

What is claimed is:

1. A bridging hanger (M) for securing to a subsea casing hanger (36) comprising:
 - a tubular main body (40);
 - a tubular sealing sleeve (42) coaxial with and mounted on an exterior diameter portion of the tubular main body (40), the body (40) being moveable from an upper run-in position to a lower set position relative to the sealing sleeve (42);
 - a first locking ring (44) carried by the sealing sleeve (42) and adapted to engage a profile (37) within an interior of the casing hanger (36) in response to movement of the main body (40) from the run-in to the set position; and
 - a second locking ring (46) carried by the sealing sleeve (42) to lock the tubular main body (40) in the set position in response to movement of the main body (40) from the run-in to the set position.
2. The apparatus of Claim 1, further comprising a cylindrical assembly nut (50) mounted to an end of the main body (40) axially below the sealing sleeve (42) and having a threaded inner surface (52) that mates with a corresponding threaded outer surface (54) of the main body (40) to secure the sealing sleeve (42) to the main body (40).
3. The apparatus of Claim 1, wherein the second locking ring (46) comprises:
 - a C-ring (46) mounted in an annular groove (48) defined by an interior diameter lower portion of the sealing sleeve (42);
 - at least one radially spaced inwardly extending locking finger (80) formed in the inner diameter surface of the C-ring (46); and
 - the locking fingers (80) adapted to fit into an annular recess (82) formed about an exterior diameter portion of the main body (40), thereby forming a load bearing connection.
4. The apparatus of Claim 1, wherein the first locking ring (44) comprises:
 - a C-ring (44) mounted in a circular recess (88) defined by an exterior diameter upper portion of the sealing sleeve (42); and

the C-ring (44) having a cam profile (57) configured to engage a mating profile (55) of the main body (40) so that the main body (40) will urge the C-ring (44) outwardly to engage the casing hanger (36) when in the set position.

5. The apparatus of Claim 1, wherein the tubular sealing sleeve (42) is mounted to the main body (40) by a shear pin (58) extending through a hole (60) in the sealing sleeve (42) and into a corresponding hole (62) in the main body (40) to retain the main body (40) in the run-in position until weight applied to the main body (40) shears the shear pin (58).
6. The apparatus of Claim 1, further comprising an internal anti-rotation key (64) mounted to the sealing sleeve (42) for engaging the casing hanger (36) to prevent rotation of the sealing sleeve (42) relative to the casing hanger (36).
7. The apparatus of Claim 6, further comprising an external anti-rotation key (68) mounted to the sealing sleeve (42) for engaging the casing hanger (36) so that the external anti-rotation (68) key is urged outwardly by a spring force exerted by a spring internal to the internal anti-rotation key (64).
8. The apparatus of Claim 1, further comprising a plurality of fingers (72) formed in the exterior surface of the main body (40) proximate to corresponding finger slots (76) formed in the interior surface of the sealing sleeve (42), the fingers (72) and slots (76) circumferentially placed around the diameter of the main body (40), and the finger slots (76) having an arcuate width twice that of the fingers (72) so that the fingers (72) may insert into the finger slots (76) and rotate from a first position to a second position to move the bridging hanger (M) from the set to a retrieval position.
9. The apparatus of Claim 1, wherein an outer diameter surface of the sealing sleeve (42) forms a metal to metal sealing surface for sealing to the casing hanger (36) when the main body (40) is in the set position.
10. The apparatus of Claim 1, an inner diameter surface of the sealing sleeve (42) forms a metal to metal sealing surface for sealing to the main body (40) when the main body (40) is in the set position.

11. A method for anchoring a bridging hanger (M) to a casing hanger (36) disposed in a subsea wellhead, the method comprising:

(a) mounting an anchoring mechanism assembly to a main body (40) of a bridging hanger (M);

(b) landing the anchoring mechanism and bridging hanger (M) on the casing hanger (36);
then

(c) actuating the anchoring mechanism by applying weight to the bridging hanger (M) to lock the bridging hanger (M) to the casing hanger (36).

12. The method of Claim 11, wherein step (c) comprises causing a first locking member (44) to expand radially outward from the sealing sleeve (42) to lock the sealing sleeve (42) to the casing hanger (36), and a second locking member (46) to move radially inward to lock the bridging hanger main body (40) to the sleeve (42).

13. The method of Claim 11, wherein the method further comprises rotating a tubular body (40) of the anchoring mechanism relative to a tubular sleeve (42) of the anchoring mechanism to disengage a locking ring (44) from the casing hanger (36), thereby allowing retrieval of the bridging hanger (M).

CLAIMS

What is claimed is:

1. A bridging hanger for securing to a subsea casing hanger comprising:
a tubular main body;

a tubular sealing sleeve coaxial with and mounted on an exterior diameter portion of the tubular main body, the body being moveable from an upper run-in position to a lower set position relative to the sealing sleeve;

an inner metal sealing surface on an inner portion of the sealing sleeve that form a metal-to-metal seal between the body and the sealing sleeve in response to the body moving to the set position;

an outer metal sealing surface on an outer portion of the sealing sleeve that forms a metal-to-metal seal between the sealing sleeve and the casing hanger in response to the body moving to the set position;

a first locking ring carried by the sealing sleeve and adapted to engage a profile within an interior of the casing hanger in response to movement of the main body relative to the first locking ring from the run-in to the set position; and

a second locking ring carried by the sealing sleeve to lock the tubular main body in the set position in response to movement of the main body relative to the second locking ring from the run-in to the set position.

2. The apparatus of claim 1, further comprising a cylindrical assembly nut mounted to an end of the main body axially below the sealing sleeve and having a threaded inner surface that mates with a corresponding threaded outer surface of the main body to retain the sealing sleeve on the main body.

