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Baugh

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[54] **UNDERWATER WELLHEAD CONNECTOR**

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[52] **U.S. Cl.** **166/.6**, 285/26, 285/131

[51] **Int. Cl.** **E21b 7/12**, E21c 19/00

[58] **Field of Search** ..... 166/.5, .6; 285/24, 26, 285/131; 137/236

[56] **References Cited**

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3,142,344	7/1964	Otteman et al.	166/.5
3,280,908	10/1966	Todd	166/.6
3,332,484	7/1967	Watkins	166/.6
3,486,556	12/1969	Burgess	166/.6
3,516,492	6/1970	Petersen	166/.6

Primary Examiner—Henry C. Sutherland
Assistant Examiner—Richard E. Favreau
Attorney, Agent, or Firm—Fulbright & Crooker

[57] **ABSTRACT**

An underwater connecting apparatus for subsea control systems for wells drilled on the ocean floor and like areas. The connecting apparatus includes at least one female receptacle, a male stinger engageable in the receptacle and a spring mounting secured to the receptacle for flexing attachment to a wellhead.

7 Claims, 3 Drawing Figures

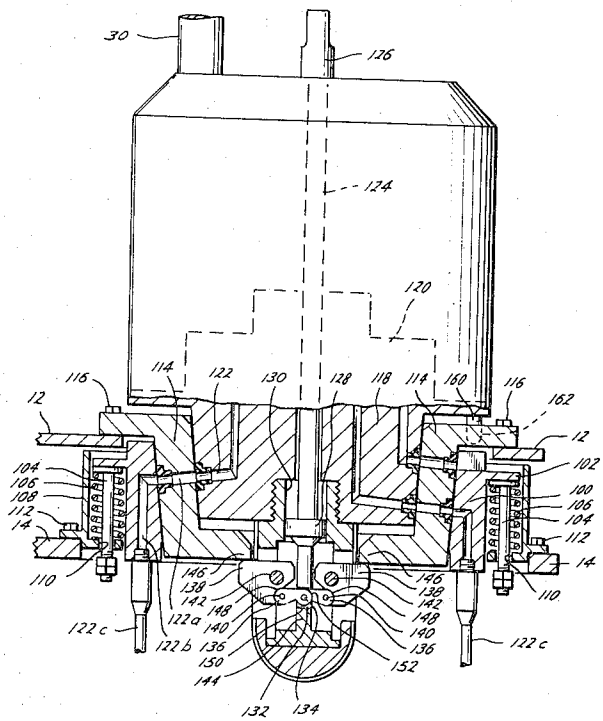


