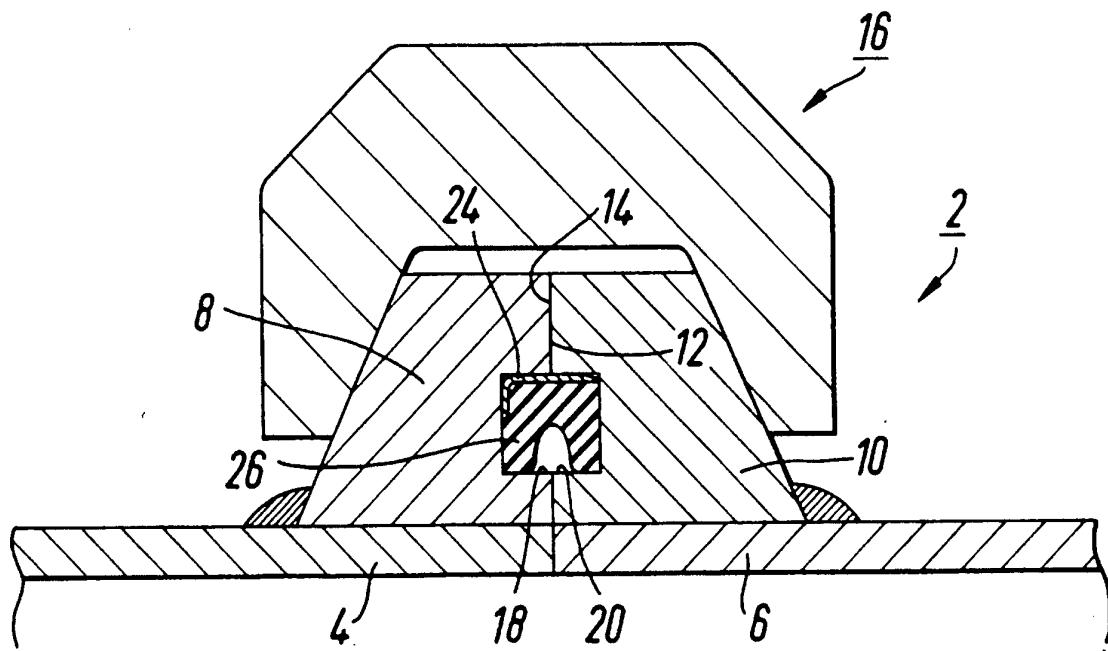




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(54) Title: PIPE COUPLING



(57) Abstract

A pipe coupling for coupling together two lengths of pipe (4, 6) comprises first and second annular collars or flanges (8, 10) secured to the ends of the lengths of pipe (4, 6) and having joining surfaces (12, 14) thereon which abut one another on securing of the lengths of pipe (4, 6) together, radially aligned grooves (18, 20) being formed in the joining surfaces (12, 14) to constitute receiving means in which is housed a seal (22) including a rigid first seal component (24) and a flexible second seal component (26) bonded to the first seal component (24), the seal (22) extending partially into both grooves (18, 20) to seal between the joining surfaces (12, 14) of the collars (8, 10).

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PIPE COUPLINGTECHNICAL FIELD

This invention relates to a pipe coupling used to join adjacent pipe lengths together to form a pipeline system.

BACKGROUND ART

A known pipe coupling comprises a clamp arrangement incorporating a clamp which embraces adjacent ends of adjacent pipe lengths. The clamp is tightened onto a seal so that the coupling can withstand the maximum pressure the pipeline is designed to carry.

The clamp arrangement may hold the pipe lengths together by friction in low pressure situations, or may co-operate with a groove or shoulder formed at each end of each pipe length in higher pressure situations.

Such clamp arrangements may be fixed into position by bolting or over centre clamping.

A problem with known clamp arrangements is that it is difficult to ensure accurate alignment of the internal bores of adjacent pipe lengths, primarily due to the resilience of the seal which can allow adjacent pipe lengths to move radially relative to one another, such as may occur as the clamp is being tightened onto the pipe lengths.

A known method of overcoming this problem is to design the pipe lengths to have one male end and one female end. Joins between adjacent pipe lengths are then made between the male end of one pipe length and the female end of another pipe

length. This allows adjacent pipe lengths to be located accurately relative to one another and leads to alignment of the bores of adjacent pipe lengths.

