

## Claims

1. A system for connecting a lower marine riser package (13) to a marine riser (17), the lower marine riser package (13) (LMRP) to be placed subsea at a wellhead so that the riser (17) will extend from the LMRP (13) to a drilling rig (19) located at a sea surface, the system comprising:

a drilling riser adapter (11) for mounting to the lower marine riser package (13) and having a hydraulically actuated engagement assembly (41) for selectively engaging and disengaging a lower end of the marine riser (17);

a control panel (141) mounted to the adapter (11) and communicatively coupled to the engagement assembly (41) for actuating the engagement assembly (41) to engage and disengage the lower end of the marine riser (17); and

a receptacle (135) for receiving hydraulic fluid pressure on the control panel (141) for engagement by a remote operated vehicle (ROV) to supply hydraulic fluid pressure to the engagement assembly (41).

2. The system of Claim 1, the system further comprising a crossover riser joint (31) having a lower end profile (133) for mating with the engagement assembly (41) when the engagement assembly (41) is in the engaged state and an upper end connection assembly (75) for connecting to the riser (17).

3. The system of Claim 1, wherein the drilling riser adapter (11) comprises:

a tubular member (33) defining a central bore (37) having an axis (38);

the central bore (37) having an inner diameter larger than an outer diameter of the lower end of the riser (17) such that the lower end of the riser (17) may insert into the central bore (37);

a plurality of openings (127) in an upper end of the tubular member (33) proximate to a rim (47) of the tubular member (33);

the openings (127) extending from an exterior diameter surface of the tubular member to the central bore (37);

a plurality of engaging members (125), each engaging member (125) substantially filling a respective opening (127);

the engaging members (125) moveable between an engaged position radially inward and a disengaged position radially outward; and

the engagement assembly (41) configured to actuate the engaging members (125) between the engaged and the disengaged position.

4. The system of Claim 3, wherein each of the engaging members (125) has a profile for engaging a matching profile (133) on an exterior surface of the lower end of the riser (17).

5. The system of Claim 3, wherein the engagement assembly (41) comprises:

an axially moveable cam ring (73) circumscribing the upper end of the tubular member (33) proximate to the engaging members (125), the cam ring (73) having an inner surface that slidably engages outer surfaces of the engaging members (125); and

a plurality of hydraulic cylinders (65) to move the cam ring (73) axially over the surface of the tubular member (33).

6. The system of Claim 5, wherein the engagement assembly (41) further comprises:

a plurality of cylinder coupler protrusions (77) extending radially from an exterior diameter portion of the cam ring (73);

a flange (45) formed in a portion of the tubular member (33) axially below the cam ring (73); and

each cylinder (65) having a first end mounted to the flange (45) and a second end coupled to a respective cylinder coupler protrusion (77) for exerting an axial force on the cam ring (73).

7. The system of Claim 5, wherein the engagement assembly (41) further comprises:

a latch dog (114) coupled to the cam ring (73), the latch dog (114) biased radially inward to an engaged state;

a lever (99) coupled to the latch dog (114) for moving the latch dog (114) between the engaged state and a disengaged state; and

an inner end of the latch dog (114) configured to engage a grooved exterior surface of the tubular member (33) in the engaged state.

8. The system of Claim 7, further comprising a key (123) formed in a surface of the latch (99) and configured to lock the latch dog (114) in a disengaged state when pulled radially and rotated by the ROV.

9. The system of Claim 1, further comprising:

a latch (75) that selectively locks the engagement assembly (41) in an engaged position; and

a handle (99) on the latch (75) configured to be engaged and manipulated by the ROV.

10. The system of Claim 1, further comprising a pair of valves (143, 145) on the control panel (141) to direct the hydraulic fluid pressure to engage and release the engagement assembly (41) from the lower end of the marine riser (17), the valves (143, 145) being configured to be engaged by the ROV.

