United States Patent

Watkins

[15] **3,675,713**

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[54] METHOD AND APPARATUS FOR SEPARATING SUBSEA WELL CONDUIT COUPLINGS FROM A REMOTE FLOATING VESSEL

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[52] **U.S. Cl.** **166/.6,** 285/18

[51] **Int. Cl.** **F21b 33/035**

[58] **Field of Search** 166/0.5, 0.6; 285/18

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[57] **ABSTRACT**

A plurality of hydraulic drive means, each including a piston, piston rod and cylinder for driving the associated piston rod relative to the associated cylinder upon introduction of hydraulic fluid under pressure, are provided at a subsea well conduit coupling having hydraulically actuated latching means therein including latching dogs cammed out of latching engagement upon pulling of the conduit upwardly when the latching means is deactivated, means are provided for mounting each of such drive means to one of the coupling members, means are provided for introducing hydraulic fluid from the floating vessel above the well and coupling into each of the drive means for driving the associated piston rod relative to the associated cylinder and an annular drive ring mounted about said one of said coupling members is connected to each of the hydraulic drive means so that upon actuation thereof the drive ring is moved coaxially down about said one coupling member into engagement with the other of said coupling members and, on continued actuation of such hydraulic drive means, said drive ring separates the coupling members by forcing them in coaxial but opposite directions, the associated latching means dogs being cammed out of latching position and the coupling members being released to allow raising of the subsea conduit and consequent release of the vessel from the subsea well. Additional hydraulic drive means are also provided in association with an additional drive ring mounted coaxially about and slidable relative to the aforementioned drive ring for disconnecting hydraulic line coupling portions connected to said additional drive ring preparatory to releasing the main coupling members and raising the associated marine conductor or conduit.

4 Claims, 7 Drawing Figures

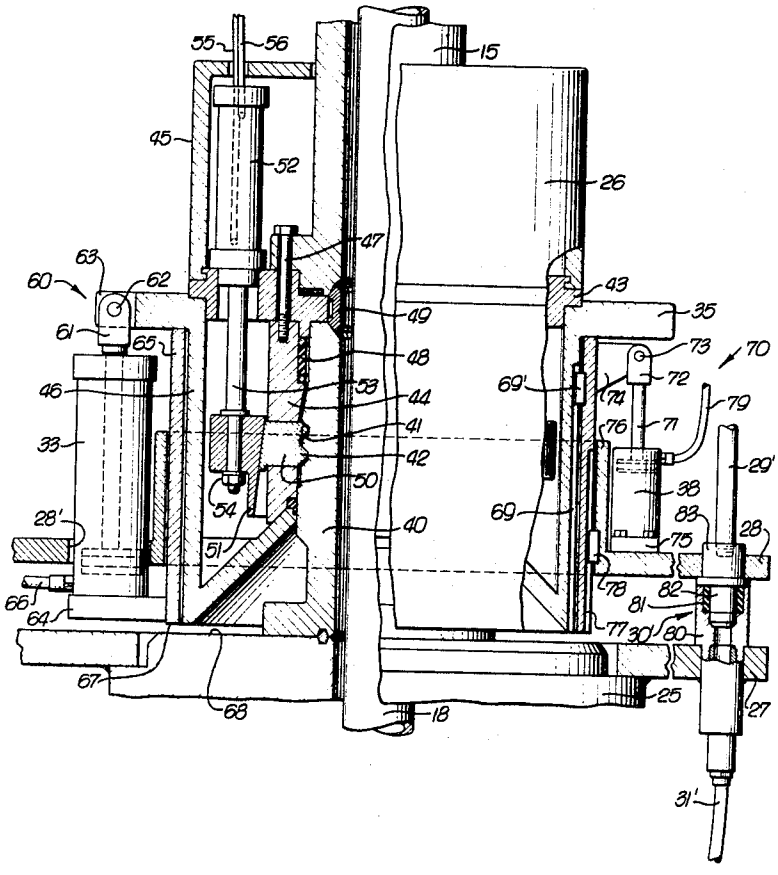


FIG. 2.

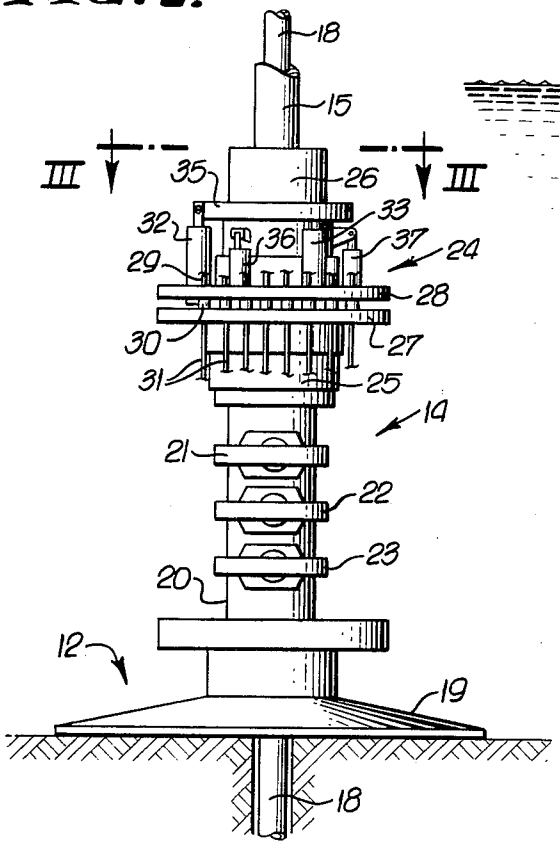


FIG. 1.

