

COMBINATION WELL CONTROL/STRING RELEASE TOOL

BACKGROUND OF THE DISCLOSURE

Field of the Disclosure

[0001] The present disclosure generally relates to apparatus and methods for releasing strings of tubular in a controlled manner in the event of critical emergency well control.

Description of the Related Art

[0002] In wellbore construction and completion operations, a wellbore is formed to access hydrocarbon-bearing formations (e.g., crude oil and/or natural gas) by the use of drilling. Drilling is accomplished by utilizing a drill bit that is mounted on the end of a drill string. To drill within the wellbore to a predetermined depth, the drill string is often rotated by a top drive or rotary table on a surface platform or rig, and/or by a downhole motor mounted towards the lower end of the drill string.

[0003] Deep water off-shore drilling operations are typically carried out by a mobile offshore drilling unit (MODU), such as a drill ship or a semi-submersible, having the drilling rig aboard and often make use of a marine riser extending between the wellhead of the well that is being drilled in a subsea formation and the MODU. The marine riser is a tubular string made up of a plurality of tubular sections that are connected in end-to-end relationship. The riser allows return of the drilling mud with drill cuttings from the hole that is being drilled. The marine riser is also adapted for being used as a guide means for lowering equipment (such as a drill string carrying a drill bit) into the hole.

[0004] After drilling to a predetermined depth, the drill string and drill bit are removed and a section of casing is lowered into the wellbore. An annulus is thus formed between the string of casing and the formation. The casing string is temporarily hung from the surface of the well. A cementing operation is then conducted in order to fill the annulus with cement. The casing string is cemented into the wellbore by circulating cement into the annulus defined between the outer wall of the casing and the borehole. The combination of cement and casing

strengthens the wellbore and facilitates the isolation of certain areas of the formation behind the casing for the production of hydrocarbons.

[0005] Hydrocarbon may enter the wellbore before casing is complete when the formation pressure is higher the pressure of the liquid column in the wellbore or when lowering the casing string causing the well pressure to increase and fractures sidewalls of the wellbore. Therefore, well control procedures may be performed during casing to prevent hydrocarbons from the formation from entering the wellbore or even escape to the surface through the wellbore. In the emergency event that the hydrocarbon cannot be controlled, the wellbore has to be closed out. To close out the wellbore, a blowout preventer shear ram positioned at the wellhead is usually used to cut the strings. However, blowout preventer shear rams cannot cut through casing strings. Traditionally, a string of drill pipes is used to lower the casing string below the blowout preventer shear ram before the well can be closed. For an off-shore drilling operation, thousands of feet of drill string has to be made up on deck to lower the casing string before the well can be closed. Making up the drill string may take considerable time and not efficient during emergency well control situations.

[0006] Therefore, there is a need for apparatus and methods for efficient emergency well control.

SUMMARY OF THE DISCLOSURE

[0007] The present disclosure generally relates a well control/string release tool for emergency well control and methods for emergency well control.

[0008] One embodiment provides a well control/string release tool including a release sub, a handling sub, and one or more load bearing elements selectively coupled between the release sub and the handling sub.

[0009] Another embodiment provides a method for operating a well including attaching a well control/string release tool to a workstring, and performing a well control procedure with through the well control/string release tool.

[0010] Another embodiment provides a drilling system includes a rig, and a well control/string release tool disposed on a floor of the rig. The well control/string release tool comprises a release sub, a handling sub, and one or more load bearing elements selectively coupled between the release sub and the handling sub.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] So that the manner in which the above recited features of the present disclosure can be understood in detail, a more particular description of the disclosure, briefly summarized above, may be had by reference to embodiments, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments of this disclosure and are therefore not to be considered limiting of its scope, for the disclosure may admit to other equally effective embodiments.

[0012] Figures 1A-1C illustrate a drilling system in a casing mode, according to one embodiment of this disclosure.

[0013] Figure 2A is a schematic sectional view of a well control/string release tool according to one embodiment of the present disclosure.

[0014] Figure 2B is a schematic sectional view of the well control/string release tool in well control mode.

[0015] Figure 2C is a schematic sectional view of the well control/string release tool in a string release mode.

[0016] Figure 3 is a schematic sectional view of a well control/string release tool having a drill pipe adaptor.

[0017] Figure 4 is a flow chart of a method for well control and string release according to one embodiment of the present disclosure.

[0018] Figures 5A-5B are schematic sectional views of a well control/string release tool according to another embodiment of the present disclosure.

[0019] Figures 6A-6B are schematic sectional views of a well control/string release tool according to another embodiment of the present disclosure.

[0020] Figures 7A-7C schematically illustrates a well control/string release tool according to another embodiment of the present disclosure.

[0021] Figures 8A-8C schematically illustrates a well control/string release tool according to another embodiment of the present disclosure.

[0022] Figures 9A-9B schematically illustrates a well control/string release tool according to another embodiment of the present disclosure.

DETAILED DESCRIPTION

[0023] The present disclosure generally relates to a well control/string release tool and methods using the tool. The well control/string release tool may be attached to a workstring while performing well control procedures. The well control/string release tool may be used to release the workstring attached thereto in a controlled manner in the event of critical emergency well control. A well control/string release tool includes a release sub, a handling sub, and one or more load bearing elements selectively coupled between the release sub and the handling sub.

[0024] Figures 1A-1C illustrate a drilling system 1 in a casing mode, according to one embodiment of this disclosure. The drilling system 1 may include a mobile offshore drilling unit (MODU) 1m, such as a semi-submersible, a drilling rig 1r, a fluid handling system 1h, a fluid transport system 1t, a pressure control assembly (PCA) 1p, and a workstring 9.

[0025] The MODU 1m may carry the drilling rig 1r and the fluid handling system 1h aboard and may include a moon pool, through which drilling operations are conducted. The semi-submersible MODU 1m may include a lower barge hull which floats below a surface (aka waterline) 2s of sea 2 and is, therefore, less subject to surface wave action. Stability columns (only one shown) may be mounted on the lower barge hull for supporting an upper hull above the waterline 2s. The upper hull may have one or more decks for carrying the drilling rig 1r and

fluid handling system 1h. The MODU 1m may further have a dynamic positioning system (DPS) (not shown) or be moored for maintaining the moon pool in position over a subsea wellhead 10.

[0026] Alternatively, the MODU may be a drill ship. Alternatively, a fixed offshore drilling unit or a non-mobile floating offshore drilling unit may be used instead of the MODU. Alternatively, the wellbore may be subsea having a wellhead located adjacent to the waterline and the drilling rig may be located on a platform adjacent the wellhead. Alternatively, the wellbore may be subterranean and the drilling rig located on a terrestrial pad.

[0027] The drilling rig 1r may include a derrick 3, a floor 4f, a rotary table 4t, a spider 4s, a top drive 5, and a hoist. The top drive 5 may include a motor for rotating the workstring 9. The top drive motor may be electric or hydraulic. A frame of the top drive 5 may be linked to a rail (not shown) of the derrick 3 for preventing rotation thereof during rotation of the workstring 9 and allowing for vertical movement of the top drive 5 with a traveling block 11t of the hoist. The top drive frame may be suspended from the traveling block 11t by a drill string compensator 8. The traveling block 11t may be supported by wire rope 11r connected at its upper end to a crown block 11c. The wire rope 11r may be woven through sheaves of the blocks 11c, and extend to drawworks 12 for reeling thereof, thereby raising or lowering the traveling block 11t relative to the derrick 3.

