WHAT IS CLAIMED IS:

1. A subsea connector, comprising:

a first tubular member (11) having an axis and a forward end (13) with an external first flange (17);

a guide basket (25) extending around the first tubular member (11), the guide basket having an open forward end (27);

a fluid cylinder assembly (43) that moves the guide basket (25) axially relative to the first tubular member (11) between a rearward position and a forward position;

a second tubular member (57) having a forward end (59) that abuts the forward end (13) of the first tubular member (11), the forward end (59) of the second tubular member (57) having an external second flange (17);

a plurality of lock dogs (67) carried by the second tubular member (57), each of the dogs (67) having a first load shoulder (73) and a second load shoulder (75) and being radially movable relative to the second tubular member (11);

wherein while the guide basket (25) is in the forward position, an interior (29) of the guide basket (25) engages outer sides of the dogs (67) to retain the first and second load shoulders (73, 75) of the dogs (67) in engagement with the first and second flanges (73, 75), respectively; and

moving the guide basket (25) to the rearward position disengages the interior (29) of the guide basket (25) from the outer sides (77) of the dogs (67).

2. The connector according to claim 1, wherein the open forward end (27) of the guide basket (25) is forward of the forward end (59) of the second tubular member (57) while the basket (25) is in the rearward and the forward positions.

3. The connector according to claim 1, wherein the interior of the guide basket (25) has a tapered conical surface (29) extending rearward and decreasing in diameter from the open forward end (27) of the basket (25).

4. The connector according to claim 1, further comprising:

a tapered soft landing shoulder (33) in the interior forward of a backstop surface (37), the dogs (67) having forward ends that initially land on the soft landing shoulder (33) as the second tubular member (57) moves toward the first tubular member (11), the forward ends of the dogs (67) then sliding from the soft landing shoulder)33) to the backstop surface (37) as the forward end (59) of the second tubular member (57) abuts the forward end (13) of the first tubular member (11).

5. The connector according to claim 1, further comprising:

a lock dog support (69) positioned around the second tubular member (57), the support (69) having a rearward end (7`1) fixed to the second tubular member (57) and axially spaced from the second flange (65);

wherein the dogs (67) are mounted to a forward end of the support (69) and located within the basket (25) when the forward ends (13, 59) of the first and second tubular members (11, 57) are in abutment with each other; and

wherein the support (69) is radially flexible and having an initial position wherein the first and second load shoulders (73, 75) of the dogs (67) are spaced radially outward from the first and the second flanges (17, 65), respectively, and a locked position wherein the basket (25) is in the forward position, the interior (29) of the basket (25) is in engagement with outer sides (77) of the dogs (67), and the first and second load shoulders (73, 75) of the dogs (67) are in engagement with the first and the second flanges (17, 65), respectively.

6. The connector according to claim 1, further comprising:

a plurality of rods (69) spaced around the second tubular member (57) parallel with the axis; and

wherein each of the dogs (67) is secured to a forward end of one of the rods (69).

7. The connector according to claim 1, further comprising:

a plurality of rods (69) spaced around the second tubular member (57) parallel with the axis, each of the rods (69) being resilient and flexible along a length of the rods (69); and

wherein each of the dogs (67) is secured to a forward end of one of the rods (69).

8. The connector according to claim 1, further comprising:

a tapered conical surface (29) extending rearward and decreasing in diameter from the open forward end of the guide basket (25); and

an annular interior back stop surface (37) in the interior of the guide basket (25) rearward from the conical surface (29).

9. The connector according to claim 8, further comprising:

a tapered soft landing shoulder (33) joining and forward from the backstop surface (37), the dogs (67) having forward ends that initially land on the soft landing shoulder (67) as the second tubular member (57) moves toward the first tubular member (11), the forward ends of the dogs (67) then sliding from the soft landing shoulder (33) to the backstop surface (37) as the forward end of the second tubular member (11) abuts the forward end (13) of the first tubular member (11).

