

Description

This invention relates to tubular connectors.

The connection of subsea tubular members, such as risers, requires that the connection not be released by pressure to which it is exposed. It is also necessary that the connection release when it is desired to be released.

In the past many connectors have relied upon the angle of taper between the locking dogs or ring and the actuator mechanism to be a self locking taper. This creates problems in that it relies upon the coefficient of friction remaining the same and the application of a lubricant may so change this coefficient that the taper no longer is a self locking taper.

The A. G. Ahlstone U.S. Patent No. 3,321,217 discloses a subsea connector which is remotely actuated and relies upon a wedge ring to force locking dogs into engagement with grooves to complete the connection and relies on a self locking taper between the two to maintain the locked position.

The M. B. Jansen, Jr. U.S. Patent No. 4,057,267 discloses a pipe connector which is stated to be particularly useful for connecting underwater riser sections and includes remotely actuated hydraulic means for moving locking dogs radially inward into locked position and a remotely actuated hydraulic means for moving a cam into position to lock the dogs and their actuator in locked position.

The K. C. Saliger et al U.S. Patent No. 4,222,592 discloses another type of connector for underwater members which includes an over-the-center toggle mechanism which is remotely actuated to move locking dogs into engagement with their grooves and the past-center position of the toggle mechanism resists unlatching of the dogs from their grooves.

The W. M. Taylor U.S. Patent No. 3,986,729 discloses a connector suitable for underwater connection of two tubular members which wedges a locking ring into engagement to join the two members and includes a means to wedge the locking ring to release position when the wedging member is moved to release position.

Examples of the use of collet type of connectors for the connection of tubular members are shown in U.S. Patent Nos. 4,265,470, 4,049,297 and 4,074,912. While these patents disclose connectors which are locked in their latched position none of them disclose any means for retaining the camming or wedging actuator member in both its latched position and its unlatched position.

US-A-4165891 describes a tubular connector in which first and second tubular members having external engaging means. The members can be latched by a latching means which can be releasably retained by a locking means.

An object of the present invention is to provide an improved tubular connector which can be releasably locked in both its latched and unlatched position.

According to the present invention there is

provided a tubular connector including a first tubular member having a plurality of external annular latching grooves around its exterior at a position near one end of said first tubular member, a second tubular member having a latching profile around its exterior at a position near one end of said second tubular member, means having internal projections for latching said tubular members together and means for releasably retaining the latching means, characterised in that the second tubular member has a plurality of external annular latching grooves said latching means includes a plurality of latching segments each having internal annular projections spaced for latching engagement with the external annular grooves of said tubular members to secure said tubular members into latching engagement to each other with their one ends in engagement, said retaining means comprise an actuator ring positioned in surrounding relationship to the segments and axially movable thereon, said actuator ring retaining said segments in position around said tubular members, said ring having an internal surface coacting with the external surfaces of said segments so that in one axial position the actuator ring wedges said segments into their latching engagement with the latching grooves of said tubular members and in its other axial position allows said segments to move out of said latching grooves of said tubular members, and means is provided to releasably retain the actuator ring in its respective positions.

The invention will be described now by way of example only with particular reference to the accompanying drawings. In the drawings:

Figure 1 is a perspective view of the improved connector with portions broken away to present details of structure and with the connector in its unlatched position.

Figure 2 is a view similar to Figure 1 showing the connector in its latched position.

Figure 3 is a partial sectional view of the latching mechanism of the present invention in its unlatched position.

Figure 4 is a view similar to Figure 3 and showing the latching mechanism in its latched position.

Figure 5 is a perspective view of the latching segments.

Figure 6 is an enlarged partial perspective view of the interior of the latching segments and actuating ring to illustrate their coaction.

As shown in Figures 1 and 2, improved connector 10 includes first tubular member 12, second tubular means 14 and means 16 for positively connecting or latching said members together with seal ring 18 therebetween. Upper end 20 of first member 12 and lower end 22 of second member 14 are suitable prepared for welding the tube sections to the tubular members which connector 10 is to connect. First tubular member 12 includes means 24 surrounding its exterior for latching engagement and second tubular member 14 includes means 26 surrounding its exterior for latching engagement. As shown,

means 24 includes grooves 28 and means 26 includes grooves 30.

Connecting or latching means 16 includes latching segments 32 which, when actuated to latching position as shown in Figure 2, has its internal projections 34 in tight engagement with grooves 28 and 30 of members 12 and 14. Actuation of latching means 16 is accomplished by movement of latching actuator ring 36 in the downward direction as shown in Figures 3 and 4 so that its inner tapered surfaces 38 engage and wedge the outer tapered surfaces 40 on latching segments 32 to move segment projections 34 into engagement with grooves 28 and 30.

