US 20140060854A1

(19) **United States**

(12) **Patent Application Publication**

**Baudoin**

(10) **Pub. No.: US 2014/0060854 A1**

(43) **Pub. Date: Mar. 6, 2014**

(54) **HYDRAULIC DISCONNECT APPARATUS AND METHOD OF USE**

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(21) Appl. No.: **14/016,097**

(22) Filed: **Aug. 31, 2013**

**Related U.S. Application Data**

(60) Provisional application No. 61/695,710, filed on Aug. 31, 2012.

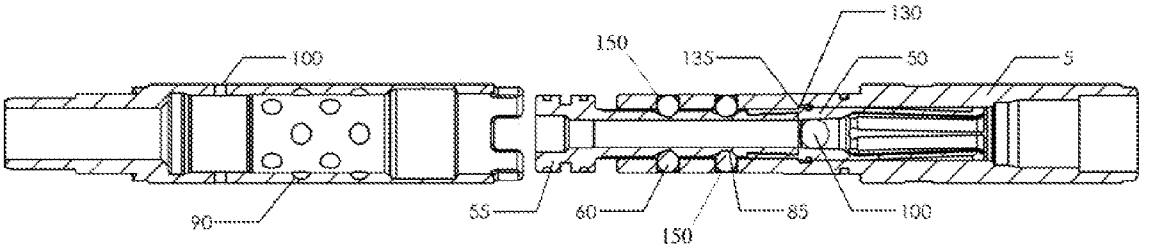
**Publication Classification**

(51) **Int. Cl.**
*E21B 23/03* (2006.01)

(52) **U.S. Cl.**
CPC ..... ***E21B 23/03*** (2013.01)
USPC ..... **166/377**; 166/242.6

(57) **ABSTRACT**

A hydraulic disconnect apparatus is disclosed for disconnecting a pipe string or coiled tubing string from a bottom hole assembly for drilling, work over, or plug and abandonment of oil and gas wells. Disconnection is accomplished by pumping a circulation ball from surface through the pipe or coiled tubing string until it lands on a seat inside the apparatus. Fluid pressure is then applied to shift a piston assembly within the apparatus, thereby allowing a series of balls to retract. The upper and lower portions of the apparatus can then be separated by applying a tensile force to the upper portion.



