

Description

This invention relates to tubular connectors.

It is common practice in offshore oil and gas production to have the wellhead and related casing hangers mounted at the ocean floor with the xmas tree and other production equipment mounted above the water level on a production platform. In such situations tieback conductors are used to connect the subsea wellhead equipment to the platform mounted production equipment. In a typical application the high pressure 18 3/4 inch casing head housing and subsequent casing strings must be tied back to the production platform. It is also desirable at time to provide a means which latches the casing string in position so that once it is seated it does not lift off its seat. Many times it is also preferred that the connector allow the string to pass freely to its seated position without encountering problems of premature setting of the connector.

A preferred connector is one in which the latch allows the threads which it is to engage to pass thereby in a ratcheting fashion so that it is not prematurely set. An example of a prior art connector of this type is shown in U. S. Patent No. 3,926,457.

U. S. Patent No. 3,827,488 discloses a ratcheting connector which includes segments having ratchet teeth and backed by resilient pads to allow radial movement of the segments during ratcheting.

U. S. Patent No. 4,561,499 discloses spring loaded ratchet segments functioning to provide connection between an inner tubular member and an outer tubular member.

Another state of the art type of latching mechanism is shown on page 808 of the 1986-87 Composite Catalog of Oil Field Equipment and Services, published by World Oil. The publication states that: "The tieback tool has patented modified wicker threads which engage the square threads of standard casing hangers. The wicker threads are backed up by solid shoulders, and lock with one to two turns of the tieback string."

Other connectors have had such ratcheting engagement but have needed a means to prevent rotation of the latch ring when the string is being rotated to tighten the connection. One such arrangement is described in GB-A-2165609.

An object of the present invention is to provide a connector for providing engagement between two concentric tubular members which is easily and quickly tightened.

According to the present invention there is provided a tubular connector comprising a first tubular member and a second tubular member and, a split latching ring mounted on one of said tubular members, said split latching ring having first threads facing mating second threads on the other

of said tubular members, said mating threads on said split latching ring and said other tubular member being formed to cam said split latching ring toward said one tubular member when said fine threads are moved through one another, characterised in that said split latching ring also has coarser third threads which engage coarser fourth threads on the tubular member on which it is mounted, the arrangement being such that after the tubular members have been positioned the latching ring is set by rotation of the tubular member on which the latching ring is mounted thereby bringing the coarser threads into a tight engagement.

Embodiments of the present invention can be constructed in which less than a full turn is necessary for the tightening of the engagement.

Also all rotation is between new threads and not on possibly damaged threads on one of the tubular members.

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 partial sectional view of two tubular members with the improved connector of the present invention therebetween and in its ratcheting position with the inner member moving through the outer member.

FIGURE 2 is another partial sectional view of the two tubular members with the improved connector in its set but unlocked position.

FIGURE 3 is another similar partial sectional view of the two tubular members with the improved connector of the present invention in its locked position.

FIGURE 4 is a sectional view of a tieback connector secured within a subsea wellhead housing and having the improved connector of the present invention on the lower interior of the tieback connector for receiving a string with exterior fine threads.

Improved connector 10 of the present invention includes central tubular member 12, split latching ring 14 and outer tubular member 16. Central tubular member 12 is shown in elevation in the drawings with split latching ring 14 and outer tubular member 16 being shown in section to more clearly illustrate the relationship of the components and to show their relative positions at all three stages of the setting of the improved connector.

In FIGURE 1 central tubular member 12 on which split latching ring 14 is mounted as hereinafter described is being lowered through outer tubular member 16. Central tubular member 12 includes an external recess 18 having upper shoulder 20 and lower shoulder 22 with coarse buttress threads 24 between such shoulders. Buttress threads 24 have their tapered surface tapering downwardly and outwardly. The interior of split

latching ring 14 includes buttress threads 26 which mate with buttress threads 24 on member 12 and external fine buttress threads 28 which mate with buttress threads 30 on the interior of outer tubular member 16. Threads 24, 26, 28 and 30 are all right hand threads. Threads 28 and 30 have their tapered surfaces tapering downwardly and inwardly so that as the threads become engaged through movement of central tubular member 12 through outer tubular member 16, they cam or wedge split latching ring 14 inwardly to the position illustrated in FIGURE 1. The taper of threads 28 in this manner also avoids threads 28 from becoming stuck or being damaged by imperfections or ridges encountered on the interior of the tubular members through which it passes to be lowered into position with its threads 28 in full engagement with threads 30 on outer tubular member 16 as shown in FIGURE 2.

