

Description

The present invention relates to an improved tubular joint or connection according to the preamble of claim 1 in which two tubular member can be brought into tight gripping and sealing engagement with each other in a well bore or other location accessible through the tubular members.

Such a tubular joint, in which tubular members have been joined together in well bores and other inaccessible locations, is known from in US-A-4,662,663 wherein one of the tubular members is cold forged or formed radially outwardly into engagement within a second member surrounding the one member responsive to pressure developed within a pressure actuated forming device. In this patent it is suggested that a suitable volume compensating material be used since the connection is being made in an underwater location and water trapped within the grooves into which the inner member is to be pressure formed could prevent proper engagement and sealing.

US-A-4,388,752 discloses another type of device for the pressure forming of one tubular member into a second tubular member surrounding the portion of the one tubular member being formed.

US-A-4791796, US-A-5010952, US-A-4805430 and US-A-4827748 all disclose devices to be used in the pressure forming of one tubular member radially outward into tight sealing engagement within a second tubular member. US-A-4791987, US-A-4892149 and US-A-4749047 all disclose various structures which are formed into a tubular joint within a well bore.

In the above systems, a tubular joint is provide which is satisfactory except that the well housing having the sealing and gripping lands and grooves is generally not reusable if such joint has to be disconnected.

According to the present invention there is provided a tubular joint between an outer tubular member and an inner tubular member, in accordance with the features of claim 1.

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 one form of the preferred joint of the present invention prior to forming.

FIGURE 2 is another partial sectional view of the joint of FIGURE 1 after forming has been completed.

FIGURES 3, 4, 5, and 6 are partial detailed sectional views illustrating the suggested forms of sealing between the sleeve and the outer tubular member.

FIGURES 8 and 8 are detailed sectional views illustrating the original emplacement of the har-

dened insert into the sleeve during manufacture and FIGURE 9 is a similar view illustrating the position which the insert takes with respect to the inner member after forming.

Description of the Preferred Embodiments

As shown in FIGURES 1 and 2, improved tubular joint 10 includes the outer tubular member 12, the inner tubular member 14 and the sleeve 16 which is positioned within recess or counterbore 18 on the interior of outer member 12 with retainer 20 being threaded within outer tubular member 12 to retain sleeve 16 in its desired position. Sleeve 16 includes a plurality of gripping and sealing ribs 22 extending inwardly and suitable sealing means 24 as hereinafter described for sealing between the exterior surface 26 of sleeve 16 and the interior surface 28 of outer tubular member 12. A suitable volume compensating material 30 is provided on either side and between the gripping and sealing ribs 22. Syntactic foam which includes a multiplicity of microspheres in an epoxy matrix has been found to be a suitable volume compensating material. It will exclude water from the annular volumes into which inner tubular member 14 is to be formed and will readily crush without offering sufficient resistance to the forming to change its effectiveness.

Sleeve 16 is positioned within recess 18 against shoulder 32 which is formed between the inner end of counterbore 18 and central bore 13 extending through member 12. The engagement of retainer 20 against the outer end of sleeve 16 holds sleeve 16 in tight abutment with shoulder 32. Retainer 20 includes external threads 34 which engage internal threads 36 at the outer end of recess 18. Retainer 20 is threaded tightly against sleeve 16 to retain it in position within recess 18 and in engagement with shoulder 32 as shown in FIGURE 1. In this position of sleeve 16, its external sealing means 24 (hereinafter discussed) are in sealing engagement with the inwardly facing surface of recess 18 and its gripping and sealing ribs 22 which are positioned on the interior of sleeve 16 with volume compensating material 30 between and on the inner and outer sides of ribs 22 including secondary recess 38 which is positioned on the interior of outer tubular member 12 immediately inward of shoulder 32.