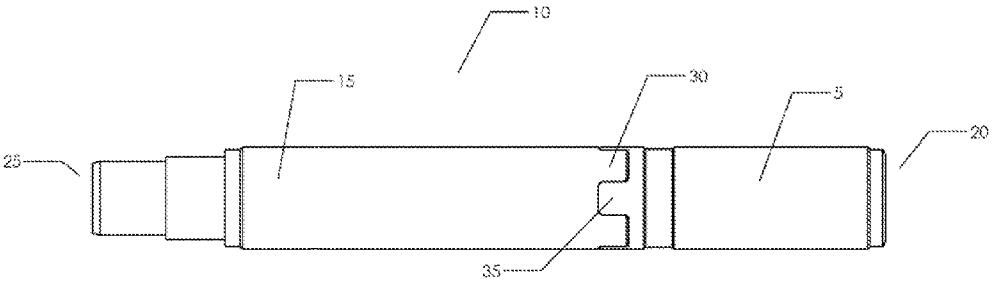



FIG. 1

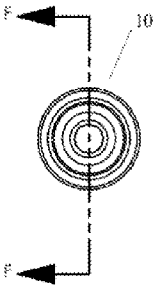



FIG. 2

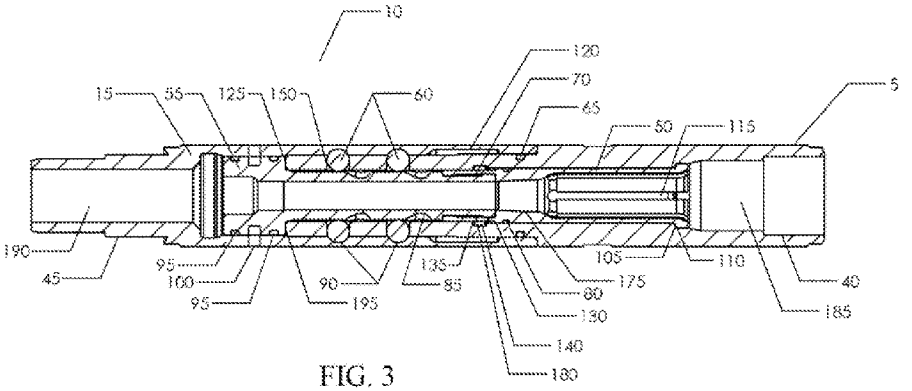



FIG. 3

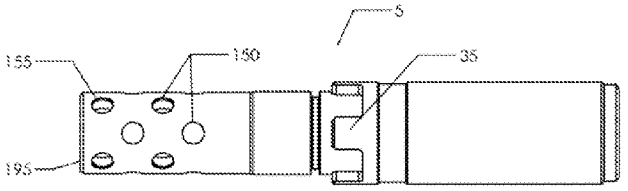



FIG. 4

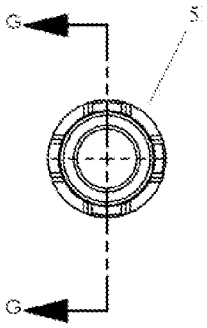



FIG. 5

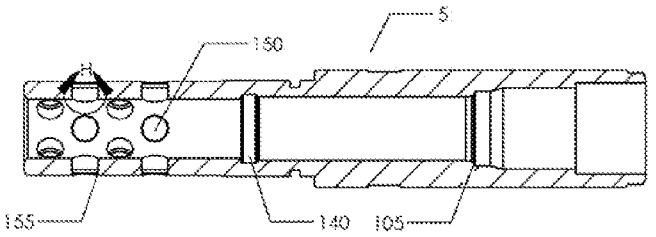



FIG. 6

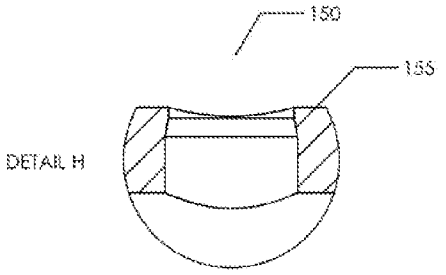



FIG. 7

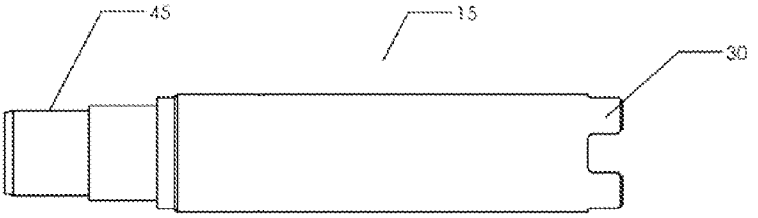



FIG. 8

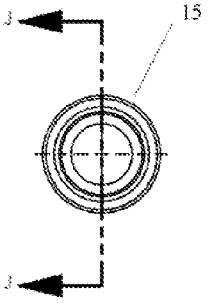



FIG. 9

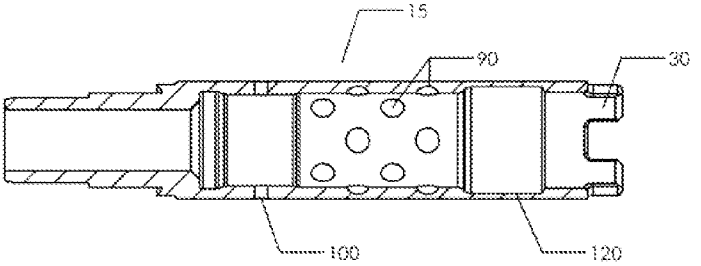



FIG. 10

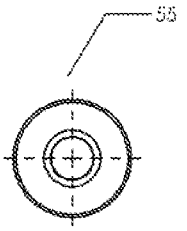



FIG. 11

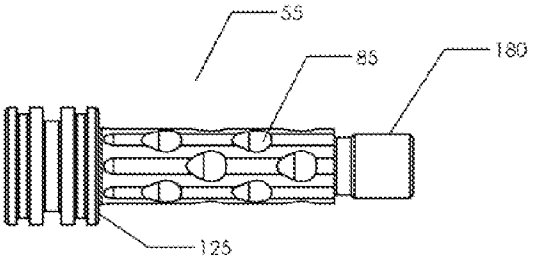



FIG. 12

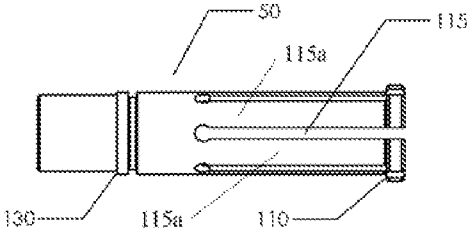



FIG. 13

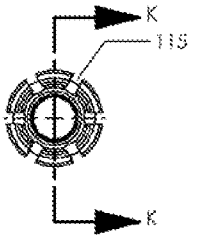



FIG. 14

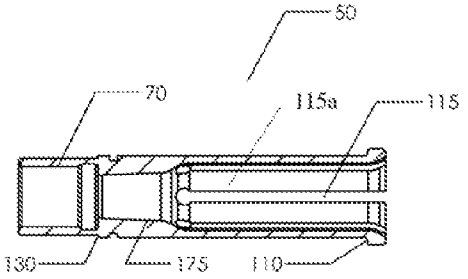



FIG. 15

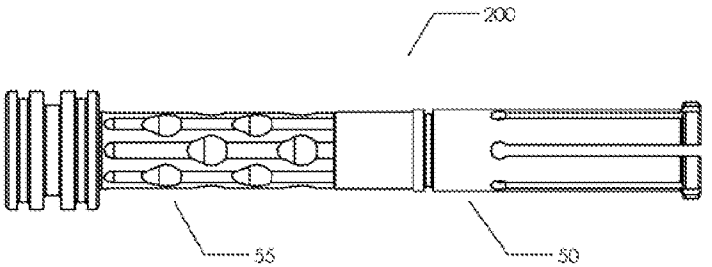



FIG. 16

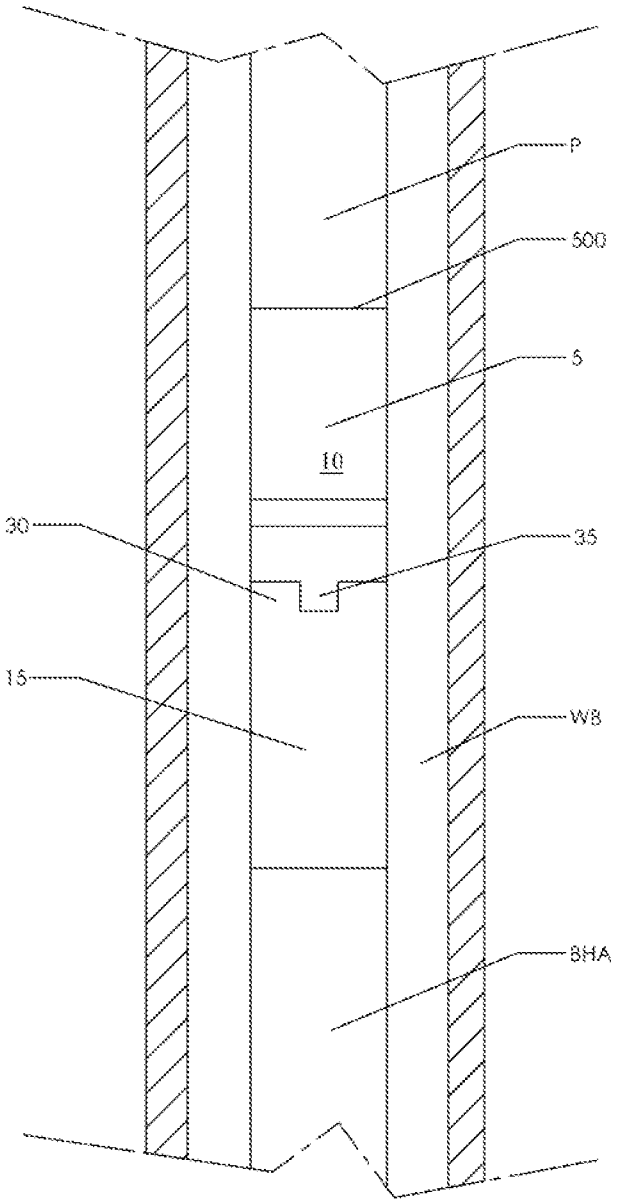



FIG. 17

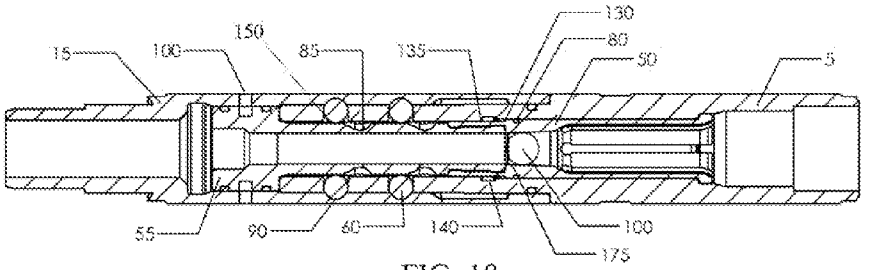



FIG. 18

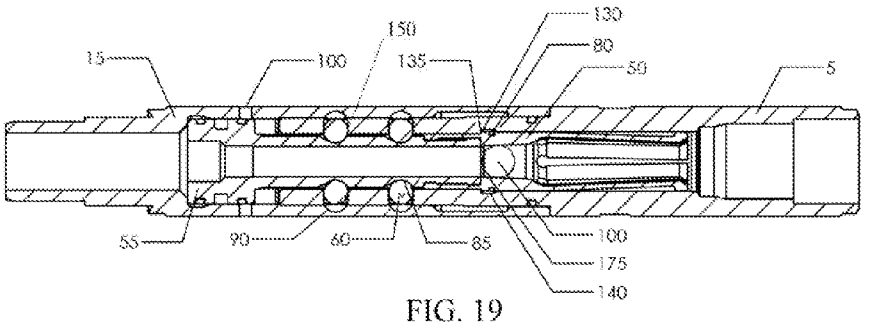



FIG. 19

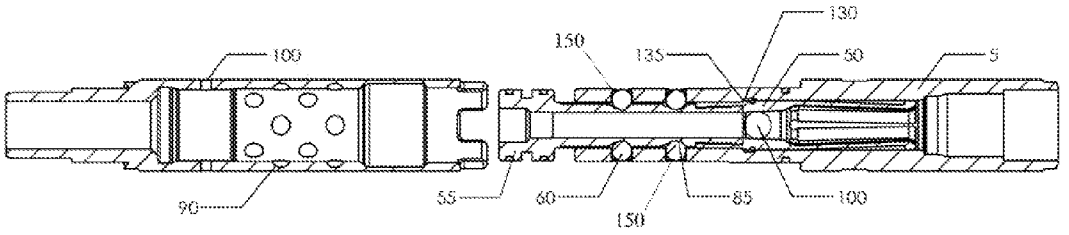



FIG. 20

# HYDRAULIC DISCONNECT APPARATUS AND METHOD OF USE

## PRIORITY

**[0001]** This application claims priority to U.S. provisional application Ser. No. 61/695,710 filed Aug. 31, 2012 for Hydraulic Disconnect Apparatus and Method, the entire content of which is hereby incorporated by reference.

## FIELD OF THE INVENTION

**[0002]** This invention pertains to downhole equipment for oil and gas wells. More particularly, it pertains to a hydraulic disconnect apparatus for use on a wellbore pipe string such as a coiled tubing string and, more particularly, this invention relates to an apparatus for disconnecting a pipe string from a bottom hole assembly (known as a BHA).

## BACKGROUND OF THE INVENTION

**[0003]** During the drilling, work over, or plug and abandonment of oil and gas producing wellbores, a variety of downhole tools can be attached to a pipe or coiled tubing string and utilized to perform a variety of functions within the wellbore. It is often desirable to disconnect a tool from the pipe or coiled tubing string so that a tool may be left in the wellbore when the pipe or coiled tubing string is removed. Other times, a tool may become stuck in the wellbore during wellbore operations and the need arises to remove the pipe or coiled tubing string from the wellbore, independent of the tool, so that the wellbore may be reentered with a fishing tool string in an attempt to free the stuck tool from the wellbore. For these reasons, a tool disconnect device must be utilized.

