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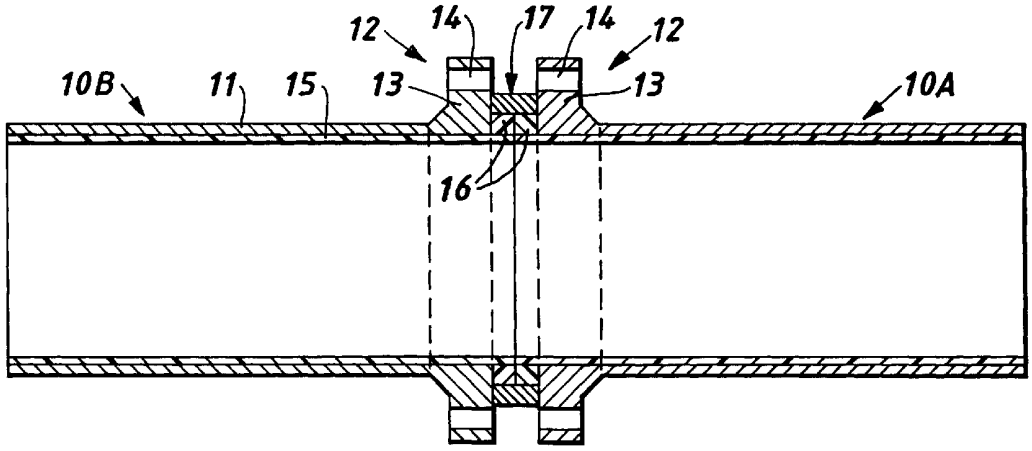
(54) Title: JOINING OF LINED PIPES



(57) Abstract: The present invention relates to the joining of lined pipes, particularly lined pipes for high pressure applications. A metal pipeline section that has a metal flange (13) at one end is lined with a plastic liner (15) such that some of the liner extends beyond the flange end (13) of the pipeline section. An annular plastic member (16) is electrofusion joined onto the outside of the portion of plastic liner (15) which extends beyond the flange end (13) of the pipeline section and any liner extending beyond the annular plastic member is trimmed off to make the liner flush with the annular plastic member (16). The annular plastic member (16) is then positioned adjacent the annular plastic member of another similarly prepared pipeline section and a containment ring (17) is secured around them to restrain any outward movement of the annular plastic members when the pipeline is in use. The metal flanges (13) are secured to each other such that the annular plastic members (16) are compressed between them to prevent leakage.

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Joining of Lined Pipes

The present invention relates to the joining of lined pipes, particularly lined pipes for high pressure applications.

Steel pipelines conveying certain fluids, such as mining slurries, at high pressures, are subject to high rates of corrosion and wear. For such applications, mining companies often specify flanged joints for routine maintenance or rotation of individual pipe sections to obtain uniform abrasion and wear. Lining the steel pipe with a suitable close-fit plastic liner can considerably reduce corrosion and wear, thereby increasing the operating life of the pipeline. However, a means of connecting sections of lined pipes is required that contains the fluid within the plastic liner, can be dismantled frequently and/or is designed such that it does not cause any internal obstruction in the pipe.

According to a first aspect of the present invention, there is provided a method for joining plastic lined metal pipeline sections to form a plastic lined metal pipeline for carrying high pressure fluids and slurries, the method comprising:

lining a metal pipeline section that has a metal flange at one end with a plastic liner such that some of the liner extends beyond the flange end of the pipeline section;

electrofusion joining an annular plastic member onto the outside of the portion of the liner which extends beyond the flange end of the metal pipeline section;

if the liner extends beyond the annular plastic member, trimming the liner to be substantially flush with the annular plastic member;

performing the above steps on another pipeline section that has a metal flange at one end;

positioning the plastic members of both lined pipeline sections substantially adjacent to each other and substantially in axial alignment with each other;

securing a containment ring around both annular plastic members to restrain any outward movement of the plastic members when in use; and

securing the annular metal flanges to each other such that the annular plastic members are compressed between the metal flanges.

The annular plastic members are compressed sufficiently to prevent leakage. The annular metal flanges are preferably secured to each other by a series of nuts and bolts passing through appropriate apertures arranged circumferentially around the metal flanges, but any method of securing the metal flanges to each other will be satisfactory.

Such a method joins two lined pipe sections together substantially reducing the risk of leakage from the joined pipe sections, even when the pipe sections are conveying high pressure fluid or slurry. If necessary the joined pipeline sections can be released from each other.