When sleeve 16 has been positioned within outer tubular member 12 as shown, then inner tubular member 14 can be positioned therein in its desired position. Thereafter, a suitable forming tool is positioned within inner tubular member 14 and it exerts sufficient radial force on the interior of inner tubular member 14 to cause it to be displaced radially outward into engagement with gripping and

sealing ribs 22. Member 14 will be displaced radially outward between ribs 22 into engagement with or close to engagement with the interior surface of sleeve 16 between ribs 22. When inner tubular member 14 has been displaced in this manner to the position shown in FIGURE 2, the forming tool is removed and the tubular connection is completed and may be put in service in any desired manner. Sealing means 24 provide the seal between the exterior of sleeve 16 and the interior of outer tubular member 12 to avoid leakage of fluids contained within members 12 and 14 through the potential leakage path between the exterior of sleeve 16 and the interior of outer tubular member 12.

In FIGURES 3 through 6 sleeve 16 is illustrated having different suggested forms of external sealing means 24 for sealing against the interior surface 28 of recess member 12. Sealing means 24 shown in FIGURE 3 includes sharpened ribs 40 on the exterior of sleeve 16a at positions radially outward from the end ribs 22 and, if desired, sharpened ribs 40 may be positioned on the exterior of sleeve outward from all of ribs 22. The pressure forming of inner tubular member 14 creates sufficient radial force on sleeve 16a to cause ribs 40 to be forced outward into gripping and sealing engagement with interior surface 28 of outer tubular member.

FIGURE 4 illustrates a modified form of sealing means 24 which includes beveled surface 42 on the inner exterior end of sleeve 16b to form annular sealing space 44 in which resilient sealing ring 46 is positioned. Sealing ring 46 may be any suitable resilient sealing ring, such as an O ring, with its material being selected to withstand the fluids and conditions of service of the completed connection.

Another form of sealing means 24 is shown in FIGURE 5 wherein sleeve 16c is provided with the configuration shown on its inner end. Such configuration includes tapered surface 48 which tapers radially outward and in the direction toward retainer 20 and tapered surface 50 which tapers radially outward and in the direction away from retainer 20. Recess 18c is provided with mating tapered surfaces 52 and 54 against which tapered surface 48 and 50 are urged by retainer 20 to provide a sealing engagement between the inner end of sleeve 16c and the interior of outer tubular member 12c.

In the form of sealing means 24 illustrated in FIGURE 6, sleeve 16d has flat exterior surface 56 and inner surface 28d of member 12d includes annular recess 58 in which resilient sealing ring 60, such as an O ring is positioned. While it is contemplated that a metal-to-metal sealing between the inner end of sleeve 16 and shoulder 32 may be provided, the addition of sealing means 24 as shown in FIGURES 3 to 6 is suggested to ensure

proper sealing at of the completed connection at all times.

While ribs 22 are shown in FIGURES 1 and 2 as being integral with sleeve 16, it is contemplated that in some connections a different material, such as a harder material, could be used advantageously for ribs 22 but it would not be desirable generally to make the whole of sleeved 16 from such harder material. For this reason sleeve 16e as shown in FIGURES 7, 8 and 9 includes hardened insert 62 and sleeve 16e includes recess 64 for receiving insert 62, both as hereinafter described. Hardened insert 62 is annular in shape and includes inner projecting spaced apart ribs 66 separated by recess 68, and annular body 70. Body 70 includes inner tapered surfaces 72 and 74 which taper toward opposite ends of body 70 and radially outward, end faces 76 and 78 which taper radially outward and toward the central portion of the body and outer tapered surfaces 80 and 82 which taper radially outward and in a direction toward the end of body 70 so that they diverge outwardly to provide a concave recess on the exterior of body 70. Recess 64 on the interior of sleeve 16e includes inner cylindrical surface 84 and end faces 86 and 88 which taper radially inward and in opposite directions away from each other so that the surfaces diverge inwardly.