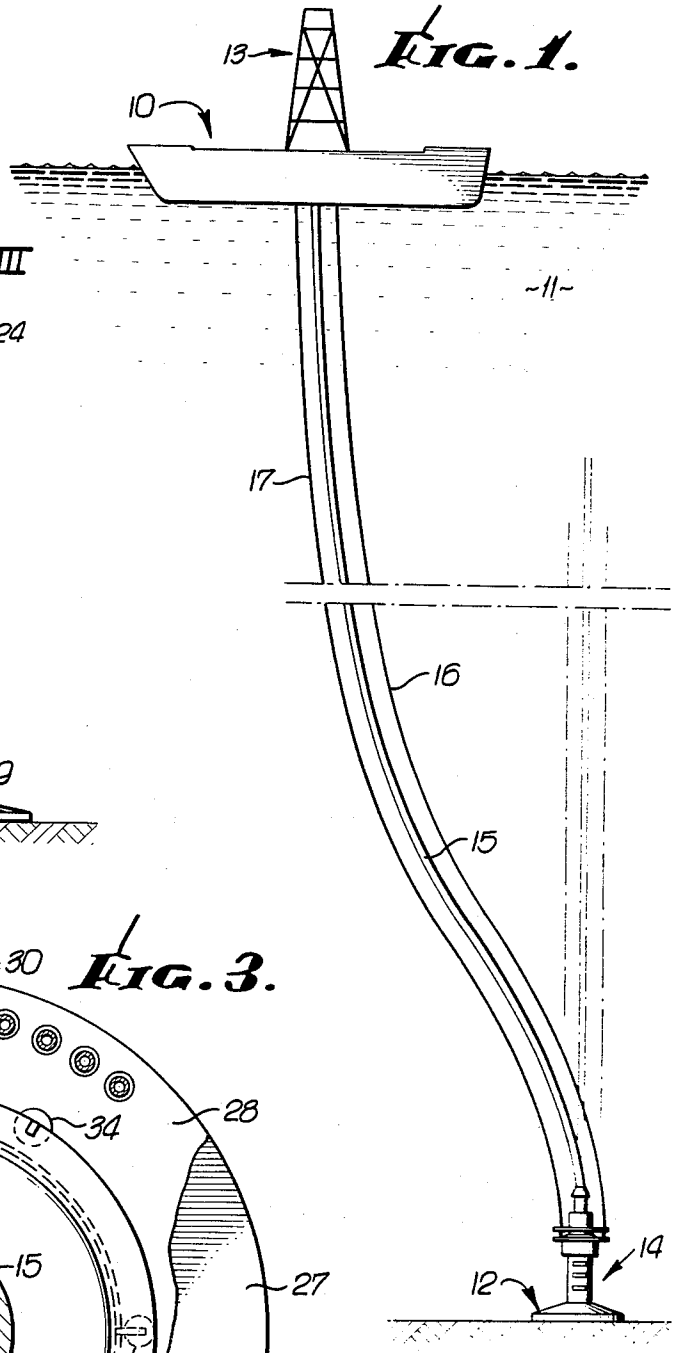
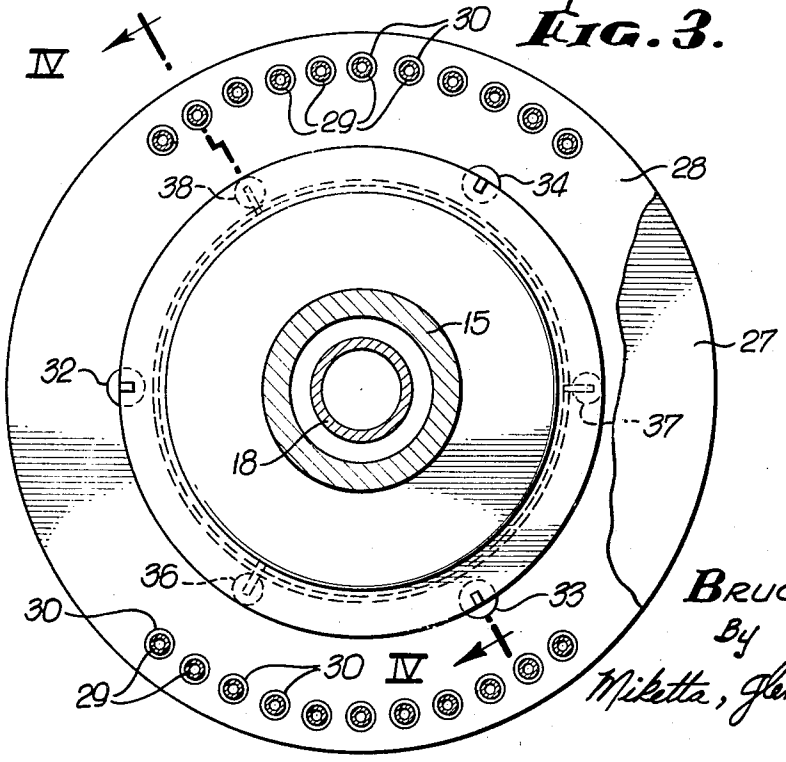


FIG. 3.



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FIG. 4.

