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(54) **WELLHEAD SYSTEMS**

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(57) **ABSTRACT**

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A tubular support system with a bowl and a hanger, the bowl for supporting at least one tubular member and including a body with at least one access port for accessing a fluid channel opening of the hanger positioned within the bowl; the hanger for connection to a tubular member and having at least one fluid channel through it from a bottom surface to an outer surface so that one or more control lines attached to a supported tubular (pipe, casing, riser, tubing) can be placed in fluid communication with the at least one fluid channel, and, via the at least one access port, the at least one fluid channel can be placed in fluid communication with other apparatus, e.g., a surface control unit.

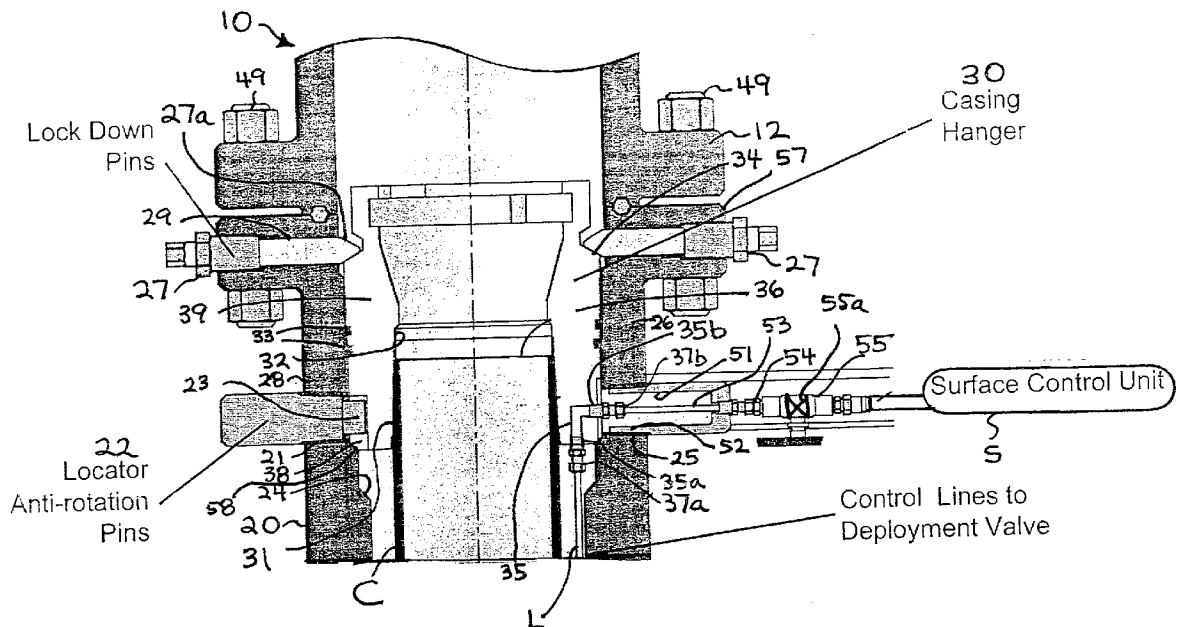


Fig. 1

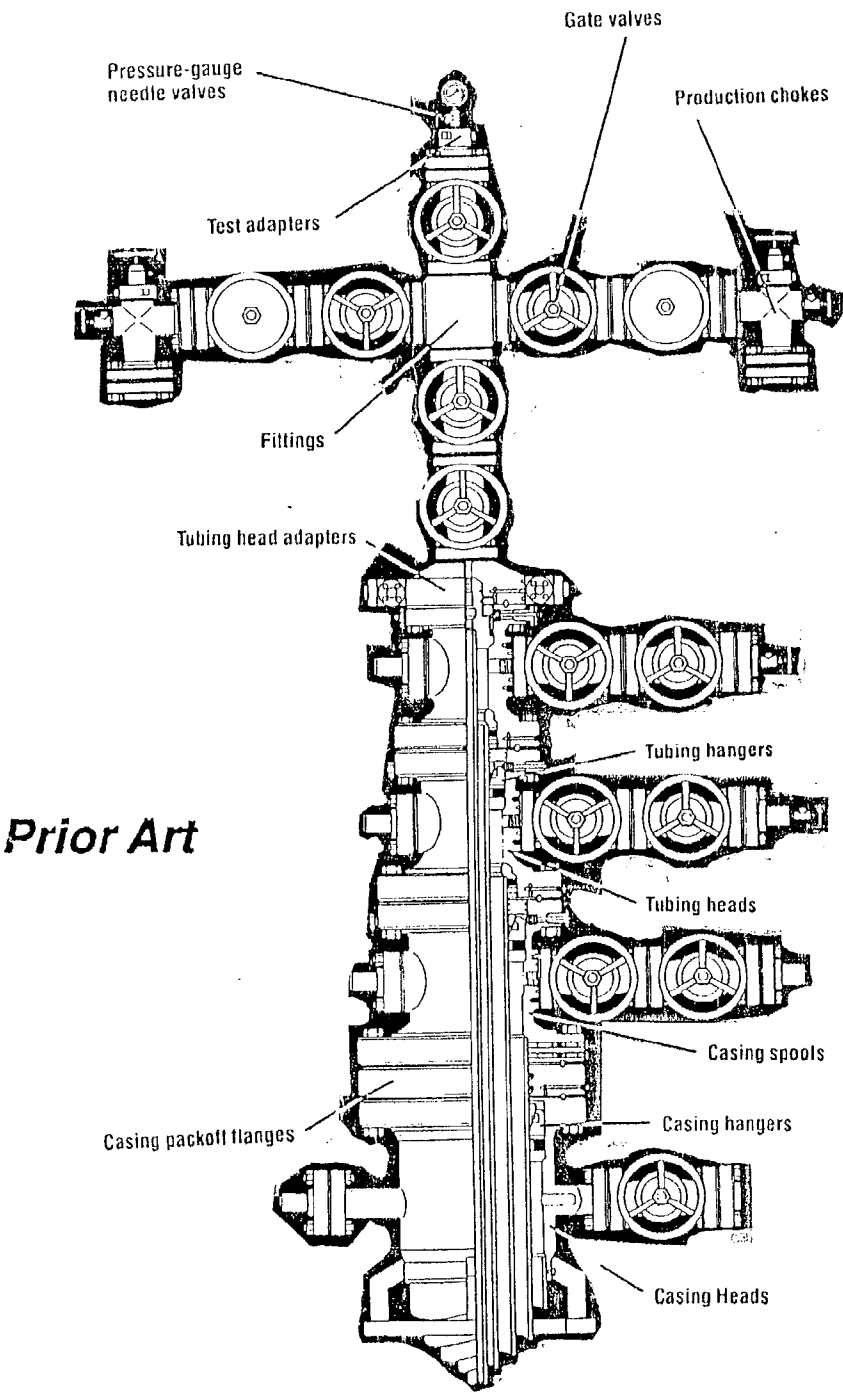
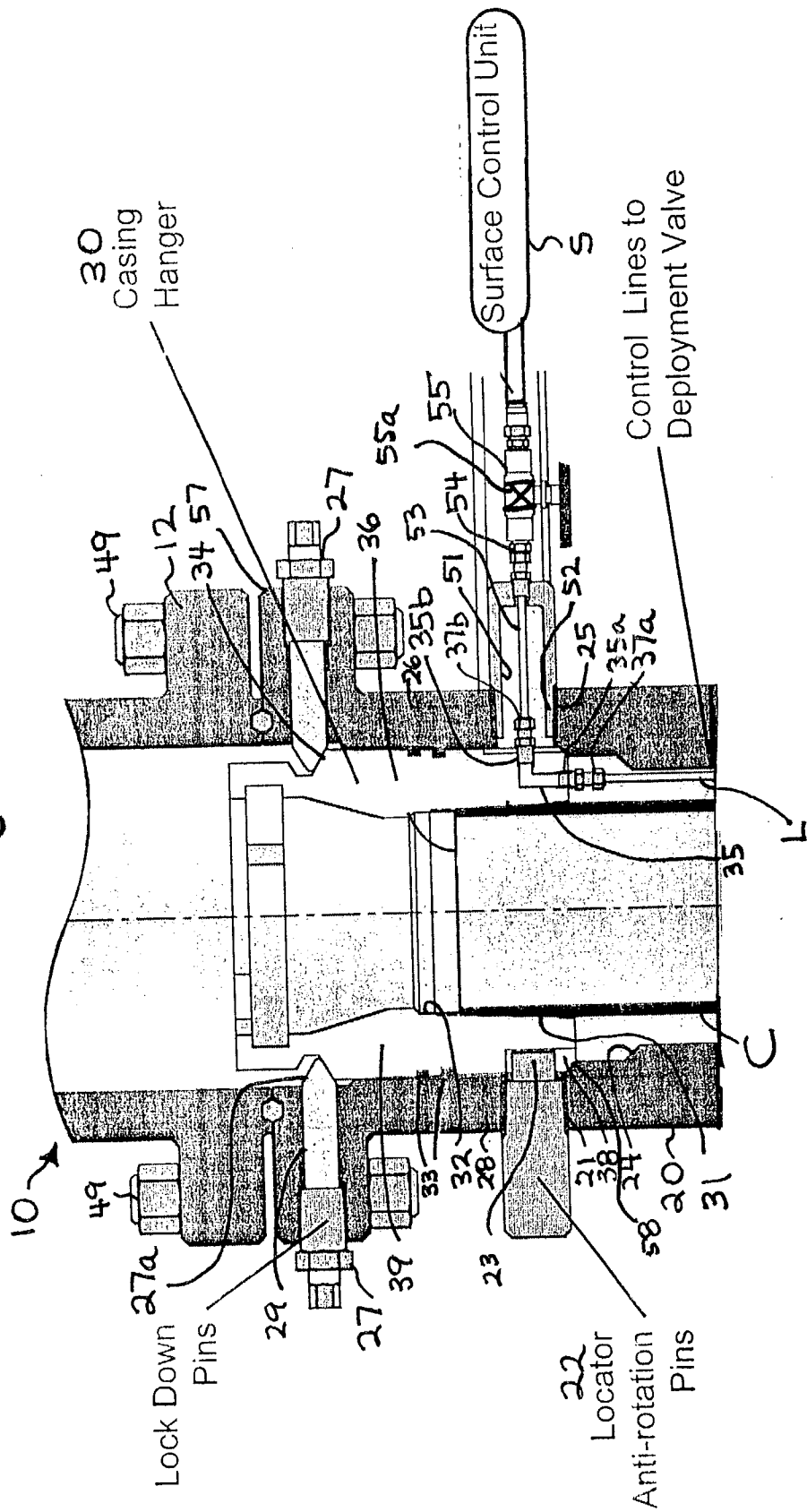


