

Description

This invention relates to collet-type connectors.

Collet connectors are commonly used to provide a remotely actuated connection between tubular members such as pipelines or other tubular members. In the oil and gas industry it has been common practice for each manufacturer to have its own design for connections between components and with collet connectors the ends of the tubular members have a different configuration.

The U. S. Patent No. 3,096,999 to A. G. Ahlstone et al dated July 9, 1963 illustrates one form of collet connector which has been used in the past having tapering shoulders on short hub type flanges which are engaged by latching fingers to maintain the tubular members connected. The latching fingers are moved by a ring which cams them into latching position and such ring is moved by a suitable actuator. The tubular members are sealed with respect to one another by an annular seal ring made of a resilient material.

Another example of a similar joint used in underwater well completions is shown in U. S. Patent No. 3,353,595 to B. H. Nelson et al, dated Nov. 21, 1967. This structure is quite similar to the Ahlstone et al structure except that the sealing between the two members is accomplished by a tapered metal seal ring positioned between the two members in engagement with tapered surfaces machined in the inner surfaces of the members at their connecting ends.

The A. G. Ahlstone Patent No. 3,321,217 dated May 23, 1967 discloses another type of joint construction which is controlled by remote actuation to move latching segments into multiple grooves in the exterior of one member and the segments are secured to the other tubular member.

US-A-4526406 describes a connector having latches carried by a main body for extension and retraction to engage a wellhead and latch the connector to the wellhead. The latches are provided with bearing members which engage profiles on the tubular members.

Difficulty is encountered in making a remote connection between tubular members which are prepared for separate types of latching members or end preparations.

An object of the present invention is to provide an improved type of collet connector which may be used with more than one type of end preparation on the tubular members to be connected.

According to the present invention there is provided a connector for connecting a first and a second tubular member together comprising

a plurality of latching fingers,
an actuator ring surrounding said latching fingers,

means for moving said actuator ring to actuate said latching fingers;

each of said latching fingers having engaging projections and an adaptor secured thereto by securing means for engaging profiles on the tubular members to be joined, characterised in that

each of said adaptors is connected to one end of each one of said latching fingers,

each said adapter being so shaped and configured that it forms a radially inner surface of the finger and defines at least one of said projections on said latching fingers, the profile of the adapter projection being arranged to conform generally with the engaging profile of the tubular member concerned, whereby the latching fingers can engage and secure the profiles on the tubular members, each adapter being replaceable by another adaptor whereby the engaging projection can be adapted to the engaging profile of another tubular member.

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 sectional view of a connector of the prior art with FIGURE 1A illustrating the connection being made between tubular members having end preparations which are similar and FIGURE 1B illustrating the connection in its unlatched position with the second tubular member removed.

FIGURE 2 is a detail sectional view of the engaging portions of the improved connector of the present invention providing connection between two tubular members having similar end preparation.

FIGURE 3 is another similar detailed sectional view of the improved connection of the present invention providing connection between two tubular members having dissimilar end preparations.

Description of the Preferred Embodiments

Remotely actuated collet connector 10 of the prior art is shown in FIGURE 1 with FIGURE 1A illustrating the connector 10 in its locking position joining first tubular member 12 to second tubular member 14 and with FIGURE 1B illustrating connector 10 mounted on first tubular member 12 but with second tubular member 14 removed.

Connector 10 includes housing 16 secured to flange 18 of first tubular member 12 and extending axially in surrounding relationship over the position into which second tubular member 14 is positioned for the connection. Upper and lower annular operating cylinders 28 and 32 are bounded by annular lip

20 of housing 16 which extends inwardly from housing 16 and includes seals 22, such as O rings, positioned in grooves on the inner surface 24 of lip 20. Passage 26 extends through flange 18 and through housing 16 and opens into upper cylinder 28 above lip 20. Passage 30 extends through flange 18 and through housing 16 and opens into lower cylinder 32 on the opposite side of lip 20 from cylinder 28.