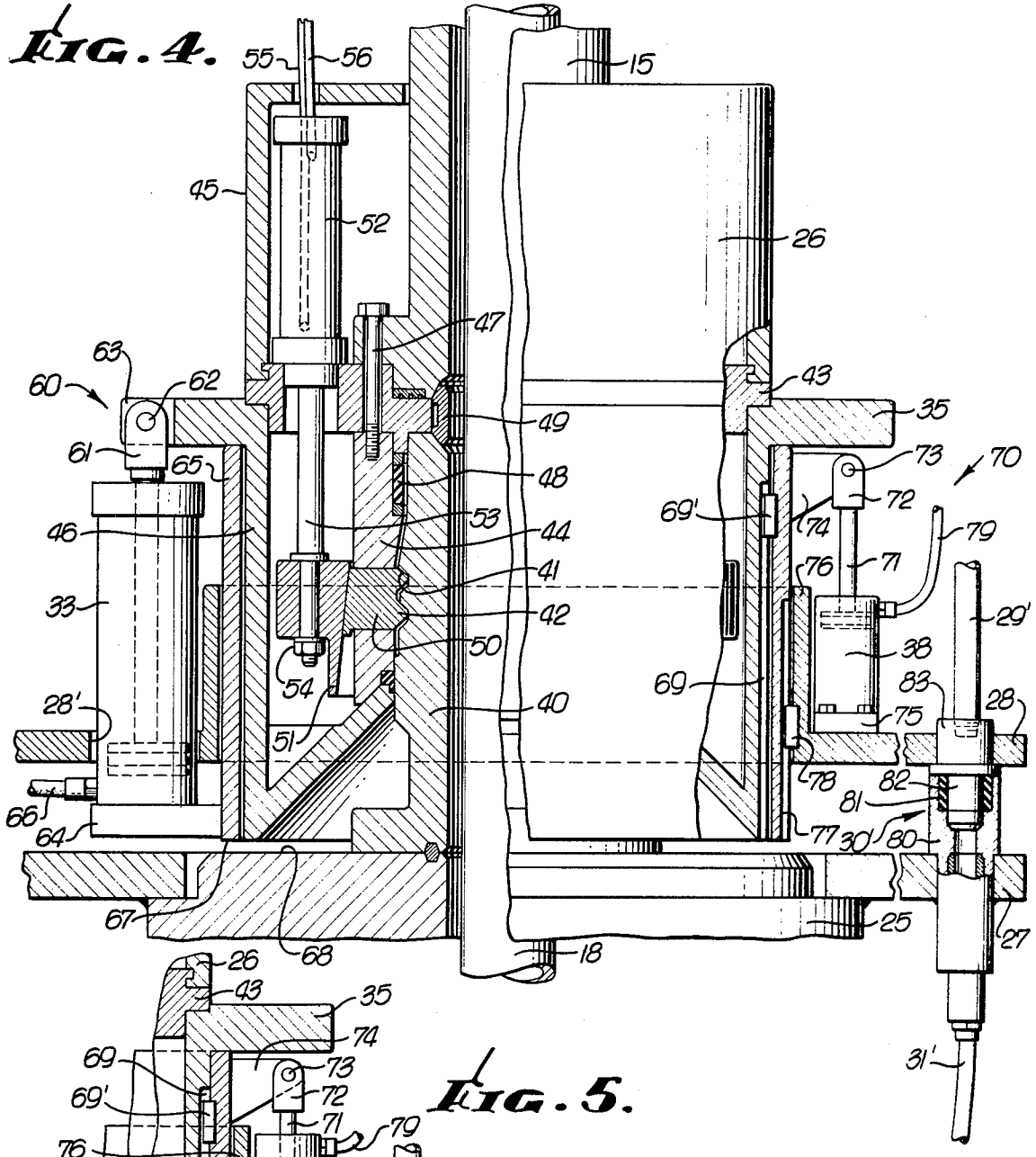
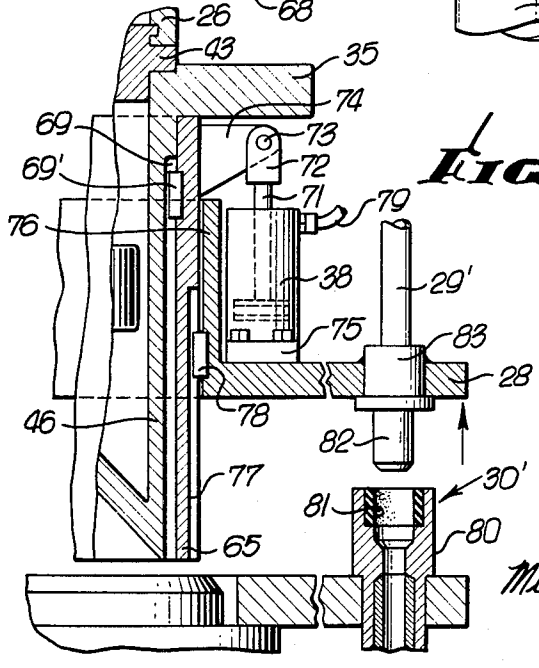


FIG. 5.



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FIG. 7.