Insert 62 is formed into recess 64 in sleeve 16e in the factory or other suitable location at which equipment is available for the pressure forming of insert 62 into recess 64. Insert 62 is formed from the position shown in FIGURE 7 to the position as shown in FIGURE 8 so that it is secured within recess 64 and further so that its ribs 66 have a diameter larger than the outer diameter of tubular member 14e so that there is no interference in assembling the components of the connection prior to the pressure forming of the completed joint. In this preformed position, insert 62 is positioned within recess 64 as shown in FIGURE 8 with its end faces 76 and 78 in tight engagement with end faces 86 and 88, respectively, of recess 64 so that it is not displaced during assembly of the components prior to pressure forming.

The completion of the connection of joint is illustrated in FIGURE 9. The pressure forces exerted on the interior of inner tubular member 14e are sufficient to displace insert 62 completely into recess 64 and to flatten body 70 so that it axially forms metal-to-metal sealing between mated surfaces 76 and 86 and between surfaces 78 and 88 and engages surface 84 and end faces 86 and 88 of recess 64 as shown. In this position insert 62 has become a portion of sleeve 16e and its hardened material provides a better engagement of ribs 66 against the exterior of inner tubular member 14e as seen in FIGURE 9.

One of the primary advantages of the improved joint of the present invention is that the outer tubular member may be salvaged and reused by the removal of the inner tubular member and sleeve. This is accomplished by the unthreading of retainer 20 from outer tubular member 12 which allows the withdrawal of sleeve 16 and inner tubular member 14 from within outer tubular member 12. Since substantially all of the deformation takes place in the deformation of inner tubular member, outer tubular member is not deformed sufficiently to prevent its reuse in another joint which is similarly formed after the original formed joint is disassembled as described above.

Claims

1. A tubular joint (10) between an outer tubular member (12) and an inner tubular member (14);

the outer tubular member (12) having a central bore and a counterbore (18) extending therein and terminating in a shoulder (32) between the counterbore (18) and the central bore; and

the inner tubular member (14) having been pressure formed outwardly for providing gripping and sealing between the tubular members;

the joint being characterised by

a sleeve (16) positioned within said counterbore (18) of said outer tubular member (12);

means (20) for retaining said sleeve (16) within said counterbore (18);

means (22) on the interior of said sleeve (16) for providing the gripping and sealing engagement against the exterior of said inner tubular member (14) when it has been pressure formed outwardly into engagement with the sleeve gripping and sealing means (22);

said engagement between the inner tubular member (14) and the sleeve (16) being the sole means securing said inner tubular member (14) to said outer tubular member (12);

the sleeve being sized and configured so that effectively it constitutes a continuation of the wall of the outer tubular member; the counterbore in said outer tubular member (12) being in surrounding relationship to the sleeve gripping and sealing means (22); and

means (40, 46, 60) for sealing between the said sleeve (16) and the interior of said counterbore (18) in said outer tubular member (12).

2. A tubular joint (10) according to claim 1, wherein said retaining means (20) includes a retainer ring (20) having external threads (34), and

internal threads (36) in said outer tubular member counterbore (18) into which said retainer ring (20) is threaded to retain said sleeve (16) within said counterbore (18).

3. A tubular joint (10) according to claim 1, wherein said sleeve gripping and sealing means (22) includes

a plurality of annular ribs (22) extending inwardly from the interior surface of said sleeve (16).

4. A tubular joint (10) according to claim 3, including

volume compensating means (30) positioned between said annular ribs (22) to avoid interference with the proper pressure forming of the inner tubular member (14) into gripping and sealing engagement with said sleeve (16).

5. A tubular joint (10) according to claim 1, wherein said sleeve gripping and sealing means (22) includes

a plurality of insert rings (62) of hard metal,

each of said insert rings (62) being positioned within an internal recess (64) in said sleeve (16).

6. A tubular joint (10) according to claim 5, wherein said insert rings (62) each includes

a body (70), and

inwardly extending ribs (66) which are spaced apart by a recess (68).