Latching means 16 includes retaining means 42 which functions to retain actuator ring 36 in both its latched and its unlatched positions. Retaining means 42 includes split ring 44 which is positioned in groove 46 in the exterior of member 12. As shown in Figure 3, split ring 44 has its upper outer bevel 48 in engagement with inner taper 50 on actuator ring 36 to exert a force in the upward direction to retain actuator ring 36 in its unlatched position. As shown in Figure 4, split ring 44 has its lower outer bevel 52 in engagement with inner taper 54 on actuator ring 36 to exert a force in the downward direction to retain actuator ring 36 in its latched position.

The edges of each of segments 32 include surfaces 56 which taper in a direction toward the adjacent segment in the upward direction. As best seen in Figure 5, this provides space 58 between adjacent segments 32. Wedge blocks 60 are secured to the interior of actuator ring 36 by cap screws 62 and are adapted to be positioned in space 58 so that the upward movement of ring 36 causes wedge blocks 60 to exert forces on the edges in a tangential direction to force segments 32 into their unlatched position.

In the event that flange 47, which is on the lower side of groove 46, is too large to allow the insertion of snap ring 44 therein without damaging ring 44, flange 47 may be made separate from member 12 and threaded thereon after the installation of snap ring 44. It is suggested that suitable stops be provided to ensure that flange 47 is properly positioned and that it does not restrict the movement of snap ring 44.

The improved connector of the present invention is assembled and set in the running of the riser string. In the usual manner the lower member is supported by a spider in the rotary table with the remainder of the components being in position. A suitable actuating device is connected to the actuator ring to move it to the latching position. In disconnecting the latched connector, it is supported on the spider and the actuator ring is engaged and moved to unlatched position by the same device.

Claims

1. A tubular connector including a first tubular member (12) having a plurality of external annular latching grooves (28) around its exterior at a

position near one end of said first tubular member, a second tubular member (14) having a latching profile around its exterior at a position near one end of said second tubular member, means (16) having internal projections for latching said tubular members together and means (42) for releasably retaining the latching means, characterised in that the second tubular member (14) has a plurality of external annular latching grooves (30) said latching means includes a plurality of latching segments (32) each having internal annular projections (34) spaced for latching engagement with the external annular grooves of said tubular members to secure said tubular members into latching engagement to each other with their one ends in engagement, said retaining means comprise an actuator ring (36) positioned in surrounding relationship to the segments and axially movable thereon, said actuator ring retaining said segments in position around said tubular members, said ring having an internal surface (38) coacting with the external surfaces of said segments (32) so that in one axial position the actuator ring (36) wedges said segments (32) into their latching engagement with the latching grooves (28, 30) of said tubular members and in its other axial position allows said segments (32) to move out of said latching grooves of said tubular members, and means (44) is provided to releasably retain the actuator ring (36) in its respective positions.

2. A tubular connector according to Claim 1, characterised by including means (60) on the interior of said actuator ring to urge said segments (32) out of engagement with said tubular member latching grooves (28, 30) when said actuator ring (36) is moved to its axial position which allows the segments (32) to move out of the latching grooves of said tubular members.

3. A tubular connector according to Claim 2 characterised in that said means urging the segments out of engagement includes a plurality of wedge shaped elements (60) on the interior of the actuator ring (36) engaging the side edges (56) of the segments (32) to force them radially outward away from their engagement within the tubular member latching grooves.

4. A tubular connector according to any preceding claim characterised by including a seal ring (18) positioned on the interior of the tubular members (12, 14) between their adjacent ends, each of the tubular members having an internal tapered surface against which the seal ring engages when the tubular members are secured together.

Patentansprüche

1. Rohrverbindung, mit
einem ersten Rohrglied (12), das an einer Stelle
nahe einem Ende desselben eine Mehrzahl äußerer ringförmiger Verriegelungsnuten (28) um die Außenseite herum aufweist,
einem zweiten Rohrglied (14), das an einer Stelle
nahe einem Ende desselben eine Verriegelungsschulter um die Außenseite herum aufweist,

means 24 includes grooves 28 and means 26 includes grooves 30.

Connecting or latching means 16 includes latching segments 32 which, when actuated to latching position as shown in Figure 2, has its internal projections 34 in tight engagement with grooves 28 and 30 of members 12 and 14. Actuation of latching means 16 is accomplished by movement of latching actuator ring 36 in the downward direction as shown in Figures 3 and 4 so that its inner tapered surfaces 38 engage and wedge the outer tapered surfaces 40 on latching segments 32 to move segment projections 34 into engagement with grooves 28 and 30.

Latching means 16 includes retaining means 42 which functions to retain actuator ring 36 in both its latched and its unlatched positions. Retaining means 42 includes split ring 44 which is positioned in groove 46 in the exterior of member 12. As shown in Figure 3, split ring 44 has its upper outer bevel 48 in engagement with inner taper 50 on actuator ring 36 to exert a force in the upward direction to retain actuator ring 36 in its unlatched position. As shown in Figure 4, split ring 44 has its lower outer bevel 52 in engagement with inner taper 54 on actuator ring 36 to exert a force in the downward direction to retain actuator ring 36 in its latched position.