[0028] The drill string compensator may 8 may alleviate the effects of heave on the workstring 9 when suspended from the top drive 5. The drill string compensator 8 may be active, passive, or a combination system including both an active and passive compensator.

[0029] Alternatively, drill string compensator 8 may be disposed between the crown block 11c and the derrick 3. Alternatively, a Kelly and rotary table may be used instead of the top drive 5.

[0030] When the drilling system 1 is in a deployment mode, an upper end of the workstring 9 may be connected to the top drive quill, such as by threaded couplings. The workstring 9 may include an inner casing string 15. The inner

casing string 15 may include joints of casing 15j, a float collar 15c, and a guide shoe 15s. The inner casing components may be interconnected, such as by threaded couplings.

[0031] The fluid transport system 1t may include an upper marine riser package (UMRP) 16u, a marine riser 17, a booster line 18b, and a choke line 18k. The riser 17 may extend from the PCA 1p to the MODU 1m and may connect to the MODU 1m via the UMRP 16u. The UMRP 16u may include a diverter 19, a flex joint 20, a slip (aka telescopic) joint 21, and a tensioner 22. The slip joint 21 may include an outer barrel connected to an upper end of the riser 17, such as by a flanged connection, and an inner barrel connected to the flex joint 20, such as by a flanged connection. The outer barrel may also be connected to the tensioner 22, such as by a tensioner ring.

[0032] The flex joint 20 may also connect to the diverter 19, such as by a flanged connection. The diverter 19 may also be connected to the rig floor 4f, such as by a bracket. The slip joint 21 may be operable to extend and retract in response to heave of the MODU 1m relative to the riser 17 while the tensioner 22 may reel wire rope in response to the heave, thereby supporting the riser 17 from the MODU 1m while accommodating the heave. The riser 17 may have one or more buoyancy modules (not shown) disposed therealong to reduce load on the tensioner 22.

[0033] The PCA 1p may be connected to the wellhead 10 located adjacent to a floor 2f of the sea 2. A conductor string 23 may be driven into the seafloor 2f. The conductor string 23 may include a housing and joints of conductor pipe connected together, such as by threaded couplings. Once the conductor string 23 has been set, a subsea wellbore 24 may be drilled into the seafloor 2f and an outer casing string 25 may be deployed into the wellbore. The outer casing string 25 may include a wellhead housing and joints of casing connected together, such as by threaded couplings. The wellhead housing may land in the conductor housing during deployment of the casing string 25. The outer casing string 25 may be cemented 26 into the wellbore 24. The casing string 25 may extend to a depth adjacent a bottom of the upper formation 27u. The wellbore 24 may then

be extended into the lower formation 27b using a drill string (not shown).

[0034] The upper formation 27u may be non-productive and a lower formation 27b may be a hydrocarbon-bearing reservoir. Alternatively, the lower formation 27b may be non-productive (e.g., a depleted zone), environmentally sensitive, such as an aquifer, or unstable.

[0035] The PCA 1p may include a wellhead adapter 28b, one or more flow crosses 29u,m,b, one or more blow out preventers (BOPs) 30a,u,b, a lower marine riser package (LMRP) 16b, one or more accumulators, and a receiver 31. The LMRP 16b may include a control pod, a flex joint 32, and a connector 28u. The wellhead adapter 28b, flow crosses 29u,m,b, BOPs 30a,u,b, receiver 31, connector 28u, and flex joint 32, may each include a housing having a longitudinal bore therethrough and may each be connected, such as by flanges, such that a continuous bore is maintained therethrough. The flex joints 21, 32 may accommodate respective horizontal and/or rotational (aka pitch and roll) movement of the MODU 1m relative to the riser 17 and the riser relative to the PCA 1p.

[0036] Each of the connector 28u and wellhead adapter 28b may include one or more fasteners, such as dogs, for fastening the LMRP 16b to the BOPs 30a,u,b and the PCA 1p to an external profile of the wellhead housing, respectively. Each of the connector 28u and wellhead adapter 28b may further include a seal sleeve for engaging an internal profile of the respective receiver 31 and wellhead housing. Each of the connector 28u and wellhead adapter 28b may be in electric or hydraulic communication with the control pod and/or further include an electric or hydraulic actuator and an interface, such as a hot stab, so that a remotely operated subsea vehicle (ROV) (not shown) may operate the actuator for engaging the dogs with the external profile.

[0037] The LMRP 16b may receive a lower end of the riser 17 and connect the riser to the PCA 1p. The control pod may be in electric, hydraulic, and/or optical communication with a control console 33c onboard the MODU 1m via an umbilical 33u. The control pod may include one or more control valves (not shown) in

communication with the BOPs 30a,u,b for operation thereof. Each control valve may include an electric or hydraulic actuator in communication with the umbilical 33u. The umbilical 33u may include one or more hydraulic and/or electric control conduit/cables for the actuators. The accumulators may store pressurized hydraulic fluid for operating the BOPs 30a,u,b. Additionally, the accumulators may be used for operating one or more of the other components of the PCA 1p. The control pod may further include control valves for operating the other functions of the PCA 1p. The control console 33c may operate the PCA 1p via the umbilical 33u and the control pod.

[0038] A lower end of the booster line 18b may be connected to a branch of the flow cross 29u by a shutoff valve. A booster manifold may also connect to the booster line lower end and have a prong connected to a respective branch of each flow cross 29m,b. Shutoff valves may be disposed in respective prongs of the booster manifold. Alternatively, a separate kill line (not shown) may be connected to the branches of the flow crosses 29m,b instead of the booster manifold. An upper end of the booster line 18b may be connected to an outlet of a booster pump 44. A lower end of the choke line 18k may have prongs connected to respective second branches of the flow crosses 29m,b. Shutoff valves may be disposed in respective prongs of the choke line lower end. An upper end of the choke line 18k may be connected to an inlet of a mud gas separator (MGS) 46.

[0039] A pressure sensor may be connected to a second branch of the upper flow cross 29u. Pressure sensors may also be connected to the choke line prongs between respective shutoff valves and respective flow cross second branches. Each pressure sensor may be in data communication with the control pod. The lines 18b,k and umbilical 33u may extend between the MODU 1m and the PCA 1p by being fastened to brackets disposed along the riser 17. Each shutoff valve may be automated and have a hydraulic actuator (not shown) operable by the control pod.

[0040] Alternatively, the umbilical 33u may be extended between the MODU 1m and the PCA 1p independently of the riser 17. Alternatively, the shutoff valve actuators may be electrical or pneumatic.

[0041] The fluid handling system 1h may include one or more pumps, such as a cement pump (not shown) , a mud pump 34, and the booster pump 44, a reservoir, such as a tank 35, a solids separator, such as a shale shaker 36, one or more pressure gauges 37k,m,r, one or more stroke counters 38m, one or more flow lines, such as cement line 14, mud line 39, and return line 40, one or more shutoff valves 41k, a cement mixer (not shown), a well control (WC) choke 45, and the MGS 46. When the drilling system 1 is in a drilling mode (not shown), the tank 35 may be filled with drilling fluid, such as mud (not shown). In the deployment mode, the tank 35 may be filled with conditioner 43. In the cementing mode, the tank 35 may be filled with chaser fluid 47. A booster supply line may be connected to an outlet of the mud tank 35 and an inlet of the booster pump 44. The choke shutoff valve 41k, the choke pressure gauge 37k, and the WC choke 45 may be assembled as part of the upper portion of the choke line 18k.

