

Pipe connector

The present invention relates to pipe connectors particularly but not exclusively for interconnecting pipe sections to form a pipe string for use in drilling and/or completion of offshore oil or gas wells, and particularly to a connector providing a connection capable of withstanding high axial loads, for example in pile driving.

A pipe connector for connecting the abutted end portions of two pipes each of which is provided with an outwardly extending surface transverse to the axis of the respective pipe and directed away from the respective pipe end, and comprising an annular ring for surrounding the abutted pipe end portions substantially completely and having a pair of inwardly extending surfaces transverse to the axis thereof and directed towards each other, and each for engagement with a respective one of the surfaces on the pipe end portions, is known from United States Patent Specification No. 4163571. In this specification the annular ring is made as two semi-circular halves which are clamped together by bolts around the two pipe ends. Such an arrangement would not be advantageous for use in drilling and/or completion of offshore oil or gas wells because the ring is entirely separate from the pipe ends so that not only would a storage place have to be found for unused rings separate from that for the pipe sections but, when two pipe sections are being connected together, not only would the sections have to be brought to the connection site but the ring would also have to be brought which would substantially increase the time involved in connecting the pipe sections together.

The pipe connector according to the present invention is characterised in that the ring is a split ring, that one of the surfaces of the ring has a greater inward radial extent than the other surface and is in use permanently engaged with the corresponding one of the pipe end portions, and that operating means are provided for causing the radial dimensions of the ring to change to permit engagement and disengagement of the ring from the other pipe end portion.

In use the split annular ring is thus permanently mounted on one of the pipe end portions. To connect that pipe end portion with another, it is thus merely a matter of arranging the ring in its radially expanded condition, bringing the two pipe ends into abutment, and causing or permitting the ring to contract to its radially contracted condition in which it engages both pipe end portions.

Preferably the ring is in its radially contracted condition when relaxed and the operating means cause radial expansion of the ring, the ring being resiliently radially expandable so that it will return to its contracted condition on release of the operating means.

Embodiments of the invention are described in detail below with reference to the drawings. In the drawings:

Figure 1 is an axial section through the ends of two pipes which have been connected together using a connector according to the present invention;

Figure 2 is an axial section through part of the connector of Figure 1 but in an axial plane angularly spaced from that of Figure 1;

Figure 3 is an axial section similar to that of Figure 2 but showing the connector during assembly of the pipes;

Figure 4 is a plan view of the ring of the embodiment of Figure 1 to a reduced scale;

Figure 5 is a side elevation of part of the connector of Figure 1 showing locking means therefor;

Figure 6 is a plan view of the part of the connector shown in Figure 5;

Figure 7 is a vertical section similar to that of Figure 2 showing a further embodiment of connector according to the present invention;

Figure 8 is a section on the line VIII—VIII of Figure 7 showing locking means for the ring;

Figure 9 is an elevation of the split end portions of the ring of Figure 8;

Figure 10 is an elevation of the locking means of Figure 8;

Figure 11 is a vertical section similar to that of Figure 2 showing another embodiment of pipe connector according to the present invention in operative condition;

Figure 12 is part of a section on the line XII—XII of Figure 11 and showing the locking means of the ring of Figure 11; and

Figure 13 is an elevation of the locking means of Figure 12.

Figures 1 to 6 show a pipe connector for connecting the ends of two pipes or pipe sections of a pipe string for use in the drilling and/or completion of an offshore oil or gas well and which is capable of withstanding pile driving forces.

The pipe connector comprises a split annular member or ring 1 which has a generally U-shaped radial section, the arms of the U of which provide inwardly extending transverse surfaces 2, 3 which are directed towards each other. The two pipes 4, 5 are provided adjacent the ends to be abutted and connected with annular grooves 6, 7 providing oppositely directed outwardly extending transverse surfaces 8, 9. In a modification these surfaces 8, 9 may be provided by flanges on the ends of the pipes 4, 5. As shown, these surfaces 8, 9 are provided on pipe end members 10, 11 which are fixed, e.g. by welding, to the ends of the pipes 4, 5 to be connected together. The surfaces 8, 9, may alternatively be provided on integral end parts of the pipes.

In use, as shown in Figures 1 and 2, the ring

1 surrounds the abutted pipe end portions with the surfaces 2, 3 of the ring engaging the respective surfaces 8, 9 of the pipe end portions to hold the ends of the pipe together. In this embodiment, the end portions of the pipes are positively clamped together by the ring 1 by inclining one or both of the pairs of surfaces 2, 8 and 3, 9 in a direction such that the surfaces converge outwardly of the pipes so as to create a wedge effect of the ring on the pipe end portions. Preferably only one pair of surfaces 3, 9 are inclined, for example at 12°, to a radial plane perpendicular to the axis of the pipes, the other pair of surfaces 2, 8 lying in a radial plane.