A disadvantage with this known system, however, is that the pipe lengths can only be fitted into the pipeline in one direction.

DISCLOSURE OF THE INVENTION

It would be desirable to be able to provide a pipe coupling which ensured positive and accurate alignment of adjacent pipe lengths, and therefore a smooth, continuous bore therethrough, the ends of adjacent pipe lengths being identical.

According to the present invention there is provided a pipe coupling for coupling together first and second lengths of pipe, the coupling comprising a first collar secured to an end of the first length of pipe and having a joining surface thereto, a second collar secured to an end of the second length of pipe and having a joining surface thereto, the first and second collars being positioned such that, when adjacent ends of the first and second pipe lengths are brought into contact with one another, the joining surfaces of the first and second collars also contact one another, and means for securing together the first and second collars, characterised in that the joining surfaces of the first and second collars each have formed therein radially-aligned receiving portions which, when the collars are brought into contact with one

another, define seal receiving means, and a seal comprising a substantially rigid first seal component and a resilient second seal component, the seal being positioned within the seal receiving means to extend partially into both receiving portions thereof and to seal between the joining surfaces of the first and second collars.

In use, the seal is positioned in the receiving portion of a first of the collars. Due to the size of the seal, a part of the seal extends beyond said receiving portion in the first collar. This protruding part is used to locate the second collar relative to the first collar by positioning the second collar such that the remaining part of the seal is located within the seal receiving portion in said second collar. Thus the arrangement provides a convenient method of positively aligning two pipe lengths to be joined to form a pipeline system.

Preferably, each receiving portion comprises a groove formed in the joining surface of the associated collar. The seal may then initially simply be positioned within one of the grooves.

Advantageously, the first seal component comprises a substantially rigid ring the width of which is slightly less than the combined width of the grooves in the two collars, and the outer diameter of which is such that the ring is a push fit into the receiving means.

Preferably, the second seal component comprises a

resilient ring of substantially U-shape in cross-section, the width of which is slightly more than the combined width of the grooves in the two collars, and the internal diameter of which is slightly larger than the minimum diameter of each groove.

The resilient ring is secured within the first, rigid seal component and thus the rigid component forms the outer periphery of the seal.

In use, the U-shaped resilient seal component reacts to pressures from within the pipe lengths and increases its seal efficiency as pressure increases.

A further advantage of the pipe coupling according to the present invention is that adjacent pipe lengths can be rotated relative to one another without the need for uncoupling.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic longitudinal section through part of a pipe coupling according to the present invention;

Figure 2 is a schematic transverse section through a collar forming part of the pipe coupling in Figure 1;

Figures 3 and 4 are a side view and a front view respectively of a clamp forming part of the pipe coupling of Figure 1, and

Figure 5 is a front view, incorporating a transverse section, of the seal forming part of the pipe coupling of Figure 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, a pipe coupling according to the present invention is designated generally by the reference numeral 2. The pipe coupling comprises a first length of pipe 4 and a second length of pipe 6 a wall of each of which is shown in Fig. 1 and to the end of each of which are welded associated annular collars 8, 10 respectively. The collars have respective joining surfaces 12, 14 thereon arranged to abut one another on coupling together of the pipe lengths 4, 6.

The rear face of each collar 8, 10 is of an outwardly and forwardly tapering nature, the collars 8, 10 being held together by a clamp indicated generally at 16 and provided with a correspondingly tapered clamping surface therein.

The joining surfaces 12, 14 of the collars 8, 10 each have formed therein a circular groove or channel 18, 20 respectively, the two grooves 18, 20 being accurately radially aligned with one another to form seal receiving means into which can be positioned a seal indicated generally at 22.

More particularly, the seal 22 comprises an outer metal ring 24 of substantially rigid, corrosive-resistant material and of generally L-shaped in transverse section to which is bonded an inner ring 26 of a flexible material such as plastics or rubber and of generally inverted U-shape in transverse section, the flexible ring 26 and the metal ring 24 forming a unitary seal.

The width of the metal ring 24, considered in the axial direction of the coupling, is slightly less than the combined depth of the two grooves 18, 20 constituting the seal receiving means, typically 0.13mm less, while the diameter of the metal ring 24 is such that it is a push-fit into one or other of the grooves 18, 20 to project partially therefrom.