10. The connector according to claim 9, wherein the backstop surface (37) comprises:

a tapered backstop shoulder (37) having an outer periphery; and

a cylindrical surface (35) joining and extending forward from the outer periphery.

11. The connector according to claim 1, wherein the guide basket (25) is free of contact with the first tubular member (11) both in the rearward and forward positions.

12. A method of connecting first and second tubular members (11, 57), each of the tubular members (11, 57) having a forward end (13, 59) with an external flange (17, 65), comprising:

(a) positioning a guide basket (25) around the first tubular member (11), the guide basket (25) having an open forward end (27);

(b) mounting a plurality of lock dogs (67) to the second tubular member (57), each of the dogs (67) having a first load shoulder (73) and a second load shoulder (75) and being radially movable relative to the second tubular member (11);

(c) moving the guide basket (25) relative to the first tubular member (11) from a rearward to a forward position;

(d) abutting the forward ends (13, 59) of the first and second tubular members (11, 57); and

(e) engaging an interior (29) of the guide basket (25) with outer sides (77) of the dogs (67), thereby pushing the first and second load shoulders (73, 75) of the dogs (67) inward into engagement with the first and second flanges 17, 65), respectively, as the forward ends (13, 59) of the first and second tubular members (11, 59) are brought into abutment with each other.

13. The method according to claim 12, wherein step (c) occurs before steps (d) and (e).

14. The method according to claim 12, further comprising disconnecting the first and second tubular members (11, 57), comprising:

moving the guide basket (25) from the forward to the rearward position; then

moving the first and second tubular members (11, 57) apart from each other.

15. The method according to claim 12, further comprising:

providing a tapered soft landing shoulder (33) in the interior of the guide basket (25);

during step (e) initially landing forward ends of the dogs (67) on the soft landing shoulder (33); then

continuing to bring the forward ends of the first and tubular members (13, 59) toward abutment with each other, causing the first and second load shoulders (73, 75) of the dogs (67) to move inward into engagement with the first and second flanges (17, 65), respectively.

CLAIMS

The invention claimed is:

1. A subsea connector, comprising:

a first tubular member having an axis and a forward end with an external first flange;

a guide basket extending around the first tubular member and axially movable along the first tubular member, the guide basket having an open forward end;

a fluid cylinder assembly that moves the guide basket axially relative to the first tubular member between a rearward position and a forward position;

a second tubular member having a forward end that abuts the forward end of the first tubular member, the forward end of the second tubular member having an external second flange;

a plurality of lock dogs carried by the second tubular member, each of the dogs having a first load shoulder for engaging the first flange and a second load shoulder for engaging the second flange and being radially movable relative to the second tubular member;

wherein while the guide basket is in the forward position, an interior of the guide basket engages outer sides of the dogs to retain the first and second load shoulders of the dogs in engagement with the first and second flanges, respectively; and

moving the guide basket to the rearward position disengages the interior of the guide basket from the outer sides of the dogs.

2. The connector according to claim 1, wherein the open forward end of the guide basket is forward of the forward end of the second tubular member while the basket is in the rearward and the forward positions.

3. The connector according to claim 1, wherein the interior of the guide basket has a tapered conical surface extending rearward and decreasing in diameter from the open forward end of the basket.

4. The connector according to claim 1, further comprising:

a tapered soft landing shoulder in the interior forward of a backstop surface, the dogs having forward ends that initially land on the soft landing shoulder as the second tubular member moves toward the first tubular member, the forward ends of dogs then sliding from the soft landing shoulder to the backstop surface as the forward end of the second tubular member abuts the forward end of the first tubular member.