The edges of each of segments 32 include surfaces 56 which taper in a direction toward the adjacent segment in the upward direction. As best seen in Figure 5, this provides space 58 between adjacent segments 32. Wedge blocks 60 are secured to the interior of actuator ring 36 by cap screws 62 and are adapted to be positioned in space 58 so that the upward movement of ring 36 causes wedge blocks 60 to exert forces on the edges in a tangential direction to force segments 32 into their unlatched position.

In the event that flange 47, which is on the lower side of groove 46, is too large to allow the insertion of snap ring 44 therein without damaging ring 44, flange 47 may be made separate from member 12 and threaded thereon after the installation of snap ring 44. It is suggested that suitable stops be provided to ensure that flange 47 is properly positioned and that it does not restrict the movement of snap ring 44.

The improved connector of the present invention is assembled and set in the running of the riser string. In the usual manner the lower member is supported by a spider in the rotary table with the remainder of the components being in position. A suitable actuating device is connected to the actuator ring to move it to the latching position. In disconnecting the latched connector, it is supported on the spider and the actuator ring is engaged and moved to unlatched position by the same device.

Claims

1. A tubular connector including a first tubular member (12) having a plurality of external annular latching grooves (28) around its exterior at a

position near one end of said first tubular member, a second tubular member (14) having a latching profile around its exterior at a position near one end of said second tubular member, means (16) having internal projections for latching said tubular members together and means (42) for releasably retaining the latching means, characterised in that the second tubular member (14) has a plurality of external annular latching grooves (30) said latching means includes a plurality of latching segments (32) each having internal annular projections (34) spaced for latching engagement with the external annular grooves of said tubular members to secure said tubular members into latching engagement to each other with their one ends in engagement, said retaining means comprise an actuator ring (36) positioned in surrounding relationship to the segments and axially movable thereon, said actuator ring retaining said segments in position around said tubular members, said ring having an internal surface (38) coaxing with the external surfaces of said segments (32) so that in one axial position the actuator ring (36) wedges said segments (32) into their latching engagement with the latching grooves (28, 30) of said tubular members and in its other axial position allows said segments (32) to move out of said latching grooves of said tubular members, and means (44) is provided to releasably retain the actuator ring (36) in its respective positions.

2. A tubular connector according to Claim 1, characterised by including means (60) on the interior of said actuator ring to urge said segments (32) out of engagement with said tubular member latching grooves (28, 30) when said actuator ring (36) is moved to its axial position which allows the segments (32) to move out of the latching grooves of said tubular members.

3. A tubular connector according to Claim 2 characterised in that said means urging the segments out of engagement includes a plurality of wedge shaped elements (60) on the interior of the actuator ring (36) engaging the side edges (56) of the segments (32) to force them radially outward away from their engagement within the tubular member latching grooves.

4. A tubular connector according to any preceding claim characterised by including a seal ring (18) positioned on the interior of the tubular members (12, 14) between their adjacent ends, each of the tubular members having an internal tapered surface against which the seal ring engages when the tubular members are secured together.

Patentansprüche

1. Rohrverbindung, mit einem ersten Rohrglied (12), das an einer Stelle nahe einem Ende desselben eine Mehrzahl äußerer ringförmiger Verriegelungsnuten (28) um die Außenseite herum aufweist, einem zweiten Rohrglied (14), das an einer Stelle nahe einem Ende desselben eine Verriegelungsschulter um die Außenseite herum aufweist,



einer Einrichtung (16) mit inneren Vorsprüngen zum Verriegeln der Rohrglieder miteinander und einer Einrichtung (42) zum lösbaren Festhalten der Verriegelungseinrichtung, dadurch gekennzeichnet, daß

das zweite Rohrglied (14) eine Mehrzahl äußerer ringförmiger Verriegelungsnuten (30) aufweist die Verriegelungseinrichtung eine Mehrzahl Verriegelungssegmente (32) aufweist, die für einen Verriegelungseingriff mit den äußeren ringförmigen Nuten der Rohrglieder beabstandet sind, um die Rohrglieder im gegenseitigen Verriegelungseingriff bei deren im Eingriff befindlichen Enden zu sichern,

die Festhalteeinrichtung einen Betätigungsring (36) aufweist, der für ein Umfassen der Segmente und axial verschieblich hierauf angeordnet ist, wobei der Betätigungsring die Segmente um die Rohrglieder in Stellung festhält und eine Innenfläche (38) aufweist, die mit den Außenflächen der Segmente (32) so zusammenwirkt, daß in einer axialen Stellung der Betätigungsring (36) die Segmente (32) in ihrem Verriegelungseingriff mit den Verriegelungsnuten (28, 30) der Rohrglieder verkeilt und in seiner anderen axialen Stellung es den Segmenten (32) ermöglicht, aus den Verriegelungsnuten der Rohrglieder herauszutreten, und

eine Einrichtung (44) vorgesehen ist, um den Betätigungsring (36) in seinen jeweiligen Stellung lösbar festzuhalten.