Fig. 2



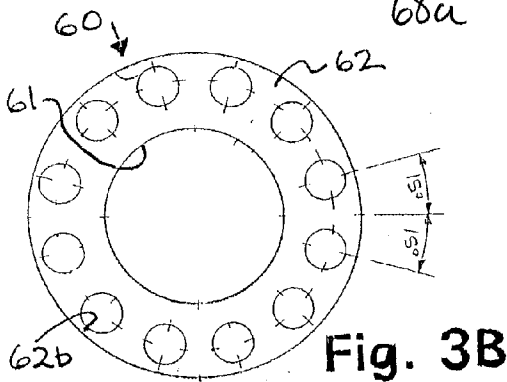
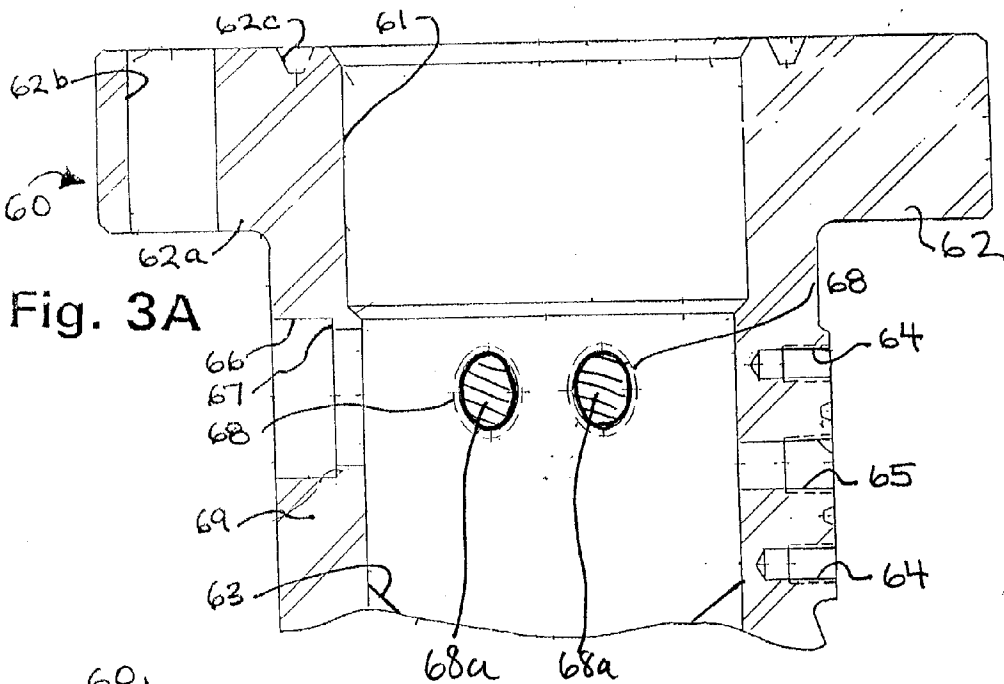