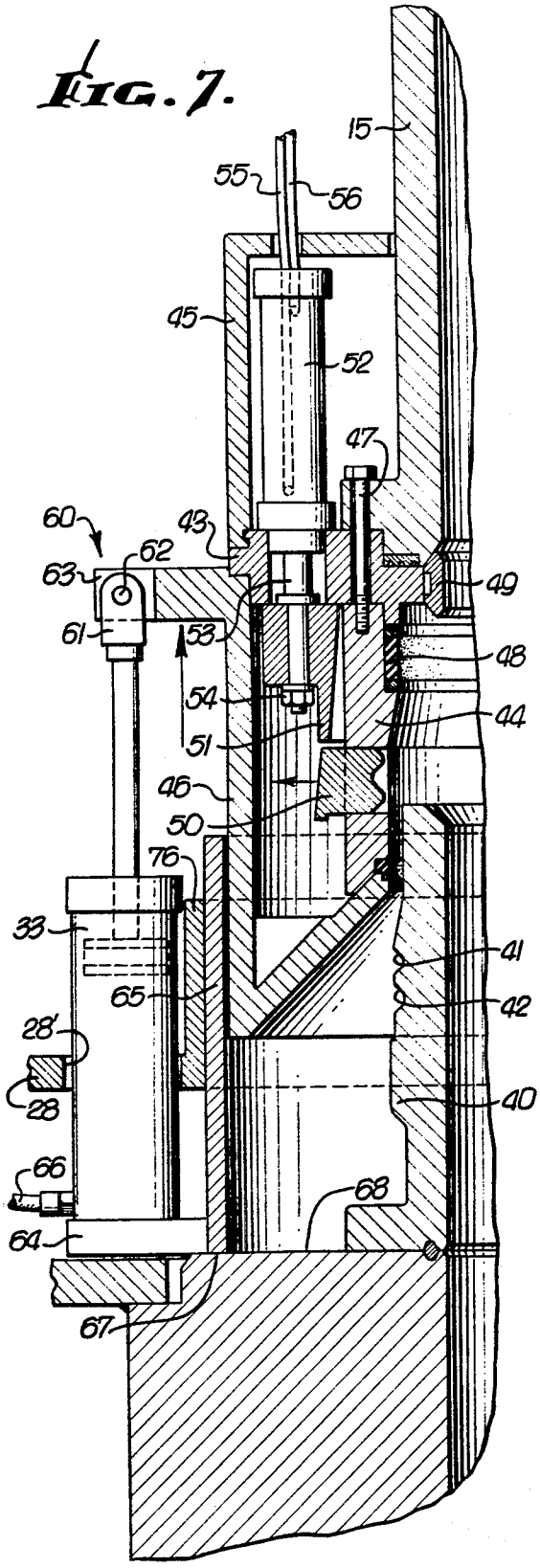
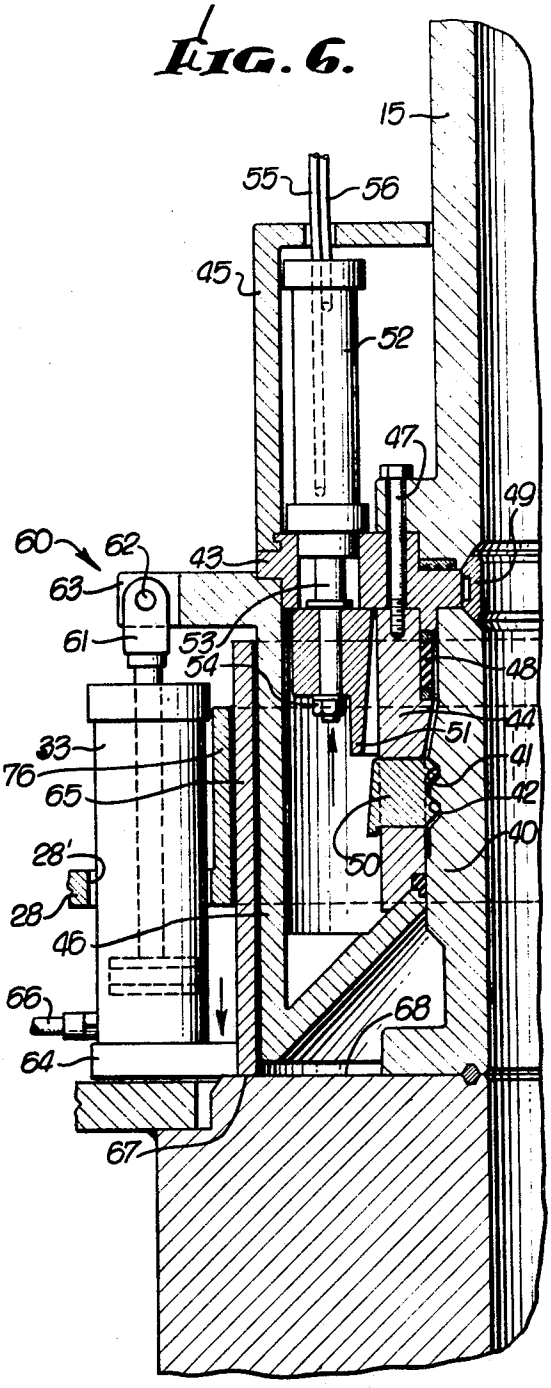


FIG. 6.



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METHOD AND APPARATUS FOR SEPARATING SUBSEA WELL CONDUIT COUPLINGS FROM A REMOTE FLOATING VESSEL

BACKGROUND OF THE INVENTION

In subsea well drilling, production and work over operations it is generally necessary to run a marine conductor, conduit or riser from the floating vessel to the subsea wellhead. Such connection of a riser or marine conductor and additional subsea conduits between a floating vessel and a subsea wellhead apparatus is illustrated in my prior U.S. Pat. No. 3,332,484 entitled "Subsea Well Control Tube Methods and Apparatus." An exemplary form of marine conductor coupling for coupling such conduits, risers or conductors is disclosed in my prior U.S. Pat. No. 3,333,870. Heretofore, such couplings have been separated at their remote subsea locations, generally adjacent the wellhead, by pulling the associated conductor, conduit or riser upwardly toward the overhead floating vessel after associated latching means have been released. In the latching mechanism of the marine conductor coupling of my U.S. Pat. No. 3,333,870, and in other present coupling constructions, a plurality of latching dogs are wedged or blocked into latching engagement with circumferential notches in a mating connector element. The release of the associated hydraulically actuated blocking or wedging means generally merely releases the blocking or wedging forces applied to the dogs and the actual release of the latching members or dogs from the complimentary coupling member is effected through a camming action occurring therebetween when the coupling members are pulled apart due to the pulling of the conductor casing or conduit upwardly of the well from the overhead vessel. Such release of subsea couplings is generally workable where the floating vessel is positioned directly over the wellhead so that the pull applied to the conductor or casing from the vessel acts in a straight line generally running through the vertical axis of the coupling members.

However, a vessel or platform floating at sea, particularly where very deep subsea well formations are being drilled or produced, cannot be maintained directly over the wellhead and tend to drift or ride laterally away from the wellhead as seen in FIG. 1 of the appended drawings. When this condition occurs, it can become impossible to release the vessel from the subsea well by the present methods of merely pulling the conductor or conduit upwardly after releasing the associated coupling latching mechanism because the pull applied to the upper coupling member is at an angle to the axis of the lower coupling member. The coupling members generally must be pulled in coaxially but opposite directions in order to cam the associated latching dogs out of locking engagement and to release the coupling members. When the pulling forces on the upper coupling member are at an angle to the axis of the lower coupling member, a binding, tight condition occurs between the coupling members, particularly where latching dogs as aforenoted are employed, which prevents uncoupling of the coupling members located beneath the sea and perhaps at such a remote or deep area thereof that it is not possible to send a diver or other equipment down to effectuate a release of the coupling members. This is particularly disadvantageous when emmergency conditions demand an immediate release of the floating vessel from the subsea well and the coupling members bind and will not release. In such situations the only recourse for the drilling or production crew on the floating vessel may be to drop the entire marine conductor or riser from the vessel and thus loose valuable equipment and create a difficult re-entry situation.

