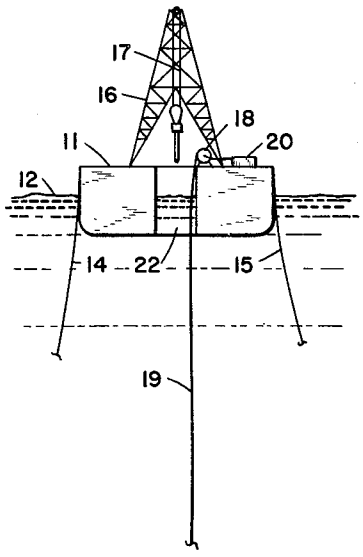
June 22, 1965 D. DE VRIES 3,190,307

HOSE REEL AND HOSE SUPPORT SYSTEM

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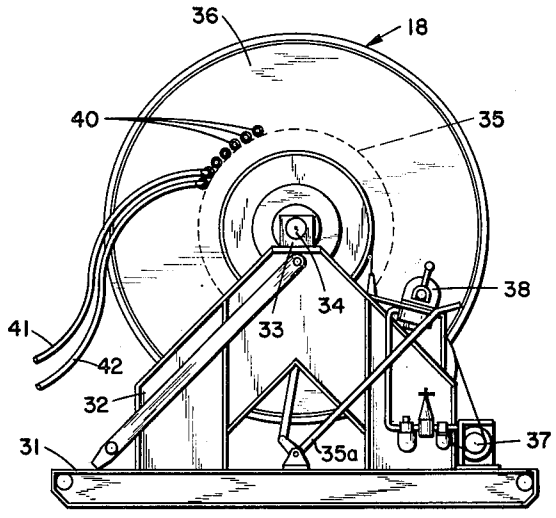


FIG. 2

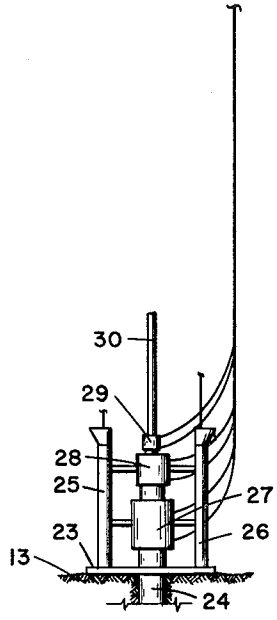


FIG. 1

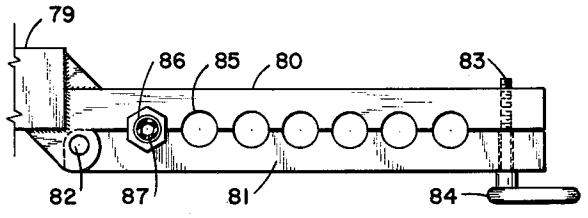


FIG. 3

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HOSE REEL AND HOSE SUPPORT SYSTEM

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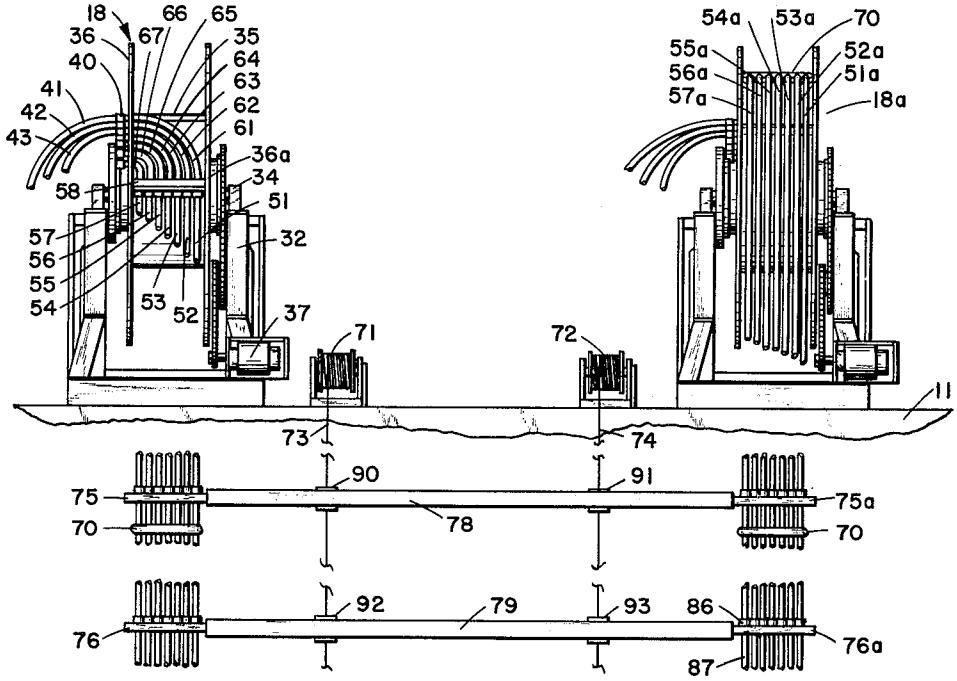