[0042] A first end of the return line 40 may be connected to the diverter outlet and a second end of the return line may be connected to an inlet of the shaker 36. The returns pressure gauge 37r may be assembled as part of the return line 40. A lower end of the mud line 39 may be connected to an outlet of the mud pump 34 and an upper end of the mud line may be connected to the top drive inlet. The mud pressure gauge 37m may be assembled as part of the mud line 39. A lower end of a mud supply line may be connected to an outlet of the mud tank 35 and an upper end of the mud supply line may be connected to an inlet of the mud pump 34.

[0043] The float collar 15c may include a housing, a check valve, and a body. The body and check valve may be made from drillable materials. The body may have a bore formed therethrough and the torsional profile female portion formed in an upper end thereof for receiving a wiper plug during cementing. The check valve may include a seat, a poppet disposed within the seat, a seal disposed around the poppet and adapted to contact an inner surface of the seat to close the body bore, and a rib. The poppet may have a head portion and a stem portion. The rib may support a stem portion of the poppet. A spring may be disposed around the stem portion and may bias the poppet against the seat to facilitate sealing. The guide

shoe 15s may include a housing and a nose made from a drillable material. The nose may have a rounded distal end to guide the inner casing 15 down into the wellbore 24.

[0044] During deployment of the inner casing string 15 may be lowered by the traveling block 11t and a conditioner may be pumped into the workstring bore by the mud pump 34 via the mud line 39 and top drive 5. The conditioner may flow down the workstring bore and the liner string bore and be discharged by the guide shoe 15s into the annulus 48. The conditioner may flow up the annulus 48 and exit the wellbore 24 and flow into an annulus formed between the riser 17 and the workstring 9 via an annulus of the LMRP 16b, BOP stack, and wellhead 10. The conditioner 43 may exit the riser annulus and enter the return line 40 via an annulus of the UMRP 16u and the diverter 19. The conditioner may flow through the return line 40 and into the shale shaker inlet. The conditioner may be processed by the shale shaker 36 to remove any particulates therefrom.

[0045] The drilling system 1 may include a well control/string release tool 70 for performing well control and string release during well control situations. During normal operation, the well control/string release tool 70 may be disposed on the floor 4f. During well control, the well control/string release tool 70 may be installed on the top of the workstring 9, especially when a casing joint 15j on the workstring 9 is cross with the blowout preventers 30a. The well control/string release tool 70 allows conventional well control procedures to be performed while attached to the workstring 9. In case of emergency, the well control/string release tool 70 may be activated to release the workstring 9 from the rig 1r. The released workstring 9 can then fall under gravity so that all casing joints 15j fall below the blowout preventer 30a in a matter of seconds. The blowout preventer 30a can then close out the wellbore.

[0046] Figure 2A is a schematic sectional view of the well control/string release tool 70. The well control/string release tool 70 may include a handling sub 202 and a release sub 204 coupled to the handling sub 202. The release sub 204 may be selectively released from the handling sub 202.

[0047] The handling sub 202 may include a landing sleeve 206 encasing a release sleeve 208. The release sleeve 208 may be coupled to the landing sleeve 206 by one or more pins 214. The one or more pins 214 may be inserted through openings through the landing sleeve 206 to a groove 212 formed on an outer surface of the release sleeve 208. The groove 212 allows the release sleeve 208 to slide relative to the landing sleeve 206. The handling sub 202 further includes a lock collar 218. The lock collar 218 may be inserted between the landing sleeve 206 and the release sleeve 208 to prevent the release sleeve 208 from sliding long the landing sleeve 206, thus, lock the release sleeve 208 in position. The lock collar 218 may include two or more sections.

[0048] A tubular connector 216 may be coupled to the release sleeve 208. The tubular connector 216 allows the handling sub 202 to interface with a tool on the rig, such as a casing running tool, a drill pipe running tool, a power swivel, or the like. In Figure 2A, the tubular connector 216 is designed to interface with a casing running tool. The tubular connector 216 may be coupled to the release sleeve 208 by a fast lock or an ACME connector.

[0049] The release sub 204 may include a tool joint 220 for connecting with a workstring, such as a casing string, a drill pipe string, or other strings. In Figure 2A, the tool joint 220 is connected to a casing joint 15j by a casing coupling 222. Other adaptors may be used to connect the tool joint 220 to other strings. The release sub 204 has a tubular section 224 extending from the tool joint 220. The tubular section 224 may be disposed inside the release sleeve 206 and selectively attached to the handling tool 202 by a weight bearing structure. In one embodiment, the weight bearing structure includes a plurality of load bearings 228 selectively disposed in grooves 226 formed on an outer surface of the tubular section 224 and through holes 230 formed through the release sleeve 208. A plurality of grooves 232 are formed in an inner surface of the landing sleeve 206 for receiving the plurality of load bearings 228 during tool release.

[0050] In one embodiment, a drill pipe connection 234 may extend from the tubular section 224. The tubular section 224 and the drill pipe connection 234 may form an inner volume 238 to allow fluid communication with an inner volume

9i of the workstring 9 during well control. An optional Kelly valve 236 may be attached to the drill pipe connection 234 to selectively close the inner volume 238.

[0051] In one embodiment, an anti-rotation component 240 may be disposed between the landing sleeve 206 of the handling sub 202 and the tool joint 220 of the release sub 204 to prevent the release sub 204 from rotating relative to the handling sub 202. The anti-rotation component 240 allows torque transfer from the handling sub 202 to the workstring 9 through the release sub 204. In one embodiment, the anti-rotation component 240 may be a plurality of pins.

[0052] Figure 2A schematically illustrates the well control/string release tool 70 being connected the workstring 9. The workstring 9 is set on the spider 4s so that the well control/string release tool 70 can be attached to the workstring 9. In Figure 2A, the well control/string release tool 70 is set in a well control mode. In the well control mode, the plurality of load bearings 228 occupy the grooves 226 of the tubular section 224 and the through holes 230 of the release sleeve 208 to join the handling sub 202 to the release sub 204 and the lock collar 218 is inserted between the handling sub 202 and the release sub 204 to prevent unintentional detachment.

[0053] During drilling operation, such as casing run-in, the well control/string release tool 70 may be disposed on the rig floor 4f. In case of emergency, the well control/string release tool 70 may be attached to the workstring 9 while the workstring 9 is set on the spider 4s as shown in Figure 2A. Well control procedures may be performed with the well control/string release tool 70 attached to the workstring 9.

[0054] Figure 2B is a schematic sectional view of the well control/string release tool 70 during well control procedures. The well control/string release tool 70 along with the workstring 9 is supported by a casing running tool 242. Depending on the procedure and conditions, other tools, for example drill pipe running tools, may be used to support the well control/string release tool 70 during well control procedure. The well control/string release tool 70 may be supported by internal slips 244 extending from the casing running tool 242. Alternatively, other support

structures, such as external slips, elevators, power swivels, may be used to support the well control/string release tool 70.

[0055] A nuzzle 248 may be extended into the well control/string release tool 70. The nuzzle 248 may be used to circulate fluid during well control procedures. A sealing element 246 may be disposed inside the handling sub 202 to prevent any fluid leaking from the well control/string release tool 70 during well control procedures.