SUMMARY OF THE INVENTION

It is therefore a primary object of the present invention to disclose and provide a method and apparatus for separating subsea well conduit couplings positioned generally adjacent the wellhead beneath the sea in a positive and forceful manner from the remote floating vessel so that subsequent drawing or pulling of the marine conductor or riser upwardly of the well

can be effected and the floating vessel can be assured of being able to disconnect from the wellhead even under emmergency conditions when the vessel may be positioned laterally offset of the well with the associated conductor or conduits running at an angle to the vertical between such vessel and wellhead.

It is a further object of the present invention to disclose a method and apparatus as in the foregoing object wherein the coupling separator apparatus includes means and provision for positively disconnecting or uncoupling any associated hydraulic line couplings mounted in association with the conduit or conductor coupling prior to drawing the conductor or conduit away from the wellhead apparatus.

Generally stated, the method and apparatus for separating subsea well conduit couplings, according to the present invention, includes the provision of coupling separator means associated with the separable coupling members for moving such members axially away from one another in an uncoupling direction upon actuation thereof and actuating means operable from a floating vessel above the subsea well and coupling for actuating such coupling separator means from such remote location. It is contemplated within the present invention that such coupling separator means includes a plurality of hydraulically actuated drive means, each having at least two relatively movable parts thereof that are driven relative to one another by introduction of hydraulic fluid under pressure into the drive means. The actuating means associated therewith includes hydraulic fluid line means run from the vessel to the individual drive means for introducing hydraulic fluid under pressure from the vessel when it is desired to positively separate the coupling members.

More particularly, the plurality of hydraulic drive means each include a piston, piston rod and cylinder with means for mounting each such drive means to one of the coupling members. Means, including an annular drive ring in the preferred exemplary embodiment, are also associated with each of the hydraulic drive means and are movable in response to actuation of such drive means to engage and forcibly push the other of said coupling members axially away from the first noted coupling member to uncouple the same.

The present invention also contemplates the provision of additional hydraulic drive means associated with one of the coupling members and with portions of a plurality of associated hydraulic line coupling members for separating or uncoupling such line couplings upon actuation of such additional hydraulic drive means. The release of the hydraulic line couplings is preferably accomplished according to the present invention prior to actuating the main hydraulic drive means to uncouple the conductor or conduit coupling members.

A more complete understanding of the methods and apparatus of the present invention will be attained by those skilled in the art and various additional objects and advantages of the methods and apparatus of the present invention will become apparent to those skilled in the art from a consideration of the following detailed explanation of a preferred exemplary embodiment of an apparatus for separating subsea well conduit couplings, including marine or conduit couplings, hydraulic line couplings and the like. Reference will be made to the appended sheets of drawings in which the various elements of the preferred exemplary apparatus will be referred to by the same numerals throughout the various figures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view depicting a floating platform or vessel over a subsea well site or formation with an apparatus for separating subsea conduit couplings according to the present invention incorporated in the otherwise conventional drilling hook-up apparatus as the well for separating the conduit coupling particularly under conditions where the vessel is not directly over the well as illustrated;

FIG. 2 is an enlarged view of the apparatus for separating subsea conduit couplings according to the present invention and the drilling hook-up apparatus of FIG. 1;

FIG. 3 is a plan view, partially in section, of the apparatus of FIG. 2 taken therein along the plane III—III;

FIG. 4 is a sectional view of the apparatus of FIG. 3 taken therein along the plane IV—IV showing the associated couplings in coupled condition;

FIG. 5 is a detailed view of the apparatus of FIG. 4 showing the hydraulic control line coupling portions separated by means of the apparatus for separating conduit couplings according to the present invention;

FIG. 6 is a detailed view of the apparatus of FIG. 4 showing the apparatus for separating subsea conduit couplings, in accordance with the present invention, in an initially actuated position preparatory to moving the main conduit coupling members axially away from each other in an uncoupling direction; and

FIG. 7 is a detailed view of the apparatus of FIGS. 4 and 6 showing the main conduit coupling members separated by means of the apparatus for separating subsea conduit couplings in accordance with the present invention.

Referring first to FIG. 1, a floating vessel or platform, such as the ship indicated generally at 10, is shown floating on a body of water or sea 11 generally above, but offset of, a subsea well indicated generally at 12. The vessel or ship 10 is provided with a conventional drilling rig, indicated generally at 13, positioned over a cellar or slot through the center of the vessel provided in known manner. A generally conventional wellhead apparatus for drilling is illustrated generally at 14 with an exemplary embodiment of the subsea well conduit coupling separator apparatus, indicated generally at 24 in FIG. 2, provided therewith.

In normal drilling operations, a marine conductor or riser 15 is connected between the floating vessel and the wellhead apparatus by a marine conductor coupling. One such conductor coupling suitable for use with the apparatus of the present invention is disclosed in my prior U.S. Pat. No. 3,333,870. The release of such coupling is normally effected by relieving hydraulic pressure on the associated latching means and pulling the conduit or riser 15 vertically upwardly, causing a camming of associated locking dogs out of the lower member of the coupling associated with the wellhead equipment, and a separation of the upper and lower coupling members. Such separation is easily effected when vessel 10 is generally vertically directly above the well and riser or conduit 15 is in a generally vertical orientation as shown in dotted line in FIG. 1. However, when vessel or platform 10 rides off to the side of the well, as seen in FIG. 1, it frequently becomes difficult if not impossible to pull the coupling apart because of the binding thereof when the pulling force of conduit or riser 15 is at an angle to the axis of the coupling. As is particularly contemplated within the present invention, apparatus for positively separating the couplings is provided at the subsea well conduit coupling which is actuated by hydraulic line means, as lines 16 and 17, prior to pulling the conduit or riser 15 upwardly, as will be explained more fully hereinafter.