Fig. 3C

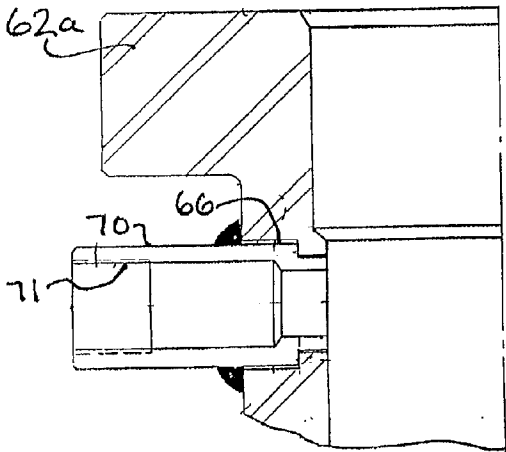


Fig. 3D

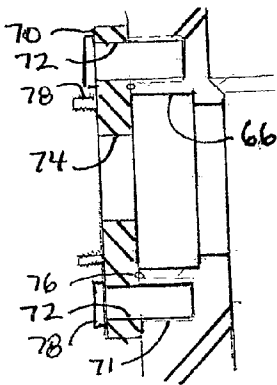


Fig. 4A

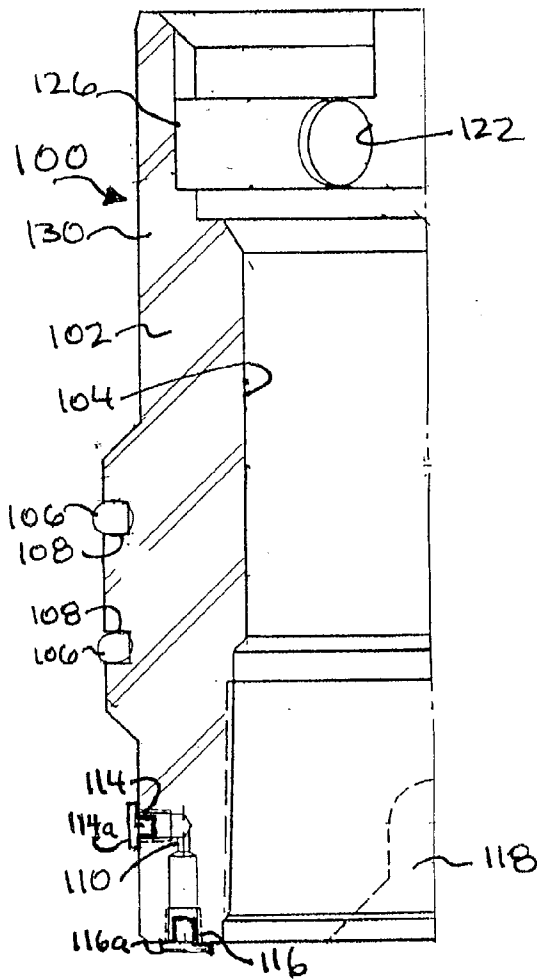


Fig. 4B

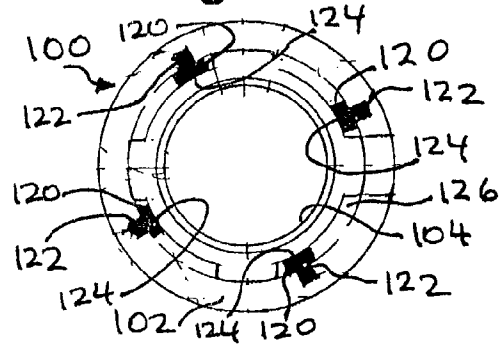


Fig. 4F

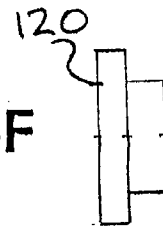


Fig. 4E

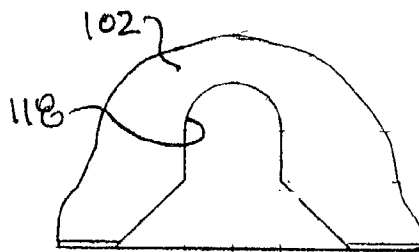
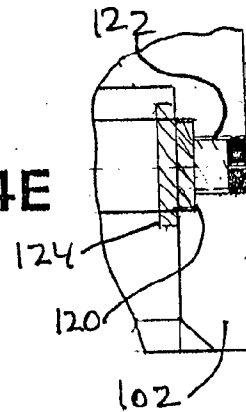