FIG. 4

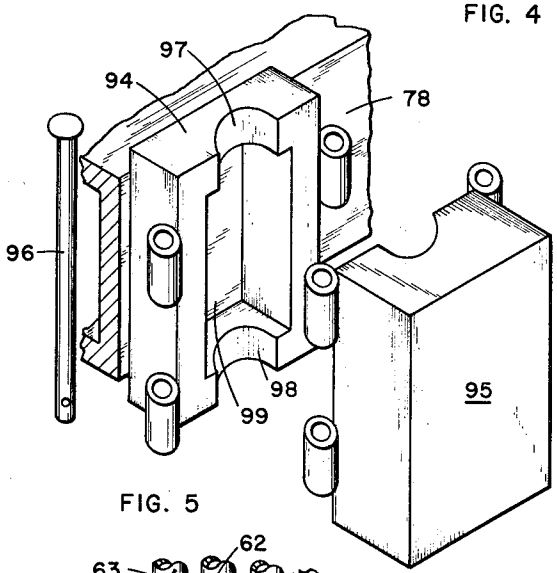


FIG. 5

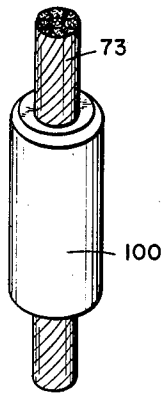


FIG. 6

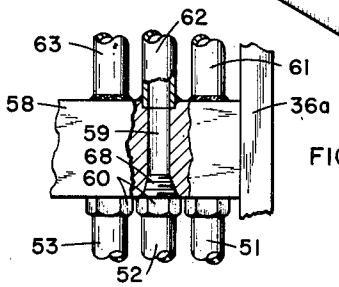


FIG. 7

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3,190,307

HOSE REEL AND HOSE SUPPORT SYSTEM

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Filed Dec. 3, 1962, Ser. No. 241,693
8 Claims. (Cl. 137—355.17)

This invention relates to a hose reel system and pertains more particularly to a hose reel adapted to reel simultaneously a plurality of hoses as well as means for suspending long lengths of hoses from a floating vessel positioned at the surface of a body of water.

During recent years, the continued search for oil has resulted in developing methods and apparatus for drilling underwater wells at locations where the water may range from 100 to 1500 feet or more in depth. In these locations it is customary to position a wellhead assembly at a considerable distance below the surface of the water, preferably on the ocean floor, so that it is not a hazard to the navigation of ships in the area. One method of drilling and completing underwater wells in this manner is described in copending patent application, Serial No. 830,538, filed July 30, 1959, and entitled "Underwater Well Completion Method."

In well drilling operations wherein the wellhead assembly is positioned below the surface of a body of water, various pieces of equipment such as wellhead connectors, blowout preventers, etc., are lowered from a vessel on the surface of the water to the underwater wellhead assembly where they are remotely connected. One method of connecting various pieces of equipment together at an underwater wellhead assembly is to employ electrically or pressure-actuated components which may be sealed or locked together by applying power or fluid pressure to the components from the remotely-located vessel. For example, in the event that pressure-actuated connectible components are employed, the component would have one or two hydraulic hoses connected to it when it was lowered from the vessel to its position on the wellhead assembly with the pressure hoses extending to the vessel where they could be connected to the source of fluid pressure.