The width of the flexible ring 26, again considered in the axial direction of the coupling, is slightly more than the combined depths of the two grooves 18, 20, while the internal diameter of said ring 26 is slightly larger than the common minimum diameter of the grooves 18, 20.

In order to achieve a sealed coupling between the two pipe lengths 4, 6, the seal 22 is pushed into the groove 18 in the collar 8 so that it seats in said groove and projects partially therefrom.

The other collar 10 is then pushed onto the protruding part of the seal 22. The rigid nature of the portion 24 of the seal, and the accurate radial alignment of the two grooves 18, 20 ensure that the two pipe lengths 4, 6 are then accurately aligned with one another with the internal bores thereof forming accurate continuations of one another.

The portions of the clamp 16 are then positioned over the abutting collars 8, 10 and are tightened up to secure the two pipe lengths 4, 6 together. The clamp 16 may be of the bolted or quick-connect type.

In an alternative embodiment of the invention, the

collars 8, 10 comprise parallel-sided annular flanges secured to respective ends of the pipe lengths 4, 6, said flanges being secured together by a plurality of circumferentially-spaced bolts extending through the flanges parallel with the central axis of the pipeline and radially outwardly of the seal 22.

In all cases, the inverted U-shaped component 26 of the seal 22 reacts to the pressure of fluid within the pipeline, said pressure being exerted on the concave surface of the ring 26 to urge the outer walls of the ring 26 against the base walls of the two grooves 18, 20 to seal between the two surfaces 12, 14. Thus it will be appreciated that in fact the efficiency of this seal increases with increase of pressure within the pipeline.

A coupling according to the invention is suitable for pipelines being used to transport, for example, liquids or slurries at high pressure of typically up to 350 bars or higher. However, it can be used at lower pressures, for example 10 bars.

Two pipe lengths coupled by means of the clamp 16 may be rotated relative to one another without having to decouple the pipe lengths, it merely being necessary to loosen the clamping effect of the clamp 16.

CLAIMS

1. A pipe coupling for coupling together first and second lengths of pipe (4, 6), the coupling comprising a first collar (8) secured to an end of the first length of pipe (4) and having a joining surface (12) thereto, a second collar (10) secured to an end of the second length of pipe (6) and having a joining surface (14) thereto, the first and second collars (8, 10) being positioned such that, when adjacent ends of the first and second pipe lengths (4, 6) are brought into contact with one another, the joining surfaces (12, 14) of the first and second collars (8, 10) also contact one another, and means (16) for securing together the first and second collars (8, 10), characterised in that the joining surfaces (12, 14) of the first and second collars (8, 10) each have formed therein radially-aligned receiving portions (18, 20) which, when the collars (8, 10) are brought into contact with one another, define seal receiving means, and a seal (22) comprising a substantially rigid first seal component (24) and a resilient second seal component (26), the seal (22) being positioned within the seal receiving means to extend partially into both receiving portions (18, 20) thereof and to seal between the joining surfaces (12, 14) of the first and second collars (8, 10).

2. A coupling as claimed in claim 1 in which each receiving portion comprises a groove (18, 20) formed in the joining surface (12, 14) of the associated collar (8, 10).

3. A coupling as claimed in claim 2 in which the first seal component comprises a substantially rigid ring (24) the width of which is slightly less than the combined width of the grooves (18, 20) in the two collars (8, 10), and the outer diameter of which is such that the ring (24) is a push-fit into the receiving means.

4. A coupling as claimed in claim 3 in which the second seal component comprises a resilient ring (26) of substantially inverted U-shape in transverse section the width of which is slightly more than the combined width of the grooves (18, 20) in the two collars (8, 10), and the internal diameter of which is slightly larger than the minimum diameter of each groove (18, 20).

5. A coupling as claimed in any one of claims 1 to 4 in which the means for securing the two collars (8, 10) together comprises a clamp (16) embracing said collars (8, 10).

6. A coupling as claimed in any one of claims 1 to 4 in which the means for securing the two collars (8, 10) together comprise a plurality of circumferentially-spaced bolts extending through the collars (8, 10) axially thereof.