Fig. 4C

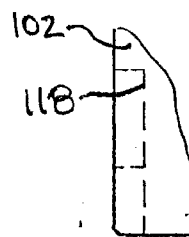


Fig. 4D

Fig. 5

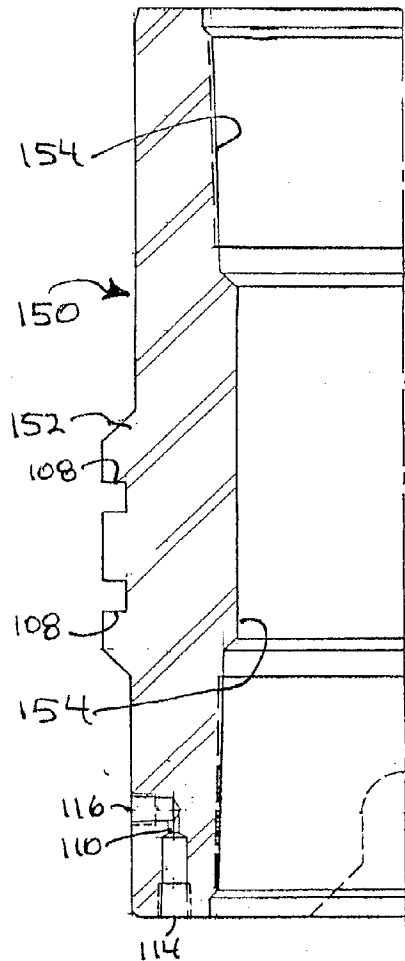


Fig. 6A

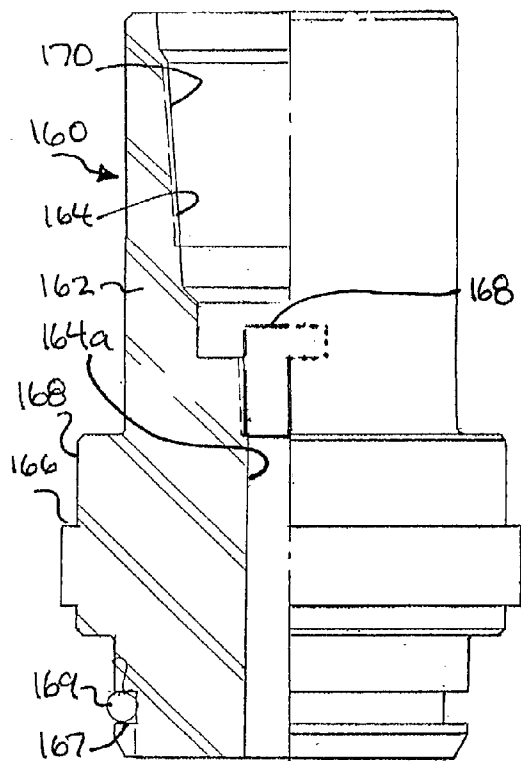


Fig. 6B

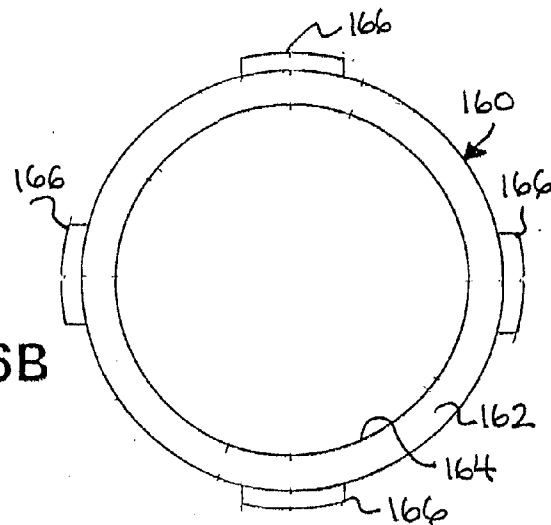
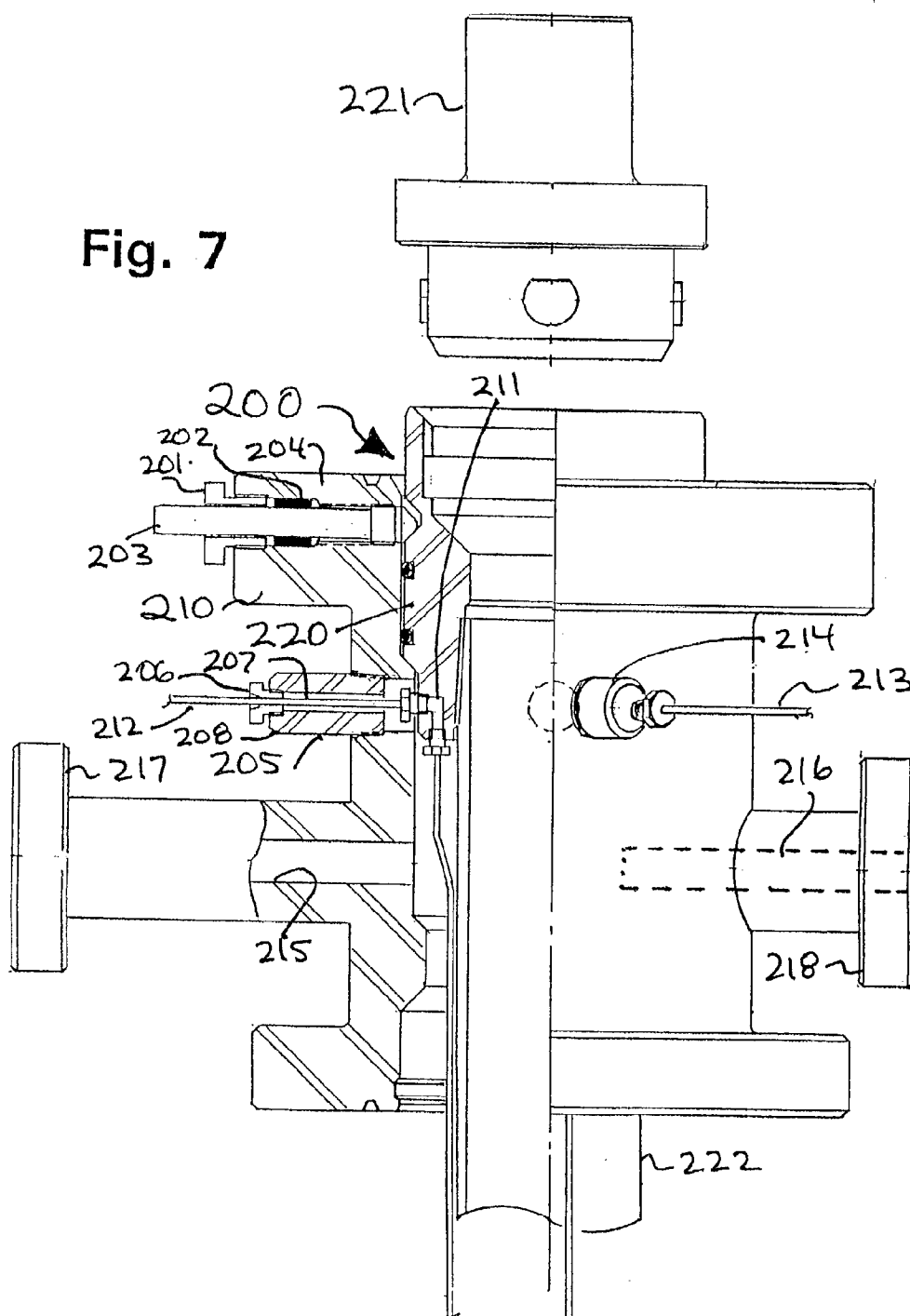


Fig. 7



WELLHEAD SYSTEMS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention is directed to wellheads, tubular heads, tubular hangers, running tools, and methods of their use.

[0003] 2. Description of Related Art

[0004] Wellheads at the surface above a wellbore provide access to the wellbore and to various strings of tubulars such as tubing and casing that extend down into the wellbore. FIG. 1 shows a typical wellhead installation.

[0005] Casing extending down into a wellbore is supported by a casing hanger in a casing head and/or a casing spool. A casing hanger is positioned within the casing head and the casing string extends through and is supported by the casing hanger. One or more tubing hangers may be used above the casing head or casing spool.

[0006] In many wellbore installations one or more control lines are positioned on the exterior of tubulars (e.g., casing, risers, tubing, pipe). These control lines extend from the surface down to a desired location on the casing. Typically downhole valves are actuated and controlled by fluid flowing through these control lines. In a variety of prior art devices connections, fittings, and interfaces are provided between a casing hanger and a casing head within wellhead apparatus so that the control lines are in fluid communication with inlets, outlets, valves and controls at the surface. Typically to access these control lines, internal fittings and to initially install them, the "stack" (the assembly of apparatuses, such as blowout preventers, etc.) above the casing head must be removed. This is an expensive and time-consuming process.

[0007] To facilitate positioning of casing within a casing head, a running tool is connected to a casing hanger. Control lines on a piece of casing are placed in fluid communication with flow lines through the hanger. A tubular, e.g. drill pipe, is movably suspended within a rig and is connected to the running tool. Lowering of the drill pipe lowers the running tool, casing hanger, and casing (with control lines) until the casing hanger seats within the casing head. The running tool can then be released from the casing hanger. To raise the hanger and the casing, the running tool is re-attached to the casing hanger.

[0008] There has long been a need, recognized by the present inventors, for effective and efficient systems and methods for accessing wellbore control lines on a tubular string within a wellhead installation or "stack" of equipment. There has long been a need, recognized by the present inventors, for accessing such control lines without the need to remove stack apparatuses above a tubular head.

SUMMARY OF THE PRESENT INVENTION

[0009] The present invention, in certain aspects, provides a casing (or other tubular) suspension system for a wellhead system that permits access to downhole control lines through the sidewall of a casing head without requiring removal of components above the casing head to access downhole control lines via interface fittings and conduits between a casing hanger and a casing head. Such systems according to

the present invention are useful to place surface control units in fluid communication with fluid-actuated and/or fluid-activated apparatuses including but not limited to downhole deployment valves, downhole safety valves, downhole velocity valves, and downhole shut-in valves. Systems according to the present invention are useful, inter alia, in underbalanced drilling operations using downhole deployment valves and useful in wellbore operations employing controlled-flow fluid flow lines, e.g., but not limited to, such lines used for fluid and/or chemical injection.

[0010] The present invention provides, in certain aspects, a bowl for a tubular support (e.g. a casing head, casing spool, or tubing head) which has one, two or more access ports through a sidewall of the bowl. The access port(s) is (are) alignable with a control line channel (or channels) of a tubular hanger positioned within the bowl. Location apparatus secures the hanger in a correct alignment within the bowl. Once the hanger is emplaced within the bowl and a control line channel's (or lines) exit opening is properly aligned with an access port through the bowl's sidewall, appropriate connections and fittings are connected at the hanger's control line channel exit opening to provide communication between the channel (and any control line and associated downhole valve and/or tool connected thereto and in fluid communication therewith) and a surface control unit or other apparatus. In one particular aspect, an alignment and anti-rotation member, bolt or pin extends through the bowl sidewall with a portion projecting into a groove, hole, or recess on the hanger to prevent rotation of the hanger within the casing head and/or to insure proper alignment of fluid channels and control lines.