**[0004]** A variety of tool disconnect devices may be use. Many tool disconnect devices employ a hydraulic tool disconnect mechanism that employ shear pins and collets in the disconnect mechanism. These tools suffer from shortcomings ranging from premature shear pin failure to cracking of collet bodies induced by the assembly or disassembly process. Some hydraulic disconnect devices employ a piston or ball to effectuate pressure changes for disconnection and that ball is typically left in the bottom sub portion of the hydraulic disconnect after the tool is disconnected from the pipe or coiled tubing string. A ball left in the bottom sub may prevent an operator from subsequently circulating fluid through the bottom sub and hinder subsequent well operations. Other types of tool disconnect devices suffer from unreliable tool disconnection or require high pressures in order to disconnect a tool from the pipe or coiled tubing string.

**[0005]** Consequently, there is a need for a hydraulic tool disconnecting apparatus having improved piston and collet configurations that will reliably disconnect a tool or BHA from a pipe or coiled tubing string without the aforementioned negative attributes.

## SUMMARY OF THE INVENTION

**[0006]** The present invention presents a new hydraulic disconnect apparatus to satisfy the aforementioned needs. The disconnect apparatus is comprised of an upper top sub member having a plurality of ball retaining pockets, a lower bottom sub housing member and a piston member preferably comprised of two parts, and a plurality of balls. The piston member is preferably configured with a lower support piston member and an upper collet member. The bottom sub contains a plurality of internal indentations that correspond with the balls, preferably matching or nearly matching the radii of the balls. The collet member contains an internal profile such that a circulation ball of a given size will seat and substantially block the circulation of fluid through the disconnect apparatus.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0007]** FIG. **1** is an elevation view of a representative embodiment of the hydraulic disconnect apparatus of Applicant's invention

**[0008]** FIG. **2** is an end view of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0009]** FIG. **3** is a longitudinal cross-sectional view showing the hydraulic disconnect apparatus shown in FIG. **1** cut through lines F-F of FIG. **2**.

**[0010]** FIG. **4** is an elevation view of the top sub member of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0011]** FIG. **5** is an end view of the top sub member of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0012]** FIG. **6** is a longitudinal cross-sectional view of the top sub member of the hydraulic disconnect apparatus shown in FIG. **1** cut through lines G-G of FIG. **5**.

**[0013]** FIG. **7** is a detailed view of a ball retaining pocket of the top sub member of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0014]** FIG. **8** is an elevation view of the bottom sub member of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0015]** FIG. **9** is an end view of the bottom sub member of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0016]** FIG. **10** is a longitudinal cross-sectional view of the bottom sub member of the hydraulic disconnect apparatus shown in FIG. **1** cut through lines through lines J-J of FIG. **9**.

**[0017]** FIG. **11** is an end view of the support piston member of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0018]** FIG. **12** is an elevation view of the support piston member of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0019]** FIG. **13** is an elevation view of the collet member of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0020]** FIG. **14** is an end view of the collet member of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0021]** FIG. **15** is as longitudinal cross-sectional view of the collet member of the hydraulic disconnect apparatus shown in FIG. **1** cut through lines through lines K-K of FIG. **14**.

**[0022]** FIG. **16** is an elevation view of the piston assembly of the hydraulic disconnect apparatus shown in FIG. **1**.

**[0023]** FIG. **17** is a longitudinal cross-sectional view of a wellbore showing the hydraulic disconnect apparatus of FIG. **1** attached to a pipe string.

**[0024]** FIG. **18** is a longitudinal cross-sectional view of the hydraulic disconnect apparatus shown in FIG. **1** at the moment the circulation ball lands on seat inside the collet member.

**[0025]** FIG. **19** is a longitudinal cross-sectional view of the hydraulic disconnect apparatus shown in FIG. **1** after the piston assembly has shifted into the released position.

**[0026]** FIG. **20** is a longitudinal cross-sectional view of the hydraulic disconnect apparatus shown in FIG. **1** after complete separation from an attached pipe or coiled tubing string tool or BHA.

## DESCRIPTION OF THE EMBODIMENTS

**[0027]** FIG. **1** shows an embodiment of the hydraulic disconnect apparatus (**10**) of the present invention. The apparatus (**10**) is configured so that it may be threadably attached on a pipe string that has a central bore through which fluid may be introduced so that it will extend longitudinally along the axis of the pipe string at a position above a downhole tool or a bottom hole assembly, sometimes referred to as a "BHA". The apparatus to provide a means for hydraulically separating the tool of BHA from a pipe string or a coiled tubing string should such a need arise.

**[0028]** In the configurations shown in FIGS. **1-3**, the apparatus (**10**) has an upper end of the referenced by (**20**) and lower end referenced by (**25**) and is comprised of an upper tubular top sub member (**5**) and a lower tubular bottom sub member (**15**). The top sub (**5**) is configured for threadable attachment to a pipe string by the means of an upper threaded connection (**40**). The lower tubular bottom sub member (**15**) is configured for threadable attachment to a downhole tool or BHA by the means of lower threaded connection **45**). As shown in FIG. **1**, Top sub (**5**) and bottom sub (**15**) are fitted together by interlocking splines or castle features (**35**) and (**30**) respectfully. These castle features aid in the transmission of torque through the apparatus (**10**) during rotation of the pipe string.