Actuator ring 34 is positioned within housing 16 and includes flange 36 extending outwardly with seals 38 in its outer surface 40 to seal against the upper inner surface 42 of housing 16.

Latching fingers or segments 44 are positioned within actuator ring 34 and are closely spaced together as best seen in FIGURE 1B. Latching fingers 44 include shoulders 46 and 48 on projections 50 and 52 and are adapted to engage and secure tapered shoulders 54 and 56 on first and second tubular members 12 and 14. Shoulders 54 and 56 are similar end preparations for which the collet connections of the prior art were adapted to connect.

Metal seal ring 58 is positioned between the inner ends of first and second tubular members 12 and 14 and seals against the inner tapered surfaces 60 and 62 of members 12 and 14, respectively. Seal ring 58 includes outer diameter enlargement 61 which is used to secure seal ring 58 to first tubular member 12 by suitable means such as bolting (not shown).

Cylinder head ring 64 is secured to the exterior surface of actuator ring 34 at its lower outer end; is suitably attached thereto by retainer 65 and split ring 67; and is sealed to the lower interior surface 66 of housing 16 and to actuator ring 34 as shown. Retainer ring 65 is secured by bolting (not shown) to cylinder head ring 64.

In FIGURE 1A the two tubular members 12 and 14 are connected to one another in sealed locking engagement by the actuation of ring 34 in the downward direction to move fingers 44 into tight clamping engagement with shoulders 54 and 56 and to sealingly engage metal seal ring 58 between surfaces 60 and 62 of members 12 and 14.

Improved collet connector 110 is illustrated in one of its forms in FIGURE 2. Connector 110 is similar to connector 10 and similar components are given the same number with the prefix 1, e.g., first tubular member 112.

Connector 110 includes housing 116 secured to flange (not shown) of first tubular member 112 and extending axially in surrounding relationship over the position into which second tubular member 114 is positioned for the connection. Upper and lower annular operating cylinders 128 and 132 are bounded by annular lip 120 of housing 116 which extends inwardly from housing 116 and includes

seals 122, such as O rings, positioned in grooves on the inner surface 124 of lip 120. Passage 126 extends through the flange (not shown) on member 112 and through housing 116 and opens into upper cylinder 128 above lip 120. Another passage (not shown) extends through the flange on member 112 and through housing 116 and opens into lower cylinder 132 on the opposite side of lip 120 from cylinder 128.

Actuator ring 134 is positioned within housing 116 and includes a flange (not shown) extending outwardly and sealing against the inner surface 142 of housing 116.

Latching fingers 70 each include adapters 72 which are secured to the inner surface of fingers 70. Cap screws 74 and projections 76 are utilized to secure adapters 72 to fingers 70. Latching fingers 70 include shoulder 146 on projection 150 which engages tapered shoulder 154 on first tubular member 112 and shoulder 78 on adapter 72 which engages tapered shoulder 156 on second tubular member 114.

Metal seal ring 158 is positioned between the inner ends of first and second tubular members 112 and 114 and seals against the inner tapered surfaces 160 and 162 of members 112 and 114, respectively. Seal ring 158 includes outer diameter enlargement 161 which is used to secure seal ring 158 to first tubular member 112 by suitable means such as bolting (not shown).

Cylinder head ring 164 is secured to the exterior surface of actuator ring 134 at its lower outer end and is suitably attached thereto by retainer 165 and split ring 167 and is sealed to the lower interior surface 166 of housing 116 and to actuator ring 134 as shown. Retainer 165 is secured to cylinder head ring 164 by bolts 169.

Improved collet connector 210 is illustrated in one of its forms in FIGURE 3. Connector 210 is similar to connector 10 and similar components are given the same number with the prefix 2, e.g., the first tubular member 212.