Referring to FIG. 2, the wellhead drilling apparatus is shown with a drill string 18 run therethrough for purposes of drilling a well beneath the template or table 19 upon which the wellhead casing 20 is mounted. Casing 20 may be provided with a plurality of rams 21, 22 and 23 for use in conventional drilling operations, each of which is hydraulically operated by means of associated hydraulic control lines described hereinafter. It is contemplated that line means 16 and 17 illustrated in FIG. 1 may each include a plurality of hydraulic hoses or lines bundled together to provide whatever number of hydraulic lines may be necessary for operating the various wellhead control devices and the hydraulic means employed in the apparatus of the present invention.

Still referring to FIG. 2, the marine conductor coupling for coupling conduit or riser 15 to wellhead casing 20 includes a lower body portion 25 mounted on casing 20 and an upper body portion 26 connected to riser or conduit 15. As seen in FIGS. 2, 3 and 4, the lower marine conductor coupling body 25 is provided with a flange 27 while the upper coupling body 26 is provided with a flange 28. The coupling members 25 and 26 separate along a line or plane lying between flanges 27 and 28. The associated hydraulic control lines for operating the various wellhead controlled devices, such as rams 21, 22 and 23, are provided with connectors suitable for coupling and uncoupling between flanges 27 and 28. As is also contemplated within the apparatus of the present invention, means are provided as hereinafter more fully explained for positively separating the hydraulic control line couplings, such as coupling 30 joining hydraulic lines 29 and 31 in FIG. 2, preparatory to uncoupling the main marine conductor coupling members 25 and 26.

As will be described more fully in detail subsequently herein, the exemplary apparatus of separator means for uncoupling the main conduit coupling members 25 and 26 includes a plurality of hydraulically actuated piston and cylinder means 32, 33 and 34, as best seen in FIGS. 2 and 3, with the piston rod members thereof fixedly secured to flange 35 provided on upper coupling member 26. In the exemplary embodiment of separator means for separating the hydraulic control line couplings 30, a plurality of hydraulic cylinder and piston means 36, 37 and 38 are employed, as seen in FIGS. 2 and 3, and as more fully explained hereinafter. It is contemplated within the present invention that by selective actuation of the hydraulic piston and cylinder means noted herein, that the hydraulic line couplings 30 may be first disconnected and the main marine conductor coupling members 25 and 26 thereafter disconnected prior to pulling the casing or riser 15 upwardly toward the vessel for releasing it from the wellhead apparatus.

Since the exemplary embodiment of conduit coupling separator apparatus of the present invention is disclosed herein with an exemplary form of marine conductor coupling, the marine conductor coupling and its associated latching mechanism will now be described in detail prior to completing the detailed description of the apparatus of the present invention. While the marine conductor coupling illustrated is more fully disclosed in my prior U.S. Pat. No. 3,333,870, and reference is made thereto for the operation of such coupling, an explanation thereof will be made here to facilitate the further explanation and understanding of the apparatus of the present invention.

Referring to FIG. 4, the lower marine conductor coupling member 25 is provided with an upstanding gib means or male coupling member 40 which has a pair of spaced circumferential notches 41 and 42 having inwardly convergent inclined side walls. Gib means or coupling member 40 is thereby adapted to be received within a socket portion provided in association with the upper coupling member 26 and latched therein as will now be explained.

Again referring to FIG. 4, the upper member 26 of the marine conductor coupling in the exemplary embodiment includes a central ring portion 43 and a lower body or socket portion 44 secured to the riser or marine conductor or conduit 15 by means of conventional bolts 47. Surrounding housing portions, including the upper housing portion 45 and the lower housing portion 46 are secured, as by welding, or other conventional means to the ring member 43. An elastic type seal 48 is provided within the socket member 44 to seal against the outside surface of the end of gib means 40 while the metal seal ring 49 is provided for sealing at the end of gib means 40 about an inner chamfered surface thereof, as more fully explained in my U.S. Pat. No. 3,333,870.

Latching means are provided in the exemplary embodiment of marine conductor coupling including a plurality of horizontally slidable or movable latch elements or dogs, such as dog 50 illustrated in FIG. 4. Each of the plurality of dogs 50 is adapted to be wedged or forced into latching engagement with the associated gib means by downward movement of the associated wedge or force transmitting ring 51. Conventional hydraulic piston and cylinder means, such as cylinder 52 are provided within the housing 45 and mounted on ring 43 with the piston rod 53 extending down within housing 46 into en-

gagement with the ring **51**, the threaded end of rod **53** being held thereto by a conventional nut **54**. Hydraulic fluid pressure lines **55** and **56** are connected to cylinder **52**, and supplied with hydraulic fluid via the bundle of hydraulic hoses **16** or **17** for actuating the enclosed piston upwardly or downwardly therein to selectively either wedge dogs **50** into engagement with gib means **40**, as seen in FIG. **4**, or release them as seen in FIG. **6**. As seen in FIG. **6**, when dogs **50** have been released by the wedging or force transmitting ring **51**, they are moved out of locking engagement with gib means **40** due to a camming action applied thereon between the inclined mating surfaces of the dog and notches **41** and **42** when the conduit **15** and associated upper coupling member, including housings **45** and **46**, ring **43**, socket **44** and associated parts, are pulled upwardly toward the vessel. However, if the pull on conduit **15** and the associated upper coupling member is not generally vertically straight upwardly, but is in a direction inclined to the axis of the gib means **40**, a binding of the coupling members has been found to exist, the dogs **50** do not release and the coupling members **25** and **26** cannot be released.