The ring 1 is, in its relaxed state, dimensioned so as to engage the pipe end portions as shown in Figures 1 and 2. For uncoupling the pipes, the ring is made radially resiliently expandable and, to uncouple the pipes, is radially expanded to disengage surfaces of the ring and pipe end portions. However surface 2 of the ring has a greater radial inward extent than surface 3 so that surfaces 2, 8 have a greater radial overlap than surfaces 3, 9. For uncoupling, the ring is radially expanded sufficient to disengage surface 3 from surface 9 but not so as to disengage surface 2 from surface 8. Thus in use the ring remains permanently mounted on the pipe 4. When the ring has been radially expanded to disengage surface 3 from surface 9, pipe 5 can be withdrawn by axial movement away from pipe 4.

It is for this reason that in this embodiment the surfaces 2, 8, extend generally in a radial plane perpendicular to the axis of the pipes so that they are permanently in contact and are guided one along the other during radial expansion and contraction of the ring.

The ring 1 is radially expanded by operating means which, in this embodiment, comprise a plurality of operating members angularly spaced apart around the ring and which are operated to force the ring to expand relative to the pipe 4. For example each operating member may comprise a threaded member 12 which is engaged in a threaded radial opening 12a in the ring 1. The members 12 may be arranged to be permanently engaged with the ring 1. When the connector is in use, as shown in Figures 1 and 2, the members 12 are retracted in openings 12a either so that they are out of contact with pipe 4 or so that they merely contact pipe 4 but without force. To disengage the pipe ends or to permit abutment and engagement of two pipes, the members 12 are screwed into the ring 1, the inner ends bearing on the outer surface of the end of the pipe 4 to force the ring 1 to expand relative to the pipe 4, as shown in Figure 3. To ensure that the ring 1 is expanded sufficient for surface 3 to be clear of surface 9 but so that surfaces 2, 8 are still in engagement, the members 12 may each be provided with a head 12b which abuts the outer surface of the ring 1 when the ring 1 has been sufficiently expanded. The heads 12b may be poly-

gonal for engagement by a suitable tool for their operation.

The number of threaded members 12 provided will depend on the overall dimensions of the ring and should be such as to ensure that the ring is evenly expanded around the pipe 4. For example, five such members 12 may be provided in threaded openings 12a as shown in Figure 4, two of the members 12 being arranged adjacent the split ends 14 of the ring, the third being arranged diametrically opposite the split and the remaining two being arranged intermediate the first and third members. A further two members may be provided between the third member and the fourth and fifth members.

To ensure that the ring 1 does not expand when in use, a locking member may be provided to hold the end portions 14 of the ring at the split together. The locking member 13 may for example be as shown in Figures 5 and 6. The end portions 14 of the ring at the split are provided with oppositely peripherally directed mutually inclined dovetailed or undercut surfaces 15, the locking member 13 which extends over the end portions 14 of the ring having correspondingly inclined correspondingly dovetailed surfaces 16 which are directed towards each other and in use engage surfaces 15. To lock the ring, the member 13 is slid in a direction parallel to the axis of the pipes over the end portions of the ring to the position shown in Figures 5 and 6. The dovetailing or undercutting of surfaces 15, 16 ensures that the member 13 cannot inadvertently be removed in a radial direction. To ensure that the member 13 remains in place on the ring, threaded members 17 may be threaded into threaded openings 17a in the member 13 to frictionally engage the outer surface of the end portions of the ring.

To uncouple the pipes 4, 5, the threaded members 17 are first removed and this is followed by removal of the locking member 13. The threaded members 12 are then operated to expand the ring 1 and this automatically frees the pipe 5 from the ring 1 so that the pipe 5 can then be removed by axial movement. To couple the pipe 5 to the pipe 4, the above steps are repeated in reverse order, the end of the pipe 5 being first abutted against the end of the pipe 4.

The abutted end surfaces 18, 19 of the pipes, or pipe end members where provided, may be stepped as shown in Figures 1 to 3, and provided with an annular seal 20 to ensure sealing of the joint.

