Nov. 25, 1958 I. L. AULT 2,861,532

FLEXIBLE HOSE SUPPORT CRANE

Filed Feb. 18, 1954

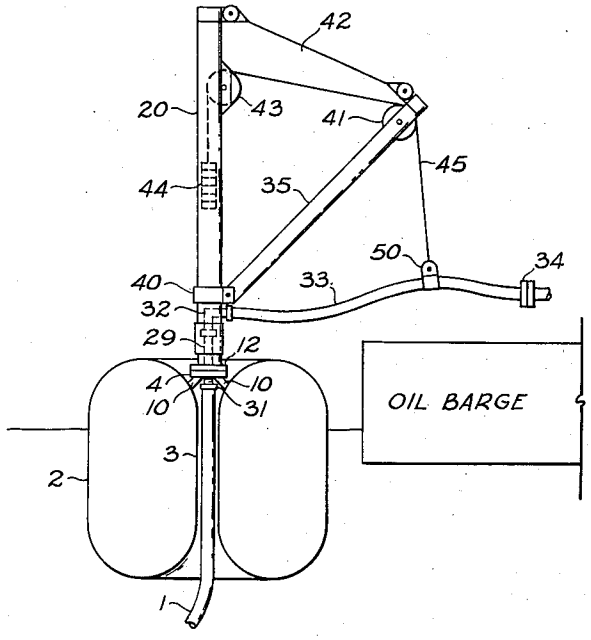


Fig. 1

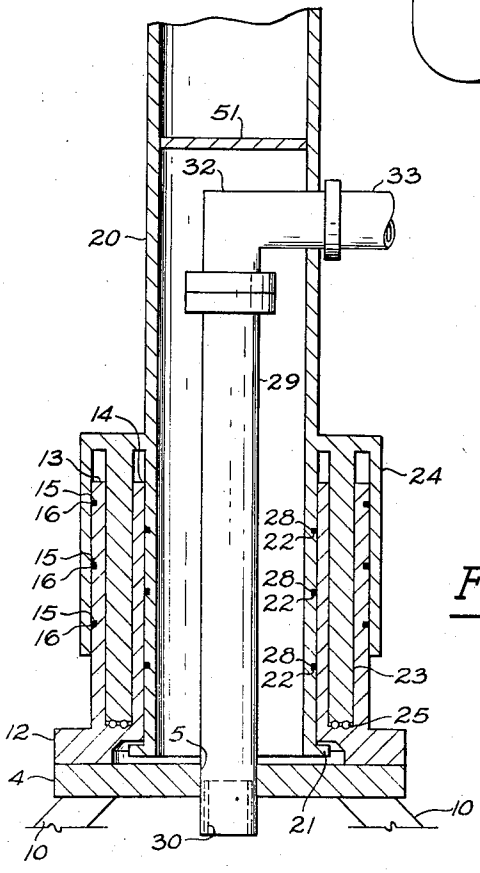


Fig. 2

ISAAC L. AULT
INVENTOR.

BY Frederick E. Dumoulin
ATTORNEY

United States Patent Office 2,861,532
Patented Nov. 25, 1958

2,861,532

FLEXIBLE HOSE SUPPORT CRANE

Isaac L. Ault, Morgan City, La., assignor, by mesne assignments, to Socony Mobil Oil Company, Inc., a corporation of New York

Application February 18, 1954, Serial No. 411,215

7 Claims. (Cl. 114—.5)

This invention relates to cranes and relates more particularly to a crane to be used in combination with a floating buoy for supporting a flexible loading hose.

Oil wells are frequently drilled offshore in areas of open water, where the problems coincident with drilling on land are often magnified and new problems are encountered. One of these new problems is that of conveying the oil from the well head to oil barges and tankers for movement to shore. Often the oil is run from the well head into storage tanks mounted on nearby platforms or into storage tanks which are submerged beneath the surface of the water. Where submerged tanks are used, the oil may be flowed to the barges and tanks through a flexible hose, the loading end of which is supported by a buoy floating at the surface of the water.

Such offshore oil wells and their accompanying loading facilities are often located a substantial distance from shore in areas of open water, where they are subject to the movement of the tides, waves, and winds. Inasmuch as tankers and barges desiring to load oil from buoy supported flexible loading hoses must approach the support buoy from the most desirable direction depending upon the wind and wave direction, it is important that the buoy support the loading end of the flexible hose where it may be readily secured from any direction around the buoy by personnel abroard the barge or tanker. It is also desirable that the loading end of the hose be held above the surface of the water during the times it is not in use.