The use of pressure hoses or current-conducting cables between the drilling vessel at the surface of a body of water and an underwater wellhead assembly poses several problems. In deep-water locations extreme lengths of pressure hose could not be hung from the vessel as they would pull apart under their own weight unless reinforced with steel or in some other manner. Additionally, when a large number of components are used on the underwater wellhead assembly this results in numerous cables extending to the vessel on the surface. In one well drilling installation, 27 separate pressure hoses extend simultaneously between the wellhead assembly on the ocean floor and the vessel on the surface. Provision must be made to prevent these numerous pressure hoses from becoming entangled due to wave action and underwater currents. At the same time the pressure hoses have to be grouped together for ease of handling as certain components of the wellhead assembly are removed and pulled back to the drilling vessel. In one installation 27 pressure hoses were divided into three bundles of 9 hoses each. Each hose bundle was about 8 inches in diameter and very cumbersome to handle on the deck of the vessel when it was necessary to pull say, 300 feet, of the cable back to the vessel. In attempting to put a bundle of hoses on a hose reel it often happens that one or more of the hoses becomes crushed. Likewise, if the hose bundles are allowed to hang free in the water the currents often cause them to rub against underwater structures and wear out.

It is therefore an object of the present invention to provide a hose-reeling apparatus on which a plurality of hoses may be simultaneously reeled and/or stored.

A further object of the present invention is to provide a hose-reeling apparatus adapted to store a plurality of hoses and providing simple means for establishing fluid communication with the ends of the hoses that are wrapped close to the drum of the hose reel.

Another object of the present invention is to provide means for supporting a plurality of pressure hoses or electrical conduits of considerable length as they depend from a drilling vessel positioned at the surface of a body of water.

Still another object of the present invention is to provide a hose-reeling apparatus including hose suspension means which may be readily connected or disconnected from a plurality of hoses as they are reeled in and stored on a hose drum.

A still further object of the present invention is to provide a hose-reeling apparatus and hose suspension means adapted to suspend a plurality of hoses in side-by-side arrangement in a manner such that all hoses are subjected to the same stresses in reeling and do not become entangled when subjected to wind, waves or ocean currents during the drilling of oil wells at offshore locations.

These and other objects of this invention will be understood from the following description taken with reference to the drawing, wherein:

FIGURE 1 is a diagrammatic view taken in longitudinal projection illustrating the relative positions of a drilling vessel at the surface of a body of water in an anchored position over an underwater wellhead assembly;

FIGURE 2 is a side view of one form of a hose reel of the present invention;

FIGURE 3 is a plan view of one form of a hose clamp of the present invention illustrating an end of a section of hose depending therefrom;

FIGURE 4 is a front view illustrating in longitudinal projection a hose reel system in accordance with the present invention together with hoist means for supporting a plurality of depending hoses from a drilling vessel;

FIGURE 5 is an isometric view taken in expanded projection illustrating one form of a clamp for clamping the hose support frame to the hoist system of the present invention;

FIGURE 6 is an isometric longitudinal view illustrating a stop means secured to a hoist cable adapted to be engaged by the clamp of FIGURE 5; and,

FIGURE 7 is a detailed view taken in partial longitudinal cross section showing the connections between the hoses on a hose drum and the permanent conduits formed thereon.