Fig. 1

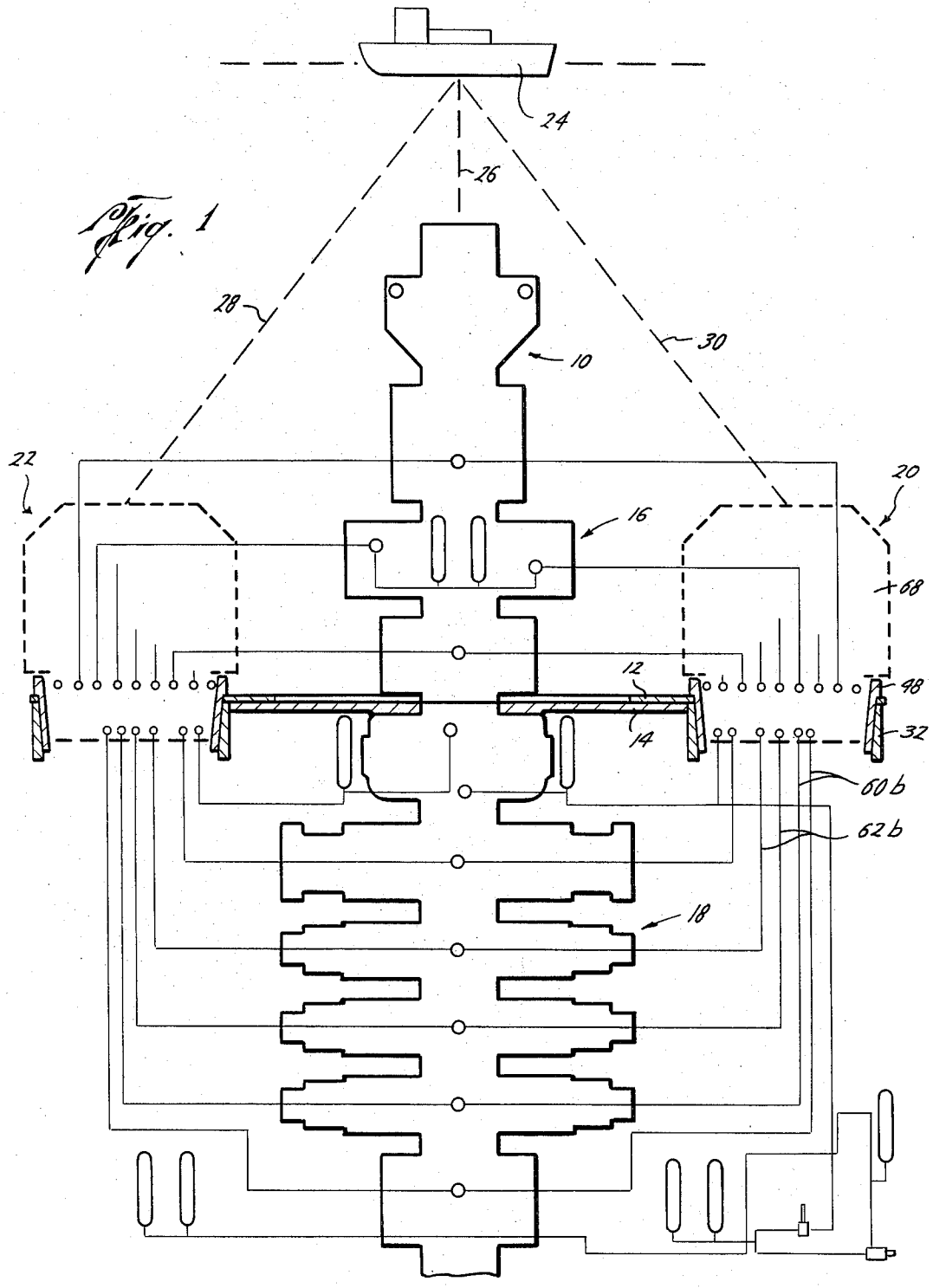


Fig. 2

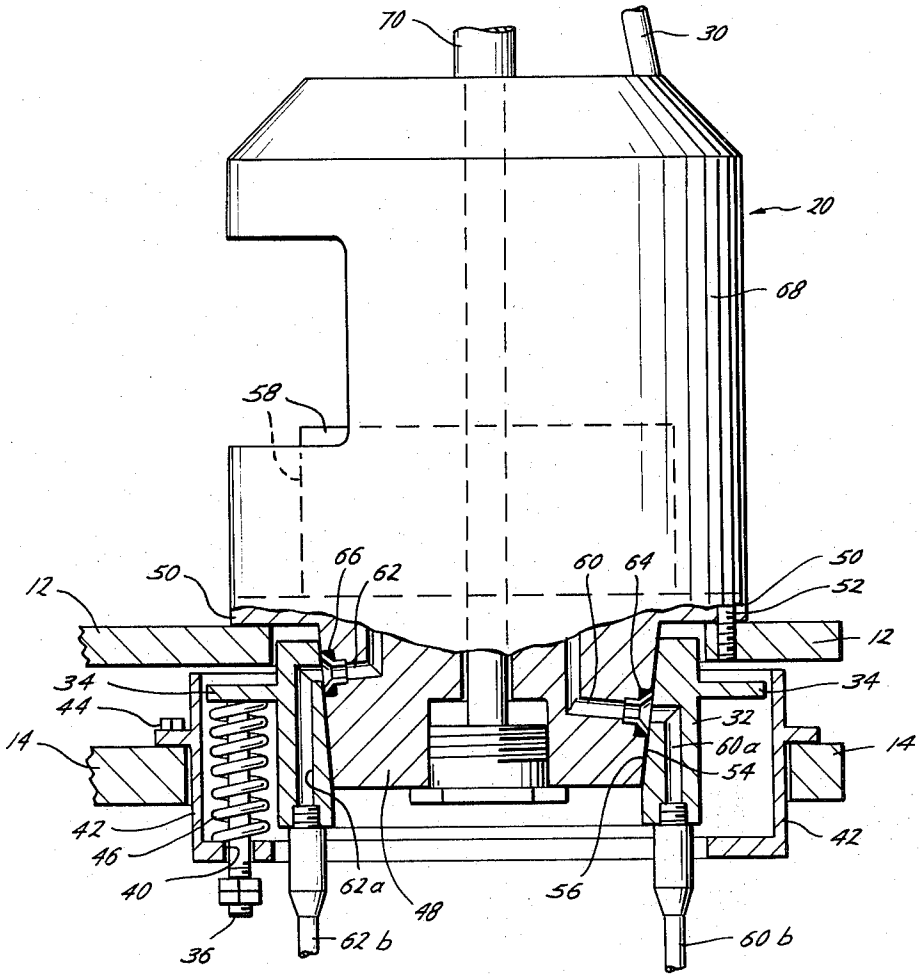
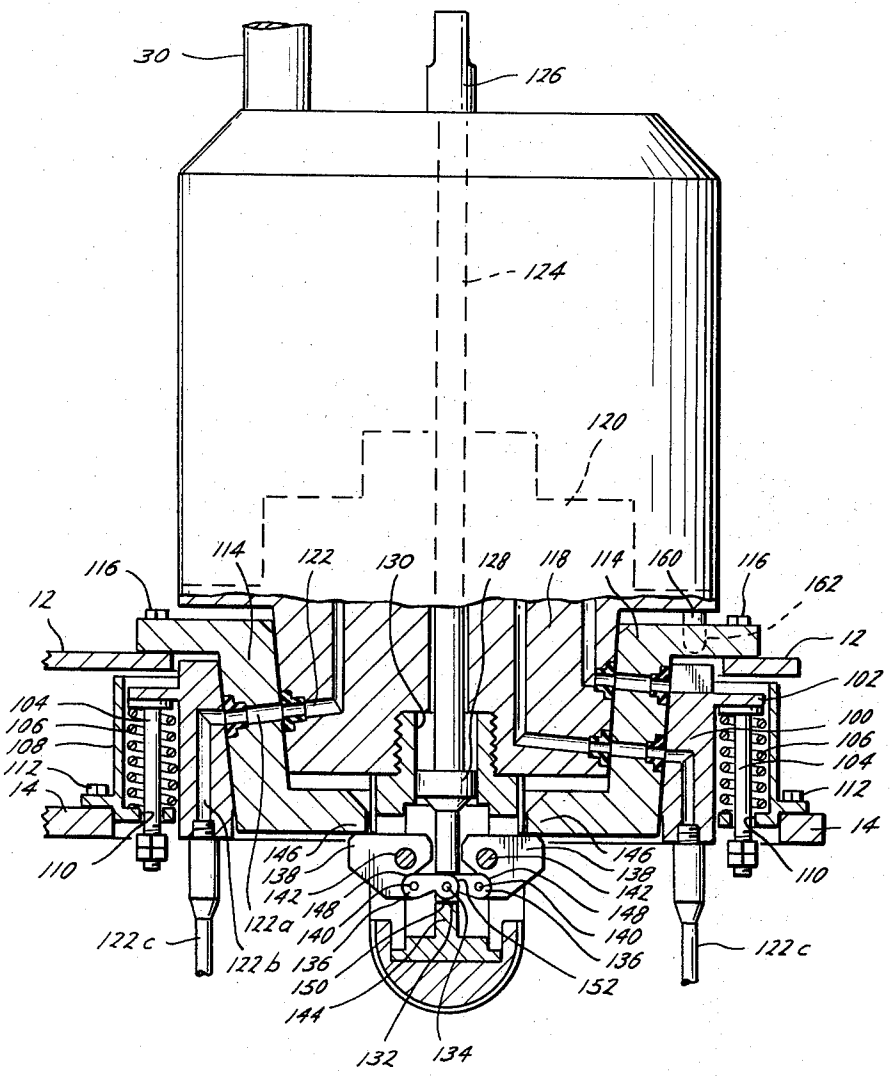

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62a
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62b
60b

Fig. 3


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122b
122c
122c

UNDERWATER WELLHEAD CONNECTOR

BACKGROUND OF THE INVENTION

When an oil or gas well is drilled under bodies of water such as lakes and oceans, the wells generally are completed by addition of wellhead equipment having valves, blow-out preventers and the like to control various functions of the wellhead. This equipment is frequently positioned underwater thereby necessitating remote control from the water's surface. The control lines are usually of the hydraulic fluid type which must be capable of expeditious connection and disconnection such as during emergencies or when moving a water surface control vessel from one location to another. Connector devices to carry out control functions are shown, for example, in U.S. Pat. No. 3,486,556 issued Dec. 30, 1969 to Harry L. Burgess and in references cited in that patent. A further embodiment of a connector device is also shown in United States application Ser. No. 79,504 filed Oct. 9, 1970 and entitled "Connector." Generally speaking, these devices provide detachable control means for connecting to and controlling underwater wells such as those drilled for oil and natural gas. The connectors may be raised and lowered as desired and, when secured to the equipment at the underwater wellhead site, provide conduit means for transmitting control fluids through underwater equipment such as a blow-out preventer.

In connector devices such as that of U.S. Pat. No. 3,486,556, the connector apparatus includes a receptacle having an opening therein into which a tapered stinger is adapted to be removably telescoped, and in which the receptacle and stinger have coacting fluid passageways when the stinger is seated therein. Typical of the conventional connector apparatus shown in such patent is the provision of a protective shield together with means for aligning the stinger for insertion into the receptacle to insure a proper fluid-tight engagement between the stinger and receptacle.