[0011] Systems according to the present invention, in certain aspects, use a running tool that is releasably connectible to a tubular hanger to facilitate lowering of the hanger into a head. The running tool, hanger, pass through blowout preventer(s), etc. and then seat in the head. In one particular aspect, a running tool according to the present invention, has a bore therethrough from end to end which can be selectively closed off (e.g. with a removable plug) so that, once the hanger with the running tool attached has been emplaced within a head or spool, the stack (or part thereof above the running tool) can be tested and/or pressure tested. With the plug removed, the wellbore, strings, and items below the running tool can be tested.

[0012] In certain embodiments the present invention provides a tubular hanger with a neck that projects upwardly from a main body of the hanger to facilitate the correct positioning of another apparatus, e.g., a tubing head or similar device, on the tubular hanger.

[0013] It is, therefore, an object of at least certain preferred embodiments of the present invention to provide new, useful, unique, efficient, and non-obvious systems and methods for suspending a tubular (e.g., casing, pipe, or tubing) above a wellbore.

[0014] It is, therefore, an object of at least certain preferred embodiments of the present invention to provide new, useful, unique, efficient, and non-obvious: tubular heads, tubular spools, running tools (which, in one aspect, need not be inverted to conduct pressure testing with the running tool connected to a tubular hanger) and methods of their use.

[0015] It is, therefore, an object of at least certain preferred embodiments of the present invention to provide new,

useful, unique, efficient, and non-obvious systems and methods for accessing, within a tubular head, downhole control lines on a tubular string going down into a wellbore without the necessity of removing components of a stack or wellhead above the tubular head.

[0016] It is, therefore, an object of at least certain preferred embodiments of the present invention to provide new, useful, unique, efficient, and non-obvious tubular hangers with a neck that facilitates the emplacement of another apparatus on the tubular hanger.

[0017] The present invention recognizes and addresses the previously-mentioned problems and long-felt needs and provides a solution to those problems and a satisfactory meeting of those needs in its various possible embodiments and equivalents thereof.

[0018] To one of skill in this art who has the benefits of this invention's realizations, teachings, disclosures, and suggestions, other purposes and advantages will be appreciated from the following description of preferred embodiments, given for the purpose of disclosure, when taken in conjunction with the accompanying drawings. The detail in these descriptions is not intended to thwart this patent's object to claim this invention no matter how others may later disguise it by variations in form or additions of further improvements.

DESCRIPTION OF THE DRAWINGS

[0019] A more particular description of certain embodiments of the invention may be had by references to the embodiments which are shown in the drawings which form a part of this specification.

[0020] FIG. 1 is a side view of a prior art wellhead installation.

[0021] FIG. 2 is a schematic view of a system according to the present invention.

[0022] FIG. 3A is a side cross-section view of a bowl according to the present invention for a tubular head or spool according to the present invention.

[0023] FIG. 3B is a top view of the bowl of FIG. 3A.

[0024] FIG. 3C is a side view of part of the bowl of FIG. 3A with a boss (for alignment/anti-rotation pin insertion) inserted into a hole in the bowl.

[0025] FIG. 3D is a side view of a diameter-reducing flange on the bowl of FIG. 3A.

[0026] FIG. 4A is a side view in cross-section of a tubular hanger according to the present invention.

[0027] FIG. 4B is a top view of the hanger of FIG. 4A.

[0028] FIG. 4C shows a portion of the hanger of FIG. 4A.

[0029] FIG. 4D shows a portion of the hanger of FIG. 4A which details an alignment slot on the body.

[0030] FIG. 4E is a side cross-section view of a portion of the hanger of FIG. 4D showing slot depth.

[0031] FIG. 4F is a side view of a stop shown in FIG. 4E.

[0032] FIG. 5 is a side cross-section view of a tubular hanger according to the present invention.

[0033] FIG. 6A is a side view partially in cross-section of a running tool according to the present invention.

[0034] FIG. 6B is a top view of the running tool of FIG. 6A.

[0035] FIG. 7 is a side view of a system according to the present invention.

DESCRIPTION OF EMBODIMENTS PREFERRED AT THE TIME OF FILING FOR THIS PATENT

[0036] FIG. 2 shows a system 10 according to the present invention which has an upper tubular support 12 (shown partially; e.g. a casing head, casing spool, tubing head, or tubing spool) secured on a casing head 20 according to the present invention. A casing hanger 30 according to the present invention is secured within the casing head 20. The hanger 30 and the head 20 are generally cylindrical.

[0037] The casing head 20 has a pin bore 21 through a side wall 26 of bowl portion 28 through which extends a pin 22. A portion 23 of the pin 22 projects into a central bore 24 which extends from the top of the casing head 20 to the bottom. Connection apparatus described below extends through an opening 25 in the sidewall 26 of the bowl portion 28. Locking pins 27 extend through bores 29 in an upper flange 57 and ends 27a of the pins 27 project into the bore 24 to secure a hanger in the bowl.

[0038] A casing C (shown partially) is threadedly connected to corresponding mating threads 31 of an internal bore 32 of the casing hanger 30. One or more o-rings 33 in grooves in the hanger exterior seal a casing-head/casing-hanger interface. Optionally or in addition to such o-rings, flat weight activated seal(s) may be used. The pin ends 27a project onto a corresponding shoulder (or shoulders) 34 on the hanger's exterior. The pins 27 releasably secure the casing hanger 30 in position within the casing head 20.

[0039] A channel 35 through a body 36 of the casing hanger 30 provides fluid communication with a control line L on the casing C. Part of a fitting 37a projects into an opening 35a (at the bottom of body 36) of the channel 35 and part of a fitting 37b projects into an opening 35b on the side of the body 36. The fittings 37a, 37b are sealingly secured in place. An end 52 of a plug 50 with a bore 51 therethrough is releasably secured (e.g. with threads and/or epoxy) in the opening 25. A flow line 53 extends from the fitting 37b, through the bore 51. A fitting 54 and connector apparatus 55 (which may include one or more valves, e.g., but not limited to, ball valve(s)) provide a connection for a surface control unit S (which may be any known suitable control unit for controlling a downhole valve or tool in fluid communication with the line L). As shown the connector apparatus 55 includes a flow control valve 55a. As desired any valve or valves may be placed between the head 20 and the surface unit S.

[0040] It is within the scope of the present invention to provide a tubular hanger with one, two, three or more access openings through a head's sidewall (like the access opening 25) and associated connection apparatus and fittings. Such access openings may be located as desired through the head's (or support's) sidewall and are, in certain aspects, aligned substantially horizontally or aligned substantially vertically. The angle of spacing between any two such

openings may be any desired angle up to 180 degrees; and, in one aspect, two such openings are about 30 degrees apart.

[0041] In certain aspects a portion 23 of the pin 22 extends into a precisely located groove, slot, recess, hole, opening or area 38 in a hanger body 39 so that the opening 35b is aligned with the opening 25 when the pin 22 is secured in the opening 21, thus facilitating correct positioning of the openings for exterior access to the opening 35b through the opening 25.

[0042] Bolts 49 through appropriate holes in the flange 57 and the upper tubular support 12 secure these two items together. A lower beveled edge 58 of the body 26 supports the casing hanger 30.

[0043] FIGS. 3A and 3B show a bowl 60 according to the present invention for a tubular support (e.g., a casing head, casing spool, tubing head or tubing spool) according to the present invention.

[0044] The bowl 60 has a body 62 with a bore 61 there-through from top to bottom. Holes 62b provide for bolting of the body 62 to other structures. A bevelled edge 63 in the bore 61 supports a hanger (not shown). Bolts (not shown) are screwed into holes 64 to connect a flange (e.g. a flange for a valve) (not shown) over an opening 65. A valve emplaced over the opening 65 can control fluid flow (e.g. from a wellbore) through the opening 65.