Referring to FIGURE 1 of the drawing, a drilling vessel, barge or platform 11 of any suitable floating or floatable type is illustrated as floating at the surface of a body of water 12 while being substantially fixedly positioned over a preselected well location by suitable vessel positioning means well known to the art or by being anchored to the ocean floor 13 by anchor lines 14 and 15 running to anchors (not shown). Equipment of this type may be used when carrying on well drilling operations or well work-over operations in water varying from about 100 feet to 1500 feet or more in depth. The drilling vessel is equipped with a suitable derrick 16 containing a fall line system 17 and other suitable auxiliary equipment needed during drilling operations. In addition, the vessel 11 is provided with one or more hose reels 18 from which a plurality of pressure hoses or electrical conduits 19 extend downwardly through the body of water. A suitable source of pneumatic, hydraulic or electric power 20 is also provided on the vessel 11. The derrick 16 is positioned over a drilling slot or well 22 which extends vertically through the barge in a conventional manner. When using the

equipment of the present invention, the slot 22 in the vessel 11 may be either centrally located or extend in from one edge. Alternatively, drilling operations may be carried out over the side of the vessel without the use of a slot. For example, the drilling vessel may be provided with a deck portion which overhangs the hull of the vessel.

One form of an underwater wellhead assembly is illustrated in FIGURE 1 as comprising a base plate 23 which is fixedly secured to a well casing 24 which in turn is positioned in a well drilled in the ocean floor 13 and preferably cemented therein. The base plate 23 is provided with a plurality of upwardly-extending guide columns 25 and 26 which are adapted to receive and center on the well casing 24 various pieces of equipment such as a wellhead connector 27, a blowout preventer 28 and a landing head 29 at the lower end of marine conductor pipe 30 through which drilling operations are conducted. The marine conductor pipe extends upwardly through the slot 22 in the vessel 11. Each of the wellhead components 27, 28 and 29 are provided with a pair of pressure hoses which are bundled together to form the hose bundle 19 extending to the vessel at the surface.

One form of a hose reel is illustrated in FIGURE 2 which comprises a base member 31 adapted to be secured as by bolting to the deck of the vessel 11 (FIGURE 1). Welded to the top of the base plate 31 are a pair of side support members 32 on which a bearing 33 is mounted. An axle 34 rotates in the bearing 33 and serves as a mounting for the reel 18 which comprises a hose drum 35 with side plates 36 which extend radially therefrom a substantial distance to increase the capacity of the drum. The hose reel 18 is provided with any suitable type of prime mover means such for example as a motor 37 having controls 38 for driving the drum 34 in one direction or the other. Extending laterally through the side wall 36 of the drum are a series of fittings 40 which in essence form one portion of a hose coupling so that hoses, for example hoses 41 and 42, can be connected to a pair of the couplings 40 outside the drum when the drum 35 is in a stationary position. Obviously, as in all hose reel systems, the drum 35 is provided with suitable brake means 35*a*, stop means or drum blocking means for preventing movement of the drum 35 when the hoses 41 and 42 are connected to the outside thereof. If it is desired to move the drum 35 to allow more hose to be reeled off or reeled on, the hoses 41 and 42 would be disconnected temporarily. The hoses 41 and 42 would extend to a suitable source of fluid pressure on board the vessel 11. In the event that the conduits 41 and 42 were electrical conduits, a generator could be employed as a source of power.

As shown in FIGURE 4, a pair of hose reels 18 and 18*a* are illustrated as being positioned in side-by-side arrangement on the deck of a vessel 11. It is to be understood that in most cases when a pair of hose reels 18 and 18*a* are employed for carrying multiple pressure hoses or electrical conduits, both reels 18 and 18*a* would have substantially the same amount of hose depending from them at the same time. For ease of illustration, hose reel 18 is illustrated with all of the hoses reeled off the drum while hose reel 18*a* is shown with practically a drum full of hoses. Hose reel 18 is shown as being provided with seven flexible hoses 51–57. Although the hoses could be arranged on the drum 35 so that the couplings at the upper end thereof extend through the side plate 36 and be provided with a coupling portion 40, it is preferred to anchor the hoses to the drum in a manner such that the hoses would hang tangentially therefrom as illustrated in FIGURE 4 in any suitable manner, as by a support bar 58. Fixedly secured to the upper side of the bar are a series of curving nipples 61–67 which are in communication at one end with the hoses 51–57 through the bar 58 while the other ends of the nipples 61–67 extend through the side plate 36 of the hose reel 18 and are provided with suitable hose connector means 40. It is to be understood that the hose connector 40 is only a portion of the hose coupling to which another hose with a mating coupling portion could be readily connected. Preferably, the couplings employed in this position are quick-disconnect couplings to facilitate the connecting or disconnecting of the pressure hoses 41, 42 and 43. Although only three pressure hoses 41–43 are illustrated as coming into the hose reel 18 it is to be understood that the number of pressure hoses employed may be equal to the number of flexible hoses 51–57 which are reeled on the drum 35.