While in the above described embodiment, the use of a wedging effect of the ring 1 on the pipe ends produced by inclining the surfaces 3, 9, to more firmly bring the pipe ends together as the ring is engaged around the pipe ends, is attractive, it has the disadvantage that the ring may in use be subject to a radial force. Where the pipe contains fluid under pressure, the pressure of the fluid will tend to force the pipes

apart in an axial direction. This force is converted to a radial bursting force by the inclination of surfaces 3, 9. Thus in designing the ring 1, it must be made capable of withstanding such a radial force and the locking means also have to be designed to be capable of withstanding the loading resulting from this radial bursting force. In the following embodiment, this bursting force is used to ensure engagement of the ring with the pipe ends. The connector is shown in Figures 7 to 10 and again comprises a generally U-shaped ring 1 provided with inwardly extending transverse surfaces 2, 3 which face each other and which in use engage outwardly extending transverse surfaces 8, 9 as in the preceding embodiment. As shown, the grooves 6, 7 on the pipe end portions are provided within stepped portions at the ends of the pipes so that, as shown, when the ring 1 is engaged with the ends of the pipes its external surface is generally flush with the external surface of the ends of the pipes.

In this embodiment, one, or as shown both, of the pairs of surfaces 2, 8 and 3, 9 are inclined to a plane perpendicular to the axis of the pipes 4, 5 in a direction such that the surfaces converge inwardly of the pipes and such that the ring 1 has a tendency to move into engagement with the pipe ends. In use, when the pipes are filled with fluid under pressure tending to move the pipes apart axially, the resultant force on the ring 1 will engage the ring more firmly on the pipe ends.

As in the preceding embodiment, the ring 1 is provided with threaded members 12x but in this embodiment the members 12x have a length such that they are received wholly within the threaded openings 12a when the ring 1 is in its relaxed condition engaging the pipe ends. The outer ends of the members 12x may be slotted or otherwise provided with means for engagement by a tool for rotating them and the threaded openings 12a are provided with an abutment member 40 in their outer end portions against which the member 12x abuts when in its outermost position clear of contact with the pipe 4. The members 12x may be arranged around the ring 1 as shown in Figure 4 of the preceding embodiment and indeed the members 12x may be used in the preceding embodiment in place of the members 12.

To ensure that the ring 1 cannot be inadvertently expanded when in use, a locking means may be provided for holding the split ends of the ring together. The locking means may be as described with reference to Figures 5 and 6 or as shown in Figures 8 to 10. As shown in Figures 8 to 10 the locking means comprises a locking member 30 in the form of a disc which is permanently mounted on one of the split end portions 14 of the ring by means of a pin 31 for angular movement about the axis of the pin. The ends 14 of the ring are recessed to accommodate the member 30 and within the recess are provided with a spigot 32 centred on

the axis of the pin 31 and spanning the split in the ring. The spigot 32 has part circular peripherally and oppositely directed surfaces 33 which are undercut and are engaged by corresponding surfaces 34 on the locking member 30. The surfaces 33, 34 are arranged so that in one angular position of the member 30 relative to the spigot 32, the surfaces 33, 34 are fully engaged and the ring is locked, and so that in another position of the locking member 30 angularly spaced by 90° from the first position, the surfaces 33, 34 are fully disengaged so that the ends 14 of the ring can move apart to permit radial expansion of the ring. The surfaces 34 on the member 30 are extended by lead-in surfaces 35 which tend to bring the split end portions 14 closer together as the member 30 is rotated to its locking position. The member 30 may be fixed in locked position by a threaded member 36, which may be similar to members 12x, which is engaged in a threaded opening in the member 30 and is screwed into the member 30 so that its inner end frictionally engages the outer surface of the ring.

The member 30 may, as shown, be provided with blind bores 37 in its outer surface for engagement by a U-shaped bar for rotating the member 30.

It will be appreciated that the above described connector is otherwise as described with reference to Figures 1 to 4.

It has been found that, while the above described embodiment avoids the disadvantages of the first embodiment as regards the radial bursting force, the connector is not entirely suitable for use in connecting pipes which will in use be subject to axial loads from for example pile driving because it may not adequately hold the end surfaces of the pipes together. When the ring 1 of the above described embodiment is engaged around the ends of two pipes, there will be a clearance between the inclined surfaces 3, 9 which must be provided to enable the ring 1 to engage the pipe 5. This disadvantage is overcome in the following embodiment in which the ring of the connector is additionally not subject to a radial bursting force, such forces being sustained axially by the ring. The embodiment is shown in Figures 11 to 13 and is similar to the embodiment of Figures 7 to 10 except that, in this embodiment, both pairs of surfaces 2, 8 and 3, 9 on the ring and pipes 4, 5 lie in radial planes. The ring 1 is made to close tolerances so as to firmly engage the end portions of the pipes 4, 5 but because the surfaces 2, 3, 8, 9 all lie in radial planes any bursting force to which the ring 1 may be subject is taken axially by the ring there being no radial component. Additionally, because the ring 1 closely engages the end portions of the pipes 4, 5 the abutting surfaces 18, 19 of the pipes are held in firm engagement for pile driving.