Connector 210 includes housing 216 secured to flange (not shown) of first tubular member 212 and extending axially in surrounding relationship over the position into which second tubular member 214 is positioned for the connection. Upper and lower annular operating cylinders 228 and 232 are bounded by annular lip 220 of housing 216 which extends inwardly from housing 216 and includes seals 222, such as O rings, positioned in grooves on the inner surface 224 of lip 220. Passage 226 extends through the flange (not shown) on member 212 and through housing 216 and opens into upper cylinder 228 above lip 220. Another passage (not shown) extends through the flange on member 212 and through housing 216 and opens into lower cylinder 232 on the opposite side of lip 220 from

cylinder 228.

Actuator ring 234 is positioned within housing 216 and includes a flange (not shown) extending outwardly and sealing against the inner surface 242 of housing 216.

Latching fingers 80 each include adapters 82 which are secured to the inner surface of fingers 80. Cap screws 84 and projections 86 are utilized to secure adapters 82 to fingers 80. Latching fingers 80 include shoulder 246 on projection 250 which engages tapered shoulder 254 on first tubular member 212 and projections 88 on adapter 82 which engage within grooves 90 on the exterior of second tubular member 214. Additionally alignment ring 92 is secured to the lower end of first tubular member 212 by cap screws 94 to assist in guiding tubular member 212 and latching fingers 80 onto tubular member 214.

Metal seal ring 258 is positioned between the inner ends of first and second tubular members 212 and 214 and seals against the inner tapered surfaces 260 and 98 of members 212 and 214, respectively. Seal ring 258 includes outer diameter enlargement 261 which is used to secure seal ring 258 to first tubular member 212 by suitable means such as bolting (not shown).

Cylinder head ring 264 is secured to the exterior surface of actuator ring 234 at its lower outer end and is suitably attached thereto by retainer 265 and split ring 267 and is sealed to the lower interior surface 266 of housing 216 and to actuator ring 234 as shown. Retainer 265 is secured to cylinder head ring 264 by bolts 269.

In all forms of the invention, the delivery of fluid under pressure through passage 26 to chamber 28 causes actuator ring 34 to move upwardly toward flange 18; and through passage 30 to chamber 32 causes actuator ring 34 to move downwardly away from flange 18. These movements of actuator ring 34 in engagement with the exterior cam surfaces of the latching fingers cause the releasing and locking, respectively, by the movement of the latching fingers in their engagement of the end configurations of first and second tubular members.

Claims

1. A connector for connecting a first (112) and a second tubular member (114) together comprising
a plurality of latching fingers (70),
an actuator ring (134) surrounding said latching fingers,
means for moving said actuator ring to actuate said latching fingers;

each of said latching fingers (70) having engaging projections and an adaptor (72) secured thereto by securing means for engaging profiles on the tubular members to be joined, characterised in that

each of said adapters (72) is connected to one end of each one of said latching fingers (70) each said adapter being so shaped and configured that it forms a radially inner surface of the finger and defines at least one of said projections on said latching fingers, the profile of the adapter projection being arranged to conform generally with the engaging profile of the tubular member concerned, whereby the latching fingers can engage and secure the profiles on the tubular members, each adapter being replaceable by another adaptor whereby the engaging projection can be adapted to the engaging profile of another tubular member.

2. A connector according to claim 1, wherein the means for moving the actuator ring (134) is a pressure responsive means and the connector includes means (126) for selectively delivering fluid pressure to opposite sides of said pressure responsive means to move said actuating ring.
3. A connector according to claim 2, wherein said pressure responsive means includes
a flange (120) on a housing (116) surrounding said actuator ring (134), and
said fluid delivering means delivers fluid pressure to opposite sides of said flange to move said actuator ring.
4. A connector according to claim 1 or claim 2, wherein each latching finger has a first projection (150) including a flange engaging surface (146), and
a second replaceable projection (72) including a flange engaging surface (78),
5. A connector according to claim 1, wherein each latching finger includes
a first projection (250) including a flange engaging surface (246), and
a second replaceable projection (82) including surfaces (88) for engaging within grooves in the exterior end profile of said second tubular member.
6. A connector according to claim 5, including
a guide ring (92) to be secured to the lower end of said first tubular member to assist in guiding said first tubular member and said latching fingers onto said second tubular member.

cylinder 228.