5. The connector according to claim 1, further comprising:

a lock dog support positioned around the second tubular member, the support having a rearward end fixed to the second tubular member and axially spaced from the second flange;

wherein the dogs are mounted to a forward end of the support and located within the basket when the forward ends of the first and second tubular members are in abutment with each other; and

wherein the support is radially flexible and having an initial position wherein the first and second load shoulders of the dogs are spaced radially outward from the first and the second flanges, respectively, and a locked position wherein the basket is in the forward position, the interior of the basket is in engagement with outer sides of the dogs, and the first and second load shoulders of the dogs are in engagement with the first and the second flanges, respectively.

6. The connector according to claim 1, further comprising:

a plurality of rods spaced around the second tubular member parallel with the axis; and

wherein each of the dogs is secured to a forward end of one of the rods.

7. The connector according to claim 1, further comprising:

a plurality of rods spaced around the second tubular member parallel with the axis, each of the rods being resilient and flexible along a length of the rods; and

wherein each of the dogs is secured to a forward end of one of the rods.

8. A subsea connector, comprising:

a first tubular member having an axis and a forward end with an external first flange;

a guide basket extending around the first tubular member and axially movable along the first tubular member, the guide basket having an open forward end and an annular interior back stop surface;

a fluid cylinder assembly that moves the guide basket axially relative to the first tubular member between a rearward position and a forward position;

a second tubular member having a forward end that abuts the forward end of the first tubular member, the forward end of the second tubular member having an external second flange;

a lock dog support positioned around the second tubular member, the support having a rearward end fixed to the second tubular member and axially spaced from the second flange;

a plurality of dogs mounted to a forward end of the support and located within the guide basket when the forward ends of the first and second tubular members are in abutment with each other, each of the dogs having an first load shoulder for engaging the first flange and a second load shoulder for engaging the second flange; and

the forward end of the support being radially flexible and having an initial position wherein the first and second load shoulders of the dogs are spaced radially outward from the first and the second flanges, respectively, and a locked position wherein the guide basket is in the forward position, the backstop surface is in engagement with outer sides of the dogs, and the first and second load shoulders of the dogs are in engagement with the first and the second flanges, respectively.

9. The connector according to claim 8, wherein the open forward end of the guide basket is forward of the forward end of the second tubular member while the guide basket is in the rearward and the forward positions.

10. The connector according to claim 8, further comprising a tapered conical surface extending rearward and decreasing in diameter from the open forward end of the guide basket, the back stop surface being rearward from the conical surface.

11. The connector according to claim 8, further comprising:

a tapered soft landing shoulder joining and forward from the backstop surface, the dogs having forward ends that initially land on the soft landing shoulder as the

second tubular member moves toward the first tubular member, the forward ends of the dogs then sliding from the soft landing shoulder to the backstop surface as the forward end of the second tubular member abuts the forward end of the first tubular member.

12. The connector according to claim 8, wherein the backstop surface comprises:

a tapered backstop shoulder having an outer periphery; and

a cylindrical surface joining and extending forward from the outer periphery.

13. The connector according to claim 8, wherein the guide basket is free of contact with the first tubular member both in the rearward and forward positions.

14. The connector according to claim 8, wherein the fluid cylinder assembly comprises:

an annular piston located within a chamber surrounding the guide basket;

a plurality of shafts extending rearward from the piston and out of the chamber; and

a frame joining rearward ends of the shafts with a rearward end of the guide basket.

15. The connector according to claim 8, wherein the support comprises:

a plurality of rods spaced around the second tubular member parallel with the axis, each of the rods being resilient and flexible along a length between the forward and rearward ends of the support, and each of the dogs being secured to one of the rods.

16. The connector according to claim 8; further comprising:

a conical surface extending rearward and decreasing in diameter from the open forward end of the guide basket; and

an external rib on each of the dogs radially, outward from the second load shoulder, the ribs sliding on the conical surface as the forward end second tubular member is moved into abutment with the forward end of the first tubular member, the

ribs circumscribing a rib outer diameter when the support member is in the located position that is less than an inner diameter of the forward open of the guide basket.