In this embodiment the threaded openings 12a for the operating members 12x have been moved so that they extend through the appro-

prate arm of the U of the member 1 rather than, in the preceding embodiments, through the base of the U of the ring 1. This feature can of course be applied to the preceding two embodiments. This ensures that, even if the ring 1 is radially expanded to such an extent that surface 2 is moved out of engagement with surface 8, the ring 1 cannot be removed from the end portion of pipe 4 because such removal would be prevented by abutment of the members 12z with the surface 8 on the pipe 4. Additionally the form of the operating members 12z have been modified so that movement of the operating members is limited in both directions. Movement of each member 12z outwardly is limited by an abutment member 41 projecting radially into opening 12a and movement of each member 12z inwardly to expand the ring 1 is limited by an annular flange 42 at the inner end of the opening 12a. To permit use of flange 42, each operating member 12z comprises an outer threaded portion and an inner portion of reduced section which passes through the opening in the flange 42, the outer threaded portion abutting flange 42 in the innermost position of the member 12z.

The locking means for the split end portions of the ring of this embodiment is very similar to that of the embodiment of Figures 7 to 10 and like reference numerals have been used for the corresponding parts.

It will be appreciated that the above described connectors are simple in construction and operation and require few moving parts for operation which makes them well suited to offshore conditions. Additionally since axial loading on the pipes is taken by the abutted pipe end surfaces 18, 19 the connector is well suited for use with pipe strings required to withstand high axial loads.

When used for connecting the ends of metal pipe sections of pipe strings, the ring is made of high tensile steel.

It will also be appreciated that numerous modifications can be made to the connectors described above, for example, in the way in which the ring 1 is expanded and the way in which the ends of the ring are locked together. Additionally, in a further modification, the ring may be made so that, in its relaxed condition, it has dimensions corresponding for example to that of Figure 3, in other words so that in this condition the pipe 5 can be freely inserted into it. With such an arrangement, coupling of the pipe ends by the ring is effected by contracting the ring around the pipe ends by drawing the ends of the ring together by applying tension to the ends of the ring or, for example, by providing the ring with screws which are threaded into the end portion of pipe 4.

Claims

1. A pipe connector for connecting the abutted end portions of two pipes (4, 5) each of which is

provided with an outwardly extending surface (8, 9) transverse to the axis of the respective pipe and directed away from the respective pipe end, comprising an annular ring (1) for surrounding the abutted pipe end portions substantially completely and having a pair of inwardly extending surfaces (2, 3) transverse to the axis thereof and directed towards each other, and each for engagement with a respective one of the surfaces (8, 9) on the pipe end portions, characterised in that the ring is a split ring that, is having a single split, that one of the surfaces (2, 3) of the ring has a greater inward radial extent than the other surface and is in use permanently engaged with the corresponding one of the pipe end portions, and that operating means (12, 12x or 12z) are provided for causing the radial dimensions of the ring to change to permit engagement and disengagement of the ring (1) from the other pipe end portion.

2. A pipe connector as claimed in claim 1, characterised in that in its relaxed condition the ring engages the surfaces (8, 9) on the pipe end portions, and the operating means (12, 12x, or 12z) are adapted to cause expansion of the ring (1), the ring being resiliently radially expandable.

3. A pipe connector as claimed in claim 2, characterised in that the operating means (12, 12x or 12z) comprise a plurality of angularly spaced radial members (12, 12x or 12z) threaded into radial openings (12a) in the ring (1) and in operation bearing on the one pipe end portion.

4. A pipe connector as claimed in any one of the preceding claims, characterised in that the pipe end portions are formed with circumferentially extending grooves (6, 7) providing the outwardly extending surfaces (8, 9) and the operating means (12, 12x, or 12z) bear against the bottom surface of the groove of the one pipe end portion.

5. A pipe connector as claimed in any one of the preceding claims, characterised in that the surfaces (2, 3 and 8, 9) on the pipe end portions and ring lie in radial planes.

6. A pipe connector as claimed in any one of claims 1 to 4, characterised in that the surfaces (2, 3 and 8, 9) on the pipe end portions and ring are correspondingly mutually inclined in a direction to converge outwardly of the pipe end portions.