[0056] In the well control position shown in Figure 2B, the plurality of load bearings 228 occupy the combined space of the grooves 226 in the tubular body 224 and the through holes 230 in the release sleeve 208, thus preventing the tubular body 224 and the workstring 9 from slipping away from the release sleeve 208. The release sleeve 208 is connected to the tubular connector 216 which may be suspended from the casing running tool 242.

[0057] In the event that the well control procedures fails to control the well pressure and closing the well is necessary, the well control/string release tool 70 may be activated to release the workstring 9 from the casing running tool 242, or whatever tool that is supporting the workstring 9. Figure 2C is a schematic sectional view of the well control/string release tool 70 during string release. To activate the well control/string release tool 70, the landing sleeve 206 is first set on the spiders 4s and the lock collar 218 may then be removed from the well control/string release tool 70 to enable sliding motion between the landing sleeve 208 and the release sleeve 206. The casing running tool 242 may be used to support the weight of the workstring 9 so that the lock collar 218 is free from the weight of the workstring 9 and may be removed from the gap between the landing sleeve 206 and the release sleeve 208. The lock collar 218 may be removed manually or by hydraulic force.

[0058] Once the lock collar 218 is removed, the tubular connector 216 and the release sleeve 208 may be lowered relative to the landing sleeve 206. In one embodiment, lowering the release sleeve 208 may be performed by lowering the casing running tool 242. Because the landing sleeve 206 is secured in place by

the spider 4s, the release sleeve 208 slides relative to the landing sleeve 206 as the release sleeve 208 is being lowered. During sliding, the through holes 230 in the release sleeve 208 come to align with the corresponding grooves 232 in the landing sleeve 206. Under the weight of the workstring 9, the plurality of load bearings 228 may be pushed radially outward into the grooves 232 and out of the grooves 226 in the tubular body 224. When the plurality of load bearings 228 are out of the tubular body 224, the tubular body 224 and the workstring 9 may fall down the wellbore under gravity. The handling sub 202, which includes the landing sleeve 206, the release sleeve 208, and the tubular connector 216, remains on the deck while the release sub 204 falls downhole with the workstring 9. The workstring 9 may fall under blow out preventers, such as the BOP 30a,u,b, in a matter of seconds, and the wellbore can be closed out by the blow out preventers immediately.

[0059] Figure 3 is a schematic sectional view of a well control/string release tool 70a according to another embodiment of the present disclosure. The well control/string release tool 70a is similar to the well control/string release tool 700 except that the well control/string release tool 70a includes a drillpipe adaptor 316. The drill pipe adaptor 316 may be coupled to the release sleeve 208 by a fast lock or an ACME connector. The drill pipe adaptor 316 may include a lower end 302 configured to couple with the release sleeve 208 and an upper end 304 configured to couple with a handling tool, such as a drilling tool. A well control/string release tool according to the present disclosure may switch between the drillpipe adaptor 316 and the tubular connector 216 of Figures 2A-2C according to the need of pressure and/or power during a well control procedure.

[0060] Figure 4 is a flow chart of a method 400 according to one embodiment of the present disclosure. The method 400 relates to well control and/or string release operation on an offshore drilling system. In one embodiment, the method 400 may be used to perform well control during casing running. The method 400 may be performed in an offshore drilling system, such as the drilling system 1 of Figures 1A-1C.

[0061] Box 410 of the method 400 includes monitoring well conditions during

operation, such as running casing with a casing running tool. Box 410 may be performed using any suitable methods with suitable tools. During casing running, well conditions may be monitored and a trigger signal may be sent when well control may be desired. For example, a trigger signal may be sent when a surge of pressure in the wellbore is detected while running casing.

[0062] In Box 420, upon detecting a trigger signal or a well control condition, such as a kick in well pressure, a well control/string release tool, such as the well control/string release tool 70, 70a, may be attached to the workstring, for example a casing string. The well control/string release tool may be attached to the workstring by first setting the workstring on spider slips on the rig floor, and then attaching the well control/string release tool to the workstring with a tool on the drilling system, such as a casing running tool or a drilling tool.

[0063] In Box 430, well control procedures may be performed through the well control/string release tool. During well control, suitable well-control procedures may be performed to retain the hydrocarbon in the production zone and to prevent fractures on the walls of the wellbore. For example, various methods may be performed to control the pressure at the bottom of the wellbore so that the pressure at the bottom of the wellbore is slightly greater than the formation pressures. Fluids may be supplied through the well control/string release tool during well control procedures. Well conditions, such as wellbore pressure, are constantly monitored while well control procedures are performed.

[0064] In one embodiment, one or more components of the well control/string release tool or the well control/string release tool to allow switching of tools during well control. For example, a casing running tool may be used at an early stage of well control. When the well pressure exceeds the operation range of the casing running tool, other tools, such as a drilling tool, may be used to continue the well control procedure. In one embodiment, a component, such as the tubular connector 216, may be replaced by another component, such as the drillpipe connector 316, to allow the well control procedure switching from a casing running tool to a drilling tool. Alternatively, the entire well control/string release tool, such as the well control/string release tool 70, may be replaced by another well

control/string release tool, such as the well control/string release tool 70a. In Box 430, the well conditions may be constantly monitored to determine whether there is a critical emergency well control situation or/whether the well control procedures are successful.

[0065] If there is a critical emergency well control situation that calls for shutting in the well, the well control/string release tool may be activated to drop the casing string in a controlled manner as shown in Box 440. As described with Figure 2C, the casing string may be released by first setting the handling sub of the well control/string release tool on the spider, then removing the lock mechanism, such as the lock collar 218, and releasing the casing string by lowering the casing running tool, drilling tool, or any other tool that supports the casing string during well control. After releasing, the casing string will fall below the blow out preventers in a matter of seconds. Once the casing string falls below the blow out preventers, the well can be shut in by closing the blow out preventers.

[0066] If the well control procedures in Box 430 succeed, the well conditions recover to allow normal operations, the well control/string release tool may be removed from the workstring in Box 450.

[0067] Even though, the method 400 relates to using the well control/string release tool of the present disclosure while running casing, the methods according to present disclosure may be used in any suitable processes during which releasing a workstring in a controlled manner may be desired.

[0068] Figures 5A-5B are schematic sectional views of a well control/string release tool 500 according to another embodiment of the present disclosure. The well control/string release tool 500 may be used in the method 400 for well control and string release. Figure 5A illustrates the well control/string release tool 500 assembled in a well control position and Figure 5B illustrates the well control/string release tool 500 in a string release position. The well control/string release tool 500 may include a handling sub 502 and a release sub 504. The release sub 504 may be selectively released from the handling sub 502 at the string release position.

[0069] The handling sub 502 may include a landing sleeve 506 and a release sleeve 508. The landing sleeve 506 may have an inner tubular 516 and an outer tubular 517. The inner tubular 516 may be handled by a tool on the rig, such as a casing running tool, a drill pipe running tool, a power swivel, or the like. An annular volume 507 is formed between the inner tubular 516 and the outer tubular 517. The release sleeve 508 is disposed in the annular volume 507. A groove 512 may be formed on an outer wall of the upper tubular 516. A dog 514 may be inserted into the groove 512 through the release sleeve 508 to prevent the release sleeve 508 from moving relative to the inner tubular 516. A lock sleeve 518 may be used to activate or release the dog 514. The lock sleeve 518 has a lock inner diameter 518a and a release inner diameter 518b. The lock sleeve 518 may slide along the release sleeve 508 so that the dog 514 is selectively biased towards the inner tubular 512 by either the lock inner diameter 518a or the release inner diameter 518b. A plurality of holes 532 may be formed through the inner tubular 516 near a lower end of the annular volume 507. The plurality of holes 532 open to the annular volume 507. A plurality of load bearing balls 528 may be movably disposed in the plurality of holes 532 to support or release the release sub 504.

