

A CONNECTOR

The present invention relates to a connector.

There is a need for a heavy duty connector which permits engagement and disengagement without the use of human operatives in hazardous or extreme conditions. Such conditions are to be found, for example, in a marine environment where connectors may be expected to operate in extreme weather conditions and/or underwater. Connectors may have many different applications. One such application is as a bend stiffener preventing kinking of a line extending through it. An existing example of a bend stiffener is described in GB 2411445A but the arrangement described requires the assembly of a two part collar which in turn requires the attention of operatives.

It is an object of the invention to provide a connector which permits engagement and disengagement as outlined above.

According to one aspect of the present invention there is provided a connector adapted for use with a complementary connector, the connector comprising locking means having operative and inoperative positions in relation to the complementary connector, release means operative to permit or prevent the locking means to move between operative and inoperative positions, means for retaining the release means in permissive position and means for moving the release means between permissive and preventative positions.

According to another aspect of the present invention there is provided a connector adapted for use with a complementary connector, the connector

comprising a body having formations adapted to receive locking means of the complementary connector.

According to a further aspect of the present invention there is provided a connector assembly comprising complementary connectors one of the
5 connectors having locking means having operative and inoperative positions in relation to the complementary connector, the connector comprising locking means having operative and inoperative positions in relation to the complementary connector, release means operative to permit or prevent the locking means to move between operative and inoperative positions, means for
10 retaining the release means in permissive position and means for moving the release means between the permissive and preventative positions.

In a preferred embodiment of the invention, the locking means comprises one or more balls. The balls advantageously extend through apertures in one connector into a formation in the other connector. The formation may be a
15 groove or a series of part spherical recesses. The release means advantageously comprises a sleeve coaxially surrounding a body of the connector and axially movable in relation thereto. The sleeve is preferably spring loaded and the means for moving preferably comprises one or more pressure fluid operable rams. The or each ram may be pneumatic or hydraulic. The
20 means for retaining the release means in a permissive position comprises one or more latches. The sleeve may be spring loaded by nitrogen gas springs or by conventional springs.

In order that the invention may be more clearly understood, one embodiment thereof will now be described, by way of example, with reference to the accompanying drawings, in which:-

- Figure 1 is a side elevational view partly broken away of a female connector;
- Figure 2 is a cross sectional view taken along the line A-A of Figure 1 of the connector of Figure 1;
- Figure 3 is a perspective view to a different scale of the connector shown in Figures 1 and 2;
- Figure 4 is an underplan view of the connector shown in Figures 1, 2 and 3;
- Figure 5 is a side elevational view of the connector of Figure 1 connected with a male connector and in use as a bend stiffener on a line;
- Figure 6 is a front elevational view of the arrangement of Figure 5;
- Figure 7 is a cross sectional view along the line A-A of Figure 6.

Referring to Figures 1 to 4, the female connector comprises a hollow substantially cylindrical body 1. The body 1 incorporates a flange 2 at one end defining a number of through apertures 3 to enable the body to be bolted to another part (not shown). The body 1 forms the main structural component of the connector and defines an axially extending through bore 4. Extending through the wall of the body 1 are a plurality of circumferentially equidistantly

spaced stepped apertures 5 for a purpose to be described later. Two diametrically opposed grooves 6 are also formed in the body 1 again for a purpose to be described later.

At the axial end of the body 1 remote from flange 2 is a further flange 7
5 concentrically disposed with respect to the body 1. Affixed to this lower flange 7 is a guide cone 8. Concentrically surrounding the body 1 is a spring loaded sleeve 9 which is movable axially with respect to the body 1 and has an axial length less than that of the body 1. The spring loading is provided by nitrogen gas springs but conventional springs may be used. Two diametrically opposed
10 apertures 10 are formed in the wall of the sleeve and are aligned with the grooves 6 formed in the body 1. Spring loaded latches 11 extend through respective apertures 10 and coact respectively with grooves 6. Two hydraulic rams 12 (only one shown in Figure 3) are disposed to push the sleeve 9 against the spring loading upwardly (looking at Figures 1 to 3). This action brings an
15 internally wider diameter portion of the sleeve 9 adjacent locking balls 14 extending through but retained by stepped apertures 5. This upward movement of the sleeve 9 enables spring loaded latches 11 to engage in grooves 6 in the body 1 locking the sleeve 9 axially with respect to the body 1.

In this position the above described female connector is ready to receive a
20 complementary male connector. Referring additionally to Figures 5 to 7 a male connector comprising a body 20 having a chamfered end 21 and defining an internal through bore 22 is inserted into the female connector described with

reference to Figures 1 to 4. At the point of insertion, the male connector is guided by the diverging walls of the guide cone 8. As insertion progresses, the chamfered end 21 meets chamfered faces 13 of the latches 11 pushing those latches radially outwardly against their spring loading and out of their respective grooves releasing the sleeve 9 with respect to the body 1.