While conventional connector devices have, in most cases, functioned for the purpose intended, nevertheless the apparatus has been rather expensive to machine and manufacture due to close tolerances required for proper sealing relationships. In addition, conventional connector apparatuses have required the use of locking devices to maintain proper sealing engagement of the connector apparatus with the wellhead which adds to the expense of the equipment as well as its operation. Advantageously, the apparatus of the present invention results in significantly reduced manufacturing costs and, in one embodiment, eliminates the necessity of providing locking means.

SUMMARY OF THE INVENTION

The present invention is of the type utilizing a tapered stinger and receptacle wherein passageways extending through the stinger terminate preferably in common planes so that a lengthy stinger body is not necessary. Spring mounting means are secured to the female receptacle for flexing attachment to a stationary portion of the wellhead. The flexing ability of the receptacle practically eliminates the possibility of damage to the stinger and passageway seals during engagement and greatly reduces the cost of manufacture.

In one embodiment of the present invention, the male stinger is adapted to be fixedly secured to an upper, detachable portion of the wellhead thereby obviating the need for locking means to secure the stinger to the receptacle. In another embodiment of the present invention, an annular second female receptacle is provided releasably engaging between the first receptacle and the stinger, the second female receptacle being adapted so as to be fixedly secured to an upper detachable portion of the wellhead. Such embodiment adds versatility to the connector apparatus in that the stinger portion may be disconnected along with the second female receptacle member when the upper portion of a wellhead is detached or disconnected from the stationary part of the wellhead, or the stinger may be disconnected and removed at will without necessity of removing the upper detachable portion of the wellhead. In the latter embodiment, locking means are employed to interlock the stinger in the annular second female receptacle to insure a fluid-tight fit.

It is, therefore, an object of the present invention to provide an underwater connecting means for expeditious connection and disconnection of control lines leading to underwater equipment such as a wellhead.

A further object of the present invention is the provision of a connector apparatus for connection to an underwater wellhead wherein the apparatus includes a female receptacle, spring mounting means secured to the female receptacle and adapted for flexing attachment to the wellhead, and a male stinger engageable in the female receptacle so as to provide hydraulic communication therewith.

Yet a further object of the present invention is the improvement in an underwater wellhead having an upper detachable portion and a lower stationary portion wherein a connector apparatus has a female receptacle secured by a spring mounting means for flexing attachment to the lower stationary portion of the wellhead for engagement by a male stinger which is easily connected or disconnected from the female receptacle.

Still a further object of the present invention is the provision of a connector apparatus for connection to an underwater wellhead wherein the apparatus includes a female receptacle, spring mounting means secured to the female receptacle and adapted for flexing attachment to the wellhead, a male stinger engageable in the female receptacle, and an annular second female receptacle releasably engaging between the first female receptacle and the male stinger and adapted to be fixedly secured to the wellhead at a point above the attachment of the first female receptacle to the wellhead.

A still further object of the present invention is the provision of such a connector apparatus wherein locking means are provided to releasably secure the male stinger to the first and second female receptacles.

Other and further objects, features and advantages will be apparent from the following description of a presently preferred embodiment of the invention, given for the purpose of disclosure and taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

Like character references designate like parts throughout the several views of the drawings, which are as follows:

FIG. 1 is a schematic elevation view of a wellhead having a connecting apparatus for remote control of

wellhead functions from a water surface vessel, the connector apparatus being shown in duplicate in dotted outline,

FIG. 2 is a partial elevation view partly in cross section showing one embodiment of the apparatus according to the present invention, and

FIG. 3 is a partial elevation view partly in cross section showing yet a further embodiment of the present invention.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, and particularly to FIG. 1, the reference numeral **10** generally designates an underwater wellhead apparatus having an upper detachable portion and a lower stationary portion. The upper detachable portion is generally the equipment shown in schematic attached to and positioned above a riser plate **12** while the lower stationary portion is that portion of the wellhead below and to which is attached a stack plate **14.** The upper detachable portion of the wellhead will simply be referred to as the "riser" and indicated generally by the reference numeral 16 while the lower stationary portion of the wellhead will be referred to as the "stack" and will be indicated generally by the reference numeral 18.

Shown secured to the wellhead **10** is a connector apparatus according to the present invention and designated generally by the reference character **20.** An identical duplicate connector apparatus **22** is also shown connected to the wellhead and which may serve in a stand-by capacity if desired should the first connector apparatus **20** become inoperative for any reason.