The nipples 61–67 and the connector bar 58 form one suitable means for normally securing the hoses 51–57 to the hose reel 18 in communication with the connector couplings 40 positioned on the outside of the hose reel. In addition to the nipples 61–67 curving from a direction normal to the axis of the drum 35 to a direction parallel to the axis, the nipples are also preferably curved to lay along the surface of the drum 35 and, if desired, may be recessed in the top surface of the drum. The connector bar or manifold 58 may be of any suitable form and as shown in FIGURE 7 comprises a bar member extending between the side plates 36 and 36*a* of the hose reel and being provided with a series of flow passages 59 therethrough. The nipples, for example nipple 62, may be secured to the top of the bar in any suitable manner, as by welding, while the coupling 60 at the top of the flexible hose section 52 is screw-threaded into a screw-threaded portion 68 of the passageway 59.

In order that the hoses on the hose reel stay in side-by-side relationship whether on or off the reel, suitable clamps or spacer elements are provided. For example, in FIGURE 4, the flexible hoses 51*a*–57*a* on the hose reel 18*a* are shown as being proivded with spacer elements 70 which may be in the form of a split bar element covered with hard rubber and provided with holes therein for containing the hoses in side-by-side relationship. The spacer elements 70 are preferably covered with hard rubber so that they do not injure the hoses when the hoses are stored on the reel. The spacer elements 70 may be attached as needed along the lengths of hoses.

Since it is often necessary to drill wells in deep water where lengths of pressure hose could not support their own weight, hose supporting equipment is provided in accordance with the present invention. One or more winches 71 and 72 may be secured to the vessel 11 for suspending, over the side of the vessel, one or more support cables 73 and 74. The winches 71 and 72 are preferably in the form of constant-tension winches adapted to reel in or out a portion of the cables 73 and 74 as the vessel 11 rises and falls with the motion of the sea. While the installation of FIGURE 4 is illustrated with two winches 71 and 72 being provided for supporting the hoses from two hose reels 18 and 18*a*, it is to be understood that a single winch could be used for one or more hose reels or that two winches could be used for one or more hose reels in any combination desired.

The flexible pressure hoses 51–57 are shown as being supported at spaced intervals along their lengths by means of hose clamps 75 and 76 which may be of any suitable type. A preferred form of hose clamp is illustrated in FIGURE 3 as being of the split-bar type with the end of one bar portion 80 being welded to a supporting frame 79 while the other portion 81 of the clamp is hinged by means of pin 82 to the first portion 80 of the clamp or to the support frame 79. Suitable connector means, such as a bolt 83 with a handle 84, may be employed to secure the movable ends of the hose clamp sections 80 and 81 together. The holes 85 through the clamp 80 and 81 are preferably slightly larger than the outside diameter of the pressure hose to be positioned therein so that the hose will not be compressed by the clamp. However, the hole 85 in the clamp is smaller

than the coupling 86 at the end of a hose 87 so that the hose in being suspended from the clamp 80–81 is supported by its upper coupling 86. In the event that each section of hose was 50 feet long, the hose clamps 75, 75*a*, 76 and 76*a* are spaced together with their support bars 78 and 79 at intervals along support cable 73 and 74 of slightly less than 50 feet so that there is no tension in the hoses and so that each section of hose supports its own weight by means of its upper coupling in contact with a hose clamp 80–81.