The released sleeve 9 moves axially downwardly (viewed in Figures 1 to 3) under the action of the nitrogen gas springs with respect to the body 1. The body 20 of the male connector is formed either with a circumferentially extending groove or a series of circumferentially spaced part spherical pockets 23. As the sleeve 9 moves under the action of the nitrogen springs a ramp between internally lesser and greater diameter portions of the sleeve rides over the locking balls 14 pressing them through the respective corresponding apertures in the body 1 to snap into the groove or pockets 23 formed in the body 20 of the male connector locking the male and female connectors together. To enable release hydraulic fluid is once again supplied to the hydraulic rams 12 pushing the sleeve 9 upwardly and in turn releasing the locking balls 14 which in turn allows the male connector to drop out of the female connector.

The particular application of the connector shown in Figures 5 to 7 is as a bend stiffener. As a connector which provides for automatic engagement and disengagement, however, the connector has general application, and provides particular advantages in hazardous and/or remote locations such as in marine application where manual engagement/disengagement may be difficult and/or

hazardous. In the bend stiffener application shown, the male connector is provided with a downwardly dependent extension 24 frusto conical in shape and the female connector is provided with a cylindrical extension 25. In both cases the extensions are connected to their respective connectors by means of a series of bolts 26, 27 extending through corresponding apertures formed in the flanges on those connectors. The bend stiffener resists any tendency of a line 28 extending through it to kink at the point at which it is entering a sea or land based production platform.

It will be appreciated that the above embodiments have been described by way of example only and that many variations are possible within the scope of the invention. The number of locking balls and corresponding recesses may be varied as desired as may be the number of rams and latches. The rams may be hydraulic or pneumatic.

CLAIMS

1. A connector adapted for use with a complementary connector, the connector comprising locking means having operative and inoperative positions in relation to the complementary connector, release means operative to permit or prevent the locking means to move between operative and inoperative positions, means for retaining the release means in permissive position and means for moving the release means between permissive and preventative positions.
2. A connector adapted for use with a complementary connector, the connector comprising a body having formations adapted to receive locking means of the complementary connector.
3. A connector as claimed in claim 2, comprising release means operative to permit or prevent the locking means to move between operative and inoperative positions, means for retaining the release means in permissive position and means for moving the release means between permissive and preventative positions.

4. A connector as claimed in claim 1, 2 or 3 in which the locking means comprises one or more balls.
5. A connector as claimed in claim 1 or 3, or 4, when appendant to claim 1 or 3, in which the release means comprises a sleeve coaxially surrounding a body of the connector and axially movable in relation thereto.
6. A connector as claimed in claim 5, in which the sleeve is spring loaded.
7. A connector as claimed in claim 6, in which the sleeve is spring loaded by conventional springs.
8. A connector as claimed in claim 6, in which the sleeve is spring loaded by nitrogen gas springs.
9. A connector as claimed in any of claims 1 or 3, or any of claims 4 to 8, when appendant directly or indirectly to claim 1 or 3, in which the means for moving comprises at least one pressure fluid operable ram.
10. A connector as claimed in claim 9, in which the or each pressure fluid operable ram is pneumatic.
11. A connector as claimed in claim 9, in which the or each pressure fluid operable ram is hydraulic.
12. A connector as claimed in claim 1 or 3, or any of claims 4 to 11 when appendant directly or indirectly to claim 1 or 3, in

which the means for retaining the release means in a permissive position comprises one or more latches.

13. A connector assembly comprising complementary connectors one of the connectors having locking means having operative and inoperative positions in relation to the complementary connector, the connector comprising locking means having operative and inoperative positions in relation to the complementary connector, release means operative to permit or prevent the locking means to move between operative and inoperative positions, means for retaining the release means in permissive position and means for moving the release means between the permissive and preventative positions.

14. A connector assembly as claimed in claim 13, in which the locking means comprise one or more balls.

15. A connector assembly as claimed in claim 14, in which the balls extend through apertures in one connector into a formation in the other connector.

16. A connector assembly as claimed in claim 15, in which the formation is a groove.

17. A connector assembly as claimed in claim 15, in which the formation is a series of part spherical recesses.

18. A connector assembly as claimed in any of claims 13 to 17, in which the release means comprises a sleeve coaxially surrounding a body of the connector and axially movable in relation thereto.
- 5 19. A connector assembly as claimed in claim 18, in which the sleeve is spring loaded.
20. A connector assembly as claimed in claim 19, in which the sleeve is spring loaded by conventional springs.
21. A connector assembly as claimed in claim 19, in which the sleeve is spring loaded by nitrogen gas springs.
- 10 22. A connector assembly as claimed in any of claims 13 to 21, in which the means for moving comprises at least one pressure fluid operable ram.
23. A connector assembly as claimed in claim 22, in which the or each pressure fluid operable ram is pneumatic.
- 15 24. A connector assembly as claimed in claim 22, in which the or each pressure fluid operable ram is hydraulic.
25. A connector assembly as claimed in any of claims 13 to 24, in which the means for retaining the release means in a permissive position comprises one or more latches.
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