Continuing with respect to FIG. **1,** the functions of the wellhead **10** are controlled remotely by a water surface vessel **24** via an umbilical **26** connecting with the riser **16** of the wellhead. The umbilical **26** provides fluid communication between the vessel **24** and the wellhead **10** to in turn impart fluid to the connectors **20** and **22** as will be described hereinafter. Alternatively, umbilicals **28** and **30** may be provided for direct fluid communication between the vessel **20** and the connectors **22** and **20** respectively in accordance with a further embodiment of the invention as will be explained.

Referring now to FIG. **2,** a connector apparatus **20** according to the present invention is shown having a female receptacle **32** secured by spring mounting means to the stack plate **14.** The spring mounting means includes an annular flange **34** fixed to and surrounding the female receptacle **32.** Mounted to and depending from the flange **34** are a plurality of bolts **36** (only one bolt **36** being visible in FIG. **2**). The bolts **36** each engage holes **40** (again only one hole **40** being shown in FIG. **2**) within the lower flange of a mounting ring **42** which in turn is secured by such as by bolts **44** or other suitable means to the stack plate **14.** It should be noted that the holes **40** are larger than the diameter of the bolts **36** in order that the bolts pass freely through the holes. Mounted between the flange **34** and the mounting ring **42** are springs **46** (only one spring **46** being shown in FIG. **2**), each spring being retained by a bolt **36.** Thus, the spring mounting means as just described attaches the female receptacle **32** to the stack plate **14** so that the female receptacle **32** has limited flexibility relative to the stack plate **14.**

Continuing with respect to FIG. **2,** a male stinger member **48** is engageable in the female receptacle **32** when inserted into the receptacle. The male stinger member **48** is provided with an outwardly projecting flange **50** which is fixedly secured such as by means of bolts **52** (only one bolt being shown in FIG. **2**) to the riser plate **12** which is a part of the upper detachable portion **16** of the wellhead **10** (see FIG. **1**). In order to insure a sealing connection upon engagement of the male stinger member **48** with the female receptacle **32,** the engaging surface **54** of the male stinger **48** and the engaging surface **56** of the female receptacle **32** both taper downwardly and inwardly as shown in the drawing.

Secured by any suitable means such as bolts and the like to the male stinger **48** is a valve block **58** which receives appropriate fluid supply lines from the umbilical **30.** The fluid supply lines connect with the valve block **58** and are in fluid communication with a plurality of passageways illustrated with reference characters **60** and **62** in FIG. **2.** The fluid passageways **60** and **62** (which are illustrative of at least one and preferably a plurality of such passageways) are in fluid communication with corresponding passageways **60*a*** and **62*a*** respectively formed in the female receptacle **32.** Thus, it may be seen that one end of the passageway **60** in the male stinger mates for fluid communication with the passageway **60*a*** when the male stinger **48** is engaged with the female receptacle **32.** Of course, the same is true with respect to the other passageways such as the passageway **62** and its corresponding passageway **62*a*** in the female receptacle **32.**

Annular seal means are provided around each passageway at the mating surfaces **54** and **56** of the male stinger **48** and female receptacle members **32** respectively. Thus, as shown in FIG. **2,** an appropriate resilient seal **64** is seated within a flared portion of the passageway **60** in the male stinger **48.** A similar resilient seal **66** is provided at one end of the passageway **62,** and it is to be understood that any other such passageways preferably are provided with similar seals. It will also be understood that such seals may be positioned within the female receptacle passageways if so desired. Consequently, the seals such as those illustrated with reference characters **64** and **66** provide a liquid-tight seal between the mating end of the passageways in communication between the male stinger **48** and the female receptacle **32** to avoid loss of fluid and to maintain appropriate pressure in the fluid communication lines or passageways.

An appropriate cover **68** is provided to surround the valve block **58** and various supply lines and the like therewithin. Also, a suitable rod **70** is connected to the male stinger **48** in order to remove the male stinger **48,** attached valve block **58** and associated parts from the female receptacle **32** for maintenance purposes and the like.

With regard to operation of the embodiment shown in FIG. **2** and referring also to FIG. **1,** the male stinger **48** with attached valve block **58,** supply lines, cover **68** and the like is fixedly secured such as by bolts **52** to the riser plate **12.** As has been described, the female receptacle **32** is adapted for flexing attachment to the lower stationary portion **18** of the wellhead **10** by spring mounting means which secure the female receptacle **32** to the stack plate **14.** Once the lower stationary portion **18** of the wellhead **10** is positioned underwater at the

well site, the upper detachable portion **16** of the wellhead **10** may be connected to and disconnected from the stack portion **18** as becomes necessary. Since the connector apparatus **20** (and also its duplicate counterpart **22** if provided) is fixedly secured to the riser by means of the riser plate **12,** removal of the riser or upper detachable portion **16** of the wellhead also disengages the male stinger **48** from the female receptacle **32.** Conversely, connection of the riser portion **16** to the stack portion **18** of the wellhead **10** causes the male stinger **48** to engage with the female receptacle **32,** provided, of course, that the male stinger **48** is positioned approximately over the female receptacle **32.** During such engaging action, the spring mounting feature of the female receptacle **32** permits the female receptacle to flex or move slightly so as to properly align its mating surface **56** with the corresponding mating surface **54** of the male stinger **48.** No locking means is necessary to maintain the male stinger **48** in engagement with the female receptacle **32** since an appropriate locking means secures the riser portion **16** to the stack portion **18** of the wellhead.