**[0029]** FIG. **3**, a longitudinal cross-sectional view of the hydraulic disconnect apparatus (**10**) on the section line F-F of FIG. **2**, illustrates the position of the components of apparatus (**10**) in a latched or connected configuration. The top sub (**5**) and bottom sub (**15**) each have central bores, (**185**) and (**190**) respectively, which are in communication with the central bore of the pipe string. The castle features (**35**) and (**30**) of top sub (**5**) and bottom sub (**15**) are interlocked and abutting. Seal (**65**) prevents fluid from entering or exiting through the castle features (**35**) and (**30**).

**[0030]** Positioned within the top sub (**5**) and bottom sub (**15**) are a support piston (**55**) and a collet (**50**). The support piston (**55**) and coil t (**50**) are threadably connected by means of box connection (**70**) of collet. (**50**) and pin connection (**180**) of support piston (**55**). Support piston (**55**) and collet (**50**) are axially aligned with top sub (**5**) and bottom sub (**15**). The annulus between collet (**50**) and the internal surface of top sub (**5**) is sealed b means of seal (**80**). The annulus between support piston (**55**) and the internal bore of bottom sub (**15**) is sealed via by means of seal(s) (**95**). The combination of the support piston (**55**) and collet (**50**) will sometimes be referred to as piston assembly (**200**), as shown in FIG. **16**.

**[0031]** A plurality of attachment balls (**60**) arrayed in a series are located in ball retaining pockets (**150**) along top sub (**5**). These balls (**60**) are urged radially outward by contact with the support piston (**55**) to extend or protrude from retaining pockets (**150**) into indentations or dimples (**90**) in bottom sub (**15**). The balls (**60**) prevent the top sub (**5**) from moving in both axial and circumferential directions in relation to the bottom sub (**15**). Thus the balls (**60**) prevent the top sub (**5**) from separating from the bottom sub (**15**) due to tensile forces. The balls (**60**) also aid in the transmission of torque from the top sub (**5**) to the bottom sub (**15**) or vice versa.

**[0032]** The support piston (**55**) is configured with a shoulder (**125**) which abuts the lower face (**195**) of top sub (**5**). The support piston (**55**) may be secured in this position via shear screw(s) (**100**) and by collet (**50**). Collet (**50**) can also be configured such that shear screw(s) (**100**) may be eliminated completely. Surface (**110**) of collet (**50**) is in contact with abutment surface (**105**) of top sub (**5**). Collet (**50**) holds the support piston (**55**) in the correct location to keep the balls (**60**) firmly pressed into dimples (**90**) in bottom sub (**15**), thereby keeping apparatus (**10**) in a connected configuration.

**[0033]** The top sub (**5**) of the hydraulic disconnect apparatus (**10**) is shown in FIGS. **4**, **5** and **6**. FIG. **4**, an elevation view of the top sub (**5**), and FIG. **6**, a longitudinal cross section view of the top sub (**5**) along line G-G of FIG. **5**, illustrate the internal abutment face (**105**), ball retaining pockets (**150**), and recess (**140**). FIG. **7** shows the ball retaining pockets (**150**) in demarcation Detail H. Each ball retaining pocket (**150**) has a protrusion (**155**) such as a lip or ring of material that forms a diameter smaller than that of ball (**60**). This protrusion (**155**) prevents the ball (**60**) from exiting the ball pocket (**150**) radially, in a direction from the center axis toward the outer diameter of the top sub (**5**) and provides a means of retaining the balls (**60**) within the top sub (**5**) during assembly of apparatus (**10**).

**[0034]** The top sub (**5**) of apparatus (**10**) is not provided with and does not require a sub collet for load transfer. The collet (**50**) in disconnect apparatus (**10**) simply retains the piston assembly (**200**) in place so as not to rely on shear screws as is the case with many current hydraulic disconnect devices. Collets are necessarily utilized in the subs in many current hydraulic disconnect devices to serve as tensile load bearing components. When a tensile load is applied to a pipe string or coiled tubing string configured with these disconnect devices, the tensile load applied must be transferred through the collet members of the sub. Accordingly, the collets of such devices are subjected to repeated tensile loads placed upon them during in normal wellbore operations, such as when the pipe string is jarred, and these repeated loads increase wear and tear on these disconnect devices and the risk of premature separation. Because the hydraulic disconnect apparatus (**10**) described herein does not utilize a collet as a load bearing member, the pipe string and the apparatus (**10**) may be repeatedly jarred during operations with the risk of premature separation of the BHA from the pipe string due to connection failure, such as shearing of the shear pin (or screw), significantly reduced.

**[0035]** FIGS. **8-10** show the bottom sub (**15**) of the hydraulic disconnect apparatus (**10**). As shown in FIG. **8**, the exterior of bottom sub (**15**) is comprised of the castle features (**30**) and connection (**45**). Four castle features (**30**) are shown for clarity but any number of interlocking castle features (**30**) may be utilized. These castle features (**30**) ma be eliminated all together without reducing the performance of this hydraulic, disconnect apparatus. Connection (**45**) is shown to be a pin (or male) connection, but may also be a box (female) connection.