According to a second aspect of the present invention, there is provided a connector for connecting two plastic lined metal pipeline sections to form a connection for pipelines able to convey high pressure fluids with no or negligible leakage, the connector comprising:-

two annular plastic members, each one being arranged to be electrofusion joined onto the outside surface of a portion of plastic liner extending out from an end of a metal pipeline section provided with a flange;

a containment ring arranged to be secured around both annular plastic members when they are arranged substantially adjacent to each other and substantially in axial alignment with each other, if necessary after trimming the liners to be substantially flush with the annular plastic members, the containment ring being provided to restrain any outward movement of the plastic members when in use; and

means to secure the annular metal flanges to each other such that the annular plastic members are compressed between the metal flanges.

According to a third aspect of the present invention, there is provided a pipeline formed using the method of the first aspect of the present invention.

An example of the present invention is described below with reference to the accompanying drawings in which:-

Figures 1a, 1b and 1c show an end view and cross-sectional side views of a pipeline section before and after having its liner trimmed;

Figure 2 shows two pipeline sections of the form shown in Figure 1 arranged adjacent to each other and in axial alignment with each other; and

Figure 3 shows a joint formed by two pipeline sections.

As shown in Figure 1, a metal pipeline section 11, in this case made from steel, has an annular metal flange 13 at one end. The pipeline section 11 could be provided with a flange 13 by any suitable means, such as by welding the flange onto the pipe or by providing a pipe with a flange already fitted for example. As seen in the end view of the flange 13 in Figure 1a, bolt holes 14 are arranged circumferentially around the metal flange 13. The steel pipeline section 11 is then lined with a plastic liner 15 such that a portion of the plastic liner 15 extends beyond the end portion 12 of metal pipeline section 11 as shown in Figure 1b. The portion of plastic liner 15 that extends beyond the end portion 12 of the metal pipeline section 11 then has an annular plastic member 16 mounted on its exposed outside surface

adjacent to the flange 13. In this example, the annular plastic member 16 is made from polyethylene. The annular plastic member 16 has electrofusion coils 16A to melt the surrounding plastic in the member 16 and in the plastic liner 15 to join the plastic member 16 to the plastic liner 15. If the liner 15 extends beyond the annular plastic member 16, the protruding liner 15 is trimmed to be substantially flush with the annular plastic member 16 as shown in Figure 1c.

Figure 2 shows the end portions 12 of two plastic lined pipeline sections 10A, 10B arranged with their ends adjacent to each other and in axial alignment. A metal ring 17 is secured around the two annular plastic members 16. The metal ring could be provided in a single piece or a number of pieces such as a split ring. The metal ring in this example is fitted by first being slipped around the plastic member 16 on one separate pipe 10A, and then bringing the plastic member 16 fitted to the second pipe 10B adjacent to the plastic member of the first pipe 10A by slipping it under the metal ring 17 already fitted around the first pipe 10A.

Figure 3 shows the cross-sectional joint between the first and second pipe sections 10A, 10B in more detail. The two flanges 13 are held together by a screw threaded bolt 18 which passes through bolt holes 14. The bolt 18 is provided with a head 19 at one end and when passed through appropriate axially aligned bolt holes 14

has a nut 20 threaded onto it at the other end to secure the two flanges 13 together. Similar nuts and bolts are secured to an appropriate number of axially aligned pairs of bolt holes arranged circumferentially around the adjacent pipes 10A, 10B.

The nut 20 is tightened onto the screw threaded bolt 19 to pull the metal flanges 13 closer together which also compresses plastic members 16 sufficiently to provide a suitable seal. The width of containment ring 17 is set such that the plastic members 16 are compressed to an optimum level. By compressing the plastic flanges, a sufficiently strong seal is provided for the joint to be used to join pipe sections carrying high pressure gases, fluids or slurries with no or negligible leakage. The degree of compression required will depend upon the pressure of fluid to be conveyed. Such a joint can advantageously be undone or released by unscrewing the nuts and bolts to enable routine maintenance or rotation of pipe sections to be performed.

The above example is illustrative and should not be taken to be limiting upon the scope of the invention. For example, neighbouring axially aligned metal flanges 13 need not be secured to each other with nuts and bolts but could be secured to each other with any appropriate securing means. Furthermore, the annular plastic members 16 need not be made from polyethylene. Any suitable compressible material will suffice.