Split latching ring 14 is biased outward so that it will be urged into the desired engagement with threads 30. While threads 28 and 30 are in full engagement as shown in FIGURE 2, buttress threads 24 and 26 are not in tight engagement. However, a rotation of central tubular member 12 to the right substantially less than one revolution causes buttress threads 24 to come into tight engagement with buttress threads on split latching ring 14 to tighten its engagement with both outer tubular member 16 and central tubular member 12. In this position it provides the latching connection between the two tubular members 12 and 16.

As can be seen, such improve connector is simple in that it is not difficult to install and can be tightened with a minimum of manipulation of central tubular member 12. Further it does not require that split latching ring 14 be provided with means by which it is prevented from rotating. The different threads on the interior and exterior of split latching ring 14 ensure that it does not rotate far before being in tight engagement with outer tubular member 16. Also, all of the relative rotation of the components is between central tubular member 12 and split latching ring 14 with substantially no rotation between split latching ring 14 and outer tubular member 16.

As shown buttress threads 24 and 26 are relatively coarse and threads 28 and 30 are relatively fine. A preferred relationship of such threads is that threads 24 and 26 should be one inch pitch 4 lead right hand threads and threads 28 and 30 should be one-fourth inch pitch 1 lead right hand threads. It is preferred that the crest to root dimension be greater for the threads 24 and 26 than for the threads 28 and 30 but the number of threads per unit of axial length does not need to be greater for the threads 24 and 26 than for the threads 28 and 30. It should be recognized that in some situations,

it may be preferable to make threads 24, 26, 28 and 30 left hand threads rather than right hand threads. Also, on occasions, a buttress thread form may not be the most desired.

Another example of the use of the improve connector of the present invention is shown in FIGURE 4 wherein tieback connector 40 which is positioned on wellhead housing 42 and secured thereto by the engagement of locking ring 44 within groove 46 on the interior of housing 42. Sleeve 48 is positioned on the interior of connector body 50 and is prevented from rotating therein by pins 52 which are in sleeve 48 and having their heads within slots in body 50. Actuator 54 is threaded onto the upper end of sleeve 48 and has its lower end in engagement with internal body shoulder 56. As actuator 54 is rotated, sleeve 48 is brought into tension to preload connector body 50 on housing 42. Ring 58 is threaded onto the lower end of sleeve 48 and provides the lower end of the recess containing split latching ring 60. The interior of sleeve 48 above the upper end of ring 58 and shoulder 62 at the upper end of the latching ring recess includes coarse buttress threads 64 which mate with buttress threads 66 on the exterior of split latching ring 60 and the interior of split latching ring 60 includes fine threads 68 having their tapered surface tapering downwardly and inwardly so that upon engagement with fine threads 70 on central tubular member 72, split latching ring 60 is ratcheted outward into its recess allowing threads 70 to pass thereby. The setting of the connector is the same as described above, in that once the fine threads 68 and 70 are in full engagement, rotation of central tubular member 72 causes split latching ring 60 to rotate with respect to sleeve 48 so that buttress threads 64 and 66 are in tight engagement retaining threads 68 and 70 in tight engagement.

If desired, it is possible to release the engagement of the split latching ring of the present invention by a reverse rotation so that the latching ring is threadedly disengaged from the connection to its companion threads.