**[0036]** FIG. **10**, a longitudinal cross-sectional view of the bottom sub (**15**) of the hydraulic disconnect apparatus (**10**) along section line J-J of FIG. **9**, illustrates the interior of the bottom sub (**15**). Bottom sub (**15**) is comprised of a plurality of dimples or indentations (**90**), shear screw(s) (**100**), and an optional recess (**120**). Dimples (**90**) are shown in a staggered orientation with four dimples per row but they may be in any orientation with any number per row. This chosen number of dimples (**90**) and orientation are merely shown for clarity of the illustration. Shear screw(s) (**100**) are optional and they ma be used as a secondary means of retention of the support piston assembly (**200**) within the hydraulic disconnect apparatus (**10**). The optional recess (**120**) may be provided as a means for engaging and disengaging the bottom sub (**15**) to a frequently utilized fishing tool known as a "GS" pulling tool

after the bottom sub (**15**) has been left in a wellbore. Recess (**120**) provides no benefit to the connection or separation of the top sub (**5**) relative to the bottom sub (**15**).

**[0037]** The support piston (**55**) of the hydraulic disconnect apparatus (**10**) is shown in FIG. **11** and FIG. **12**. FIG. **12**, an elevation view of the support piston (**55**) illustrates the threaded connection (**180**), the plurality of ball recesses (**85**), and shoulder (**125**). Threaded connection (**180**) is provided as a means of connection to the collet (**50**). The ball recesses (**85**), preferably elongated or ramped recesses, provide a means or space to allow the balls (**60**) to retract inwardly from the dimples (**90**) that are located inside the bottom sub (**15**). When the support piston (**55**) and collet (**50**) are shifted downward from the position shown in FIG. **2**, support piston (**50**) will roll along the balls (**60**) moving the ramped recesses (**85**) so that the balls will move radially inward from the bottom sub (**15**) to disengage the top sub (**5**) and allow separation of the top sub (**5**) portion from the bottom sub (**15**). This process is shown in more detail in FIG. **18** through FIG. **20**.

**[0038]** FIGS. **13-15** show the collet (**50**) of the hydraulic disconnect apparatus (**10**). The collet (**50**) is comprised of a latching shoulder (**110**), a plurality of splits or slots (**115**) creating collet fingers (**115***a*) and abutment shoulder (**130**). While the collet (**50**) is shown to have six slots (**115**) to recreate collet fingers (**115***a*) however, any desired number greater than one may be utilized. The amount of force required to downwardly shift the support piston (**55**) while collapsing the collet (**50**) can be varied by altering the number and or length of slots (**115**) as well as the thickness of each of the collet fingers (**115***a*). This force can be adjusted to suit the particular application.

**[0039]** FIG. **15** is a longitudinal cross-sectional view of the collet (**50**) of the hydraulic disconnect apparatus (**10**) cut along section line K-K of FIG. **14** showing the latching shoulder (**110**), splits or slots (**115**), collet abutment shoulder (**130**), circulation ball seat (**175**), and box connection (**70**). FIG. **16** illustrates the support piston assembly (**200**) with the support piston (**55**) is threadably engaged. to the collet (**50**). The abutment shoulder (**130**) of collet (**50**) limits axial travel of the support piston (**55**) upon separation of the support piston assembly (**200**) from top sub (**5**) to place the support piston recesses (**85**) in the correct location to allow the balls (**60**) to retract. It also prevents the support piston assembly (**200**) from exiting the top sub (**5**) upon separation. This assures that all upper components, including the circulation ball, may be removed from the wellbore upon separation except for the bottom sub (**15**). This is an advantage as it allows an operator to circulate through the bottom sub (**15**) and subsequently through the BHA after separation.

**[0040]** In the typical hydraulic disconnect device only shear screws are employed to retain a piston assembly in place. Use of the collet (**50**) gives the hydraulic disconnect apparatus (**10**) the ability to withstand repeated jarring impacts without the potential for premature separation of the BHA. Another advantage of the collet (**50**) of disconnect apparatus (**10**) is that collet (**50**) does not have to be collapsed for assembly and disassembly of the apparatus (**10**). Most hydraulic disconnect devices utilize collets where the fingers of the collets must be collapsed in order for the tool to be assembled and disassembled. Stresses are induced into a collet each time it is collapsed and this repeated collapsing can cause cracking in the fingers of the collet leading to premature failure.

**[0041]** For assembly of the hydraulic disconnect apparatus (**10**), the balls (**60**) are first inserted into the ball retaining pockets (**150**) of top sub (**5**) until balls (**60**) contact pocket protrusions (**155**). After all balls (**60**) are in place, the support piston (**55**) is inserted into the lower end of top sub (**5**) with the ball recesses (**85**) aligned with the balls (**60**). Insertion continues until shoulder (**125**) abuts lower face (**195**). Collet (**50**) is then inserted into top sub (**5**) and box connection (**70**) is partially threadably engaged to pin connection (**180**). The support piston (**55**) must be repositioned downward such that the balls (**60**) are fully retracted. The top sub (**5**) along with the partially threaded piston assembly (**200**) is then inserted into bottom sub (**15**) while interlocking castle features (**30**) and (**35**) until it can go no further.

**[0042]** The piston assembly (**200**) is then shifted upward until shoulder (**125**) again abuts lower face (**195**). When the piston assembly (**200**) is shifted upward the balls (**60**) will be pushed radially outward from the ball recesses (**85**) and seated in the dimples (**90**) that are located inside the bottom sub (**15**). The collet (**50**) is then fully threaded to support piston (**55**) until tight. The shear screws (**100**) can now be inserted if being utilized. The hydraulic, disconnect apparatus (**10**) is now complete.

