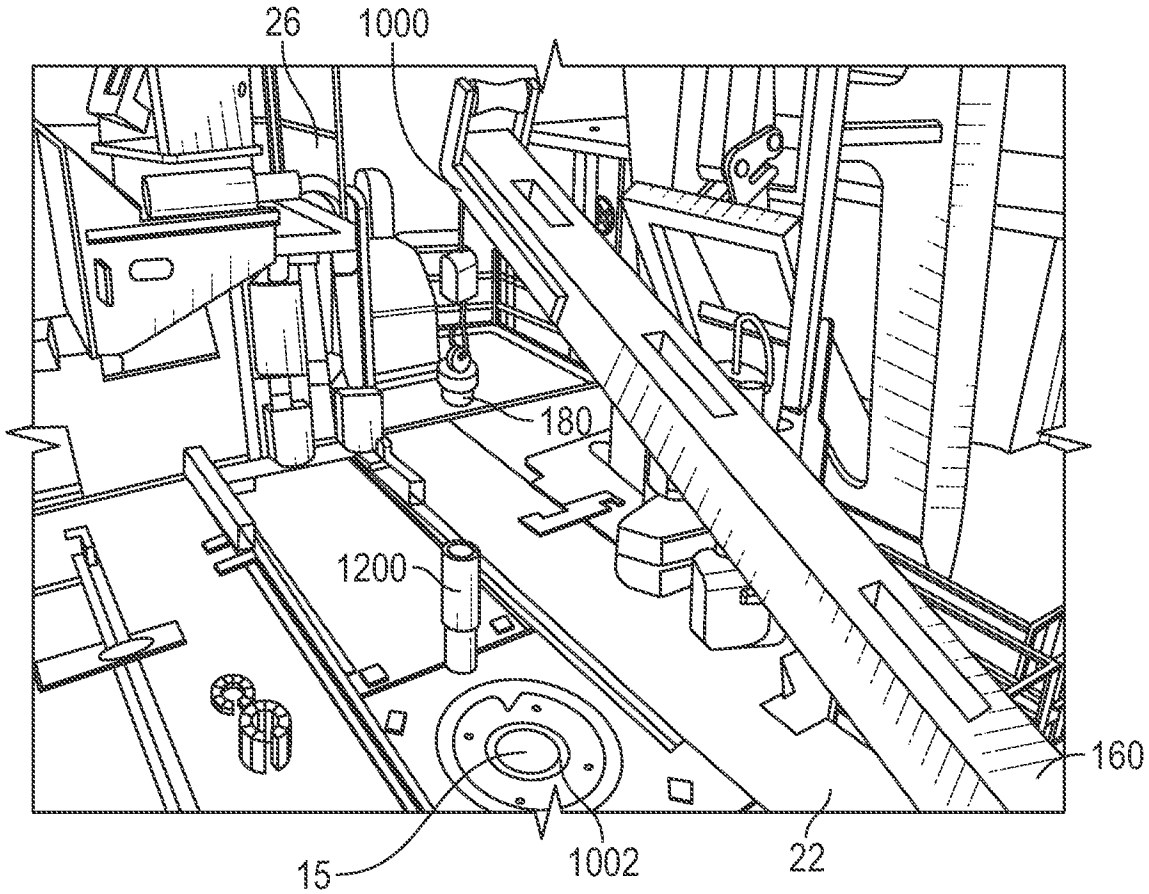

FIG. 13

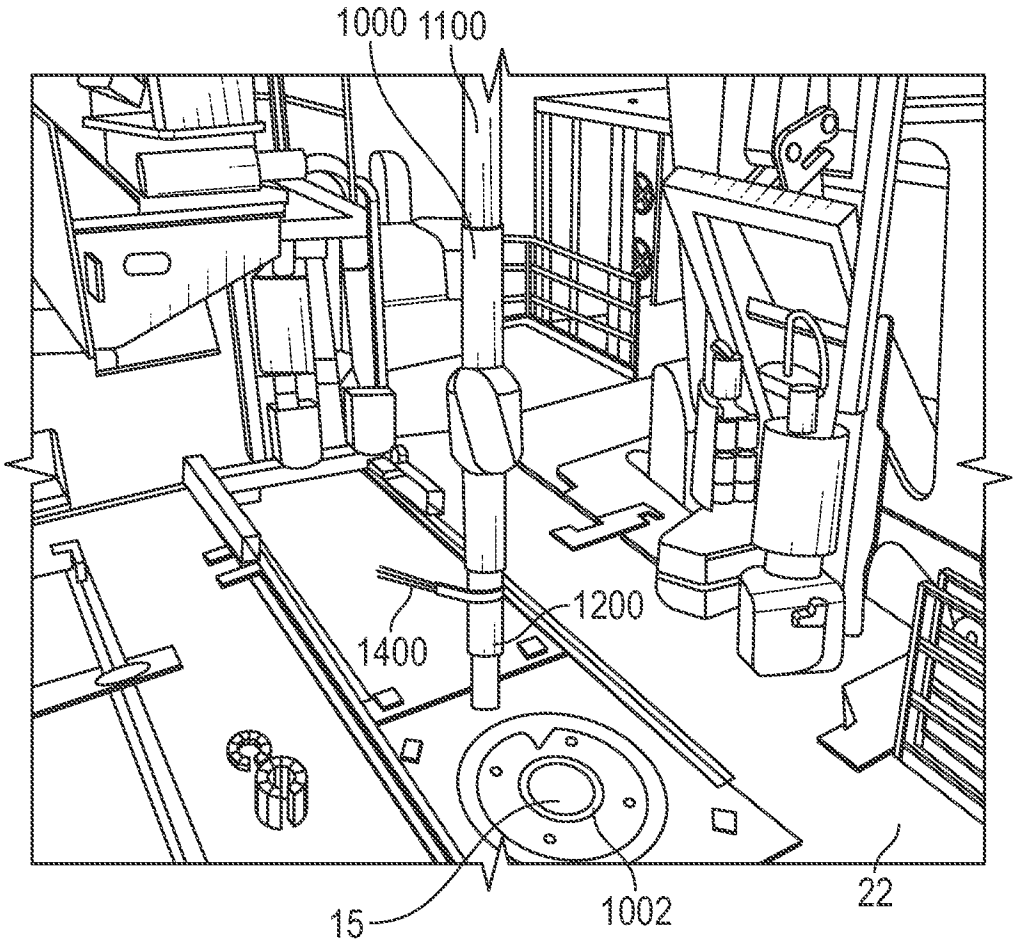

FIG. 14

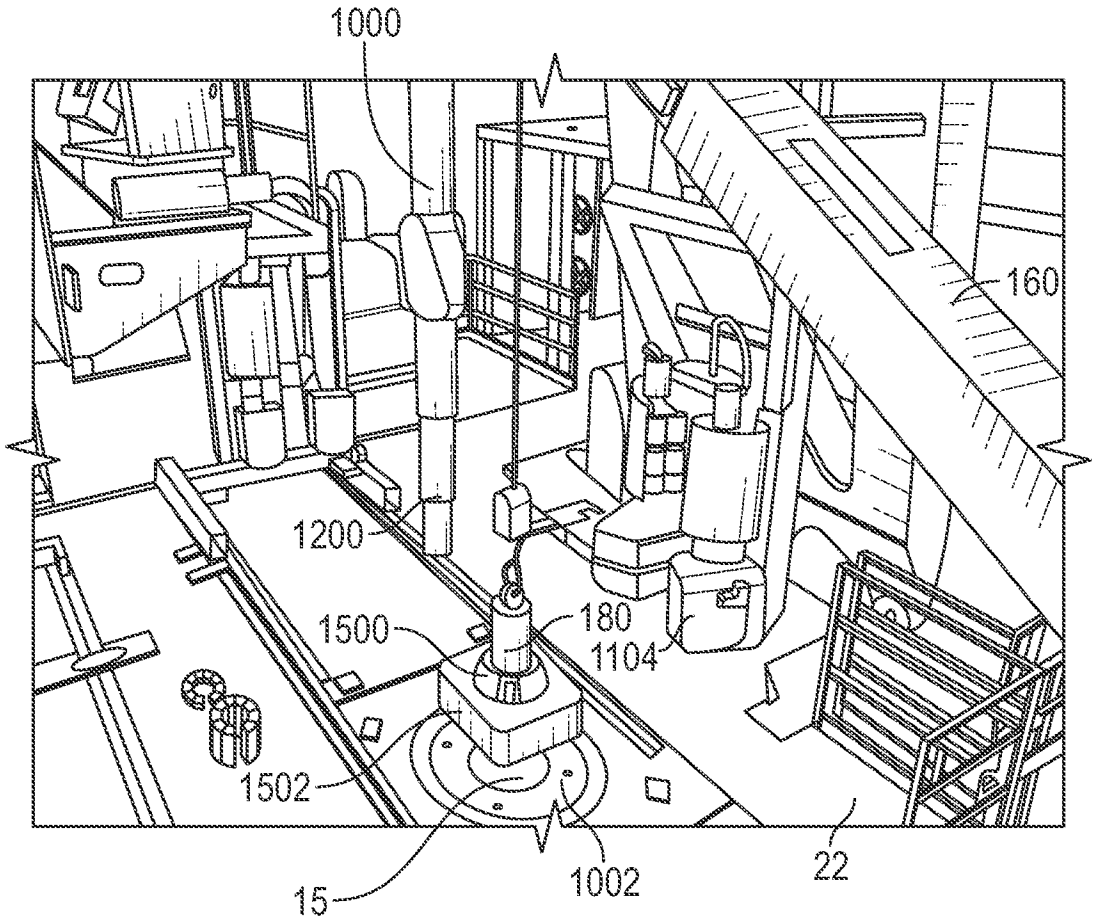

FIG. 15

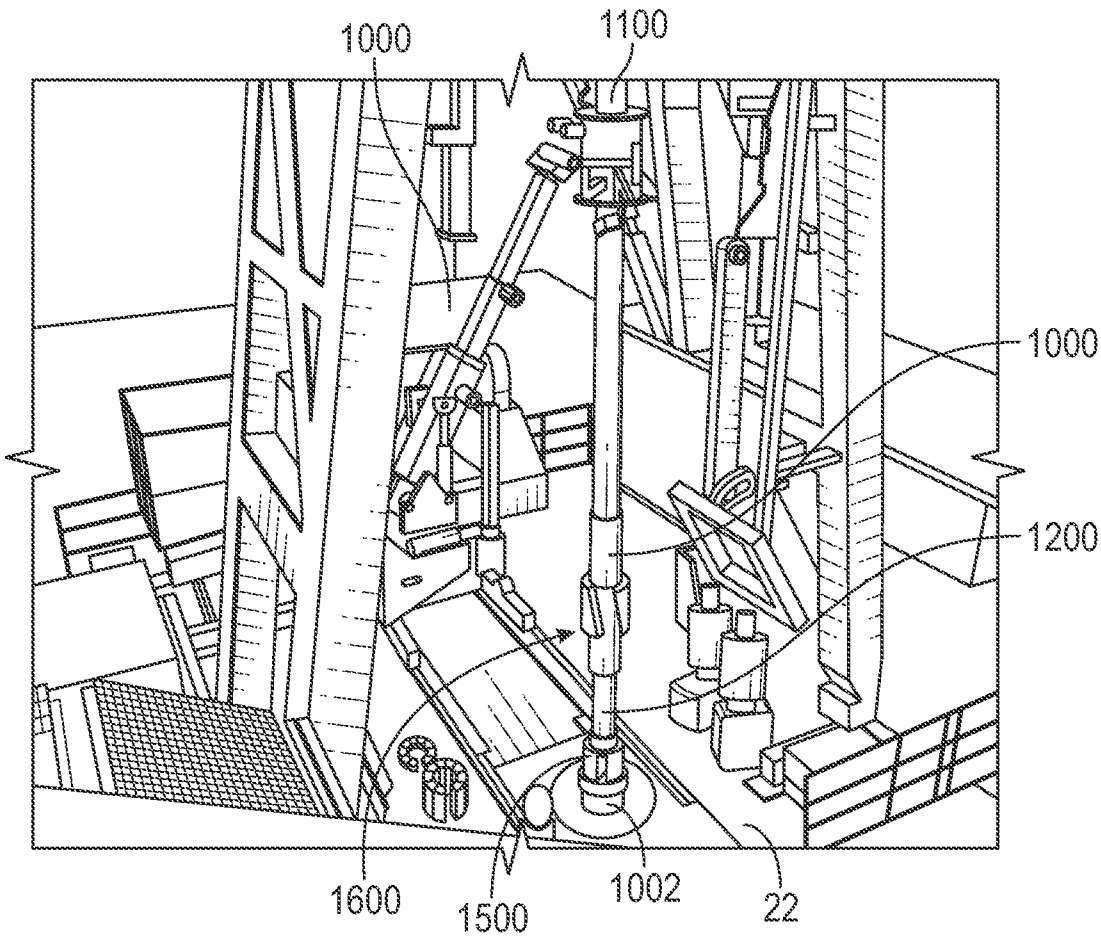

FIG. 16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2020/027922

A. CLASSIFICATION OF SUBJECT MATTER

E21B 19/20(2006.01)i, E21B 19/15(2006.01)i, E21B 19/16(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 19/20; E21B 19/00; E21B 19/06; E21B 19/14; E21B 19/16; E21B 44/00; E21B 7/20; G08B 21/18; E21B 19/15

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: stabilizer collar, cross-over collar, drill pipe, drill bit, assembly, rig floor, crane

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010-0230166 A1 (SIGMAR et al.) 16 September 2010 paragraphs [0008]-[0009], [0067]-[0081] and figures 1-3	1-19
A		20
Y	US 2008-0202812 A1 (CHILDERS et al.) 28 August 2008 paragraphs [0073]-[0076] and figures 16-25	1-19
Y	US 2008-0136203 A1 (KRIJNEN et al.) 12 June 2008 paragraph [0062]	7-12
A	WO 2017-210033 A1 (SCHLUMBERGER TECHNOLOGY CORPORATION et al.) 07 December 2017 paragraph [0019] and figure 2	1-20
A	US 2016-0060980 A1 (NABORS INDUSTRIES, INC.) 03 March 2016 paragraph [0042] and figure 3	1-20

☐ 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
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"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
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 July 2020 (29.07.2020)	**29 July 2020 (29.07.2020)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea
Facsimile No. +82-42-481-8578

Authorized officer
BAHNG SEUNG HOON
Telephone No. +82-42-481-5560

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2020/027922

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2020/027922

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