Upon engagement of the stinger **48** with the female receptacle **32,** the various passageways such as those designated by the reference characters **60** and **62** of the stinger **48** and **60***a* and **62***a* of the female receptacle are in alignment for fluid communication. Such fluid communication is maintained once the riser portion **16** is locked to the stack portion **18** of the wellhead. In this engaged state, the fluid supply lines communicating with the passageways in the male stinger are pressurized with fluid which in turn passes through the fluid supply lines **60***b* and **62***b* (the only ones shown but which are representative of a plurality of such lines). The fluid supply lines such as **60***b* and **62***b* are connected to the stack portion **18** of the wellhead for proper control of the stack and its function. If desired, similar supply lines lead from the valve block **58** to the riser portion **16** of the wellhead **10** to control functions of the riser. It should also be mentioned in relation to FIG. **1** that the umbilical **30** may be omitted and the fluid supply lines therethrough pass instead through the umbilical **26** to the riser portion **16** of the wellhead and thence to the valve block **58.** Thus, it is seen that the male stinger **48,** the valve block **58** and the various fluid transfer and supply lines are permanently connected to the riser portion **16** of the wellhead and may move up and down with the riser. When circumstances dictate that the control lines **26, 28** and **30** shown in FIG. **1** be raised to the surface of the water, the riser portion **16** of the wellhead is simply disconnected from the stack portion **18** and drawn to the surface taking with it the male stinger **48** and associated parts described above.

Referring now to FIG. **3,** a further embodiment of the connector apparatus of the present invention is illustrated, and it should be understood that this embodiment is to be arranged in the schematic of FIG. **1** in the same way as described with respect to the embodiment of FIG. **2.** Thus, secured to the lower stationary portion or stack **18** of the wellhead **10** (FIG. **1**) is a female receptacle **100.** The receptacle **100** is provided with a flange **102** to which are attached a plurality of bolts **104,** each of which retains a spring **106.** A mounting ring **108** is provided with a plurality of holes **110** of sufficient diameter so as to receive the bolts **104** and allow movement of the bolts in the holes. The mounting ring **108** is attached to the lower stationary portion **18** of the wellhead **10** (FIG. **1**) such as by bolts **112** screwed to the stack plate **14.** Thus provided is a spring mounting means securing the female receptacle **100** for flexing attachment to the lower stationary or stack portion of the wellhead.

One feature of the embodiment of FIG. **3** that is different from that of FIG. **2** is the provision of an annular second female receptacle **114** which is adapted to be fixedly secured to the upper detachable portion **16** of the wellhead **10** such as by means of bolts **116** (or other suitable attaching means) screwed to the riser plate **12.** The male stinger member **118** in the embodiment of FIG. **3** is not itself attached to the upper detachable portion or riser **16** of the wellhead **10.** Rather the male stinger **118** is inserted into the annular second female receptacle **114** so that the second female receptacle releasably engages between the first female receptacle **100** and the male stinger **118.** The annular second female receptacle **114** has sidewalls that taper downwardly and inwardly to mate with similar such sidewalls of the stinger **118** and the first female receptacle **100.**

As shown in FIG. **3,** the male stinger **118** is of unitary construction and includes a valve block **120** formed integrally thereof although it will be appreciated that the valve block **120** may be formed separatedly and then attached to the male stinger **118.**

The engaging surfaces of the male stinger **118,** the annular second female receptacle **114** and the first female receptacle **100** taper downwardly and inwardly as described with respect to the embodiment of FIG. **2.** In addition, passageways are provided in the foregoing members similar to those described with respect to FIG. **2.** Thus, the male stinger includes at least one passageway such as that designated by the reference character **122,** one end of which mates for fluid communication with a corresponding passageway **122***a* in the annular second female receptacle **114** to in turn mate for fluid communication with a corresponding passageway **122***b* in the first female receptacle **100.** Annular seal means are provided around the passageways at their mating ends for purposes of forming a liquid-tight seal between the ends of the passageways as described with respect to FIG. **2.** Consequently, the passageways provide fluid communication between the umbilical **30** and fluid supply lines **122***c* (similar to lines **60***b* and **62***b* in FIG. **1**) which pass to the stack portion **18** of the wellhead for purposes of controlling the functions thereof. In addition, while not shown in FIG. **3,** certain of the passageways may communicate with fluid supply lines to control functions of the riser portion **16** of the wellhead as desired.