**[0043]** As shown in FIG. **17**, the hydraulic disconnect apparatus (**10**) is positioned and threadably attached to the down hole end (**500**) of a pipe or coiled tubing string (P) by means of upper threaded connection (**40**) at the top (**20**) of the top sub (**5**). A bottom hole assembly (BHA) is then attached to the hydraulic disconnect apparatus (**10**) by means of threaded connection (**45**) at the bottom (**25**) of sub member (**15**). The sequence of connection of the pipe or coiled tubing string (P) and the bottom hole assembly (BHA) to the hydraulic disconnect apparatus (**10**) may be reversed as desired. After such assembly the pipe or coiled tubing string (P), with the attached hydraulic disconnect apparatus (**10**) and BHA, may be inserted into wellbore (WB) for use.

**[0044]** FIGS. **18-20** show the sequence of disengagement of the BHA from the pipe or coiled tubing string (P) by means of the hydraulic disconnect apparatus (**10**) described herein. When an operator desires to disconnect the pipe string or coiled tubing string (P) from the BHA, a circulation ball (**100**) of the correct size is pumped down the pipe string (P). The ball (**100**) will continue until it reaches the ball seat (**175**) inside the collet (**50**).

**[0045]** FIG. **18** shows a longitudinal cross-sectional view of the hydraulic disconnect apparatus (**10**) in the connected state with the balls (**60**) positioned in ball retaining pockets (**150**) of top sub (**5**), at the moment the circulation ball (**100**) lands on seat (**175**) inside the collet (**50**). At this time the operator will see an increase in pump (circulation) pressure. The pressure will continue to increase until the hydraulic forces created from fluid pressure overcomes the force of the collet (**50**) holding the piston assembly (**200**) in place.

**[0046]** As shown in FIG. **19**, the collet (**50**) will then be forced to collapse and the entire piston assembly (**200**) will move downward until abutment shoulder (**130**) of collet (**50**) encounters shoulder (**135**) of top sub (**5**). When the piston assembly (**200**) moves to this downward position, the balls (**60**) are aligned with recesses (**85**) of the support piston (**55**). This alignment allows the balls (**60**) to retract away from the dimples (**90**) of the bottom sub (**15**). It can be noted that seal (**80**) of the collet (**50**) is now aligned with recess (**140**) of the top sub (**5**) thus allowing fluid to flow around the seal thereby relieving pump pressure. This decrease in pump pressure

indicates to the operator that the piston assembly (**200**) has shifted and the hydraulic disconnect apparatus (**10**) is ready for separation.

**[0047]** When a tensile load, is applied to the pipe string, the top sub (**5**) of the hydraulic disconnect apparatus (**10**) is separated from the bottom sub (**5**) as shown in FIG. **20**. Upon such separation the top sub (**5**), piston assembly (**200**), balls (**60**), and circulation ball (**100**) may then be removed from the wellbore with the pipe string (P) and the bottom sub (**15**) with the still attached BHA is left behind.

**1**. A disconnect apparatus for disconnecting a pipe string from a bottom hole assembly comprising:

(a) a tubular top sub member having an upper end, a lower end, a central bore through which a fluid may be introduced, a collet engagement surface, a plurality of radially oriented ball retaining pockets, and an internal abutment shoulder;

(b) a plurality of attachment balls extending from said ball retaining pockets of said top sub member;

(c) a support piston assembly having an upper end, a lower end, a central bore through which a fluid may be introduced, a collet section at said upper end, said collet section having an external abutment shoulder, and a piston section at said lower end, said piston section having a plurality of ball recesses;

(d) said support piston assembly positioned within and releasably attached to said top sub member by means of said collet section and said collet engagement surface and configured to move upward and downward within said top sub member upon release of said collet from said collet engagement surface of said top sub member, said downward support piston assembly movement being restrained by said internal abutment shoulder of said top sub member and said external abutment shoulder of said collet;

(e) a tubular bottom sub member having an upper end, a lower end, a central bore through which a fluid may be introduced, and a plurality of internal radially oriented dimples, said bottom sub member attached to said top sub member by engagement of said attachment balls within said internal dimples of said bottom member between said piston section and said bottom sub member; and

(f) wherein downward movement of said support piston assembly will move said attachment balls from said internal dimples of said bottom sub member into said ball recesses of said piston section thereby releasing said bottom sub member from said top sub member.

**2**. The disconnect apparatus recited in claim **1** wherein said upper end of said top sub member is attached to a pipe string and said lower end of said bottom sub member is attached to a bottom hole assembly.

**3**. The disconnect apparatus recited in claim **2** wherein the introduction of a desired pressure on said support piston assembly will release said collet section of said piston support assembly from said collet engagement surface of said top sub member thereby imparting downward movement of said piston support assembly for releasing said bottom sub member.

**4**. The disconnect apparatus recited in claim **3** wherein said desired pressure on said on said support piston assembly is created by a circulation ball obstructing said central bore of said support piston assembly.

**5**. The disconnect apparatus recited in claim **4** wherein said top sub member and said bottom sub member abut between interlocking splines.

**6**. A disconnect apparatus for disconnecting a pipe string from a bottom hole assembly comprising:

(a) a pipe string having central bore through which a fluid may be introduced;

(b) a tubular top sub member having an upper end, a lower end, and a central bore aligned with said central bore of said pipe string through which a fluid may be introduced, said upper end of said top sub member threadedly attached to said pipe string;

(c) said top sub member having a collet engagement surface and a plurality of radially oriented ball retaining pockets;

(d) a plurality of attachment balls positioned in said ball retaining pockets of said top sub member;

(e) a support piston assembly positioned within said top sub member, said support piston assembly having a central bore aligned with said central bore of said top sub member, a collet section releaseably attached to said collet engagement surface of said top sub member, and piston section having a plurality of plurality of ball recesses, said support piston assembly and said top sub member configured to limit axial travel of said support piston assembly within said top sub member upon release of said collet from said collet engagement surface of said top sub member; and

(f) a tubular bottom sub member having a plurality of internal radially oriented dimples and a central bore through which a fluid may be introduced, said bottom sub member attached to said top sub member by confined engagement of said attachment balls between said internal dimples of said bottom sub member and said piston member wherein upon release of said collet from said collet engagement surface of said top sub member, said attachment balls will disengage from said internal dimples of said bottom sub member and move into said ball recesses of said piston section thereby releasing said bottom sub member from said top sub member.