[0070] The release sub 504 may include a tool joint 520 for connecting with a workstring, such as a casing string, a drill pipe string, or other strings. The release sub 504 has a tubular section 524 extending from the tool joint 520. The tubular section 524 may be disposed inside an inner diameter 515 of the inner tubular 516 and selectively attached to the handling tool 502 by a weight bearing structure. In one embodiment, the weight bearing structure includes a groove 526 formed on an outer surface of the tubular section 524. The plurality of load bearing balls 528 may partially protrude from the inner tubular 516 and occupy the groove 526 to prevent the tubular section 524 from moving vertically relative to the inner tubular 516, thus, hanging the release sub 504 onto the handling sub 502. The release sleeve 508 may be lowered into the annular volume 507 to insert a portion of each load bearing ball 528 into the groove 526. The release sleeve 508 may be moved up to allow the plurality of load bearing balls 528 to return into the annular volume 507 to release the release sub 504. In one embodiment, the release sleeve 508 may have a curved surface 530 for

contacting the load bearing balls 528.

[0071] In one embodiment, a drill pipe connection 534 may extend from the tubular section 524. The tubular section 524 and the drill pipe connection 534 may form an inner volume of the tubular section 524 to allow fluid communication with an inner volume of the workstring during well control.

[0072] In one embodiment, the release sub 504 may include a torque transmission feature 540 to allow torque transmission between the handling sub 502 and the release sub 504. In one embodiment, the tubular section 524 may have one or more drain ports 544 formed therethrough. The drain ports 544 may be through holes in the tubular section 524. The drain ports 544 fluidly connect the inner volume the workstring to an exterior volume. During string release, if the workstring is full of fluid, the drain ports 544 allow fluid in the workstring to flow out and enable string dropping. In one embodiment, seal stacks 542 may be positioned above and below the drain ports 544 between the lease sub 504 and the handling sub 502. The seal stacks 542 prevent fluid from leaking out from the inner volume of the release sub 502 during well control.

[0073] The well control/string release tool 500 may be set in the well control position shown in Figure 5A while being attached to the workstring, during well control, and while being removed from the workstring. In the well control position, the lock sleeve 518 is pulled down to push and insert the dog 514 in the groove 512. The dog 514 locks the release sleeve 508 in the lowered position. At the lowered position, the release sleeve 508 pushes the load bearing balls 528 against the groove 526 on the release sub 502. Each load bearing ball 528 is partially in the release sub 504 and partially in the handling sub 502. The load bearing balls 528 prevent the release sub 504 and the handling sub 502 from relative motion along the vertical direction.

[0074] To release the workstring attached to the release sub 504, the handling sub 502 may be first secured to the rig while the well control/string release tool 500 is in the well control position. For example spider slips on the rig may be used to secure the handling sub 502 around the landing sleeve 506. Then the lock sleeve

518 may be moved to the release position shown in Figure 5B. The lock sleeve 518 may be pulled up or otherwise moved so that the lock inner diameter 518a is no longer pushing against the dog 514 allowing the dog 514 to pop out the groove 512. The release sleeve 508 may move relative to the inner tubular 516. Without the release sleeve 508 fixed in the annular volume 507, the load bearing balls 528 move radially outward into the annular volume 507 under the weight of the release sub 504 and the workstring attached to the release sub 504. With the load bearing balls 528 out of the groove 526, the release sub 502 along with the workstring attached thereto may fall under gravity and become released from the rig.

[0075] Figures 6A-6B are schematic sectional views of a well control/string release tool 600 according to another embodiment of the present disclosure. The well control/string release tool 600 may be used in the method 400 for well control and string release. Figure 6A illustrates the well control/string release tool 600 in assembled in a well control position and Figure 6B illustrates the well control/string release tool 600 in a string release position. The well control/string release tool 600 may include a handling sub 602 and a release sub 604. The release sub 604 may be selectively released from the handling sub 602 at the string release position.

[0076] The handling sub 602 may include a landing sleeve 606 and a release sleeve 608. The release sleeve 608 may be movably disposed inside the landing sleeve 606. On or more dogs 614 may be inserted through the landing sleeve 606 into a groove 612 formed on an outer diameter of the release sleeve 608 to prevent the release sleeve 608 from moving relative to the landing sleeve 606. A lock sleeve 618 may be used to activate or release the one or more dogs 614. The lock sleeve 618 has a lock inner diameter 618a and a release inner diameter 618b. The lock sleeve 618 may slide along the landing sleeve 606 so that the dogs 614 is selectively biased towards the release sleeve 608 by either the lock inner diameter 618a or the release inner diameter 618b.

[0077] One or more recesses 630 may be formed in an inner diameter of the landing sleeve 606. The one or more recesses 630 are configured to receive one

or more load carrying dogs 628. The load carrying dogs 628 are configured to support the weight of the release sub 604 and the workstring attached to the release sub 604. Each dog 628 has a slanted surface 631 for interacting with a slanted bottom surface 632 on the release sleeve 608. When the release sleeve 608 moves down relative to the landing sleeve 606, the slanted bottom surface 632 of the release sleeve 608 pushes the dogs 628 radially outward into the recesses 630.

[0078] The release sub 604 may include a tool joint 620 for connecting with a workstring, such as a casing string, a drill pipe string, or other strings. The release sub 604 has a tubular section 624 extending from the tool joint 620. The tubular section 624 may be disposed inside an inner diameter 615 of the release sleeve 608 and selectively attached to the handling tool 602 by a weight bearing structure. In one embodiment, the weight bearing structure includes a groove 626 formed on an outer surface of the tubular section 624. The one or more dogs 628 may partially enter into the groove 626 to prevent the tubular section 624 from moving vertically relative to the landing sleeve 606, thus, hanging the release sub 604 from the handling sub 602. The release sleeve 608 may move up to allow a portion of each dog 628 into the groove 626. The release sleeve 608 may move down to push the dogs 628 into the recesses 630 to release the release sub 504.

[0079] In one embodiment, a drill pipe connection 634 may extend from the tubular section 624. The tubular section 624 and the drill pipe connection 634 may form an inner volume of the tubular section 624 to allow fluid communication with an inner volume of the workstring during well control. In one embodiment, the release sub 604 may include a torque transmission feature 640 to allow torque transmission between the handling sub 602 and the release sub 604. In one embodiment, the tubular section 624 may have one or more drain ports 644 formed therethrough. The drain ports 644 may be through holes in the tubular section 624. The drain ports 644 fluidly connect the inner volume of the workstring to an exterior volume. During string release, if the workstring is full of fluid, the drain ports 644 allow fluid in the workstring to flow out and enable string dropping. In one embodiment, seal stacks 642 may be positioned above and below the drain

ports 644 between the lease sub 604 and the handling sub 602. The seal stacks 642 prevent fluid from leaking out from the inner volume of the release sub 602 during well control.