[0045] A pin (not shown) (or a boss for receiving a pin) can be inserted into a stepped opening 66. Such a pin or boss can have a portion that abuts a stop edge 67 of the opening 66. A pin like the pin 22, FIG. 2, can be used in the opening 66.

[0046] Access ports 68 are provided through a sidewall 69 of the body 62 which function like the opening 25, FIG. 2. The body 62 has a flange 62a through which the holes 62b extend. A sealing gasket (not shown) is positioned in a groove 62c in the body 62.

[0047] FIG. 3C shows a hollow pin-receiving boss 70 in the opening 66 (in FIG. 3C). A bore 71 extends through the boss 70 and a pin (not shown, like the pin 22, FIG. 2) can be inserted through the boss 70 into a corresponding hole, etc. in a hanger (not shown) to correctly align fluid channel openings of the hanger with casing control line(s) and with the access ports 68, and to prevent hanger rotation. The opening 66 may be any desired diameter. As shown in FIG. 3B, in one aspect the openings 68 are spaced-apart about 30°. FIG. 3D shows a flange 70 connected to the body 62 with bolts 78 that extend through holes 72 in the flange 70 and holes 71 in the body 62. An opening 74 in the flange 70 is smaller in diameter than the diameter of the opening 66. The opening 74 may be any desired diameter and, in one particular aspect, is about a half inch. Optionally, studs 78 are provided to connect other apparatus to the flange 70.

[0048] FIGS. 4A-4E show a tubular hanger 100 according to the present invention which has a body 102 with a bore 104 extending therethrough from top to bottom. o-rings 106[and/or flat weight-activated seal(s)] are positioned in corresponding recesses 108 to seal an interface between the tubular hanger 100 and an interior surface of a casing head, etc., in which the tubular hanger 100 is positioned.

[0049] A channel 110 extends through the body 102 and has a lower opening 114 (for receiving, e.g., a connection

fitting like the fitting 37a, FIG. 2) and an upper opening 116 (for receiving, e.g., a connection fitting like the fitting 35b, FIG. 2). A slot 118 in the side of the body 102 provides an opening into which an end of an alignment-anti-rotation pin (like the pin 22, FIG. 2) can be inserted to accurately position the openings 114 and 116. In certain aspects, two such slots, each with a corresponding pin, may be used.

[0050] Stop and groove structure is, optionally, provided at the top of the tubular hanger 100 (and can be provided on any hanger according to the present invention) for releasably securing a running tool to the tubular hanger 100. Stops 120 (in side view, FIG. 4F) in holes 122 have ends 124 that project into the a recess 126 which extends around the tubular hanger 100 and is configured, sized, and positioned for receiving corresponding lugs of a running tool (not shown). Once the running tool has been lowered into the tubular hanger 100 with its lugs in vertical alignment with the recess 126, rotating the running tool moves the lugs within the recess 126 so that the lugs are held in the recess 126 releasably securing the running tool to the tubular hanger 100. The lugs move to abut the stops 120 to prevent further rotation of the running tool.

[0051] An extended neck 130 facilitates emplacement of a tubular head or other apparatus on the tubular hanger 100. In certain aspects such an extended neck is in length about 50% of the length of the entire tubular hanger 100. In certain particular aspects such a neck is about 5½ inches long and, in another aspect, is about 7.7 inches long in a tubular hanger that has an outer diameter of about 9.6 inches and an overall length of about 15.9 inches. Such a neck provides an area for a secondary seal within a tubular head to facilitate testing. Any tubular hanger according to the present invention can have such an extended neck. Any fluid channel opening in any hanger according to the present invention may initially have a removable plug or pin therein to prevent dirt and debris from entering the channel. FIG. 4A shows a removable plug 114a in opening 114 and a removable plug 116a in opening 116. Any access port in any head according to the present invention may initially have a removable plug or pin therein to prevent dirt and debris from entering through the access port. The ports 6B, FIG. 3A, initially have removable plugs 68a therein.

[0052] FIG. 5 shows a tubular hanger 150 according to the present invention which is like the tubular hanger 100, FIG. 4A, and like numerals indicate like parts; but a body 152 (like the body 102, FIG. 4A) with a bore 154 (like the bore 104, FIG. 4A) has no stop-recess structure like that of the tubular hanger 100. Instead, the top of the body 152 has internal threading 154 for releasably and threadedly connecting a tubular, e.g. a joint of drill pipe suspended in a rig, to the tubular hanger 150. Such a tubular, e.g. the suspended drill pipe, can then be lowered to lower the tubular hanger 150 into a tubular head. The hangers of FIGS. 4A and 5 may each have two, three or more fluid flow channels 110—one for each control line on a tubular member or string to be supported by the hanger. [FIGS. 4A and 5 present half views of the items depicted. In one aspect the half not shown in both figures is substantially a mirror image of the half that is shown.]

[0053] FIGS. 6A and 6B show a running tool 160 which has a body 162 with a bore 164 therethrough from top to bottom. Lugs 166 project from an enlarged body portion

168. The lugs **166** are sized and located to cooperate with a stop and recess structure like the stops **120** and recess **126**, **FIG. 4A**, to releasably secure the running tool **160** to a tubular hanger.

[0054] An o-ring **169** (and/or flat seal) extending around the circumference of the body **162** in a groove **167** seals an interface between the running tool **160** and an interior surface of a tubular hanger (e.g. the hangers of **FIGS. 4A and 5**).

[0055] Optionally the bore **164** has a portion **164a** which has a diameter less than the diameter of the bore **164**. A plug **168** closes off the portion **164a** to fluid flow. As desired, the plug **168** may be removed. In one aspect the plug and bore have corresponding threads. With the plug **168** in place, and with the running tool emplaced in a tubular hanger which is emplaced in a tubular head of a wellhead, the wellhead (any part above the running tool) can be tested and/or pressure tested and/or a stack of equipment or part thereof on the wellhead can be tested and/or pressure tested, since the running tool/hanger combination seals off the tubular head. The running tool as shown in **FIG. 6A** remains in a vertical position (as shown in **FIG. 6A**) for such testing and it is not required to remove the running tool for testing or to invert or change the vertical orientation of the running tool to conduct such testing. Testing can commence immediately after the running tool is lowered into place.

[0056] Internal threads **170** within the upper end of the bore **164** provide for connecting a tubular, e.g. drill pipe, with corresponding threading to the running tool **160**.

[0057] **FIG. 7** shows a system **200** according to the present invention with a casing support **210** (which may be a casing spool or a casing head) according to the present invention and a casing hanger **220** according to the present invention supporting a casing string **201**. A running tool **221** is used to insert and retrieve the casing hanger **220** into and out of the casing support **210**.

[0058] The casing hanger **220** is like the hanger **100**, **FIG. 4A**. The casing support **210** is like the head **60**, **FIG. 3A**. A gland nut **201** holds packing **202** around a pin **203** (or bull plug) that is like the pin **22**, **FIG. 2** (but which extends through a flange **204** rather than through a main body of the support **210**). Connection apparatus **205** is like the fittings, plugs, lines etc. connected at the opening **356**, **FIG. 2**. A fitting **206** seals off an interior **207** of a plug **208**. In one aspect a commercially available thermocouple fitting may be used.