**7**. The disconnect apparatus recited in claim **6** wherein said bottom sub member is attached to a bottom hole assembly.

**8**. The disconnect apparatus recited in claim **7** wherein a desired pressure on said support piston assembly will release said collet section of said piston support assembly from said collet engagement surface of said top sub member.

**9**. The disconnect apparatus recited in claim **8** wherein said desired pressure on said on said support piston assembly is created by introduction of a circulation ball into said central opening of said pipe string thereby obstructing said central bore of said support piston assembly.

**10**. The disconnect apparatus recited in claim **8** wherein said top sub member and said bottom sub member abut between interlocking splines.

**11**. In a pipe string having a having a central bore containing a fluid column, a method for disconnecting a pipe string from a bottom hole assembly comprising the steps of:

(a) providing a pipe string having a central bore containing to fluid column;

(b) providing a tubular top sub member having an upper end, a lower end, and a central bore aligned with said central bore of said pipe string, said top sub member having a collet engagement surface and a plurality of radially oriented ball retaining pockets;

(c) providing a plurality of attachment balls positioned in said ball retaining pockets of said to sub member;

(d) providing a support piston assembly, said support piston assembly having a central bore aligned with said central bore of said top sub member, a collect section, and piston section having a plurality of plurality of ball recesses;

(e) positioning said support piston assembly within said top sub member in a manner whereby axial travel of said support piston assembly within said top sub member is limited;

(f) releasably attaching said collet section of said piston support assembly to said collet engagement surface of said top sub member;

(g) providing a bottom sub member having a plurality of internal radially oriented dimples and a central bore through which a fluid may be introduced;

(h) attaching said top sub member to said bottom sub member in a manner whereby said attachment balls are confined between said internal dimples of said bottom sub member and said piston member and whereby upon release of said collet from said collet engagement surface of said top sub member, said attachment balls will disengage from said internal dimples of said bottom sub member and move into said ball recesses of said piston section thereby allowing said bottom sub member to be released from said top sub member;

(i) attaching said bottom sub member to a bottom hole assembly;

(j) running said pipe string and said attached bottom hole assembly into a wellbore; and

(k) releasing said collet from said collet engagement surface of said top sub member thereby moving said support piston assembly and said attachment balls from said internal dimples of said bottom sub member into said ball recesses of said piston section of support piston assembly thereby releasing said bottom sub member from said top sub member.

**12**. The method as recited in claim **11** further comprising the step of applying tension to said pipe string.

**13**. The method as recited in claim **12** wherein said step of releasing said collet from said collet engagement surface of said top sub member includes the step of apply fluid pressure on said support piston assembly.

**14**. The method as recited in claim **13** wherein the step of apply fluid pressure on said support piston assembly includes introducing a circulation ball into said central opening of said pipe string thereby obstructing said central bore of said support piston assembly.

**15**. The method as recited in claim **14** wherein the step of attaching said top sub member to said bottom sub member includes abutting said top sub member and said bottom sub member between interlocking splines.

**16**. The method as recited in claim **15** wherein the step of positioning said support piston assembly within said top sub member in a manner whereby axial travel of said support piston assembly within said top sub member is limited includes providing interfacing shoulder surfaces on said top sub member and said collet of said support piston assembly.

**17**. A disconnect apparatus for disconnecting a pipe string from a bottom hole assembly comprising:

(a) a pipe string having central bore through which a fluid may be introduced;

(b) a tubular top sub member threadedly attached to said pipe string; said top sub member having a collet engagement surface and a plurality of radially oriented ball retaining pockets;

(c) a plurality of attachment balls positioned in said ball retaining pockets of said top sub member;

(d) a support piston assembly haying a collet and a piston section having a plurality of plurality of ball recesses, said support piston assembly releasably attached to said collet engagement surface of said top sub member and positioned within said top sub member to allow limited axial moment of said support piston assembly within said top sub member;

(e) a tubular bottom sub member having a plurality of internal radially oriented dimples, said bottom sub member abutting said top sub member with said attachment balls confined between said internal dimples of said bottom sub member and said piston member thereby attaching said bottom sub member to said top sub member and whereby downward movement of said support piston assembly will move said attachment balls from said internal dimples of said bottom sub member into said ball recesses of said piston section of support piston assembly thereby releasing said bottom sub member from said top sub member; and

(f) a bottom hole assembly attached to said bottom sub member.

**18**. The disconnect apparatus recited in claim **17** further comprising a means for obstructing said central bore of said support piston assembly and creating a desired pressure on said support piston assembly thereby releasing said collet from said collet engagement surface of said top sub member causing downward movement of said support piston assembly.

**19**. The disconnect apparatus recited in claim **18** wherein axial travel of said support piston assembly within said top sub member is limit by interfacing shoulder surfaces on said top sub member and said collet of said support piston assembly.

**20**. The disconnect apparatus recited in claim **19** further comprising interlocking splines between said top sub member and said bottom sub member.

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