It is therefore an object of the present invention to provide an apparatus which in combination with a floating buoy will support the loading end of a flexible hose in a manner that it may be readily moved to any point about the buoy. It is another object of this invention to provide in combination with a floating buoy an apparatus which after loading is completed will automatically return the loading end of a flexible hose to a position above the surface of the water in which the buoy is floating.

The invention will be more readily understood by reading of the following specification taken in conjunction with the accompanying drawings. In the drawings, Figure 1 is a crane constructed in accordance with my invention. Figure 2 is an enlarged sectional view of the lower portion of the crane of Figure 1.

Referring now to Figure 1, the loading end of flexible hose 1 is supported at the surface of the water by buoy 2. Buoy 2 is cylindrical in shape and contains an axial tubular opening 3 permitting hose 1 to pass through the buoy as shown. Flange 4, which contains a central aperture 5, is secured to the upper end of buoy 2 by means of a plurality of support members 10. Hose 1 is supported at its upper end from flange 4 by means hereinafter described.

Secured to the upper face of flange 4 is base member 12. Formed integral with base member 12 and extending upwardly therefrom are concentric cylindrical members 13 and 14. Member 12 serves as a base for the

rotatable portion of my crane while cylindrical concentric members 13 and 14 stabilize the rotatable portion of it. Member 13 is provided around its outside with a plurality of peripheral slots 15 which are preferably of rectangular shape in cross section and are adapted to receive packing rings 16 which are positioned therein.

Mast 20, which is of hollow cylindrical construction, is movably mounted on base member 12 with the lower portion of mast 20 fitting in close spaced relationship within member 14. Formed integral with the lower end of mast 20 is flange 21, the external diameter of which is greater than the internal diameter of member 14 in order to prevent the dislodging of mast 20 from its operating position within member 14. The lower portion of mast 20 is provided with external peripheral slots 22 which preferably have a rectangular cross section. Tubular members 23 and 24 are concentric with mast 20 and are either secured to or formed integral with the lower portion of mast 20 as shown in Figure 2.

The lower end of member 23 is finished perpendicular to the vertical axis of member 23 and is surface hardened to provide a bearing surface. Positioned between the lower end of member 23 and the upper surface of base member 12 is thrust bearing 25 which serves to support the weight of mast 20 and permits the mast to freely rotate. As shown, bearing 25 comprises a double row of ball bearings with a retaining cage, although it will be recognized that any other type of thrust bearing of the proper size and thrust capacity may be used here.

Packing rings 28 are positioned within slots 22 to form seals between mast 20 and member 14, while previously mentioned rings 16 provide seals between members 13 and 24. Rings 16 and 28 are formed of rubber; however, it will be understood that the rings may be made of any other suitable packing material which will form a satisfactory seal and will not be adversely affected by contact with either salt or fresh water. Rings 16 and 28 serve to keep water from getting into contact with bearing 25.

Pipe 29, which is secured at its lower end into aperture 5 of flange 4, is provided in its lower end with internal threads 30 permitting the upper end of hose 1 to be fixed into pipe 29 by means of an externally screw threaded fitting 31 on the upper end of hose 1. Swivel joint 32 is fixed at its lower end to the upper end of pipe 29 and extends through and is secured to the wall of mast 20. Hose 33 is connected at one end to the upper end of swivel joint 32 and is provided at its other end with flange 34 which may be connected to the oil inlet on a barge or tanker. Thus, there is fluid communication from hose 1 through pipe 29, swivel joint 32, and into hose 33.

Swivel joint 32 is of the two-way type with rotation in a horizontal plane being permitted at the connection between joint 32 and pipe 29 and rotation in a vertical plane being permitted at the connection between joint 32 and hose 33. Mast 20 may be freely rotated and hose 33 may be moved to any position in a circle about buoy 2 with fluid communication being provided at all times into hose 33.

Boom 35 is pivotally secured at its inward or lower end to mast 20 by means of member 40, which is positioned on and secured to mast 20 at a point just above swivel joint 32. The upper end of boom 35 is provided with a sheave 41. Boom 35 is held at a fixed angle with respect to mast 20 by tension member 42, which is secured at one end to the upper end of boom 35 and at the other end to the top of mast 20. Tension member 42 may be formed of steel chain, or cable if desired.