7. A pipe connector as claimed in any one of claims 1 to 4, characterised in that the surfaces (2, 3 and 8, 9) on the pipe end portions and the ring are correspondingly mutually inclined in a direction to converge inwardly of the pipe end portions.

8. A pipe connector as claimed in either claim 6 or claim 7, characterised in that the surface (8) on the one pipe end portion and the corresponding surface (2) on the ring lie in radial planes.

9. A pipe connector as claimed in any one of

prate arm of the U of the member 1 rather than, in the preceding embodiments, through the base of the U of the ring 1. This feature can of course be applied to the preceding two embodiments. This ensures that, even if the ring 1 is radially expanded to such an extent that surface 2 is moved out of engagement with surface 8, the ring 1 cannot be removed from the end portion of pipe 4 because such removal would be prevented by abutment of the members 12z with the surface 8 on the pipe 4. Additionally the form of the operating members 12z have been modified so that movement of the operating members is limited in both directions. Movement of each member 12z outwardly is limited by an abutment member 41 projecting radially into opening 12a and movement of each member 12z inwardly to expand the ring 1 is limited by an annular flange 42 at the inner end of the opening 12a. To permit use of flange 42, each operating member 12z comprises an outer threaded portion and an inner portion of reduced section which passes through the opening in the flange 42, the outer threaded portion abutting flange 42 in the innermost position of the member 12z.

The locking means for the split end portions of the ring of this embodiment is very similar to that of the embodiment of Figures 7 to 10 and like reference numerals have been used for the corresponding parts.

It will be appreciated that the above described connectors are simple in construction and operation and require few moving parts for operation which makes them well suited to offshore conditions. Additionally since axial loading on the pipes is taken by the abutted pipe end surfaces 18, 19 the connector is well suited for use with pipe strings required to withstand high axial loads.

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It will also be appreciated that numerous modifications can be made to the connectors described above, for example, in the way in which the ring 1 is expanded and the way in which the ends of the ring are locked together. Additionally, in a further modification, the ring may be made so that, in its relaxed condition, it has dimensions corresponding for example to that of Figure 3, in other words so that in this condition the pipe 5 can be freely inserted into it. With such an arrangement, coupling of the pipe ends by the ring is effected by contracting the ring around the pipe ends by drawing the ends of the ring together by applying tension to the ends of the ring or, for example, by providing the ring with screws which are threaded into the end portion of pipe 4.

Claims

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provided with an outwardly extending surface (8, 9) transverse to the axis of the respective pipe and directed away from the respective pipe end, comprising an annular ring (1) for surrounding the abutted pipe end portions substantially completely and having a pair of inwardly extending surfaces (2, 3) transverse to the axis thereof and directed towards each other, and each for engagement with a respective one of the surfaces (8, 9) on the pipe end portions, characterised in that the ring is a split ring that, is having a single split, that one of the surfaces (2, 3) of the ring has a greater inward radial extent than the other surface and is in use permanently engaged with the corresponding one of the pipe end portions, and that operating means (12, 12x or 12z) are provided for causing the radial dimensions of the ring to change to permit engagement and disengagement of the ring (1) from the other pipe end portion.

2. A pipe connector as claimed in claim 1, characterised in that in its relaxed condition the ring engages the surfaces (8, 9) on the pipe end portions, and the operating means (12, 12x, or 12z) are adapted to cause expansion of the ring (1), the ring being resiliently radially expandable.

3. A pipe connector as claimed in claim 2, characterised in that the operating means (12, 12x or 12z) comprise a plurality of angularly spaced radial members (12, 12x or 12z) threaded into radial openings (12a) in the ring (1) and in operation bearing on the one pipe end portion.

4. A pipe connector as claimed in any one of the preceding claims, characterised in that the pipe end portions are formed with circumferentially extending grooves (6, 7) providing the outwardly extending surfaces (8, 9) and the operating means (12, 12x, or 12z) bear against the bottom surface of the groove of the one pipe end portion.

5. A pipe connector as claimed in any one of the preceding claims, characterised in that the surfaces (2, 3 and 8, 9) on the pipe end portions and ring lie in radial planes.

6. A pipe connector as claimed in any one of claims 1 to 4, characterised in that the surfaces (2, 3 and 8, 9) on the pipe end portions and ring are correspondingly mutually inclined in a direction to converge outwardly of the pipe end portions.