[0059] The casing hanger **220** has two fluid channels **211** (line, shown, like the fluid channel **35**, **FIG. 2** and the fluid channel **110**, **FIG. 4A**), one corresponding to each of two fluid lines **212**, **213** extending from the system **200** [e.g. to surface control unit(s) or other surface apparatus]. Connection apparatus **214** for fluid line **213** is like the connection apparatus **205**.

[0060] Access to the interior of the casing support **210** (and thus to a wellbore beneath it) is provided via two conduits **215**, **216**. Any desirable valve or other apparatus can be connected at flanges **217**, **218**.

[0061] Casing **222** is connected to the casing hanger **220**.

[0062] The running tool **221** has lugs **223** (like the lugs **166**, **FIG. 6A**) for cooperating with stop/recess structure

(not shown) of the casing hanger **220** like the stop **120**/recess **126** structure, **FIGS. 4A, 4B**, and **4E**.

[0063] The present invention, therefore, in at least certain aspects, provides a tubular bowl for supporting at least one tubular, the tubular bowl (for, e.g., but not limited to, a tubing head, casing head, casing spool, or tubing spool) including a body with a top and a bottom and a bore therethrough from top to bottom, the body having a generally cylindrical sidewall, at least one access port through the sidewall for accessing therethrough a fluid channel opening of a tubular hanger apparatus positioned within within the tubular bowl, and a support structure, e.g., an edge, on and within the body for supporting hanger apparatus supporting the at least one tubular member; and in one aspect the tubular hanger has a fluid channel such that the fluid channel is alignable with an end or fitting of a control line on a tubular such as casing or tubing. Such a bowl may have one or some of the following in any combination: wherein the at least one access port is a plurality of access ports; wherein the plurality of access ports is two spaced-apart access ports; wherein two spaced-apart access ports are substantially vertically aligned or are substantially horizontally aligned and are spaced-apart by an angle of about thirty degrees of a circumference of the tubular bowl; locator apparatus having a portion extending through the generally cylindrical sidewall for cooperation with an apparatus within the tubular bowl to locate the apparatus at a desired location within the tubular bowl and to align an access port of the bowl with a fluid channel opening of a hanger; locking apparatus for securing another apparatus (e.g., a hanger) within the tubular bowl; and/or connection apparatus connected to the at least one access port, the connection apparatus for placing the at least one access port in fluid communication with surface apparatus spaced-apart from the tubular bowl, the connection apparatus in one aspect including a valve or valves.

[0064] The present invention, in certain aspects, therefore, provides a tubular hanger for connection to a tubular member, the tubular hanger including a body having a top, a bottom, a bore therethrough from top to bottom, and a sidewall surrounding said bore, the sidewall having an outer surface, the body having a bottom surface, at least one fluid channel through the body, the at least one fluid channel extending from the bottom surface to the outer surface of the sidewall, the at least one fluid channel having a first opening at the bottom surface and a second opening at the outer surface of the sidewall, and a lower portion of the bore threaded for threaded mating with a threaded end of a tubular member to be connected to the tubular hanger. Such a hanger may have one or some, in any combination, of the following: location apparatus for cooperating with locator apparatus of a tubular bowl in which the tubular hanger is positioned for locating the second opening so that the second opening is accessible through an access port of the tubular bowl; wherein the at least one fluid channel is a plurality of fluid channels and/or there is one such channel for each of a plurality of control lines attached to a tubular to be supported by the hanger; wherein the plurality of fluid channels is a first fluid channel and a second fluid channel each with a bottom opening at the bottom surface and a side opening at the surface of the sidewall; wherein the body is generally cylindrical and the first fluid channel and the second fluid channel are substantially vertically aligned or are substantially horizontally aligned and are spaced-apart by about thirty degrees of a circumference of the body;

connection apparatus at the first opening for connection to a flow control line on a tubular member to be connected to the tubular hanger, the connection apparatus, in one aspect, including one or more valves; connection apparatus at the second opening for connection to a surface apparatus for placing said surface apparatus in fluid communication with the at least one fluid channel, such connection apparatus, in one aspect, including one or more valves; locking apparatus for cooperating with corresponding apparatus of a tubular bowl for securing the tubular hanger in the tubular bowl; securement apparatus for receiving and releasably holding part of a running tool to releasably secure the running tool to the tubular hanger; a neck at the top of the body, the neck sized for receipt within an opening of another apparatus emplaceable on the tubular hanger, the neck for facilitating positioning of the another apparatus on the tubular hanger; and/or wherein the neck is sufficiently long that a portion thereof is projectable from and extendable above a top surface of a tubular bowl within which the tubular hanger is positionable.

[0065] The present invention, therefore, in at least certain aspects, provides a tubular suspension system with a tubular support, the tubular support having a tubular bowl, the tubular bowl having a body with a top and a bottom and a bore therethrough from top to bottom, the body having a generally cylindrical sidewall, at least one access port through the sidewall for accessing therethrough a fluid channel opening of a tubular hanger apparatus positioned within the tubular bowl, and a tubular hanger substantially within and supported by the tubular bowl, the tubular hanger comprising a body having a top, a bottom, a bore therethrough from top to bottom, and a sidewall surrounding said bore, the sidewall having an outer surface, the body having a bottom surface, at least one fluid channel through the body, the at least one fluid channel extending from the bottom surface to the outer surface of the sidewall, the at least one fluid channel having a first opening at the bottom surface and a second opening at the outer surface of the sidewall, and a lower portion of the bore threaded for threaded mating with a threaded end of a tubular member to be connected to the tubular hanger.

[0066] The present invention, therefore, provides in at least certain aspects, a method for supporting at least one tubular member having threaded ends, the tubular member having at least one fluid control line attached thereto, the method including connecting an end of the at least one tubular member threadedly to a tubular hanger, the tubular hanger with a body having a top, a bottom, a bore therethrough from top to bottom, and a sidewall surrounding said bore, the sidewall having an outer surface, the body having a bottom surface, at least one fluid channel through the body, the at least one fluid channel extending from the bottom surface to the outer surface of the sidewall, the at least one fluid channel having a first opening at the bottom surface and a second opening at the outer surface of the sidewall, and a lower portion of the bore threaded and threadedly mated with a threaded end of the at least one tubular member, placing the at least one fluid control line in fluid communication with the first opening, and suspending the tubular hanger and the at least one tubular member within a tubular support, the tubular support having a tubular bowl with a body with a top and a bottom and a bore therethrough from top to bottom, the body having a generally cylindrical sidewall, at least one access port through the sidewall for

accessing therethrough the second opening of the tubular hanger apparatus positioned within the tubular bowl. Such a method may include one or some of the following in any possible combination: placing the second opening in fluid communication with control apparatus for controlling an item in fluid communication with the at least one fluid control line; wherein the at least one tubular member is a string of tubular members extending down into a wellbore; and/or wherein the at least one tubular member is from the group consisting of casing and tubing.

[0067] The present invention, therefore, provides in at least certain aspects, a running tool having a body with a top, a bottom, and a bore therethrough from top to bottom, the bore having a top portion and a bottom portion, the bottom portion having an inner diameter less than an inner diameter of the top portion so that a plug within the body is selectively emplaceable to close off fluid flow through the bottom portion, and connection apparatus on the body for releasably connecting the body to a tubular hanger, a plug closing off the bore to fluid flow, seal apparatus on an exterior surface of the running tool for sealing an interface between the running tool and a tubular hanger to which the running tool is connectable so that with the running tool and tubular hanger located within a well apparatus, a portion of the well apparatus above the running tool can be tested without disconnecting the running tool from the tubular hanger. Such a running tool may have one or some, in any possible combination, of the following: wherein the testing is pressure testing; and/or wherein the plug is removable to permit testing below the running tool.