A sheave 43 is secured to mast 20 near the upper end of the mast with the sheave projecting through the wall of and into the interior of the mast such a distance that

the vertical axis of the mast is approximately tangent to the periphery of the sheave.

Counterweight 44 is supported within mast 20 at one end of line 45 which operates on sheaves 41 and 43. Hose 33 is connected to the other end of line 45 by means of a clamp 50. The weight of counterweight 44 is preferably in excess of the pull exerted by hose 33 on line 45 by an amount sufficient to lift hose 33 upward to boom 35 when the hose is not in use for loading. Secured within mast 20 is circular shaped member 51 which serves as a stop for counterweight 44.

When an oil barge is to be loaded, it may be tied up to buoy 2 at any desired position around the buoy, preferably on the leeward side. The crane is then rotated to a desired position and the loading hose 33 is pulled downward so that flange 34 may be connected to the oil inlet of the barge. Once loading of the barge is completed, flange 34 is disconnected and hose 33 is released permitting counterweight 44 to pull hose 33 upward to its position of rest adjacent to boom 35. The position of rest of hose 33 keeps it clear of the water in which buoy 2 floats and maintains the hose in a position readily accessible to personnel on a barge desiring to load oil.

Having thus described my invention, it will be understood that such description has been given by way of illustration and example and not by way of limitation, reference for the latter purpose being had to the appended claims.

I claim:

1. In combination with floating buoy, a hose support crane which comprises in combination a hollow vertical mast rotatably mounted on said buoy, a boom pivotally secured to the lower portion of said mast, a tension member secured between the upper end of said mast and the upper end of said boom to support said boom at a fixed position with respect to said mast, a first flexible hose supported at its upper end by said buoy, a second flexible hose extending outwardly from said mast, means positioned in the lower portion of said mast for connecting said first hose to said second hose, a counterweight positioned within said mast, and cable means connected between said counterweight and the outward end of said second hose whereby said hose is pulled into a position adjacent to said boom when said hose is not in use.

2. In combination with a floating buoy, a hose support crane which comprises in combination a hollow vertical mast rotatably mounted on said buoy, a boom pivotally secured at one end to the lower portion of said mast, a tension member connected between the other end of said boom and the upper end of said mast holding said boom at an angle with the upper portion of said mast, a first sheave positioned in the upper portion of said mast, a second sheave mounted near the outer end of said boom, a line operating over said first and second sheaves, a counterweight positioned within said mast and connected to one end of said line, a first flexible hose secured at the upper end of said buoy and extending downwardly through said buoy, a swivel joint positioned within the lower portion of said mast and connected to said first hose, a second flexible hose connected to said swivel joint and extending outwardly from the lower portion of said mast, said last mentioned flexible hose being connectable to the inlet of an oil barge, and connecting means between said last mentioned hose and said line providing support for said hose from said boom.

3. In combination with a floating buoy having a central opening therethrough, a hose support crane which comprises in combination a base member mounted on the top of said buoy over said central opening, a thrust bearing positioned on said base member, a hollow vertical mast rotatably supported on said thrust bearing, packing means about the lower portion of said mast to exclude water from said bearing, a boom pivotally secured at one end to the lower portion of said mast and extending upwardly and outwardly therefrom, a tension member connected between the upper end of said mast and the upper end of said boom supporting said boom in a fixed position with respect to said mast, a first sheave fixed in the upper portion of said mast, a second sheave positioned in the upper end of said boom, a line operating over said sheaves, a first flexible hose extending upward into said buoy and supported at its upper end by said base member, a pipe in fluid communication with said hose fixed at its lower end into said base member and extending upwardly therefrom into said mast, a two-way swivel joint secured at one end to the upper end of said pipe and extending through the wall of said mast in the lower portion thereof, a second flexible hose secured to the other end of said swivel joint and extending outwardly from said mast, a flange secured to the outward end of said second hose permitting it to be connected to the inlet of an oil barge or tanker, a counterweight positioned within said mast and secured to one end of said line, and means for securing said second hose near its outward end to the other end of said line providing support for the outward end of said hose from the upper end of said boom.