In the embodiment of FIG. **3,** the male stinger **118** is locked to the annular second female receptacle **114.** The preferred apparatus for performing the interlocking function is that shown in the previously mentioned U.S. Pat. No. 3,486,556 to which reference is made for a full and complete disclosure of a thru-center latching means. However, a brief description of the latching means applied to the present embodiment will be given. Thus, continuing with respect to FIG. **3,** a rod **124** is provided which extends through the male stinger **118** and connects to the latching means at its lowermost end. A generally U-shaped element **126** is connected at the uppermost end of the rod **124** and serves as an at-

taching means for a raising and lowering cable (not shown).

As can be seen from FIG. 3, a piston 128 is fixedly secured near the lower end of the rod 124 and is slidable within a cylinder 130 provided with suitable seals so as to contain a fluid.

Located on the lowermost end of the rod 124 is a flat portion 132 through which a pin 134 extends, the pin having a central pivotal axis. Actuating links 136 are pivotally connected to the pin 134. At the outermost ends of the links 136 are levers 138 which are connected by means of the pins 140 which in turn have central pivotal axes. The levers 138 are pivotally attached to the stinger 118 by means of pins 142. A stop 144 is located in the foremost or nose portion of the stinger portion 118. Interlocking shoulders 146 are formed as part of the annular second female receptacle 114 being of a larger diameter than the lowermost portion of the first female receptacle 114.

Load bearing shoulders 148 are located on each lever 138 to engage mating shoulders of a similar configuration on each of the links 136. In like manner, load bearing shoulders or surfaces 150 and 152 are located on the links themselves. While not visible in the drawings, openings in the levers 138 for the pins 140 are dimensioned significantly larger in diameter than the diameter of the pins 140. In this manner, a loose fit is achieved at these pivot points. In like manner, the opening through the link 136 as viewed in FIG. 3 to accommodate the pin 132 is dimensioned larger than the pin 132.

With respect to operation of the embodiment of FIG. 3, the fluid control functions of the embodiments are similar to those described with respect to the embodiment of FIG. 2 and reference is hereby made to the description of operation of that embodiment. With respect to use of the connector apparatus shown in FIG. 3, for connect and disconnect purposes, however, the female receptacle 100 is secured to the stack plate 14 by means of spring mounting means for flexing attachment as described. The annular second female receptacle 114 is secured to the riser plate 12 and the male stinger member 118 is inserted into the second female receptacle 114, all as shown in FIG. 3. The latching and interlocking means functions as described in U.S. Pat. No. 3,486,556 through the use of fluid actuating means for moving the piston 128 downward and the levers 138 into engagement with the interlocking shoulder 146 for interlocking the male stinger 118 with the annular second female receptacle 114. Of course, the interlocking means includes the levers 138 each of which is pivotal about an axis 142 so that the levers 138 may engage the shoulder 146. The load bearing surfaces 148 on the levers 138 and the load bearing surfaces 150 and 152 of the links 136 are in their respective mating engagement relationship when the levers 138 engage the shoulder 146 so that any load transmitted to the levers 138 from the shoulder 146 is borne by the load bearing surfaces rather than the pins or axis members 134 and 140, all as described in U.S. Pat. No. 3,486,556.

When the apparatus as just described with respect to FIG. 3 is in place at an underwater well site, fluid communication is established between a remote control station such as a vessel 24 at the surface of the water and the wellhead 10 as shown in FIG. 1 by means of the umbilical 30 leading directly to the connector apparatus shown in FIG. 3, as will be understood by those skilled in the art. When the need arises for removing the upper detachable or riser portion 16 of the wellhead from the lower stationary portion 18 thereof, the necessary disconnect is made in the wellhead 10 and the upper portion of the wellhead lifted to the water's surface as known by those skilled in the art. Since the riser plate 12 accompanies the upper detachable portion 16 of the wellhead 10, the annular second female receptacle portion 13 together with the male stinger 118 and its associated parts likewise are lifted to the surface of the water. Thus, the apparatus of FIG. 3 provides an expedient means for separating all control lines from the wellhead.

If there is no need to raise the upper stationary or riser portion 16 of the wellhead but it is desired to remove control lines of the umbilical 30, then the latching means associated with the rod 124 are actuated as previously described herein so that the levers 138 are released from the interlocking shoulder 146. Thus a cable attached to the rod 124 can be raised taking with it the male stinger 118 and its associated parts.