11. A system for connecting a lower marine riser package (13) (LMRP) to a marine riser (17), the lower marine riser package to be placed subsea at a wellhead so that the riser (17) extends from the LMRP (13) to a drilling rig located at a sea surface, the system comprising:

a plurality of engaging members (125);

the engaging members (125) moveable between an engaged position radially inward and a disengaged position radially outward;

an engagement assembly (41) configured to actuate the engaging members (125) between the engaged and the disengaged positions;

a crossover riser joint (31) having a lower end profile (133) for mating with the engagement assembly (41) when the engagement assembly (41) is in the engaged position and an upper end connection assembly for connecting to the riser (17);

a control panel (141) communicatively coupled to the engagement assembly (41) for actuating the engagement assembly (41) to engage to and disengage the lower end of the marine riser (17);

- a hot stab receptacle (135) on the control panel (141) for engagement by a remotely operated vehicle (ROV) to supply hydraulic fluid pressure to the engagement assembly (41).
12. The system of Claim 11, wherein each of the engaging members (125) has a profile for engaging a matching profile (133) on an exterior surface of the lower end of the riser (17).
13. The system of Claim 12, wherein the engagement assembly (41) further comprises:
- a latch dog (114) coupled to an upper portion of the cam ring (73), the latch dog (114) biased radially inward to an engaged state;
  - a lever (99) coupled to the latch dog (114) for moving the latch dog (114) between the engaged state and a disengaged state; and
  - an inner end of the latch dog (114) configured to engage a grooved exterior surface of the tubular member (33) in the engaged state.
14. The system of Claim 11, wherein the engagement assembly (41) comprises:
- an axially moveable cam ring (73) circumscribing the upper end of the tubular member (33) proximate to the engaging members (125);
  - a plurality of cylinder coupler protrusions (77) extending from an exterior diameter portion of the cam ring (73);
  - a flange (45) formed in a portion of the tubular member (33) axially below the cam ring (73);
  - a plurality of hydraulic cylinders (65), each cylinder (65) having a first end mounted to the flange (45) and a second end coupled to a respective cylinder coupler protrusion (77) for exerting an axial force on the cam ring (73), allowing the cam ring (73) to move axially over the exterior surface of the tubular member (33); and
  - a bevel (131) on an interior lower end of the cam ring (73) for slidingly engaging the engaging members (125) when the cam ring (73) moves axially downward over the openings in the tubular member (33).
15. The system of Claim 14, further comprising a key (123) formed in a surface of the lever (99) and configured lock the latch dog (114) in a disengaged state when pulled radially and rotated by the ROV.

16. A method for disconnecting a marine riser (17) joint from a lower marine riser package (13) (LMRP), the method comprising:

(a) providing a marine riser (17) adapter having a hydraulically actuated engagement assembly (41) and a control panel (141) with a hydraulic fluid pressure receptacle (135);

(b) connecting the adapter (11) to the LMRP (13);

(c) inserting an end of a riser joint (23) into a central bore (37) of the marine riser adapter (11); then

(d) supplying hydraulic fluid to the hydraulic fluid pressure receptacle (135) to actuate the hydraulically-actuated engagement assembly (41) to engage the riser joint (23);

(e) lowering the LMRP (13), marine riser adapter (11), and riser joint (23) to a subsea location; and

(f) stabbing a probe of a remotely operated vehicle (ROV) into the hydraulic fluid pressure receptacle (135) and supplying hydraulic fluid to actuate the engagement assembly (41) to disengage the riser joint (23) from the marine riser adapter (11).

17. The method of Claim 16, wherein step (d) further comprises manipulating a valve (137, 139) on the control panel (141).

18. The method of Claim 16, wherein, while the marine riser adapter is on a drilling rig (19) at a surface of the ocean, step (d) comprises:

connecting a hydraulic line to the control panel (141);

manually operating a valve (137, 139) on the control panel (141) to activate a hydraulic circuit (151, 153) of the engagement assembly (41);

passing hydraulic fluid through the hydraulic line, through the control panel (141) and into the hydraulic circuit (151, 153); and

actuating hydraulic cylinders (65) of the engagement assembly (41) in response.