4. In apparatus of the character described adapted to be supported by a floating buoy the combination which comprises a hollow, cylindrical, rotatable, vertical mast, a boom pivotally secured at one end to said mast near the lower end of said mast, a tension member secured between the upper end of said mast and the other end of said boom to support said boom at a fixed position with respect to said mast, a first flexible hose supported at its upper end within the lower portion of said mast, a second flexible hose secured at one end to said mast below said boom, a fluid-conducting swivel connection positioned within said mast and connected to said first flexible hose and said second flexible hose, a counterweight positioned in said mast, and cable means connected between said counterweight and said second flexible hose near the outer end of said flexible hose whereby said hose is pulled into position adjacent to said boom when said hose is not in use.

5. In apparatus of the character described adapted to be supported by a floating buoy the combination which comprises a hollow, cylindrical, rotatable, vertical mast, a boom pivotally secured at one end to said mast near the lower end of said mast, a tension member connected between the other end of said boom and the upper end of said mast holding said boom at an angle with the upper portion of said mast, a first sheave secured in said mast near the upper end thereof, a second sheave secured in said boom near the outer end thereof, a line operating over said first and second sheaves, a counterweight positioned within said mast and connected to one end of said line, a first flexible hose extending into the lower portion of said mast, a fluid-conducting swivel joint secured in said mast and connected to said first flexible hose, said swivel joint being positioned below the connection of said boom to said mast, a second flexible hose connected to said swivel joint and extending outwardly from said mast, said second flexible hose being connectable to the inlet of an oil barge, and connecting means between said second flexible hose and said line providing support for said hose from said boom.

6. In apparatus of the character described adapted to be supported by a floating buoy the combination which comprises a base member, a thrust bearing secured on said base member, a hollow vertical mast rotatably supported on said thrust bearing, packing means around the lower portion of said mast to exclude water from said bearing, a boom pivotally secured at one end to the lower portion of said mast and extending upwardly and outwardly therefrom, a tension member connected between the upper end of said mast and the other end of said boom supporting said boom in a fixed position with respect to said mast, a first sheave secured in the upper portion of said mast, a second sheave secured in the

upper end of said boom, a line operating over said sheaves, a pipe secured through said base member and extending upwardly into said mast, a first flexible hose connected to said pipe below said base member, a two-way, fluid-conducting swivel joint secured at one end to the upper end of said pipe and extending through the wall of said mast below the connection of said boom to said mast, a second flexible hose secured to the other end of said swivel joint and extending outwardly from said mast, a flange secured to the outward end of said second hose permitting it to be connected to the inlet of an oil barge or tanker, a counterweight positioned within said mast and secured to one end of said line, and means for securing said second hose near its outward end to the other end of said line providing support for the outward end of said hose from the upper end of said boom.

7. In apparatus of the character described, adapted to be supported by a floating buoy the combination which comprises a flange, a base member secured to the upper face of said flange, at least two concentric cylindrical members secured to said base member and extending upwardly therefrom, said cylindrical members being spaced apart one from the other, a thrust bearing positioned on said base member between said concentric cylindrical members, a hollow, vertical mast, at least two cylindrical members secured around and concentric with the lower portion of said mast, said cylindrical members on said mast being spaced apart from said mast and from each other to intermesh with said concentric cylindrical members on said base member, the innermost of said cylindrical members on said mast resting on said thrust bearing to rotatably support said mast, packing means between said cylindrical members on said mast and said cylindrical members on said base member to exclude water from said bearing, an outwardly extending flange formed around the lower end of said mast, a boom pivotally secured at one end to the lower portion of said mast, a tension member connected between the upper end of said mast and the outer end of said boom to hold said boom in a fixed position with respect to said mast, a first sheave secured through the wall of said mast in the upper portion thereof, a second sheave secured in said boom near the outer end thereof, a line operating over said sheaves, a pipe secured through said first-mentioned flange extending upwardly into said mast, a first flexible hose connected to said pipe below said first-mentioned flange, a two-way, fluid-conducting swivel joint secured at one end to the upper end of said pipe and extending through the wall of said mast below the connection of said boom to said mast, a second flexible hose secured to the other end of said swivel joint and extending outwardly from said mast, a flange secured to the outer end of said second hose permitting it to be connected to the inlet of an oil barge or tanker, a counterweight positioned within said mast and secured to one end of said line, means for securing said second hose near its outer end to the other end of said line providing support for the outer end of said hose from said boom, and a cylindrical member secured in said mast above said swivel joint to serve as a stop for said counterweight.

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