[0080] The well control/string release tool 600 may be in the well control position shown in Figure 6A while being attached to the workstring, during well control, and while being removed from the workstring. In the well control position, the lock sleeve 618 is pulled down to push and insert the dogs 614 in the groove 612. The dogs 614 lock the release sleeve 608 in an upper position. At the upper position, the release sleeve 608 allows the load carrying dogs 628 to be biased towards the groove 626 on the release sub 602. Each load bearing dog 628 is partially in the release sub 604 and partially in the handling sub 602. At this position, the load bearing dogs 628 prevent the release sub 604 and the handling sub 602 from relative motion along the vertical direction.

[0081] To release the workstring attached to the release sub 604, the handling sub 602 may be first secured to the rig while the well control/string release tool 600 is in the well control position. For example spiders on the rig may be used to secure the handling sub 602 around the landing sleeve 606. Then the lock sleeve 618 may be moved to the release position shown in Figure 6B. The lock sleeve 618 may be pulled up or otherwise moved so that the lock inner diameter 618a is no longer pushing against the dogs 614 allowing the dogs 614 to pop out the groove 612. The release sleeve 608 may move relative to the landing sleeve 606. The release sleeve 608 may be moved down relative to the landing sleeve 606 to push the load bearing dogs 628 outward into the recesses 630. In one embodiment, the release sleeve 608 may be moved down by applying a downward force to the release sleeve 608. For example, an upper tubular 609 of the release sleeve 608 may be coupled to a top drive which may move the release sleeve 608 downward. With the load bearing dogs 628 out of the groove 626, the release sub 602 along with the workstring attached thereto may fall under gravity and become released from the rig.

[0082] Figures 7A-7C schematically illustrates a well control/string release tool 700 according to another embodiment of the present disclosure. The well

control/string release tool 700 may be used in the method 400 for well control and string release. Figure 7A illustrates the well control/string release tool 700 in assembled in a well control position. Figures 7B-7C illustrate a sequence of tool releasing using the well control/string release tool 700. The well control/string release tool 700 is similar to the well control/string release tool 600 except that the well control/string release tool 700 has a two stage release sleeve 708 in place of the release sleeve 608. The two stage release sleeve 708 moves the load bearing dogs 628 from the release sub 604 in two steps, thus, further prevent accidental release of the workstring attached to release sub 604.

[0083] The two stage release sleeve 708 includes an inner sleeve 752 and an outer sleeve 754. The inner sleeve 752 has a slanted bottom surface 756 for interacting with the load bearing dogs 628. The outer sleeve 754 has a slanted bottom surface 758 for interacting with the load bearing dogs 628. When assembled, as shown in Figure 7A, the inner sleeve 752 and the outer sleeve 754 are joined together by a releasable connector 750. When the inner sleeve 752 and the outer sleeve 754 are joined together, the slanted bottom surfaces 756, 758 are at the different levels so that only one of the slanted bottom surfaces 756, 758 contacts the load bearing dogs 628. In the embodiment shown in Figure 7A, the outer sleeve 754 has a groove 760 for receiving the dogs 614 which lock the two stage release sleeve 708 to the landing sleeve 606. The outer sleeve 754 also has a groove 762 for receiving the releasable connection 750. In one embodiment, a groove 764 may be formed on an outer diameter of the tubular section 624. The groove 764 may be positioned to release the releasable connection 750.

[0084] The well control/string release tool 700 may be in the well control position shown in Figure 7A while being attached to the workstring, during well control and while being removed from the workstring. In the well control position, the lock sleeve 618 is pulled down to push and insert the dogs 614 in the groove 760 on the outer sleeve 754. The dogs 614 lock the two stage release sleeve 708 in an upper position where the slanted bottom surface 756 of the inner sleeve 752 contacts the load bearing dogs 628. The slanted bottom surface 758 of the outer

sleeve 754 does not contact the load bearing dog 628. At the upper position, the two stage release sleeve 708 allows the load carrying dogs 628 to be biased towards the groove 626 on the release sub 604. Each load bearing dog 628 is partially in the release sub 604 and partially in the handling sub 602. At this position, the load bearing dogs 628 prevent the release sub 604 and the handling sub 602 from relative motion along the vertical direction.

[0085] To release the workstring attached to the release sub 604, the handling sub 602 may be first secured to the rig while the well control/string release tool 700 is in the well control position. For example a spider on the rig may be used to secure the handling sub 702 around the landing sleeve 606. Then the lock sleeve 618 may be moved to the release position as shown in Figure 7B. The lock sleeve 618 may be pulled up or otherwise moved so that the lock inner diameter 618a is no longer pushing against the dogs 614 allowing the dogs 614 to pop out the groove 760. The inner sleeve 752 and the outer sleeve 754 of the two stage release sleeve 708 may move together relative to the landing sleeve 606.

[0086] After the lock sleeve 618 is released, the inner sleeve 752 and the outer sleeve 754 may be moved down together relative to the landing sleeve 606 to push the load bearing dogs 628 radially outward into the recesses 630. The releasable connection 750 ensures that the inner sleeve 752 and the outer sleeve 754 stay together. In one embodiment, the two stage release sleeve 708 may be moved down by applying a downward force to the two stage release sleeve 708. At this stage, the slanted bottom surface 756 of the inner sleeve 752 contacts and pushes the load bearing dogs 628. However, the joint motion of the inner sleeve 752 and the outer sleeve 754 may be stopped while the load bearing dogs 628 are still inserted in the release sub 604 as shown in Figure 7B. In one embodiment, the joined motion may be stopped by the releasable connection 750 when the releasable connection 750 springs into the groove 764 and couples the inner sleeve 752 to the release sub 604. Alternatively, the joined motion may be stopped because the slanted bottom surface 756 reaches the end of the slanted surface 631 of the load bearing dogs 628. In the position shown in Figure 7B, the load bearing dogs 628 are partially removed from the release sub 604.

[0087] When the releasable connection 750 springs into the groove 764, the outer sleeve 754 becomes movable relative to the inner sleeve 752. The outer sleeve 754 may be moved by itself further down so that the slanted bottom surface 758 reaches the slanted surface 631 and pushes the load bearing dogs 628 radially outward. The outer sleeve 754 may be moved down using a tool on the rig. As shown in Figure 7C, the downward movement of the outer sleeve 754 may push the load bearing dogs 628 completely out of the release sub 604 to release the workstring attached to thereon.

[0088] Figures 8A-8D schematically illustrates a well control/string release tool according to another embodiment of the present disclosure. The well control/string release tool 800 may be used in the method 400 for well control and string release. Figure 8A illustrates the well control/string release tool 800 in assembled in a well control position. Figures 8B-8D illustrate a sequence of tool releasing using the well control/string release tool 800.

[0089] The well control/string release tool 800 may include a handling sub 802 and a release sub 804. The release sub 804 may be selectively released from the handling sub 802 at the string release position. The handling sub 802 may include a landing sleeve 806 and a release sleeve 808. The release sleeve 808 may be movably disposed inside the landing sleeve 806. The release sleeve 808 has one or more through holes 807. Each through hole 807 has a slanted bottom 832. The slanted bottom 832 is higher at the inner diameter and lower at the outer diameter.