The hoses on hose reels 18 and 18*a* are reeled in simultaneously while the winches 71 and 72 reel in the supporting cables 73 and 74. In order to facilitate handling of this operation the hose clamps 75, 75*a*, 76 and 76*a* are preferably of a quick-disconnect type. At the same time it is necessary to quickly disconnect the supporting frames 78 and 79 from the supporting cables 73 and 74 so that the rest of the cables can be reeled in. Any suitable connector means 90, 91, 92 and 93 may be employed. One suitable form is shown in FIGURE 5 as comprising a hollow housing having portions 94 and 95 which may be connected together by means of pins, one of which is shown at 96. Holes 97 and 98 are formed in the top and bottom of the housing clamp sections 94 and 95 and are of a size slightly larger than the supporting cables 73. In addition, the recess 99 formed with the clamp housing portions 94 and 95 is large enough to accommodate a button or stop member fixedly secured to the support cable (FIGURE 6), the button 100 being larger than the holes 97 and 98 in the clamp housing so that it does not slip through. Thus, as the hoses from the hose reels 18 and 18*a* are reeled in, at least one of the pins 96 would be taken out of the hinges of the clamp housing sections 95 and 94 so that the clamp housings 90 and 91 could be open and pulled away from the supporting cables 73 and 74 after the hose clamp 75 and 75*a* had been disconnected from the hoses normally contained therein.

I claim as my invention:

1. A hose reeling apparatus comprising
   - a frame having spaced-apart vertical uprights and a horizontal axle between said frame uprights,
   - a drum mounted for rotation about said horizontal axle,
   - vertical side plates carried in spaced relationship on said drum and extending radially from the axis thereof forming a hose storage area,
   - a hose adapted to be reeled on and off said drum,
   - a two-piece disconnectible hose coupling means comprising male and female coupling portions, one portion of said hose coupling means extending through and terminating outside one side plate of said drum at a point radially offset outwardly from said drum axis and adapted to be coupled to another hose from a pressure source, and
   - means normally securing one end of said hose to said portion of said hose coupling means on the drum side of said side plate.

2. The apparatus of claim 1 including motor means for rotating said hose-reeling drum and stop means engageable between said rotating drum and a fixed point for positioning the drum against rotation.

3. A hose reeling apparatus comprising
   - a frame having spaced-apart vertical uprights and a horizontal axle between said frame uprights,

   - a drum mounted for rotation about said horizontal axle,
   - vertical side plates carried in spaced relationship on said drum and extending radially from the axis thereof forming a hose storage area, the spacing between the side plates being substantially equal to the sum of the diameters of the number of hoses to be carried on said drum,
   - a plurality of hoses having one end of each anchored to the drum in side-by-side arrangement,
   - a plurality of two-piece disconnectible hose coupling means comprising male and female coupling portions, one portion of each of said hose coupling means being secured to a hose on said drum and extending through and terminating outside one side plate of said drum at a point radially offset outwardly from said drum axis and adapted to be coupled to another hose from a pressure source,
   - prime mover means connected to said drum for turning it to reel in hoses, and
   - stop means engageable between said drum and said base member.

4. The apparatus of claim 3 including
   - hose clamp means attachable to said plurality of hoses,
   - winch means mounted adjacent said hose-reeling apparatus,
   - support cable means extending from said winch means adjacent said hoses, and
   - connector means interconnecting said hose clamp means and said support cable means at spaced intervals therealong.

5. The apparatus of claim 4 wherein each hose is made up of a series of hose sections coupled together with couplings at the ends of each section, and wherein said hose clamp means supportingly engage said hose section couplings.

6. The apparatus of claim 4 wherein said winch means are constant tension winch means adapted to be mounted on a floating drilling vessel.

7. The apparatus of claim 3 including spacer elements secured to said plurality of hoses at intervals along the length thereof holding the hoses in side-by-side arrangement, said spacer elements being of a size to pass between the side plates of the hose drum and reeled thereon along with the hoses.

8. The apparatus of claim 4 including a second drum having a plurality of hoses secured thereto and extending therefrom, and wherein said hose clamp means comprises
   - a hose clamp secured to the plurality of hoses from each drum, and
   - a rigid frame interconnecting the hose clamp at each level.

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