7. A tubular joint (10) according to claim 6, wherein said internal sleeve recess (64) includes

an inner cylindrical surface (84) and a pair of tapered end surfaces (86, 88) which are tapered to diverge inwardly, and

said insert body (70) includes

inner surfaces (72, 74) diverging outwardly at the sides of the ribs, end faces (76, 78) converging outwardly and outer surfaces (80, 82) which diverge outward,

said body (70) being initially formed into partial engagement with said sleeve recess (64).

8. A tubular joint (10) according to claim 7, wherein

said body (70) is deformed into said sleeve recess (64) during pressure forming of said inner tubular member (14) so that its end faces (76, 78) engage the tapered end faces (86, 88) of said sleeve recess (64) and its outer surfaces (80, 82) engage the cylindrical sur-



One of the primary advantages of the improved joint of the present invention is that the outer tubular member may be salvaged and reused by the removal of the inner tubular member and sleeve. This is accomplished by the unthreading of retainer 20 from outer tubular member 12 which allows the withdrawal of sleeve 16 and inner tubular member 14 from within outer tubular member 12. Since substantially all of the deformation takes place in the deformation of inner tubular member, outer tubular member is not deformed sufficiently to prevent its reuse in another joint which is similarly formed after the original formed joint is disassembled as described above.

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the inner tubular member (14) having been pressure formed outwardly for providing gripping and sealing between the tubular members;

the joint being characterised by

a sleeve (16) positioned within said counterbore (18) of said outer tubular member (12);
means (20) for retaining said sleeve (16) within said counterbore (18);

means (22) on the interior of said sleeve (16) for providing the gripping and sealing engagement against the exterior of said inner tubular member (14) when it has been pressure formed outwardly into engagement with the sleeve gripping and sealing means (22);

said engagement between the inner tubular member (14) and the sleeve (16) being the sole means securing said inner tubular member (14) to said outer tubular member (12);

the sleeve being sized and configured so that effectively it constitutes a continuation of the wall of the outer tubular member; the counterbore in said outer tubular member (12) being in surrounding relationship to the sleeve gripping and sealing means (22); and

means (40, 46, 60) for sealing between the said sleeve (16) and the interior of said counterbore (18) in said outer tubular member (12).

2. A tubular joint (10) according to claim 1, wherein said retaining means (20) includes a retainer ring (20) having external threads (34), and

internal threads (36) in said outer tubular member counterbore (18) into which said retainer ring (20) is threaded to retain said sleeve (16) within said counterbore (18).

3. A tubular joint (10) according to claim 1, wherein said sleeve gripping and sealing means (22) includes

a plurality of annular ribs (22) extending inwardly from the interior surface of said sleeve (16).

4. A tubular joint (10) according to claim 3, including

volume compensating means (30) positioned between said annular ribs (22) to avoid interference with the proper pressure forming of the inner tubular member (14) into gripping and sealing engagement with said sleeve (16).

5. A tubular joint (10) according to claim 1, wherein said sleeve gripping and sealing means (22) includes

a plurality of insert rings (62) of hard metal,

each of said insert rings (62) being positioned within an internal recess (64) in said sleeve (16).

6. A tubular joint (10) according to claim 5, wherein said insert rings (62) each includes

a body (70), and

inwardly extending ribs (66) which are spaced apart by a recess (68).

7. A tubular joint (10) according to claim 6, wherein said internal sleeve recess (64) includes

an inner cylindrical surface (84) and a pair of tapered end surfaces (86, 88) which are tapered to diverge inwardly, and

said insert body (70) includes

inner surfaces (72, 74) diverging outwardly at the sides of the ribs, end faces (76, 78) converging outwardly and outer surfaces (80, 82) which diverge outward,

said body (70) being initially formed into partial engagement with said sleeve recess (64).