[0090] One or more dogs 814 may be inserted through the landing sleeve 806 into a groove 812 formed on an outer diameter of the release sleeve 808 to prevent the release sleeve 808 from moving relative to the landing sleeve 806. A lock sleeve 818 may be used to activate or release the one or more dogs 814. The lock sleeve 818 may slide along the landing sleeve 806 so that the dogs 814 are selectively activate or release the one or more dogs 814.

[0091] One or more recesses 830 may be formed in an inner diameter of the landing sleeve 806. Each recess 830 has a slanted bottom 829. The slanted

bottom 829 is higher at the inner diameter and lower towards the outer diameter. The one or more recesses 830 are configured to receive one or more load carrying dogs 828. The load carrying dogs 828 are configured to support the weight of the release sub 804 and the workstring attached to the release sub 804. Each load carrying dog 828 may have a slanted lower surface 831 for interacting with the slanted bottom 832 on the release sleeve 808. Each load bearing dog 828 may have a flat upper surface 823 for load bearing. When the release sleeve 808 moves up relative to the landing sleeve 806, the slanted bottom 832 on the release sleeve 808 pushes the dogs 828 radially outward into the recesses 830.

[0092] The release sub 804 may include a tool joint 820 for connecting with a workstring, such as a casing string, a drill pipe string, or other strings. The release sub 804 has a tubular section 824 extending from the tool joint 820. The tubular section 824 may be disposed inside the inner diameter of the release sleeve 808 and selectively attached to the handling tool 802 by a weight bearing structure. In one embodiment, the weight bearing structure includes a groove 826 formed on an outer surface of the tubular section 824. The groove 826 may have a flat upper surface 827 and a slanted lower surface 825. The slanted lower surface 825 is lower at the outer diameter and higher towards the center axis. The slanted bottom 832, the slanted bottom 829, the slanted lower surface 825, and the slanted lower surface 831 may have the same angle so that the load bearing dogs 828 may move from the groove 826 to the recess 830 by the release sleeve 808. The one or more dogs 828 may partially enter into the groove 826 to prevent the tubular section 824 from moving vertically relative to the landing sleeve 806, thus, hanging the release sub 804 onto the handling sub 802. The release sleeve 808 may move down to push the dogs 828 into the recesses 830 to release the release sub 804.

[0093] The well control/string release tool 800 may be in the well control position shown in Figure 8A while being attached to the workstring, during well control and while being removed from the workstring. In the well control position, the lock sleeve 818 is pulled down to push and insert the dogs 814 in the groove 812. The dogs 814 lock the release sleeve 808 in a lower position. At the lower position,

the release sleeve 808 allows the load carrying dogs 828 to be biased towards the groove 826 on the release sub 804 so that each load bearing dog 828 is partially in the release sub 804 and partially in the handling sub 802. At this position, the load bearing dogs 828 prevent the release sub 804 and the handling sub 802 from relative motion along the vertical direction.

[0094] To release the workstring attached to the release sub 804, the handling sub 802 may be first secured to the rig while the well control/string release tool 800 is in the well control position. For example spider slips on the rig may be used to secure the handling sub 802 around the landing sleeve 806. Then the lock sleeve 818 may be moved to the release position shown in Figure 8B.

[0095] The release sleeve 808 may move up relative to the landing sleeve 806 as shown in Figure 8C. As the release sleeve 808 moves up relative to the landing sleeve 806, the slanted bottom 832 on the release sleeve 808 pushes against the bottom surface 831 of the load bearing dogs 828 causing the load bearing dogs 828 to move outward into the recesses 830 in the landing sleeve 806. In one embodiment, the release sleeve 808 may be moved up using a tool on the rig. As shown in Figure 8C, the release sleeve 808 may move the load bearing dogs 828 completely out of the groove 826, thus, releasing the release sub 804 along with the workstring attached thereto may fall under gravity and become released from the rig.

[0096] Figures 9A-9B schematically illustrates a well control/string release tool 900 according to another embodiment of the present disclosure. The well control/string release tool 900 may be used in the method 400 for well control and string release. Figure 9A is a schematic sectional side view of the well control/string release tool 900 in assembled in a well control position. Figure 9B is schematic sectional view of the well control/string release tool 900.

[0097] The well control/string release tool 900 may include a handling sub 902 and a release sub 904. The release sub 904 may be selectively released from the handling sub 902 at the string release position. The handling sub 902 may include a landing sleeve 906 and a release sleeve 908. The release sleeve 908

may be configured to connect with a top drive unit on the rig. The release sub 904 may be connected to a workstring by an adaptor (not shown).

[0098] The release sub 904 may be a mandrel having torque keys 912 formed in an outer diameter 942. Key ways 913 matching the torque keys 912 may be formed in an inner surface 962 of the landing sleeve 906. The release sub 904 and the landing sleeve 906 are coupled together by the torque keys 912 and the key ways 913. One or more seal 914 may be disposed between the release sub 904 and the landing sleeve 906. The release sub 904 may have a threaded portion 910 formed on an inner surface 944. A threaded portion 911 may be formed on an outer surface 982 of the release sleeve 908. Threads in the threaded portion 911 match threads in the threaded portion 912. The release sub 904 may be coupled to the release sleeve 908 by the threaded portions 912 and 911. In one embodiment, the thread portions 912, 911 may be connected by left hand threads, where turning clockwise breaks the connection and turning counter clockwise makes the connection. One or more seal 916 may be disposed between the release sub 904 and the release sleeve 908.

[0099] During operation, the well control/release tool 900 may be attached to a workstring by connecting the release sub 904 to the top of a workstring. The release sleeve 908 of the well control/release tool 900 may be connected to a top drive on the rig to perform well control operations. During well control operations, the threaded portions 912, 911 bear tension loads and a portion of torsional loads. The key way 913 and the torque keys 912 bear a portion of torsional loads.

[0100] To release the workstring attached to the release sub 904, the handling sub 902 may be first secured to the rig while the well control/string release tool 900 is in the well control position. For example spider slips on the rig may be used to secure the handling sub 902 around the landing sleeve 906. Then the threaded connection between the release sleeve 908 and the release sub 904 may be broken up to release the workstring. For example, the release sleeve 908 may be rotated clockwise to break up the connection between the release sub 904 and the release sleeve 908.

[0101] Embodiments of the present disclosure provide a tool comprising a release sub configured to connect with an upper end of a workstring, a handling sub configured to connect with a tubular handling tool disposed above a wellbore, and one or more load bearing elements selectively coupled between the release sub and the handling sub.

[0102] In one or more embodiment, the release sub comprises a tubular section having a groove on an outer surface, and the groove is configured to receive a portion of each of the one or more load bearing elements.

[0103] In one or more embodiment, the handling sub comprises a landing sleeve, and a release sleeve coupled to the landing sleeve, wherein the release sleeve is positioned to allow the one or more load bearing elements out of the groove of the tubular section.

[0104] In one or more embodiment, the handling sub comprises a landing sleeve, and a release sleeve coupled to the landing sleeve, wherein the release sleeve is positioned to move the one or more load bearing elements out of the groove of the tubular section.

[0105] In one or more embodiment, the handling sub further comprises a lock to selectively secure the landing sleeve to the release sleeve.

[0106] In one or more embodiment, the release sub further comprises a torque transmission component.

[0107] In one or more embodiment, the handling sub further comprises a tubular connector adapted to interact with a tool.

[0108] In one or more embodiment, the tubular section includes one or more drain ports.