Actuator ring 234 is positioned within housing 216 and includes a flange (not shown) extending outwardly and sealing against the inner surface 242 of housing 216.

Latching fingers 80 each include adapters 82 which are secured to the inner surface of fingers 80. Cap screws 84 and projections 86 are utilized to secure adapters 82 to fingers 80. Latching fingers 80 include shoulder 246 on projection 250 which engages tapered shoulder 254 on first tubular member 212 and projections 88 on adapter 82 which engage within grooves 90 on the exterior of second tubular member 214. Additionally alignment ring 92 is secured to the lower end of first tubular member 212 by cap screws 94 to assist in guiding tubular member 212 and latching fingers 80 onto tubular member 214.

Metal seal ring 258 is positioned between the inner ends of first and second tubular members 212 and 214 and seals against the inner tapered surfaces 260 and 98 of members 212 and 214, respectively. Seal ring 258 includes outer diameter enlargement 261 which is used to secure seal ring 258 to first tubular member 212 by suitable means such as bolting (not shown).

Cylinder head ring 264 is secured to the exterior surface of actuator ring 234 at its lower outer end and is suitably attached thereto by retainer 265 and split ring 267 and is sealed to the lower interior surface 266 of housing 216 and to actuator ring 234 as shown. Retainer 265 is secured to cylinder head ring 264 by bolts 269.

In all forms of the invention, the delivery of fluid under pressure through passage 26 to chamber 28 causes actuator ring 34 to move upwardly toward flange 18; and through passage 30 to chamber 32 causes actuator ring 34 to move downwardly away from flange 18. These movements of actuator ring 34 in engagement with the exterior cam surfaces of the latching fingers cause the releasing and locking, respectively, by the movement of the latching fingers in their engagement of the end configurations of first and second tubular members.

Claims

1. A connector for connecting a first (112) and a second tubular member (114) together comprising
a plurality of latching fingers (70).
an actuator ring (134) surrounding said latching fingers.
means for moving said actuator ring to actuate said latching fingers;

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each of said latching fingers (70) having engaging projections and an adaptor (72) secured thereto by securing means for engaging profiles on the tubular members to be joined, characterised in that

each of said adapters (72) is connected to one end of each one of said latching fingers (70) each said adapter being so shaped and configured that it forms a radially inner surface of the finger and defines at least one of said projections on said latching fingers, the profile of the adapter projection being arranged to conform generally with the engaging profile of the tubular member concerned, whereby the latching fingers can engage and secure the profiles on the tubular members, each adapter being replaceable by another adaptor whereby the engaging projection can be adapted to the engaging profile of another tubular member.

2. A connector according to claim 1, wherein the means for moving the actuator ring (134) is a pressure responsive means and the connector includes means (126) for selectively delivering fluid pressure to opposite sides of said pressure responsive means to move said actuating ring.
3. A connector according to claim 2, wherein said pressure responsive means includes a flange (120) on a housing (116) surrounding said actuator ring (134), and said fluid delivering means delivers fluid pressure to opposite sides of said flange to move said actuator ring.
4. A connector according to claim 1 or claim 2, wherein each latching finger has a first projection (150) including a flange engaging surface (146), and a second replaceable projection (72) including a flange engaging surface (78).
5. A connector according to claim 1, wherein each latching finger includes a first projection (250) including a flange engaging surface (246), and a second replaceable projection (82) including surfaces (88) for engaging within grooves in the exterior end profile of said second tubular member.
6. A connector according to claim 5, including a guide ring (92) to be secured to the lower end of said first tubular member to assist in guiding said first tubular member and said latching fingers onto said second tubular member.