[0068] In conclusion, therefore, it is seen that the present invention and the embodiments disclosed herein and those covered by the appended claims are well adapted to carry out the objectives and obtain the ends set forth. Certain changes can be made in the subject matter described, shown and claimed without departing from the spirit and the scope of this invention. It is realized that changes are possible within the scope of this invention and it is further intended that each element or step recited in any of the following claims is to be understood as referring to all equivalent elements or steps. The following claims are intended to cover the invention as broadly as legally possible in whatever form its principles may be utilized.

What is claimed is:

1. A tubular bowl for supporting at least one tubular member, the tubular bowl comprising

a body with a top and a bottom and a bore therethrough from top to bottom, the body having a generally cylindrical sidewall,

at least one access port through the sidewall for accessing therethrough a fluid channel opening of a tubular hanger apparatus positioned within the tubular bowl, and

a support edge on and within the body for supporting hanger apparatus supporting the at least one tubular member.

2. The tubular bowl of claim 1 wherein the at least one access port is a plurality of access ports.

3. The tubular head of claim 2 wherein the plurality of access ports is two spaced-apart access ports.

4. The tubular head of claim 3 wherein the two spaced-apart access ports are substantially horizontally aligned and are spaced-apart by an angle of about thirty degrees of a circumference of the tubular bowl.

5. The tubular head of claim 1 further comprising

locator apparatus having a portion extending through the generally cylindrical sidewall for cooperation with an apparatus within the tubular bowl to locate the apparatus at a desired location within the tubular bowl.

6. The tubular bowl of claim 1 further comprising

locking apparatus for securing another apparatus within the tubular bowl.

7. The tubular bowl of claim 1 further comprising

connection apparatus connected to the at least one access port, the connection apparatus for placing the at least one access port in fluid communication with surface apparatus spaced-apart from the tubular bowl.

8. A tubular hanger for connection to a tubular member, the tubular hanger comprising

a body having a top, a bottom, a bore therethrough from top to bottom, and a sidewall surrounding said bore, the sidewall having an outer surface, the body having a bottom surface,

at least one fluid channel through the body, the at least one fluid channel extending from the bottom surface to the outer surface of the sidewall,

the at least one fluid channel having a first opening at the bottom surface and a second opening at the outer surface of the sidewall, and

a lower portion of the bore threaded for threaded mating with a threaded end of a tubular member to be connected to the tubular hanger.

9. The tubular hanger of claim 8 further comprising

location apparatus for cooperating with locator apparatus of a tubular bowl in which the tubular hanger is positioned for locating the second opening so that the second opening is accessible through an access port of the tubular bowl.

10. The tubular hanger of claim 8 wherein the at least one fluid channel is a plurality of fluid channels.

11. The tubular hanger of claim 10 wherein the plurality of fluid channels comprises a first fluid channel and a second fluid channel each with a bottom opening at the bottom surface and a side opening at the surface of the sidewall.

12. The tubular hanger of claim 10 wherein the body is generally cylindrical and the first fluid channel and the second fluid channel are substantially horizontally aligned and are spaced-apart by about thirty degrees of a circumference of the body.

13. The tubular hanger of claim 8 further comprising

connection apparatus at the first opening for connection to a flow control line on a tubular member to be connected to the tubular hanger.

14. The tubular hanger of claim 8 further comprising

connection apparatus at the second opening for connection to a surface apparatus for placing said surface apparatus in fluid communication with the at least one fluid channel.

15. The tubular hanger of claim 8 further comprising

locking apparatus for cooperating with corresponding apparatus of a tubular bowl for securing the tubular hanger in the tubular bowl.

16. The tubular hanger of claim 8 further comprising

securement apparatus for receiving and releasably holding part of a running tool to releasably secure the running tool to the tubular hanger.

17. The tubular hanger of claim 8 further comprising

a neck at the top of the body, the neck sized for receipt within an opening of another apparatus emplaceable on the tubular hanger, the neck for facilitating positioning of the another apparatus on the tubular hanger.

18. The tubular hanger of claim 17 wherein the neck is sufficiently long that a portion thereof is projectable from and extendable above a top surface of a tubular bowl within which the tubular hanger is positionable.

19. A tubular suspension system comprising

a tubular support, the tubular support having a tubular bowl, the tubular bowl comprising a body with a top and a bottom and a bore therethrough from top to bottom, the body having a generally cylindrical sidewall, at least one access port through the sidewall for accessing therethrough a fluid channel opening of a tubular hanger apparatus positioned within the tubular bowl, and

a tubular hanger substantially within and supported by the tubular bowl, the tubular hanger comprising a body having a top, a bottom, a bore therethrough from top to bottom, and a sidewall surrounding said bore, the sidewall having an outer surface, the body having a bottom surface, at least one fluid channel through the body, the at least one fluid channel extending from the bottom surface to the outer surface of the sidewall, the at least one fluid channel having a first opening at the bottom surface and a second opening at the outer surface of the sidewall, and a lower portion of the bore threaded for threaded mating with a threaded end of a tubular member to be connected to the tubular hanger.

20. A method for supporting at least one tubular member having threaded ends, the tubular member having at least one fluid control line attached thereto, the method comprising

connecting an end of the at least one tubular member threadedly to a tubular hanger, the tubular hanger comprising a body having a top, a bottom, a bore therethrough from top to bottom, and a sidewall surrounding said bore, the sidewall having an outer surface, the body having a bottom surface, at least one fluid channel through the body, the at least one fluid channel extending from the bottom surface to the outer surface of the sidewall, the at least one fluid channel having a first opening at the bottom surface and a second opening at the outer surface of the sidewall, and a lower portion of the bore threaded and threadedly mated with a threaded end of the at least one tubular member,

placing the at least one fluid control line in fluid communication with the first opening, and

suspending the tubular hanger and the at least one tubular member within a tubular support, the tubular support having a tubular bowl comprising a body with a top and a bottom and a bore therethrough from top to bottom, the body having a generally cylindrical sidewall, at least one access port through the sidewall for accessing therethrough the second opening of the tubular hanger apparatus positioned within hanger apparatus positioned within the tubular bowl.

21. The method of claim 20 further comprising placing the second opening in fluid communication with control apparatus for controlling an item in fluid communication with the at least one fluid control line.

22. The method of claim 20 wherein the at least one tubular member is a string of tubular members extending down into a wellbore.

23. The method of claim 20 wherein the at least one tubular member is from the group consisting of casing and tubing.

24. A running tool comprising

a body with a top, a bottom, and a bore therethrough from top to bottom,

the bore having a top portion and a bottom portion, the bottom portion having an inner diameter less than an inner diameter of the top portion so that a plug within the body is selectively emplaceable to close off fluid flow through the bottom portion, and

connection apparatus on the body for releasably connecting the body to a tubular hanger,

a plug closing off the bore to fluid flow,

seal apparatus on an exterior surface of the running tool for sealing an interface between the running tool and a tubular hanger to which the running tool is connectable so that with the running tool and tubular hanger located within a well apparatus, a portion of the well apparatus above the running tool can be tested without disconnecting the running tool from the tubular hanger.

25. The running tool of claim 24 wherein the testing is pressure testing.

26. The running tool of claim 24 wherein the plug is removable to permit testing below the running tool.

27. Any new invention disclosed herein.

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