8. A tubular joint (10) according to claim 7, wherein

said body (70) is deformed into said sleeve recess (64) during pressure forming of said inner tubular member (14) so that its end faces (76, 78) engage the tapered end faces (86, 88) of said sleeve recess (64) and its outer surfaces (80, 82) engage the cylindrical sur-



face (84) of said sleeve recess.

9. A tubular joint (10) according to claim 1, wherein said sealing means (40, 46, 60) between the exterior of said sleeve (16) and the interior of said outer tubular member (12) includes

an external sharpened rib (40) on said sleeve (16) for providing sealing engagement with the interior of said outer tubular member (14).

10. A tubular joint (10) according to claim 1, wherein said sealing means (40, 46, 60) between the exterior of said sleeve (16) and the interior of said outer tubular member (12) includes

a resilient sealing ring (46, 60) positioned between the said sleeve (16) and said outer tubular member (12).

11. A tubular joint (10) according to claim 10, wherein

said resilient sealing ring (60) is positioned in a recess (58) on the interior surface (28d) of said counterbore (18) in said outer tubular member (12).

12. A tubular joint (10) according to claim 10, including

a bevel (42) on the inner exterior end of said sleeve (16),

said resilient sealing ring (46) positioned in the space (44) between said bevel (42) and the wall of the counterbore (18) in the outer tubular member (12).

13. A tubular joint (10) according to claim 1, wherein said sealing means (40, 46, 60) between the exterior of said sleeve (16) and the interior of said outer tubular member (12) includes

at least one tapered surface (48, 50) on the inner end of said sleeve (16), and

a mating tapered surface (52, 54) on said shoulder (32) of said outer tubular member (12) for engagement by said tapered sleeve surface (48, 50) for sealing engagement therebetween.

Patentansprüche

1. Rohrförmige Verbindung (10) zwischen einem äußeren rohrförmigen Körper (12) und einem inneren rohrförmigen Körper (14), wobei der äußere rohrförmige Körper (12) eine Mittelbohrung und eine Gegensenkung, die sich in der Mittelbohrung erstreckt und in einer Schul-

ter (32) zwischen der Gegensenkung (18) und der Mittelbohrung endet, aufweist und der innere rohrförmige Körper (14) nach außen druckverformt wird, um ein Greifen und Abdichten zwischen den rohrförmigen Körpern zu ermöglichen, **gekennzeichnet** durch eine Buchse (16), die in der Gegensenkung (18) des äußeren rohrförmigen Körpers (12) angeordnet ist,

durch eine Einrichtung (20) zum Halten der Buchse (16) in der Gegensenkung (18); durch eine Einrichtung (22) an der Innenseite der Buchse (16), um das Greifen und Abdichten gegenüber der Außenseite des inneren rohrförmigen Körpers (14) zu ermöglichen, wenn dieser nach außen in einem Eingriff mit der Spann- und Abdichtungseinrichtung (22) der Buchse druckverformt wurde;

wobei dieser Eingriff zwischen dem inneren rohrförmigen Körper (14) und der Buchse (16) die einzige Einrichtung ist, die den inneren rohrförmigen Körper (14) mit dem äußeren rohrförmigen Körper (12) verbindet;

wobei die Buchse in ihrer Größe so bemessen und geformt ist, daß sie eine wirksame Verlängerung der Wand des äußeren rohrförmigen Körpers bildet, wobei die Gegensenkung in dem äußeren rohrförmigen Körper (12) die Spann- und Abdichtungseinrichtung (22) umschließt; und

durch eine Einrichtung (40, 46, 60) zur Abdichtung zwischen der Buchse und dem Inneren der Gegensenkung (18) im äußeren rohrförmigen Körper (12).

2. Rohrförmige Verbindung (10) nach Anspruch 1, **dadurch gekennzeichnet**, daß die Rückhalteeinrichtung (20) umfaßt:

einen Rückhaltering (20) mit Außengewinde (34) und

einem Innengewinde (36) in der Gegensenkung (18) des äußeren rohrförmigen Körpers, in welches der Rückhaltering (20) eingeschraubt ist, um die Buchse (16) in der Gegensenkung (18) zu halten.