7. A pipe connector as claimed in any one of claims 1 to 4, characterised in that the surfaces (2, 3 and 8, 9) on the pipe end portions and the ring are correspondingly mutually inclined in a direction to converge inwardly of the pipe end portions.

8. A pipe connector as claimed in either claim 6 or claim 7, characterised in that the surface (8) on the one pipe end portion and the corresponding surface (2) on the ring lie in radial planes.

9. A pipe connector as claimed in any one of



the preceding claims, characterised in that locking means (13, 30) for engaging the split ends of the ring to prevent radial expansion of the ring are provided.

10. A pipe connector as claimed in claim 9, characterised in that the split end portions (14) of the ring (1) are provided with oppositely circumferentially directed surfaces (15 or 33) and the locking means includes a locking member (13 or 30) provided with corresponding surfaces (16 or 34) directed towards each other and for engagement with the surfaces (15 or 33) on the split end portions (14) of the ring (1).

11. A pipe connector as claimed in claim 10, characterised in that the surfaces (15) on the split end portions of the ring extend transversely of the circumferential extent of the ring in mutually inclined planes, the locking member (13) being engageable therewith by movement in a direction transversely of the circumferential extent of the ring.

12. A pipe connector as claimed in claim 10, characterised in that the surfaces (33) of the split end portions of the ring lie on a circle and the locking member (30) is engageable therewith by angular movement about an axis passing through the centre of the circle.

13. A pipe connector as claimed in claim 12, wherein the centre of the circle lies on one split end portion and the locking member (30) is mounted on that end portion for angular movement about the centre.

14. A pipe connector as claimed in any one of claims 10 to 13, characterised in that the surfaces (15, 33) on the split end portions of the ring and the corresponding surfaces (16, 34) on the locking member are undercut to prevent removal of the locking member in the radial direction of the pipe end portions.

15. A pipe connector as claimed in any one of the preceding claims, characterised in that the ring (1) is generally U-shaped in radial section with one arm of the U providing the one surface (2) being longer than the other arm.

Patentansprüche

1. Rohrverbinder zum Verbinden der aneinanderstoßenden Endstücke zweier Rohre (4, 5), welche jeweils eine sich quer zur Rohrachse auswärts erstreckende, dem jeweiligen Rohrende angewandte Fläche (8, 9) aufweisen, mit einem die aneinanderstoßenden Rohrenden im wesentlichen vollständig umgebenden Ring (1), welcher zwei sich quer zu seiner Achse einwärts erstreckende, einander zugewandte Flächen (8, 9) aufweist, welche jeweils an der ihnen zugeordneten Fläche (8, 9) der Endstücke der Rohre in Anlage bringbar sind, dadurch gekennzeichnet, daß der Ring ein einen einzigen Schlitz aufweisender Schlitzring ist, daß eine der Flächen (2, 3) des Rings eine größere radiale Einwärtserstreckung aufweist als die andere Fläche und sich im Gebrauch in Dauereingriff mit dem ihm zugeordneten Rohr-

Endstück befindet, und daß Betätigungseinrichtungen (12, 12x oder 12z) vorgesehen sind, mittels welcher die Radialabmessungen des Rings derart veränderbar sind, daß er mit dem Endstück des anderen Rohrs in und außer Eingriff bringbar ist.

2. Rohrverbinder nach Anspruch 1, dadurch gekennzeichnet, daß sich der Ring im entspannten Zustand mit den Flächen (8, 9) der Rohrendstücke in Eingriff befindet und mittels der Betätigungseinrichtungen (12, 12x oder 12z) elastisch radial expandierbar ist.

3. Rohrverbinder nach Anspruch 2, dadurch gekennzeichnet, daß die Betätigungseinrichtungen (12, 12x oder 12z) eine Anzahl von in gegenseitigen Winkelabständen radial angeordneten Teilen (12, 12x oder 12z) aufweist, welche in radiale Öffnungen (12a) des Rings (1) geschraubt sind und sich bei Betätigung an dem einen Rohrendstück abstützen.

4. Rohrverbinder nach wenigstens einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Rohrendstücke sich entlang ihrem Umfang erstreckende Nuten (6, 7) aufweisen, welche die sich auswärts erstreckenden Flächen (8, 9) bilden, und daß sich die Betätigungseinrichtungen (12, 12x oder 12z) an der Bodenfläche der Nut des einen Rohrendstücks abstützen.

5. Rohrverbinder nach wenigstens einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Flächen (2, 3 und 8, 9) an den Rohrendstücken und am Ring in radialen Ebenen liegen.