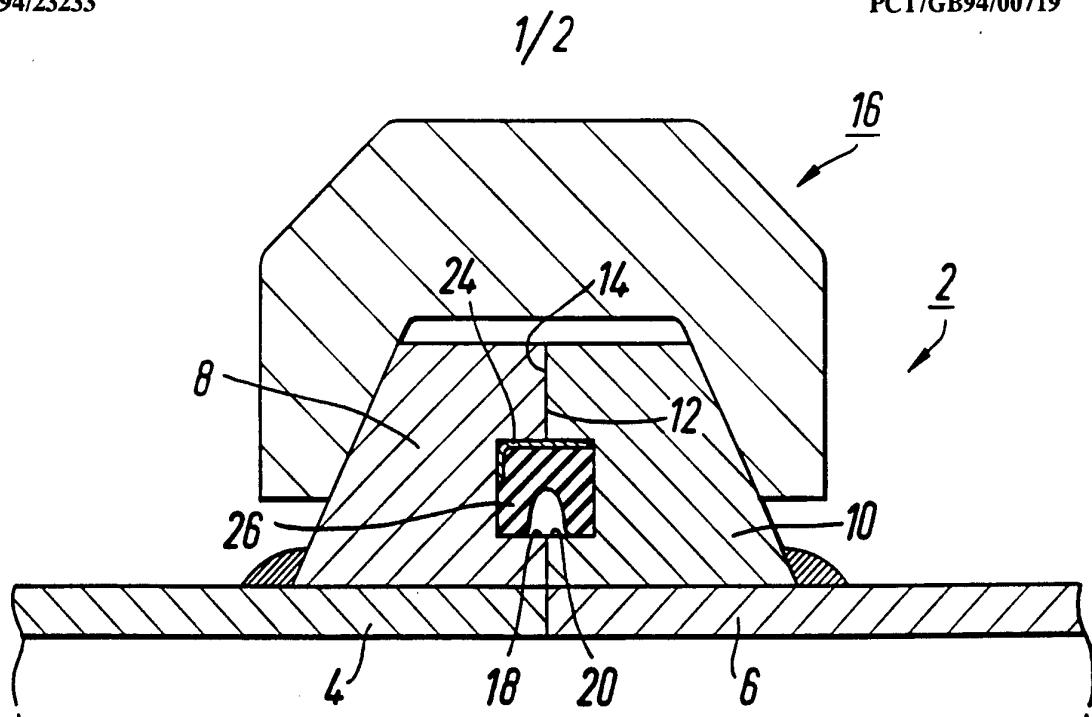


Fig. 1

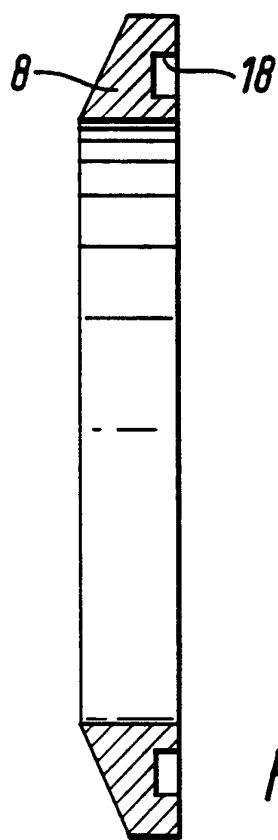


Fig. 2

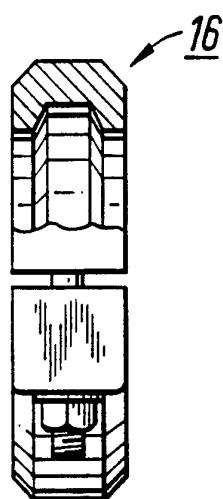


Fig. 3

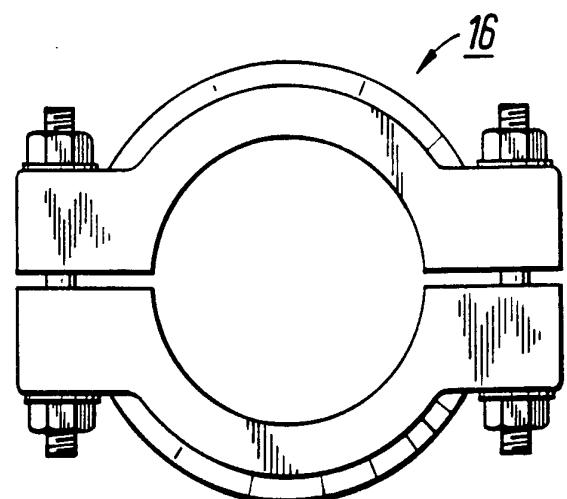


Fig. 4

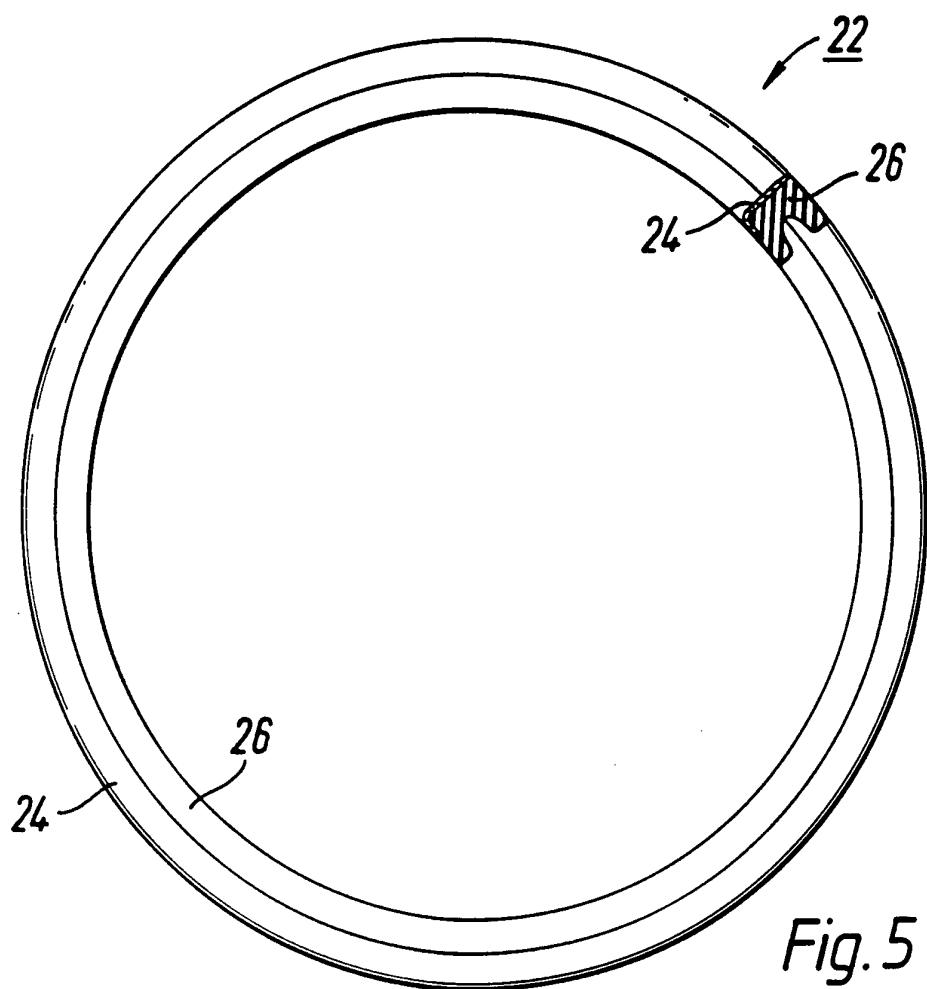


Fig. 5

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/GB 94/00719

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 5 F16L23/032 F16L23/16 F16L23/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 5 F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A,3 836 159 (DRYER) 17 September 1974 see figures 2-4,6 ---	1-3,5,6
Y	DE,C,875 108 (GEWERKSCHAFT RÉUSS) 30 April 1953 see page 2, right column, line 8 - line 15; figures ---	1-3,5,6
A	DE,U,82 30 776 (KESSEL, B.) 2 October 1986 see figures ---	1,2,5
A	FR,A,1 438 458 (MILLET, J.) 1966 see figures ---	1,2,6
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1 Date of the actual completion of the international search

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-3836159	17-09-74	US-A-	3918725	11-11-75
		US-A-	4050624	27-09-77
DE-C-875108		NONE		
DE-U-8230776	02-10-86	NONE		
FR-A-1438458		NONE		
FR-A-2252897	27-06-75	GB-A-	1443810	28-07-76
		AT-B-	341863	10-03-78
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