19. The method of Claim 16, wherein, while the marine riser adapter (11) is subsea, the method further comprises:

operating at least one valve (137, 139) on the control panel (141) with the ROV to activate a hydraulic circuit (151, 153) of the marine riser adapter (11);

passing hydraulic fluid through the ROV, through the control panel (141) and into the hydraulic circuit (151, 153); and

actuating hydraulic cylinders (65) of the engagement assembly (41) in response, to actuate the engagement assembly (41).

20. The method of Claim 16, further comprising mechanically latching the engaging apparatus (41) into engagement with the riser joint (23).

21. A system for connecting a lower marine riser package (13) to a drilling rig (19) located at a sea surface, the lower marine riser package (13) (LMRP) to be placed subsea at a wellhead, the system comprising:

a plurality of marine riser joints (23) for extending between the drilling rig (19) and the LMRP (13), each marine riser joint (23) having at least one end coupleable to an adjacent marine riser joint (23);

a drilling riser adapter (11) for mounting to the lower marine riser package (13) and having a hydraulically actuated engagement assembly (41) for selectively engaging and disengaging a lower end of at least one marine riser joint (23) of the plurality of marine riser joints (23);

a control panel (141) mounted to the adapter (11) and communicatively coupled to the engagement assembly (41) for actuating the engagement assembly (41) to engage and disengage the lower end of the marine riser (17); and

a receptacle (135) for receiving hydraulic fluid pressure on the control panel (141) for engagement by a remote operated vehicle (ROV) to supply hydraulic fluid pressure to the engagement assembly (41).

22. A system for connecting a lower marine riser package (13) to a marine riser (17), the lower marine riser package (13) (LMRP) to be placed subsea at a wellhead so that the riser (17) will extend from the LMRP (13) to a drilling rig (19) located at a sea surface, the system comprising:

a blowout preventer (BOP) (13) mounted at an upper end of the LMRP (13);

a drilling riser adapter (11) for mounting to the BOP (13) and having a hydraulically actuated engagement assembly (41) for selectively engaging and disengaging a lower end of the marine riser (17);

a control panel (141) mounted to the adapter (11) and communicatively coupled to the engagement assembly (41) for actuating the engagement assembly (41) to engage and disengage the lower end of the marine riser (17); and

a receptacle (135) for receiving hydraulic fluid pressure on the control panel (141) for engagement by a remote operated vehicle (ROV) to supply hydraulic fluid pressure to the engagement assembly (41).

23. A method for connecting a marine riser (17) joint to a marine riser (17) adapter located at a subsea location, the method comprising:

(a) stabbing a probe of a remotely operated vehicle (ROV) into a hydraulic fluid pressure receptacle (135) in a control panel (141) of a marine riser (17) adapter having a hydraulically actuated engagement assembly (41);

(b) supplying hydraulic fluid from the probe of the ROV to the hydraulic fluid pressure receptacle (135) to actuate the engagement assembly (41) to disengage a first riser joint (23) from the riser adapter (11);

(c) removing the first riser joint (23) from the riser adapter (11);

(d) disposing a second riser joint (23) into the riser adapter (11);

(e) stabbing the probe of the ROV into the hydraulic fluid pressure receptacle (135) of the marine riser (17) adapter; and

(f) supplying hydraulic fluid from the probe of the ROV to the hydraulic fluid pressure receptacle (135) to actuate the engagement assembly (41) to engage the second riser joint (23) with the riser adapter (11).