6. Rohrverbinder nach wenigstens einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Flächen (2, 3 und 8, 9) an den Rohrendstücken und am Ring einander komplementär geneigt sind, so daß sie in bezug auf die Rohrendstücke auswärts konvergieren.

7. Rohrverbinder nach wenigstens einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Flächen (2, 3 und 8, 9) an den Rohrendstücken und am Ring einander komplementär geneigt sind, so daß sie in bezug auf die Rohrendstücke einwärts konvergieren.

8. Rohrverbinder nach Anspruch 6 oder 7, dadurch gekennzeichnet, daß die Fläche (8) an dem einen Rohrendstück und die zugeordnete Fläche (2) des Rings in radialen Ebenen liegen.

9. Rohrverbinder nach wenigstens einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß er mit an den durch den Schlitz gebildeten Enden des Rings angreifenden Verriegelungseinrichtungen (13, 30) zum Verhindern der radialen Expansion des Rings versehen ist.

10. Rohrverbinder nach Anspruch 9, dadurch gekennzeichnet, daß die durch den Schlitz gebildeten Endstücke (14) des Rings (1) mit in Umfangsrichtung einander abgewandten Flächen (15 oder 33) geformt sind und daß die Verriegelungseinrichtung ein Verriegelungsteil (13 oder 30) aufweisen, welches mit einander zugewandten Flächen (16 oder 34) geformt ist,



welche mit den genannten Flächen (15 oder 33) der Endstücke (14) des Rings (1) in Eingriff bringbar sind.

11. Rohrverbinder nach Anspruch 10, dadurch gekennzeichnet, daß sich die Flächen (15) an den Endstücken des geschlitzten Rings quer zur Umfangserstreckung des Rings in gegeneinander geneigten Ebenen erstrecken, so daß das Verriegelungsteil (13) durch eine Bewegung quer zur Umfangserstreckung des Rings damit ein Eingriff bringbar ist.

12. Rohrverbinder nach Anspruch 10, dadurch gekennzeichnet, daß die Flächen (33) an den Endstücken des geschlitzten Rings auf einer Kreislinie liegen und daß das Verriegelungsteil (30) durch eine Winkelbewegung um eine den Mittelpunkt der Kreislinie durchsetzende Achse herum damit in Eingriff bringbar ist.

13. Rohrverbinder nach Anspruch 12, dadurch gekennzeichnet, daß der Mittelpunkt der Kreislinie auf einem der durch den Schlitz gebildeten Endstücke liegt und daß das Verriegelungsteil (30) um den Mittelpunkt herum verdrehbar an dem betreffenden Endstück gelagert ist.

14. Rohrverbinder nach wenigstens einem der Ansprüche 10 bis 13, dadurch gekennzeichnet, daß die Flächen (15, 33) an den durch den Schlitz gebildeten Endstücken des Rings und die diesen komplementären Flächen (16, 34) des Verriegelungsteils unterschritten sind, um das Ablösen des Verriegelungsteils in Radialrichtung der Rohrendstücke zu verhindern.

15. Rohrverbinder nach wenigstens einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Ring (1) in Radialrichtung einen im wesentlichen U-förmigen Querschnitt hat, wobei der eine Schenkel des U-Profiles die eine Fläche (2) bildet und länger ist als der andere Schenkel.

Revendications

1. Raccord de tuyauteries destiné à la connexion de parties d'extrémités en butée de deux tuyauteries (4, 5) ayant chacune une surface (8, 9) transversale à l'axe de la tuyauterie correspondante, s'étendant vers l'extérieur et dirigée à l'opposé de l'extrémité de la tuyauterie correspondante, le raccord comprenant une bague (1) destinée à entourer les parties d'extrémités en butée pratiquement en totalité et ayant deux surfaces (2, 3) transversales à son axe, s'étendant vers l'intérieur et dirigées l'une vers l'autre, chacune des surfaces étant destinée à coopérer avec une surface respective (8, 9) formée sur les parties d'extrémités de tuyauterie, caractérisé en ce que la bague est une bague fendue, c'est-à-dire ayant une seule fente, en ce que l'une des surfaces (2, 3) de la bague a une étendue radial vers l'intérieur supérieure à celle de l'autre surface et est en coopération permanente, lors du fonctionnement, avec la partie correspondante d'extrémité

de tuyauterie, et en ce qu'un dispositif de manoeuvre (12, 12x ou 12z) est destiné à provoquer un changement des dimensions radiales de la bague afin qu'il permette la coopération de la bague (1) avec l'autre partie d'extrémité de tuyauterie et la séparation de la bague (1) de cette autre partie.