3. Rohrförmige Verbindung (10) nach Anspruch 1, **dadurch gekennzeichnet**, daß die Spann- und Abdichtungseinrichtung (22) umfaßt:

eine Vielzahl von ringförmigen Rippen (22), die von der Innenfläche der Buchse (16) nach innen vorstehen.

4. Rohrförmige Verbindung (10) nach Anspruch 3, **dadurch gekennzeichnet**, daß diese umfaßt:

Volumenausgleichende Mittel (30), die zwischen den ringförmigen Rippen (22) angeord-



net sind, um Störungen beim geeigneten Druckverformen des inneren rohrförmigen Körpers (14) in einen Spann- und Dichtungseingriff mit der Buchse (16) zu vermeiden.

5. Rohrförmige Verbindung (10) nach Anspruch 1, **dadurch gekennzeichnet**, daß die Spann- und Dichtungseinrichtung (22) der Buchse umfaßt:
eine Vielzahl von Ringeinsätzen (62) aus hartem Metall,
wobei jeder dieser Ringeinsätze (62) in einer inneren Ausnehmung (64) in der Buchse (16) angeordnet ist.

6. Rohrförmige Verbindung (10) nach Anspruch 5, **dadurch gekennzeichnet**, daß jeder der Ringeinsätze (62) umfaßt:
einen Körper (70) und
nach innen vorstehende Rippen (66), die durch eine Ausnehmung (68) voneinander beabstandet sind.

7. Rohrförmige Verbindung (10) nach Anspruch 6, **dadurch gekennzeichnet**, daß die innere Ausnehmung (64) in der Buchse umfaßt:
eine innere zylindrische Fläche (84) und ein Paar von kegelförmigen Stirnflächen (86, 88), welche geneigt sind, so daß sie nach innen divergieren und
daß der Einsatzkörper (20) innere Flächen (72, 74), welche nach außen an den Seiten der Rippen auseinanderlaufen, Stirnflächen (76, 78), welche nach außen zusammenlaufen, und Außenflächen (80, 82) aufweist, welche nach außen auseinanderlaufen,
wobei der Körper (70) am Anfang in teilweisem Eingriff mit den Ausnehmungen (64) der Buchse verformt wird.

8. Rohrförmige Verbindung (10) nach Anspruch 7, **dadurch gekennzeichnet**, daß der Körper (70) in die Ausnehmung (64) der Buchse während der Druckverformung des inneren rohrförmigen Körpers (14) verformt wird, so daß seine Stirnflächen (76, 78) in die kegelförmigen Stirnflächen (86, 88) der Ausnehmung (64) der Buchse eingreifen und seine Außenflächen (80, 82) die zylindrische Oberfläche (84) der Ausnehmung der Buchse berührt.

9. Rohrförmige Verbindung (10) nach Anspruch 1, **dadurch gekennzeichnet**, daß die Dichtungseinrichtung (40, 46, 60) zwischen der Außenseite der Buchse (16) und der Innenseite des äußeren rohrförmigen Körpers (12) eine äußere geschärfte Rippe (40) an der Buchse (16) umfaßt, um eine dichtende Verbindung mit

der Innenseite des äußeren rohrförmigen Körpers (14) herzustellen.

10. Rohrförmige Verbindung (10) nach Anspruch 1, **dadurch gekennzeichnet**, daß die Dichtungseinrichtung (40, 46, 60) zwischen der Außenseite der Buchse (16) und der Innenseite des äußeren rohrförmigen Körpers (12) einen elastischen Dichtring (46, 60) aufweist, der zwischen der Buchse (16) und dem äußeren rohrförmigen Körper (12) angeordnet ist.