Means are provided, in accordance with the present invention, for positively moving or forcing the coupling members **25** and **26** away from each other in coaxial but opposite directions to cam latching dogs **50** out of engagement with gib means **40** and effect a release of the coupling members **25** and **26** preparatory to pulling conduit or riser **15** and the upper coupling member **26** away from the well and thus release vessel **10** from the subsea well. As is contemplated within the present invention, such means may include a plurality of hydraulic drive means, each including a piston, piston rod and cylinder for driving the associated piston rod relative to the associated cylinder upon introduction of hydraulic fluid under pressure therein, means for mounting each of such drive means to one of the coupling members, means for introducing hydraulic fluid from the vessel **10** into each of such drive means for driving the associated pistons rods relative to the associated cylinders and means associated with each of the drive means for moving the other coupling members in an uncoupling direction coaxially away from the first coupling member in response to relative movement between the cylinder and associated piston rods. Such method of disconnecting couplings and apparatus may be employed within the present invention for uncoupling either a main conduit coupling, such as coupling members **25** and **26** or such a main coupling and a plurality of hydraulic fluid control line couplings associated therewith as well. A preferred exemplary embodiment of such coupling separator apparatus will now be explained.

Conduit coupling separator apparatus, in the exemplary embodiment, include the plurality of hydraulic cylinder and piston means **32**, **33** and **34** and are in part illustrated generally at **60** in FIGS. **4**, **6** and **7**. Referring to FIGS. **4**, **6** and **7**, the construction of one of the plurality of hydraulic cylinder and piston means, hydraulic cylinder **33**, will be explained, it being understood that the other exemplary cylinders **32** and **34** are similarly constructed and operated in association with the common members to be described. As seen in FIG. **4**, cylinder **33** is provided with a piston and piston rod in conventional manner with a rod end fitting **61** pivotally mounted by pin **62** to the flange **35** provided on lower housing member **46**. Pin **62** is mounted in a slot **63** formed in flange **35**. The hydraulic cylinder and associated piston and piston rod means are thereby fixed to the upper coupling member **26** so that upon actuation thereof the cylinder **33** of each such hydraulic drive means will move downwardly relative to the upper coupling member **26**. As seen in FIG. **4**, each cylinder, as cylinder **33**, passes through a port or opening **28'** in flange **28** and has a cylinder base flange **64** secured, either by being integral with or being welded to, a drive ring or annular member **65** mounted about and coaxially of the housing **46** and socket member **44** of upper coupling member **26**. Ring or annular member **46** thus serves as a guide for directing each of the cylinder portions **32**, **33**, and **34** downwardly about coupling member **26** into uncoupling engagement with the lower coupling member **25**, or as in the preferred exemplary embodiment, also acts as a drive ring with its lower surface **67** engaging the upper surface **68** of lower coupling member **25**. Suitable hydraulic lines, as hydraulic line **66**, connected to the hydraulic line bundles **16** or **17** run from the vessel **10** are provided for introducing hydraulic fluid under pressure into the respective hydraulic cylinders **32**, **33** and **34** to selectively force drive ring or annular member **65** downwardly from the inactive position of FIG. **4** into the initially actuated lower coupling member contacting position of FIG. **6** and the coupling separator position of FIG. **7**. Annular member or ring **65** is provided with a slide block **69'** positioned in spline **69** formed in the outer surface of housing **46** to prevent relative rotation therebetween while allowing coaxial linear movement therebetween.

As can be seen from a comparison of FIGS. **6** and **7**, the actuation of hydraulic piston and cylinder means **32**, **33** and **34** causes the coupling members **25** and **26** to move in opposite, but coaxial, directions to cam the locking dogs **50** out of gib means **40** and separate and uncouple the coupling members without any binding or twisting of the coupling members. When the coupling members **25** and **26** are separated into the uncoupled position of FIG. **7**, the conduit **15** and associated hydraulic lines **16** and **17** may be pulled upwardly away from the well releasing the vessel from the wellhead. Where hydraulic control lines for operating devices at the portion of the wellhead remaining at the subsea location are not included, it can be seen that the hydraulic lines associated with the latching means hydraulic cylinders, as cylinder **52** and the hydraulic drive means of the apparatus of the present invention, including cylinders **32**, **33** and **34**, are all released and readily drawn upwardly away from the wellhead casing and associated lower coupling member **25** when the couplings have been released into the uncoupled position of FIG. **7**.

It is also contemplated within the present invention that in certain subsea well installations, a plurality of hydraulic fluid control lines, as lines **29**, **31**, may also be provided for controlling various devices associated with the wellhead apparatus or equipment below the marine conductor coupling. In such installations, it is considered desirable to be able to release the associated hydraulic line connectors **30** prior to releasing the main marine conductor coupling members **25** and **26**. The method and apparatus of the present invention allows such prereleasing of the hydraulic line couplings prior to the positive separation of the coupling members **25** and **26** as will now be explained in detail.

Conduit coupling separator apparatus for uncoupling hydraulic fluid line couplings **30**, in the exemplary embodiment, includes the plurality of hydraulic drive means, including hydraulic cylinder means **36**, **37** and **38**, and is in part illustrated at **70** in FIGS. **4** and **5**. As seen in FIGS. **2** and **3**, a plurality of hydraulic drive means are employed in the apparatus of the present invention for disconnecting the hydraulic line couplings. The exemplary hydraulic cylinder means **38**, as seen in FIGS. **4** and **5**, will be explained in detail, it being understood that the other hydraulic means **36** and **37** are of similar construction and operate in cooperation with cylinder **38** and the commonly associated members for releasing the couplings **30** as explained herein. Referring to FIGS. **4**, hydraulic cylinder means **38** includes a piston and piston rod **71** of conventional nature with a rod end fitting **72** mounted by pin **73** to a bracket or flange **74** mounted on the exterior surface of annular member or ring **65**. Each hydraulic cylinder, as cylinder **38**, is provided with a base flange, as flange **75**, bolted as shown, or otherwise secured, to flange **28** which in turn is formed integrally with a second drive or guide ring **76** mounted coaxially about and slidable relative to the annular member **65**. Annular member **65** is provided with a spline **77** on its outer surface in which slide block **78**, fixed to ring **76**, is slidable for limiting guide ring **76** and integral flange **28** to vertical coaxial movement relative to the annular