2. Raccord selon la revendication 1, caractérisé en ce que, à son état relaxé, la bague est au contact des surfaces (8, 9) des parties d'extrémités de tuyauterie, et le dispositif de manoeuvre (12, 12x ou 12z) est destiné à provoquer une dilatation de la bague (1), la bague étant élastiquement expansible en direction radiale.

3. Raccord selon la revendication 2, caractérisé en ce que le dispositif de manoeuvre (12, 12x ou 12z) comporte plusieurs organes radiaux angulairement espacés (12, 12x ou 12z) vissés dans des orifices radiaux (12a) de la bague (1) et, lors du fonctionnement, étant en appui contre la première partie d'extrémité de tuyauterie.

4. Raccord selon l'une quelconque des revendications précédentes, caractérisé en ce que les parties d'extrémités de tuyauterie comportent des gorges circonférentielles (6, 7) délimitant les surfaces (8, 9) qui s'étendent vers l'extérieur, et le dispositif de manoeuvre (12, 12x ou 12z) est en appui contre la face du fond de la gorge de la première partie d'extrémité de tuyauterie.

5. Raccord selon l'une quelconque des revendications précédentes, caractérisé en ce que les surfaces (2, 3 et 8, 9) des parties d'extrémités de tuyauterie et de la bague sont formées dans des plans radiaux.

6. Raccord selon l'une quelconque des revendications 1 à 4, caractérisé en ce que les surfaces (2, 3, et 8, 9) des parties d'extrémités de tuyauterie et de la bague ont des inclinaisons que se correspondent mutuellement, dans une direction telle qu'elles convergent vers l'extérieur des parties d'extrémités de tuyauterie.

7. Raccord selon l'une quelconque des revendications 1 à 4, caractérisé en ce que les surfaces (2, 3, et 8, 9) formées sur les parties d'extrémités de tuyauterie et sur la bague ont des inclinaisons que se correspondent mutuellement dans une direction telle qu'elles convergent vers l'intérieur des parties d'extrémités de tuyauterie.

8. Raccord selon l'une des revendications 6 et 7, caractérisé en ce que la surface (8) formée sur la première partie d'extrémités de tuyauterie et la surface (2) formée sur la bague se trouvent dans des plans radiaux.

9. Raccord selon l'une quelconque des revendications précédentes, caractérisé par la présence d'un dispositif de blocage (13, 30) destiné à mettre en coopération les extrémités fendues de la bague de manière que celle-ci ne puisse pas s'écarter radialement.

10. Raccord selon la revendication 9, caracté-



térisé en ce que les parties d'extrémités fendues (14) de la bague (1) ont des surfaces opposées formées circonférentiellement (15 ou 33) et le dispositif de blocage comporte un organe de blocage (13 ou 30) ayant des surfaces correspondantes (16 ou 34) dirigées l'une vers l'autre et destinées à coopérer avec les surfaces (15 ou 33) formées sur les parties d'extrémités fendues (14) de la bague (1).

11. Raccord selon la revendication 10, caractérisé en ce que les surfaces (15) formées sur les parties d'extrémités fendues de la bague sont disposées transversalement à la direction circonférentielle de la bague dans des plans inclinés l'un par rapport à l'autre, l'organe de blocage (13) étant destiné à coopérer avec ces surfaces par déplacement en direction transversale à la circonférence de la bague.

12. Raccord selon la revendication 10, caractérisé en ce que les surfaces (33) des parties d'extrémités fendues de la bague sont disposées sur un cercle et l'organe de blocage (30) et destiné à coopérer avec ces surfaces par

déplacement angulaire d'un axe passant par le centre du cercle.

13. Raccord selon la revendication 12, caractérisé en ce que le centre du cercle se trouve sur une première partie d'extrémité fendue et l'organe de blocage (30) est monté sur cette partie d'extrémité afin qu'il puisse tourner angulairement autour du centre.

14. Raccord selon l'une quelconque des revendications 10 à 13, caractérisé en ce que les surfaces (15, 33) des parties d'extrémités fendues de la bague et les surfaces correspondantes (16, 34) de l'organe de blocage sont dégagées afin qu'elles empêchent l'extraction de l'organe de blocage en direction radiale par rapport aux parties d'extrémités de tuyauterie.

15. Raccord selon l'une quelconque des revendications précédentes, caractérisé en ce que la bague (1) a une configuration générale en U en coupe radiale, l'une des branches du U formant la première surface (2) étant plus longue que l'autre branche.

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* C L M S *