11. Rohrförmige Verbindung (10) nach Anspruch 10, **dadurch gekennzeichnet**, daß der elastische Dichtring (60) in einer Ausnehmung (58) an der Innenfläche (28d) der Gegensenkung (18) im äußeren rohrförmigen Körper (12) angeordnet ist.

12. Rohrförmige Verbindung (10) nach Anspruch 10, **gekennzeichnet** durch eine Facette (42) auf der Innenseite der äußeren Stirnfläche der Buchse (16), wobei der Dichtring (46) in dem Hohlraum (44) zwischen der Facette (42) und der Wand der Gegensenkung (18) im äußeren rohrförmigen Körper (12) angeordnet ist.

13. Rohrförmige Verbindung (10) nach Anspruch 1, **dadurch gekennzeichnet**, daß die Dichtungseinrichtung (40, 46, 60) zwischen der Außenseite der Buchse (16) und der Innenseite des äußeren rohrförmigen Körpers (12) umfaßt:
mindestens eine kegelförmige Fläche (48, 50) am inneren Ende der Buchse (16) und
eine passende kegelförmige Fläche (52, 54) an der Schulter (32) des äußeren rohrförmigen Körpers (12) zum Zusammenwirken mit der kegelförmigen Fläche (48, 50) der Buchse für eine dichtende Verbindung zwischen diesen.

Revendications

1. Joint tubulaire (10) entre une pièce tubulaire extérieure (12) et une pièce tubulaire intérieure (14),
- la pièce tubulaire extérieure (12) comportant un alésage central et un contre-alésage (18) s'étendant dans cette pièce et se terminant par un épaulement (32) situé entre le contre-alésage (18) et l'alésage central,
- tandis que la pièce tubulaire intérieure (14) a été formée par pression vers l'extérieur, de façon à réaliser un serrage et une étanchéité entre les pièces tubulaires,
le joint étant caractérisé par :