Claims

1. A tubular connector comprising a first tubular member and a second tubular member (12, 16) and, a split latching ring (14) mounted on one of said tubular members, said split latching ring (14) having first threads (28) facing mating second threads (30) on the other of said tubular members, said mating threads on said split latching ring (14) and said other tubular member being formed to cam said split latching ring toward said one tubular member when said fine threads are moved through one another, characterised in that said split latching



latching ring 14 includes buttress threads 26 which mate with buttress threads 24 on member 12 and external fine buttress threads 28 which mate with buttress threads 30 on the interior of outer tubular member 16. Threads 24, 26, 28 and 30 are all right hand threads. Threads 28 and 30 have their tapered surfaces tapering downwardly and inwardly so that as the threads become engaged through movement of central tubular member 12 through outer tubular member 16, they cam or wedge split latching ring 14 inwardly to the position illustrated in FIGURE 1. The taper of threads 28 in this manner also avoids threads 28 from becoming stuck or being damaged by imperfections or ridges encountered on the interior of the tubular members through which it passes to be lowered into position with its threads 28 in full engagement with threads 30 on outer tubular member 16 as shown in FIGURE 2.

Split latching ring 14 is biased outward so that will be urged into the desired engagement with threads 30. While threads 28 and 30 are in full engagement as shown in FIGURE 2, buttress threads 24 and 26 are not in tight engagement. However, a rotation of central tubular member 12 to the right substantially less than one revolution causes buttress threads 24 to come into tight engagement with buttress threads on split latching ring 14 to tighten its engagement with both outer tubular member 16 and central tubular member 12. In this position it provides the latching connection between the two tubular members 12 and 16.

As can be seen, such improve connector is simple in that it is not difficult to install and can be tightened with a minimum of manipulation of central tubular member 12. Further it does not require that split latching ring 14 be provided with means by which it is prevented from rotating. The different threads on the interior and exterior of split latching ring 14 ensure that it does not rotate far before being in tight engagement with outer tubular member 16. Also, all of the relative rotation of the components is between central tubular member 12 and split latching ring 14 with substantially no rotation between split latching ring 14 and outer tubular member 16.

As shown buttress threads 24 and 26 are relatively coarse and threads 28 and 30 are relatively fine. A preferred relationship of such threads is that threads 24 and 26 should be one inch pitch 4 lead right hand threads and threads 28 and 30 should be one-fourth inch pitch 1 lead right hand threads. It is preferred that the crest to root dimension be greater for the threads 24 and 26 than for the threads 28 and 30 but the number of threads per unit of axial length does not need to be greater for the threads 24 and 26 than for the threads 28 and 30. It should be recognized that in some situations,

it may be preferable to make threads 24, 26, 28 and 30 left hand threads rather than right hand threads. Also, on occasions, a buttress thread form may not be the most desired.

Another example of the use of the improve connector of the present invention is shown in FIGURE 4 wherein tieback connector 40 which is positioned on wellhead housing 42 and secured thereto by the engagement of locking ring 44 within groove 46 on the interior of housing 42. Sleeve 48 is positioned on the interior of connector body 50 and is prevented from rotating therein by pins 52 which are in sleeve 48 and having their heads within slots in body 50. Actuator 54 is threaded onto the upper end of sleeve 48 and has its lower end in engagement with internal body shoulder 56. As actuator 54 is rotated, sleeve 48 is brought into tension to preload connector body 50 on housing 42. Ring 58 is threaded onto the lower end of sleeve 48 and provides the lower end of the recess containing split latching ring 60. The interior of sleeve 48 above the upper end of ring 58 and shoulder 62 at the upper end of the latching ring recess includes coarse buttress threads 64 which mate with buttress threads 66 on the exterior of split latching ring 60 and the interior of split latching ring 60 includes fine threads 68 having their tapered surface tapering downwardly and inwardly so that upon engagement with fine threads 70 on central tubular member 72, split latching ring 60 is ratcheted outward into its recess allowing threads 70 to pass thereby. The setting of the connector is the same as described above, in that once the fine threads 68 and 70 are in full engagement, rotation of central tubular member 72 causes split latching ring 60 to rotate with respect to sleeve 48 so that buttress threads 64 and 66 are in tight engagement retaining threads 68 and 70 in tight engagement.