member 65, inner housing 46, inner socket member 44 and, when the coupling members are in coupled condition as shown in FIG. 4, the gib means 40. As seen in FIG. 4, each of the hydraulic cylinders 36, 37 and 38 has its associated internal piston at the upper end of the associated cylinder when the apparatus is in the coupled condition of FIG. 4. The associated hydraulic lines, as line 79, are connected to the upper end of each cylinder so that upon introduction of hydraulic fluid into each of the cylinders, the cylinders, guide ring 76 and associated flange 28 will all be drawn straight vertically upwardly in a direction coaxial to the center line of the coupling members 25 and 26. By providing the hydraulic line coupling body portions 80 on the lower flange 27, in the exemplary coupling 30' in FIG. 4, with the center line thereof parallel to the center line of the main coupling members 25 and 26, the aforedescribed raising of flange 28 draws the male line coupling portion 82 directly out of the associated socket portion 80 and its associated internal seal 81, as seen in FIG. 5. The male portion 82 of each hydraulic line coupling 30, 30' is preferably connected by a fitting portion 83 to the movable flange 28 and integral guide ring portion 76 so that upon actuation of the hydraulic cylinder means 36, 37 and 38, all of the associated upper hydraulic line portions 29, 29' are coupled from the lower hydraulic line portions 31, 31'.

According to the preferred method of releasing subsea well conduit couplings of the present invention, the hydraulic drive means including cylinders 36, 37 and 38 are initially operated to uncouple the line couplings 30, as seen in FIGS. 4 and 5, prior to releasing the main coupling members 25 and 26. The hydraulic means in the coupling latching apparatus, including cylinder 52, as seen in FIG. 6, may then be operated to a release position so that the associated latching dogs 50 are released and ready to be cammed outwardly of the associated gib means notches 41 and 42 upon actuation of the main hydraulic drive means including cylinders 32, 33, and 34. The extent of travel of flange 28 during the release of line couplings 30 as seen in FIGS. 4 and 5 is sufficiently great so that upon the initial downward movement of annular means 65, and thus the associated brackets 74 mounting the cylinders 36, 37 and 38, a recoupling of line coupling portions 80 and 82 is not effected, such initial actuating position for annular member 65 being illustrated in FIG. 6. Thereafter, continued actuation of the hydraulic drive means including cylinders 32, 33 and 34 causes further separation of such line couplings and a separation or uncoupling of the main coupling members as seen in FIG. 7.

From the foregoing detailed explanation of a preferred exemplary embodiment of the method and apparatus for separating subsea conduit couplings, according to the present invention, the method and apparatus of the present invention provide for a positive uncoupling or separation of subsea couplings, including marine conductor couplings, hydraulic line couplings or other subsea conduit couplings, to positively release a floating vessel from a subsea well even where the vessel has floated to an offset position from that directly over the well and a binding non-releasable condition would otherwise exist. It should be understood by those skilled in the art that various modifications, adaptations and alternative embodiments of the method and apparatus of the present invention may be made within the scope of the present invention which is defined in the following claims.

I claim:

1. In a subsea well conduit coupling apparatus including a first coupling member comprising an upstanding wellhead gib means mounted to wellhead equipment at a subsea well and providing entry to said well, a second coupling member mounted to a conduit running to an overhead floating vessel, hydraulically operated latching means for latching said first and second members together including latch dogs, a latch dog receiving means, and caming means therebetween for caming said dogs out of said receiving means upon uncoupling movement of said members, the improvement comprising the provision of:

coupling separater means mounted to said coupling apparatus for moving said members axially away from one another in an uncoupling direction to back said second coupling member off of said wellhead gib means and associated wellhead equipment to facilitate pulling of said conduit and second coupling member from said well upon actuation thereof; and

actuating means for actuating said coupling separater means from said vessel.

2. In a subsea well conduit coupling apparatus as in claim 2 further having hydraulic fluid control line couplings provided with one of said coupling members, said hydraulic line couplings including male and female coupling portions, the further provision of:

additional separator means for separating said hydraulic line male and female coupling portions upon actuation thereof; and

means for actuating said additional separator means from said vessel to uncouple said portions.

3. In a marine conductor coupling, for a marine conductor run from a floating vessel to a subsea wellhead, having an upper coupling member and means for mounting it to the lower end of the marine conductor conduit, said upper coupling member having a socket portion, and a lower coupling member comprising an upstanding gib means at said wellhead upon which said upper coupling member and marine conductor are landed for providing entry to the subsea well through said conductor conduit, latch means including latch dogs mounted on one of said members and means on the other of said members for receiving said dogs on actuation of said latching means when said members are coupled and caming means for caming said dogs outwardly thereof when said latching means is deactivated and said coupling members are forcibly separated, the improvement comprising the provision of:

coupling separater means on said coupling for forcibly moving said upper coupling member and marine conductor conduit axially away from said wellhead in an uncoupling direction upon actuation thereof for caming said latching dogs outwardly of said dog receiving means and at least partially separating said coupling members to allow pulling of said marine conductor conduit away from said wellhead and gib means by raising said conductor after said latch dogs are released; and

actuating means for actuating said coupling separator means from said vessel.

4. The method of positively releasing a marine conductor conduit and the associated vessel from which it is run from a subsea well wherein a coupling member is mounted to a conductor conduit and has hydraulically actuated latching means for latching said member to an upstanding gib means at said subsea wellhead, said method comprising the steps of:

relieving hydraulic pressure holding said latching means in latched relation;

releasing said marine conductor conduit and associated vessel from said wellhead by forcing said coupling member back off of said upstanding gib means by means operable from said floating vessel above the wellhead sufficiently to cause unlatching of said latching means and thereafter pulling said conductor conduit upwardly toward said vessel.

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