- un manchon (16) disposé à l'intérieur du contre-alésage (18) de la pièce tubulaire extérieure (12),
 - des moyens (20) servant à retenir le manchon (16) à l'intérieur du contre-alésage (18),
 - des moyens (22) situés sur la surface intérieure du manchon (16) et servant à assurer le contact de serrage et d'étanchéité contre la surface extérieure de la pièce tubulaire intérieure (14) lorsque celle-ci a été formée par pression vers l'extérieur au contact des moyens de serrage et d'étanchéité (22) du manchon,
 - le contact entre la pièce tubulaire intérieure (14) et le manchon (16) constituant les seuls moyens immobilisant la pièce tubulaire intérieure (14) vis-à-vis de la pièce tubulaire extérieure (12),
 - le manchon ayant des dimensions et une configuration telles qu'il constitue effectivement un prolongement de la paroi de la pièce tubulaire extérieure, le contre-alésage ménagé dans la pièce tubulaire extérieure (12) entourant les moyens de serrage et d'étanchéité (22) du manchon, et
 - des moyens (40, 46, 60) servant à assurer l'étanchéité entre le manchon (16) et la surface intérieure du contre-alésage (18) de la pièce tubulaire extérieure (12).
2. Joint tubulaire (10) selon la revendication 1, dans lequel les moyens de retenue (20) comprennent :
- un anneau de retenue (20), comportant un filetage extérieur (34), et
 - un filetage intérieur (36) qui est réalisé dans le contre-alésage (18) de la pièce tubulaire extérieure et dans lequel l'anneau de retenue (20) est vissé de façon à retenir le manchon (16) à l'intérieur du contre-alésage (18).
3. Joint tubulaire (10) selon la revendication 1, dans lequel les moyens de serrage et d'étanchéité (22) du manchon comprennent plusieurs nervures annulaires (22) s'étendant vers l'intérieur à partir de la surface intérieure du manchon (16).
4. Joint tubulaire (10) selon la revendication 3, comprenant des moyens de compensation de volume (30) disposés entre les nervures annulaires (22) en vue d'éviter une interférence avec le formage par pression correcte de la pièce tubulaire intérieure (14) en contact de serrage et d'étanchéité avec le manchon (16).
5. Joint tubulaire (10) selon la revendication 1, dans lequel les moyens de serrage et d'étanchéité (22) du manchon comprennent plusieurs anneaux rapportés (62) en métal dur, chacun des anneaux rapportés (62) étant disposé dans un évidement intérieur (64) ménagé dans le manchon (16).
6. Joint tubulaire (10) selon la revendication 5, dans lequel les anneaux rapportés (62) comprennent chacun un corps (70) et des nervures (66) qui s'étendent vers l'intérieur et sont séparées par un évidement (68).
7. Joint tubulaire (10) selon la revendication 6, dans lequel l'évidement intérieur (64) du manchon comprend une surface cylindrique intérieure (84) et deux surfaces d'extrémité évasées (86, 88) qui s'évasent de façon à diverger vers l'intérieur, tandis que le corps (70) de l'anneau rapporté comprend des surfaces intérieures (72, 74), qui divergent vers l'extérieur sur les côtés des nervures, des faces d'extrémité (76, 78), qui convergent vers l'extérieur, et des surfaces extérieures (80, 82) qui divergent vers l'extérieur, le corps (70) étant initialement formé en contact partiel avec l'évidement (64) du manchon.
8. Joint tubulaire (10) selon la revendication 7, dans lequel le corps (70) est déformé dans l'évidement (64) du manchon au cours du formage par pression de la pièce tubulaire intérieure (14), d'une façon telle que ses faces d'extrémité (76, 78) sont au contact des faces d'extrémité évasées (86, 88) de l'évidement (64) du manchon et que ses surfaces extérieures (80, 82) sont au contact de la surface cylindrique (84) de l'évidement du manchon.
9. Joint tubulaire (10) selon la revendication 1, dans lequel les moyens d'étanchéité (40, 46, 60) prévus entre la surface extérieure du manchon (16) et la surface intérieure de la pièce tubulaire extérieure (12) comprennent une nervure extérieure (40) à arête vive qui est réalisée sur le manchon (16) de façon à assurer un contact étanche avec la surface intérieure de la pièce tubulaire extérieure (14).
10. Joint tubulaire (10) selon la revendication 1, dans lequel les moyens d'étanchéité (40, 46, 60) prévus entre la surface extérieure du manchon (16) et la surface intérieure de la pièce tubulaire extérieure (12) comprennent une bague élastique d'étanchéité (46, 60) qui est disposée entre le manchon (16) et la pièce tubulaire extérieure (12).



11. Joint tubulaire (10) selon la revendication 10, dans lequel l'anneau élastique d'étanchéité (60) est disposé dans un évidement (58) ménagé sur la surface intérieure (28d) du contre-alésage (18) de la pièce tubulaire extérieure (12). 5
12. Joint tubulaire (10) selon la revendication 10, comprenant un chanfrein (42) réalisé sur l'extrémité extérieure du manchon (16) qui est située du côté intérieur, l'anneau élastique d'étanchéité (46) étant disposé dans l'espace (44) situé entre le chanfrein (42) et la paroi du contre-alésage (18) de la pièce tubulaire extérieure (12). 10 15
13. Joint tubulaire (10) selon la revendication 1, dans lequel les moyens d'étanchéité (40, 46, 60) prévus entre la surface extérieure du manchon (16) et la surface intérieure de la pièce tubulaire extérieure (12) comprennent au moins une surface évasée (48, 50), située sur l'extrémité du manchon (16) qui est disposée du côté intérieur, et une surface évasée (52, 54) de forme correspondante qui est réalisée sur l'épaule (32) de la pièce tubulaire extérieure (12) de façon à venir au contact de la surface évasée (48, 50) du manchon afin de réaliser un contact étanche entre elles. 20 25 30

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