If desired, it is possible to release the engagement of the split latching ring of the present invention by a reverse rotation so that the latching ring is threadedly disengaged from the connection to its companion threads.

Claims

1. A tubular connector comprising a first tubular member and a second tubular member (12, 16) and, a split latching ring (14) mounted on one of said tubular members, said split latching ring (14) having first threads (28) facing mating second threads (30) on the other of said tubular members, said mating threads on said split latching ring (14) and said other tubular member being formed to cam said split latching ring toward said one tubular member when said fine threads are moved through one another, characterised in that said split latching



ring (14) also has coarser third threads (26) which engage coarser fourth threads (24) on the tubular member on which it is mounted, the arrangement being such that after the tubular members have been positioned the latching ring (14) is set by rotation of the tubular member on which the latching ring is mounted thereby bringing the coarser threads into a tight engagement.

2. A tubular connector according to claim 1, wherein said split latching ring (14) is mounted in the inner tubular member (12), and said first and second threads (28, 30) are on the exterior of said split latching ring (14) and the interior of the outer tubular member (10).

3. A tubular connector according to claim 1, wherein said split latching ring (14) is mounted on the outer tubular member (10), and said first and second threads (28, 30) are on the interior of said split latching ring (14) and the exterior of the inner tubular member (12).

4. A tubular connector according to claim 1, wherein said coarser threads have a lead and pitch which is such that setting of said connector requires less than one full turn of the central tubular member (12).

5. A tubular connector according to claim 1, wherein said coarser threads (24, 26) are one inch pitch with 4 lead right hand threads, and first and second threads (28, 30) are 1/4 inch pitch with 1 lead right hand threads.

6. A tubular connector according to claim 1, wherein said one tubular member (12) includes a recess (18) with upper and lower shoulders (20, 22) between which said split latching ring (14) is mounted with its coarser threading in engagement with the mating coarser threading within the bottom of said recess.

Patentansprüche

1. Rohrförmige Kupplung umfassend ein erstes rohrförmiges Element und ein zweites rohrförmiges Element (12, 16) und einen geschlitzten Einklinkring (14), der auf einem der rohrförmigen Elemente befestigt ist, wobei der geschlitzte Einklinkring (14) ein erstes Gewinde (28) aufweist, das einem eingreifenden zweiten Gewinde (30) auf dem anderen rohrförmigen Element gegenüberliegt, so daß die ineinandergreifenden Gewinde auf dem geschlitzten Einklinkring (14) und dem anderen rohrförmigen Element derart ausgebildet sind, daß sie

den geschlitzten Einklinkring zu einem rohrförmigen Element mitnehmen, wenn die Feingewinde zueinander bewegt werden, dadurch gekennzeichnet, daß der geschlitzte Einklinkring (14) des weiteren ein größeres, drittes Gewinde (26) aufweist, welches in ein größeres, viertes Gewinde (24) auf dem rohrförmigen Element, auf dem es befestigt ist, eingreift, wobei die Vorrichtung derart ausgebildet ist, daß nach der Anordnung der rohrförmigen Elemente der Einklinkring (14) durch Rotation des rohrförmigen Elements, auf dem der Einklinkring befestigt ist, eingesetzt wird und dadurch die größeren Gewinde in einen festen Eingriff gebracht werden.

2. Rohrförmige Kupplung nach Anspruch 1, wobei der geschlitzte Einklinkring (14) in dem inneren rohrförmigen Element (12) befestigt ist, und das erste und zweite Gewinde (28, 30) auf der Außenseite des geschlitzten Einklinkringes (14) und auf der Innenseite des äußeren rohrförmigen Elements (10) sind.

3. Rohrförmige Kupplung nach Anspruch 1, wobei der geschlitzte Einklinkring (14) auf dem äußeren rohrförmigen Element (10) befestigt ist, und das erste und zweite Gewinde (28, 30) auf der Innenseite des geschlitzten Einklinkringes (14) und auf der Außenseite des inneren rohrförmigen Elements (12) sind.