2. Rohrverbindung nach Anspruch 1, gekennzeichnet durch

eine Einrichtung (60) auf der Innenseite des Betätigungsringes, um die Segmente (32) außer Eingriff mit den Rohrglied-Verriegelungsnuten (28, 30) zu bringen, wenn der Betätigungsring (36) in seine axiale Stellung bewegt wird, die es den Segmenten (32) ermöglicht, aus den Verriegelungsnuten der Rohrglieder auszutreten.

3. Rohrverbindung nach Anspruch 2, dadurch gekennzeichnet, daß

die die Segmente außer Eingriff drängende Einrichtung eine Mehrzahl keilförmiger Elemente (60) auf der Innenseite des Betätigungsringes (36) aufweist, welche die Seitenkanten (56) der Segmente (32) erfassen, um diese radial auswärts aus ihrem Eingriff in den Rohrglied-Verriegelungsnuten wegzudrängen.

4. Rohrverbindung nach einem der vorstehenden Ansprüche, gekennzeichnet, durch

einen Dichtungsring (18), der auf der Innenseite der Rohrglieder (12, 14) zwischen deren benachbarten Enden angeordnet ist, wobei jedes Rohrglied eine innere Schrägfläche besitzt, gegen die sich der Dichtungsring legt, wenn die Rohrglieder gegenseitig fixiert sind.

Revendications

1. Un connecteur tubulaire comprenant une première pièce tubulaire (12) munie d'un certain nombre de rainures d'encastement annulaires

externes (28) autour de son extérieur, situées près d'une extrémité de cette pièce tubulaire, une seconde pièce tubulaire (14) munie d'un épaulement d'encastement autour de son extérieur, et situé près d'une extrémité de cette seconde pièce tubulaire, des moyens (16) ayant des saillies internes pour enclencher ensemble ces pièces tubulaires, et des moyens (42) pour retenir de façon réversible les moyens d'encastement, caractérisé en ce que la seconde pièce tubulaire (14) est munie d'un certain nombre de rainures d'encastement annulaires externes (30), ces moyens d'encastement comprenant un certain nombre de segments d'encastement (32) munis chacun de saillies annulaires internes (34) espacées pour venir au contact et s'encastement sur les rainures annulaires externes des pièces tubulaires pour fixer ces pièces tubulaires au contact et en position d'encastement l'une par rapport à l'autre par l'une de leurs extrémités, ces moyens de retenue comprenant un anneau d'actionnement (36) entourant les segments et axialement mobile dessus, cet anneau d'actionnement retenant ces segments en position autour des pièces tubulaires, cet anneau ayant une surface interne (38) réagissant sur les surfaces externes des segments (32), de sorte que dans une position axiale l'anneau d'actionnement (36) coince les segments (32) dans leur engagement d'encastement avec les rainures d'encastement (28, 30) des pièces tubulaires, et que dans son autre position axiale il permette aux segments (32) de sortir des rainures d'encastement des pièces tubulaires, des moyens (44) étant prévus pour retenir l'anneau d'actionnement (36) de façon réversible dans ses positions respectives.

2. Un connecteur tubulaire conforme à la revendication 1, caractérisé en ce qu'il comprend des moyens (60) à l'intérieur de l'anneau d'actionnement, pour dégager en force les segments (32) les rainures d'encastement (28, 30) de la pièce tubulaire, quand l'anneau d'actionnement (30) est amené dans la position axiale, permettant aux segments (32) de sortir des rainures d'encastement des pièces tubulaires.

3. Un connecteur tubulaire conforme à la revendication 2, caractérisé en ce que les dits moyens de dégagement en force des segments comprennent un certain nombre d'éléments (60) en forme de coins à l'intérieur de l'anneau d'actionnement (36), s'engageant dans les bords latéraux (56) des segments (32) pour les sortir en force radialement et vers l'extérieure de leur engagement dans les rainures d'encastement de la pièce tubulaire.

4. Un connecteur tubulaire conforme à l'une quelconque des précédentes revendications, caractérisé en ce qu'il comprend un joint annulaire (18), placé sur l'intérieur des pièces tubulaires (12, 14) entre leurs extrémités adjacentes, chacune des pièces tubulaires ayant une surface interne conique contre laquelle le joint annulaire vient au contact lorsque les pièces tubulaires sont fixées l'une à l'autre.