7. A connector according to any preceding claim, wherein said latching fingers are collet fingers and the connector includes a housing supported from the first tubular member.
8. An assembly of a connector according to any preceding claim, and first and second tubular members (112, 114) and including a seal ring (158) having a configuration to mate with the internal end sealing surface of first and second tubular members and positioned therein to seal the members when they are secured together.

Revendications

1. Un connecteur destiné à connecter entre eux un premier (112) et un deuxième (114) éléments tubulaires comprenant :
 - plusieurs doigts de verrouillage (70) ;
 - une bague d'actionnement (134) entourant lesdits doigts de verrouillage ;
 - un moyen pour déplacer ladite bague d'actionnement pour actionner lesdits doigts de verrouillage ;
 - chacun desdits doigts de verrouillage (70) comportant des saillies d'engagement, et un adaptateur (72) qui y est fixé par un moyen de fixation, pour être en prise avec des profils des éléments tubulaires à assembler, caractérisé en ce que
 - chacun desdits adaptateurs (72) est connecté à une extrémité de chacun desdits doigts de verrouillage (70) ;
 - chacun desdits adaptateurs étant formé et configuré de telle manière qu'il forme une surface radialement intérieure du doigt et définit au moins l'une desdites saillies sur lesdits doigts de verrouillage, le profil de la saillie d'adaptateur étant agencé pour se conformer généralement au profil d'engagement des éléments tubulaires concernés, grâce à quoi les doigts de verrouillage peuvent être en prise avec et fixer les profils sur les éléments tubulaires, chaque adaptateur étant remplaçable par un autre adaptateur, grâce à quoi la saillie d'engagement peut être adaptée au profil d'engagement d'un autre élément tubulaire.
2. Un connecteur selon la revendication 1, dans lequel le moyen de déplacement de la bague d'actionnement (134) est un moyen sensible à la pression et le connecteur comprend un moyen (126) pour appliquer sélectivement une pression de fluide sur des côtés opposés dudit moyen sensible à la pression pour déplacer ladite bague d'actionnement.
3. Un connecteur selon la revendication 2, dans lequel ledit moyen sensible à la pression comprend :
 - une bride (120) sur un boîtier (116) entourant ladite bague d'actionnement (134) ; et
 - ledit moyen d'amenée de fluide applique une pression de fluide sur les côtés opposés de ladite bride pour déplacer ladite bague d'actionnement.
4. Un connecteur selon la revendication 1 ou 2, dans lequel chaque doigt de verrouillage comporte une première saillie (150) comprenant une surface (146) d'engagement de bride, et une deuxième saillie remplaçable (72) comprenant une surface d'engagement de bride (78).
5. Un connecteur selon la revendication 1, dans lequel chaque doigt de verrouillage comprend :
 - une première saillie (250) comprenant une surface (246) d'engagement de bride, et
 - une deuxième saillie remplaçable (82) comprenant des surfaces (88) à mettre en prise à l'intérieur de rainures dans le profil d'extrémité extérieur dudit deuxième élément tubulaire.
6. Un connecteur selon la revendication 5, comprenant une bague de guidage (92) à fixer sur l'extrémité inférieure dudit premier élément tubulaire pour aider au guidage dudit premier élément tubulaire et desdits doigts de verrouillage sur ledit deuxième élément tubulaire.
7. Un connecteur selon l'une quelconque des revendications précédentes, dans lequel lesdits doigts de verrouillage sont des doigts de serrage et le connecteur comprend un boîtier supporté à partir du premier élément tubulaire.
8. Un ensemble composé d'un connecteur selon l'une quelconque des revendications précédentes et d'un premier et d'un deuxième éléments tubulaires (112, 114), et comprenant : une bague d'étanchéité (158) dont la configuration correspond à la surface d'étanchéité d'extrémité intérieure du premier et du deuxième éléments tubulaires, et positionnée dans ceux-ci pour former un joint étanche entre les éléments lorsqu'ils sont assemblés entre eux.