4. Rohrförmige Kupplung nach Anspruch 1, wobei das größere Gewinde einen Gang und eine Steigung aufweist, die derart sind, daß das Einsetzen der Kupplung weniger als eine volle Umdrehung des zentralen rohrförmigen Elements (12) erfordert.

5. Rohrförmige Kupplung nach Anspruch 1, wobei die größeren Gewinde (24, 26) viergängige Rechtsgewinde mit einer Steigung von 1 Zoll sind, und das erste und zweite Gewinde (28, 30) eingängige Rechtsgewinde mit einer Steigung 1/4 Zoll sind.

6. Rohrförmige Kupplung nach Anspruch 1, wobei ein rohrförmiges Element (12) eine Ausnehmung (18) mit oberen und unteren Schultern (20, 22) umfaßt, zwischen denen der geschlitzte Einklinkring (14) mit seinen größeren Gewinden im Eingriff mit den eingreifenden größeren Gewinden am Boden der besagten Ausnehmung befestigt ist.

**Revendications**

1. Connecteur tubulaire comportant un premier élément tubulaire et un second élément tubulaire (12, 16) et, un anneau fendu (14) de verrouillage monté sur un premier desdits éléments tubulaires, ledit anneau fendu (14) de verrouillage ayant des premiers filets (28) tournés vers des deuxièmes filets (30) complémentaires situés sur l'autre desdits éléments tubulaires, lesdits filets complémentaires situés sur ledit anneau fendu (14) de verrouillage et sur ledit autre élément tubulaire étant formés pour déplacer par effet de came ledit anneau fendu de verrouillage vers ledit premier élément tubulaire lorsque lesdits filets fins sont déplacés l'un à travers l'autre, caractérisé en ce que ledit anneau fendu (14) de verrouillage comporte également des troisièmes filets (26) plus grossiers qui viennent en prise avec des quatrièmes filets (24) plus grossiers situés sur l'élément tubulaire sur lequel il est monté, l'agencement étant tel qu'après que les éléments tubulaires aient été mis en position, l'anneau de verrouillage est mis en place par rotation de l'élément tubulaire sur lequel l'anneau de verrouillage est monté de manière à amener les filets plus grossiers dans une position de prise étroite.
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2. Connecteur tubulaire selon la revendication 1, dans lequel ledit anneau fendu (14) de verrouillage est monté dans l'élément tubulaire extérieur 12, et lesdits premier et second filets (28, 30) sont situés sur l'extérieur dudit anneau fendu (14) de verrouillage et l'intérieur de l'élément tubulaire extérieur (10).
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3. Connecteur tubulaire selon la revendication 1, dans lequel ledit anneau fendu (14) de verrouillage est monté sur l'élément tubulaire extérieur (10), et lesdits premier et second filets (28, 30) sont situés sur l'intérieur dudit anneau fendu (14) de verrouillage et sur l'extérieur de l'élément tubulaire intérieur (12).
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4. Connecteur tubulaire selon la revendication 1, dans lequel lesdits filets plus grossiers ont une hauteur et un pas qui sont tels que la mise en place dudit connecteur nécessite moins d'un tour complet de l'élément tubulaire central (12).
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5. Connecteur tubulaire selon la revendication 1, dans lequel lesdits filets plus grossiers (24, 26) sont des filets ayant un pas de 2,54 cm (un pouce) à droite et une hauteur de 10,16 cm (4 pouces) et les premier et second filets (28, 30)
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ont un pas de 0,635 cm (1/4 de pouce) à droite et une hauteur de 2,54 cm (un pouce).

6. Connecteur tubulaire selon la revendication 1, dans lequel ledit premier élément tubulaire (12) comporte une cavité (18) ayant des épaulements supérieur et inférieur (20, 22) entre lesquels ledit anneau fendu (14) de verrouillage est monté avec son filet plus grossier en contact avec le filet plus grossier complémentaire situé dans le fond de ladite cavité.