[0109] In one or more embodiment, the release sleeve comprises an inner sleeve, an outer sleeve, and a releasable connection coupled to the inner sleeve and the outer sleeve.

[0110] In one or more embodiment, the tool further comprises a Kelly valve coupled to the tubular section.

[0111] In one or more embodiment, the one or more load bearing elements comprise one or more load bearing dogs.

[0112] In one or more embodiment, the load bearing elements comprising a thread portion.

[0113] Embodiments of the present disclosure provide a method for operating a well. The method comprises attaching a well control/string release tool to a workstring, wherein the well control/release tool comprises a release sub, a handling sub, and one or more load bearing elements selectively coupled between the release sub and the handling sub, and performing a well control procedure through the well control/string release tool.

[0114] In one or more embodiment, the workstring is a casing string.

[0115] In one or more embodiment, attaching the well control/string release tool comprises attaching an upper end of the workstring to the release sub.

[0116] In one or more embodiment, the method further comprises monitoring well condition while performing the well control procedure.

[0117] In one or more embodiment, the method further comprises activating the well control/string release tool to release the workstring upon detecting an emergency condition.

[0118] In one or more embodiment, the method further comprises removing the well control/string release tool upon detecting a normal operational condition.

[0119] In one or more embodiment, activating the well control/string release tool comprises securing the handling sub by spider slips, and moving the one or more load bearing elements out of the release sub.

[0120] In one or more embodiment, performing a well control procedure comprises controlling a well pressure using a casing running tool.

[0121] In one or more embodiment, the handling sub comprises a landing sleeve, and a release sleeve coupled to the landing sleeve, wherein the release sleeve is positioned to allow the one or more load bearing elements out of the groove of the tubular section.

[0122] In one or more embodiment, performing a well control procedure further comprises connecting a drill pipe adaptor to the well control/string release tool, and controlling the well pressure using a drilling tool.

[0123] In one or more embodiment, activating the well control/string release tool further comprises releasing a releasable connection attached between a releasing sleeve and a handling sleeve of the handling sub, and moving the release sleeve relative to the handling sleeve.

[0124] In one or more embodiment, moving the one or more load bearing elements out of the release sub comprises moving the release sleeve with a tubular handling tool disposed above a wellbore.

[0125] Embodiment of the present disclosure provides a method for operating a well, comprising attaching a well control/string release tool to a workstring, wherein the well control/release tool comprises a release sub attached to the workstring, a handling sub, and one or more load bearing elements selectively coupled between the release sub and the handling sub, and activating the well control/string release tool to release the workstring upon detecting an emergency condition.

[0126] Embodiment of the present disclosure provides a drilling system comprising a rig, and a well control/string release tool disposed on a floor of the rig. The well control/string release tool comprises a release sub, a handling sub, and one or more load bearing elements selectively coupled between the release sub and the handling sub.

[0127] Embodiment of the present disclosure provides a method for operating a well, comprising attaching a well control/string release tool to a workstring, performing a well control procedure through the well control/string release tool,

and activating the well control/string release tool to release the workstring upon detecting an emergency condition.

[0128] While the foregoing is directed to embodiments of the present disclosure, other and further embodiments of the disclosure may be devised without departing from the basic scope thereof, and the scope of the present invention is determined by the claims that follow.

Claims:

1. A tool comprising:
 - a release sub configured to connect with an upper end of a workstring;
 - a handling sub configured to connect with a tubular handling tool disposed above a wellbore, the handling sub comprising a landing sleeve and a release sleeve coupled to the landing sleeve;
 - a lock collar moveable between a lock position in which the release sleeve is locked relative to the landing sleeve and an unlock position in which the release sleeve is slideable relative to the landing sleeve between a first position and a second position; and
 - one or more load bearing elements positioned between and selectively coupling the release sub and the handling sub,
 - wherein when the lock collar is in the unlock position and the release sleeve is in the first position, the one or more load bearing elements couples the release sub to the handling sub; and
 - wherein when the release sleeve is in the second position, the one or more load bearing elements decouples the release sub from the handling sub.
2. The tool of claim 1, wherein the release sub comprises a tubular section having a groove on an outer surface, and the groove is configured to receive a portion of each of the one or more load bearing elements when the release sleeve is in the first position relative to the landing sleeve.
3. The tool of claim 2, wherein the release sleeve is configured to move the one or more load bearing elements out of the groove of the tubular section when the release sleeve slides relative to the landing sleeve from the first position to the second position.
4. The tool of claim 2, wherein the release sub further comprises a torque transmission component.
5. The tool of claim 3, wherein the handling sub further comprises a tubular

connector adapted to interact with a tool.

6. The tool of claim 2, wherein the tubular section includes one or more drain ports.

7. The tool of claim 3, wherein the release sleeve comprises:
an inner sleeve;
an outer sleeve; and
a releasable connection coupled to the inner sleeve and the outer sleeve.

8. The tool of claim 2, further comprising a Kelly valve coupled to the tubular section.

9. The tool of claim 1, wherein the one or more load bearing elements comprise one or more load bearing dogs.

10. The tool of claim 2, wherein the release sleeve is configured to allow the one or more load bearing elements to move out of the groove of the tubular section when the release sleeve slides relative to the landing sleeve from the first position to the second position.

11. A method for operating a well having a wellbore, comprising:
attaching a well control/string release tool to a workstring, wherein the well control/release tool comprises:

a release sub;

a handling sub comprising a landing sleeve and a release sleeve coupled to the landing sleeve;

a lock collar moveable between a lock position in which the release sleeve is locked relative to the landing sleeve and an unlock position in which the release sleeve is slideable relative to the landing sleeve between a first position and a second position; and

one or more load bearing elements positioned between and

- selectively coupling the release sub and the handling sub;
- attaching the handling sub of the well control/string release tool to a tubular handling tool disposed above the wellbore;
- performing a well control procedure through the well control/string release tool while the lock collar is in the lock position and the one or more load bearing elements couples the release sub and the handling sub;
- detecting a condition with respect to the well control procedure; and
- in response to the detected condition:
 - securing the landing sleeve in place relative to the wellbore;
 - moving the lock collar to the unlock position; and
 - sliding the release sleeve to the second position relative to the landing sleeve to move the one or more load bearing elements and thereby decoupling the release sub from the handling sub.

12. The method of claim 11, wherein attaching the well control/string release tool comprises attaching an upper end of the workstring to the release sub;

13. A drilling system, comprising:

- a rig; and

- a well control/string release tool disposed on a floor of the rig, wherein the well control/string release tool comprises:

- a release sub connected to an upper end of a workstring;

- a handling sub connected to a tubular handling tool disposed above a wellbore, the handling sub comprising a landing sleeve and a release sleeve coupled to the landing sleeve;

- a lock collar moveable between a lock position in which the release sleeve is locked relative to the landing sleeve and an unlock position in which the release sleeve is slideable relative to the landing sleeve between a first position and a second position; and

- one or more load bearing elements positioned between and selectively coupling the release sub and the handling sub,
- wherein when the lock collar is in the unlock position and the release

sleeve is in the first position, the one or more load bearing elements couples the release sub to the handling sub; and

wherein when the release sleeve is in the second position, the one or more load bearing elements decouples the release sub from the handling sub.

14. The method of claim 11, wherein when the release sub is decoupled from the handling sub while the handling sub is secured in place via the landing sleeve, the release sub falls into the wellbore.