Ansprüche

1. Ein Verbindungsstück zum Zusammenbinden eines ersten (112) und eines zweiten Rohrteiles (114), mit:
 einer Vielzahl von einklinkenden Fingern (70),
 einem Betätigungsring (134), der die einklinkenden Finger umgibt,
 einer Einrichtung zum Bewegen des Betätigungsringes, um die einklinkenden Finger zu betätigen;
 wobei jeder der Klinkenfinger (70) eingreifende Vorsprünge und einen Adapter (72), der daran durch einen Befestigungsmechanismus befestigt ist, zum Eingreifen in Profile auf den zu verbindenden Rohrteilen aufweist,
dadurch gekennzeichnet,
 daß jeder der Adapter (72) mit einem Ende von jedem einzelnen der Klinkenfinger (70) verbunden ist,
 daß jeder der Adapter so geformt und gestaltet ist, daß er eine radiale innere Oberfläche des Fingers formt und wenigstens einen der Vorsprünge auf den Klinkenfingern bildet, wobei das Profil des Adaptervorsprunges derart vorgesehen ist, daß es im wesentlichen dem Eingriffsprofil des betreffenden Rohrteiles angepaßt ist, wodurch die Klinkenfinger in die Profile auf den Rohrteilen eingreifen und die Profile festhalten können, wobei jeder Adapter durch einen anderen Adapter austauschbar ist, wodurch der eingreifende Vorsprung an das Eingriffsprofil von einem anderen Rohrteil angepaßt werden kann.
2. Ein Verbindungsstück nach Anspruch 1, wobei die Einrichtung zum Bewegen des Betätigungsringes (134) eine auf Druck reagierende Einrichtung ist und das Verbindungsstück eine Einrichtung (126) zum selektiven Zuführen von Fluiddruck zu gegenüberliegenden Seiten der druckempfindlichen Einrichtung, um den Betätigungsring zu bewegen, enthält.
3. Ein Verbindungsstück nach Anspruch 2, wobei die druckempfindliche Einrichtung enthält:
 einen Flansch (120) an einem Gehäuse (116), das den Betätigungsring (134) umgibt, und
 wobei die Fluidzuführungseinrichtung einen Fluiddruck zu gegenüberliegenden Seiten des Flansches liefert, um den Antriebsring zu bewegen.
4. Ein Verbindungsstück nach Anspruch 1 oder 2, wobei jeder Klinkenfinger einen ersten Vorsprung (150), der eine Flanscheingriffsfläche (146) enthält, und
 einen zweiten auswechselbaren Vorsprung (72), der eine Flanscheingriffsfläche (78) enthält, aufweist.
5. Ein Verbindungsstück nach Anspruch 1 wobei jeder Klinkenfinger enthält:
 einen ersten Vorsprung (250), der eine Flanscheingriffsfläche (246) enthält, und
 einen zweiten auswechselbaren Vorsprung (82), der eine Oberfläche (88) zum Eingreifen innerhalb von Rillen in dem äußeren Endprofil des zweiten Rohrteiles enthält.
6. Ein Verbindungsstück nach Anspruch 5, welches einen Führungsring (92) enthält, welcher an dem unteren Ende des ersten Rohrteiles befestigt ist, um die Führung des ersten Rohrteiles und der Klinkenfinger zu dem zweiten Rohrteil zu unterstützen.
7. Ein Verbindungsstück nach wenigstens einem der vorhergehenden Ansprüche, wobei die Klinkenfinger Zwingenfinger sind und das Verbindungsstück ein Gehäuse enthält, das von dem ersten Rohrteil gehalten ist.
8. Eine Anordnung von einem Verbindungsstück nach wenigstens einem der vorhergehenden Ansprüche und von einem ersten und zweiten Rohrteil (112, 114), welche enthält:
 einen Dichtungsring (158), der eine Konfiguration aufweist, um an die innere Enddichtungsfläche des ersten und zweiten Rohrteiles angepaßt und darin angeordnet zu sein, um die Teile abzudichten, wenn sie miteinander verbunden sind.