For purposes of making re-connections of the apparatus embodied in FIG. 3 and, assuming that the upper detachable portion 16 of the wellhead 10 is removed, the riser portion 16 is lowered such as by means of a cable or umbilical 26 back to the wellhead site. While the riser 16 is guided into engagement with the stack portion 18 of the wellhead 10, at the same time the second annular female receptacle 114 is guided into engagement with the first female receptacle 100. By virtue of the spring mounting means providing flexing attachment of the female receptacle 100 to the stack plate 14, the annular second female receptacle 114 is automatically seated in engagement with the female receptacle 100. Fluid communication is then established through the passageways and wellhead functions may be carried out.

On the other hand, if the upper detachable portion 16 of the wellhead 10 has remained in place at the well site and only the male stinger portion 118 of the apparatus of FIG. 3 removed, the male stinger 118 is lowered such as by cable attached to the upper end 126 of the rod 24 until the male stinger engages the annular second female receptacle 114. Then the male stinger 118 is guided into a sealed, seated position by rotating the male stinger portion 118 until a lug 160 engages a recess 162 to properly align fluid passageways within the male stinger 18 with corresponding passageways in the annular second female receptacle 114. Once this position is attained, fluid communication may be established via the passageways and functions of the well head 10 begun.

The present invention, therefore, is well adapted to carry out the objects and attain the ends and advantages mentioned as well as others inherent therein. While a presently-preferred embodiment of the invention is given for the purpose of disclosure, numerous changes in the details of construction and arrangement of parts may be made which will readily suggest themselves to those skilled in the art and which are encompassed within the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A connector apparatus for connection to an underwater wellhead, the wellhead having an upper detachable portion and a lower stationary portion, including,

a. a female receptacle,
b. spring mounting means secured to the female receptacle (a) and adapted for flexing attachment to the lower stationary portion of the wellhead,
c. a male stinger engageable in said female receptacle (a) when inserted into the receptacle, and
d. an annular second female receptacle releasably engaging between the female receptacle (a) and the male stinger (c) and adapted to be fixedly secured to the upper detachable portion of the wellhead.

2. The invention of claim **1** including, additionally,
an interlocking shoulder on the annular second female receptacle,
interlocking means pivotally carried by the male stinger (c), and
link means for moving said interlocking means into engagement with the interlocking shoulder for interlocking the male stinger (c) and the annular second female receptacle.

3. The invention of claim **2** wherein the interlocking means includes,
at least one lever pivotal about an axis member for engagement with said shoulder, and
load-bearing surfaces on said lever and on said link actuating means, said surfaces being in mating engagement when said lever engages said shoulder, whereby any load transmitted to the lever from said shoulder is borne by said surfaces rather than the axis member.

4. A connector apparatus for connection to an underwater wellhead, the wellhead having an upper detachable portion and a lower stationary portion, including,

a. a female receptacle,
b. spring mounting means secured to the female receptacle (a) and adapted for flexing attachment to the lower stationary portion of the wellhead,
c. a male stinger engageable in said female receptacle (a) when inserted into the receptacle,
d. an annular second female receptacle releasably engaging between the female receptacle (a) and the male stinger (c) and being adapted to be fixedly secured to the upper detachable portion of the wellhead, and
e. the sidewalls of the annular second female receptacle (d) and the surfaces of the female receptacle (a) and the male stinger (c) which engage the sidewalls of the annular second female receptacle (d) tapering downwardly and inwardly.

5. In an underwater wellhead apparatus having an upper detachable portion and a lower stationary portion, the improvement comprising,
a. a female receptacle,
b. spring mounting means having
(i) an outwardly extending flange secured to the female receptacle (a),
(ii) a mounting ring secured to the lower stationary portion of the wellhead, and
(iii) bolt-guided spring means for flexingly connecting the flange (i) to the mounting ring (ii),

c. a male stinger engageable in said female receptacle (a) when inserted into the receptacle, and
d. an annular second female receptacle releasably engaging between the female receptacle (a) and the male stinger (c) and adapted to be fixedly secured to the upper detachable portion of the wellhead.

6. The invention of claim **5** including, additionally,
an interlocking shoulder on the annular second female receptacle (d),
interlocking means pivotally carried by the male stinger (c), and
link actuating means for moving said interlocking means into engagement with the interlocking shoulder for interlocking the male stinger (c) and the annular second female receptacle (d).

7. The invention of claim **6** wherein the interlocking means includes,
at least one lever pivotal about an axis member for engagement with said shoulder, and
load-bearing surfaces on said lever and on said link-actuating means, said surfaces being in mating engagement when said lever engages said shoulder whereby any load transmitted to the lever from said shoulder is borne by said surfaces rather than the axis member.

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