## CLAIMS

1. A system for connecting a lower marine riser package to a marine riser, the lower marine riser package (LMRP) to be placed subsea at a wellhead so that the riser will extend from the LMRP to a drilling rig located at a sea surface, the system comprising:

a drilling riser adapter for mounting to the lower marine riser package and having a hydraulically actuated engagement assembly for selectively engaging and disengaging a lower end of the marine riser;

a crossover riser joint having a lower end profile selectively mated with the engagement assembly when the engagement assembly is in an engaged state, and an upper end connection assembly selectively connected to the riser;

a control panel mounted to the adapter and communicatively coupled to the engagement assembly for actuating the engagement assembly to engage and disengage the lower end of the marine riser; and

a receptacle for receiving hydraulic fluid pressure on the control panel for engagement by a remote operated vehicle (ROV) to supply hydraulic fluid pressure to the engagement assembly.

2. The system of claim 1, wherein the drilling riser adapter comprises:

a tubular member defining a central bore having an axis;

the central bore having an inner diameter larger than an outer diameter of the lower end of the riser such that the lower end of the riser may insert into the central bore;

a plurality of openings in an upper end of the tubular member proximate to a rim of the tubular member;

the openings extending from an exterior diameter surface of the tubular member to the central bore;

a plurality of engaging members, each engaging member substantially filling a respective opening;

the engaging members moveable between an engaged position radially inward and a disengaged position radially outward; and

the engagement assembly configured to actuate the engaging members between the engaged and the disengaged position.

3. The system of claim 2, wherein each of the engaging members has a profile for engaging a matching profile on an exterior surface of the lower end of the riser.

4. The system of claim 2, wherein the engagement assembly comprises:
  - an axially moveable cam ring circumscribing the upper end of the tubular member proximate to the engaging members, the cam ring having an inner surface that slidingly engages outer surfaces of the engaging member; and
  - a plurality of hydraulic cylinders to move the cam ring axially over the surface of the tubular member.
5. The system of claim 4, wherein the engagement assembly further comprises:
  - a plurality of cylinder coupler protrusions extending radially from an exterior diameter portion of the cam ring;
  - a flange formed in a portion of the tubular member axially below the cam ring; and
  - each cylinder having a first end mounted to the flange and a second end coupled to a respective cylinder coupler protrusion for exerting an axial force on the cam ring.
6. The system of claim 4, wherein the engagement assembly further comprises:
  - a latch dog coupled to the cam ring, the latch dog biased radially inward to an engaged state;
  - a lever coupled to the latch dog for moving the latch dog between the engaged state and a disengaged state; and
  - an inner end of the latch dog configured to engage a grooved exterior surface of the tubular member in the engaged state.
7. The system of claim 6, further comprising a key formed in a surface of the latch and configured to lock the latch dog in a disengaged state when pulled radially and rotated by the ROV.
8. The system of claim 1, further comprising:
  - a latch that selectively locks the engagement assembly in an engaged position; and
  - a handle on the latch configured to be engaged and manipulated by the ROV.
9. The system of claim 1, further comprising a pair of valves on the control panel to direct the hydraulic fluid pressure to engage and release the engagement assembly from the lower end of the marine riser, the valves being configured to be engaged by the ROV.

10. A system for connecting a lower marine riser package to a marine riser, the lower marine riser package (LMRP) to be placed subsea at a wellhead so that the riser will extend from the LMRP to a drilling rig located at a sea surface, the system comprising:  
a blowout preventer (BOP) mounted at an upper end of the LMRP;

a drilling riser adapter for mounting to the BOP and having a hydraulically actuated engagement assembly for selectively engaging and disengaging a lower end of the marine riser;

a crossover riser joint having an end selectively mated with the engagement assembly when the engagement assembly is in an engaged state, and an upper end connection assembly selectively connected to the marine riser;

a control panel mounted to the adapter and communicatively coupled to the engagement assembly for actuating the engagement assembly to engage and disengage the lower end of the marine riser; and

a receptacle for receiving hydraulic fluid pressure on the control panel for engagement by a remote operated vehicle (ROV) to supply hydraulic fluid pressure to the engagement assembly.