3. The apparatus of claim 1, wherein the second locking ring comprises:

a C-ring mounted in an annular groove defined by an interior diameter lower portion of the sealing sleeve;

at least one radially spaced inwardly extending locking finger formed in the inner diameter surface of the C-ring; and

the locking fingers adapted to fit into an annular recess formed about an exterior diameter portion of the main body, thereby forming a load bearing connection.

4. The apparatus of claim 1, wherein the first locking ring comprises:

a C-ring mounted in a circular recess defined by an exterior diameter upper portion of the sealing sleeve; and

the C-ring having a cam profile configured to engage a mating profile of the main body so that the main body will urge the C-ring outwardly to engage the casing hanger when in the set position.

5. The apparatus of claim 1, wherein the tubular sealing sleeve is mounted to the main body by a shear pin extending through a hole in the sealing sleeve and into a corresponding hole in the main body to retain the main body in the run-in position until weight applied to the main body shears the shear pin.

6. The apparatus of claim 1, further comprising a plurality of fingers formed in the exterior surface of the main body proximate to corresponding finger slots formed in the interior surface of the sealing sleeve, the fingers and slots circumferentially placed around the diameter of the main body, and the finger slots having an arcuate width twice that of the fingers so that the fingers may insert into the finger slots and rotate from a first position to a second position to move the bridging hanger from the set to a retrieval position.

7. The apparatus of claim 1, further comprising:

a first cam surface on the body in engagement with the first locking ring;

a second cam surface on the body in engagement with the second locking ring; and wherein

the movement of the body to the set position causes the first and second cam surfaces to simultaneously move the first and second locking rings into locking engagement with the casing hanger and the body, respectively, and to simultaneously move the inner and outer metal sealing surfaces into sealing engagement with the body and the casing hanger.

8. The apparatus of claim 1, further comprising:

a downward facing shoulder on the sealing sleeve adapted to land on a rim of the casing hanger while the body is in the run-in position.

9. A bridging hanger for securing to a subsea casing hanger comprising:
a tubular main body;

a tubular sealing sleeve coaxial with and mounted on an exterior diameter portion of the tubular main body, the body being moveable from an upper run-in position to a lower set position relative to the sealing sleeve;

a first locking ring carried by the sealing sleeve and adapted to engage a profile within an interior of the casing hanger in response to movement of the main body from the run-in to the set position;

a second locking ring carried by the sealing sleeve to lock the tubular main body in the set position in response to movement of the main body from the run-in to the set position;
and

an internal anti-rotation key mounted to the sealing sleeve for engaging the sealing sleeve to prevent rotation of the sealing sleeve relative to the casing hanger.

10. The apparatus of claim 9, further comprising an external anti-rotation key mounted to the sealing sleeve for engaging the casing hanger so that the external anti-rotation key is urged outwardly by a spring force exerted by a spring internal to the internal anti-rotation key.

11. A subsea wellhead assembly comprising:

a casing hanger adapted to be landed and set in a wellhead, the casing hanger having a locking profile;

a bridging hanger landed and set in the wellhead in engagement with the casing hanger, the bridging hanger having a tubular main body with a seal surface and a locking profile;

a tubular sealing sleeve carried by the body for landing on a rim of the casing hanger, the body being downwardly movable relative to the sleeve from a run-in position to a set position after the sealing sleeve lands on the rim of the casing hanger;

a first locking ring carried by the sealing sleeve that is expanded into engagement with the locking profile of the casing hanger in response to the downward movement of the body from the run-in to the set position, thereby locking the sealing sleeve to the casing hanger;

a second locking ring carried by the sealing sleeve that is contracted into engagement with the locking profile of the body response to downward movement of the body from the run-in to the set position, thereby locking the sealing sleeve to the body; and

an inner seal surface on the sealing sleeve that sealingly engages the seal surface of the body in response to the downward movement of the body from the run-in to the set position.

12. The wellhead assembly of claim 11, further comprising:

an outer seal surface on the sealing sleeve that sealingly engages a seal surface on the casing hanger prior to the downward movement of the body from the run-in to the set position.

13. The wellhead assembly of claim 11, wherein the second locking ring comprises:

a C-ring mounted in an annular groove defined by an interior diameter lower portion of the sealing sleeve;

at least one radially spaced inwardly extending locking finger formed in the inner diameter surface of the C-ring; and wherein

the locking fingers fit into an annular recess formed about an exterior diameter portion of the main body.

14. The wellhead assembly of claim 11, wherein the first locking ring comprises:

a C-ring mounted in a circular recess defined by an exterior diameter upper portion of the sealing sleeve; and

the C-ring having a cam profile configured to engage a mating profile of the main body so that the main body will urge the C-ring outwardly to engage the casing hanger when in the set position.

15. The wellhead assembly of claim 11, wherein the tubular sealing sleeve is mounted to the main body by a shear pin extending through a hole in the sealing sleeve and into a corresponding hole in the main body to retain the main body in the run-in position until weight applied to the main body shears the shear pin.

16. The wellhead assembly of claim 11, further comprising a plurality of fingers formed in the exterior surface of the main body proximate to corresponding finger slots formed in the interior surface of the sealing sleeve, the fingers and slots circumferentially placed around the diameter of the main body, and the finger slots having an arcuate width twice that of the fingers so that the fingers may insert into the finger slots and rotate from a first position to a second position to move the bridging hanger from the set to a retrieval position.

17. The wellhead assembly of claim 11, further comprising:
a downward facing and outward extending shoulder on the sealing sleeve that lands on the rim of the casing hanger while the body is in the run-in position.