CLAIMS

1. A method for joining plastic lined metal pipeline sections to form a plastic lined metal pipeline for carrying high pressure fluids and slurries, the method comprising:

lining a metal pipeline section that has a metal flange at one end with a plastic liner such that some of the liner extends beyond the flange end of the pipeline section;

electrofusion joining an annular plastic member onto the outside of the portion of plastic liner which extends beyond the flange end of the metal pipeline section;

if the liner extends beyond the annular plastic member, trimming the liner to be substantially flush with the annular plastic member;

performing the above steps on another pipeline section that has a metal flange at one end;

positioning the plastic members of both lined pipeline sections substantially adjacent to each other and substantially in axial alignment with each other;

securing a containment ring around both annular plastic members to restrain any outward movement of the plastic members when in use; and

securing the annular metal flanges to each other such that the annular plastic members are compressed between the metal flanges.

2. A method according to claim 1, wherein the annular plastic members are compressed between the metal flanges until both metal flanges are brought into contact with the containment ring and the width of the containment ring is set such that when both metal flanges are in contact with the ring, the plastic members are compressed an optimum amount.

3. A method according to claim 1 or claim 2, wherein the containment ring is a split ring.

4. A method according to claim 1 or claim 2, wherein the containment ring is provided in a single piece.

5. A method substantially as hereinbefore described with reference to the accompanying drawings.

6. A connector for connecting two plastic lined metal pipeline sections to form a connection for pipelines able to convey high pressure fluids with no or negligible leakage, the connector comprising:-

two annular plastic members, each one being arranged to be electrofusion joined onto the outside surface of a portion of plastic liner extending out from an end of a metal pipeline section provided with a flange;

a containment ring arranged to be secured around both annular plastic members when they are arranged substantially adjacent to each other and substantially in axial alignment with each other, if necessary after trimming the liners to be substantially flush with the annular plastic members, the containment ring being provided to restrain any outward movement of the plastic members when in use; and

means to secure the annular metal flanges to each other such that the annular plastic members are compressed between the metal flanges.

7. A connector according to claim 6, wherein the width of the containment ring is set such that the securing of the flanges to each other brings them into contact with the containment ring and compresses the annular plastic members an optimum amount.

8. A connector according to claim 6 or claim 7, wherein the containment ring is a split ring.

9. A connector according to claim 6 or claim 7, wherein the containment ring is provided in a single piece.

10. A connector substantially as hereinbefore described with reference to the accompanying drawings.

11. A high pressure pipeline comprising two substantially adjacent, substantially axially aligned metal pipeline sections joined to each other by the method of any of claims 1 to 5.

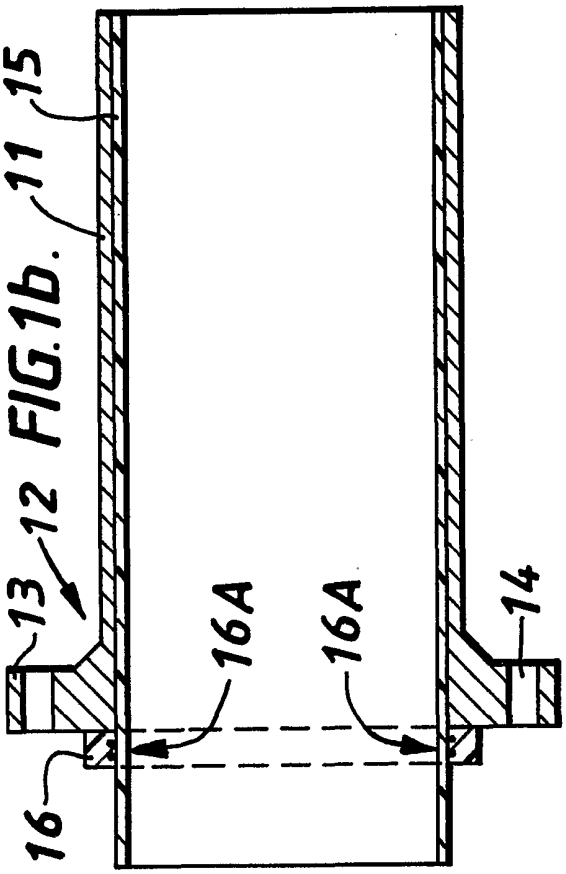


FIG.1b.

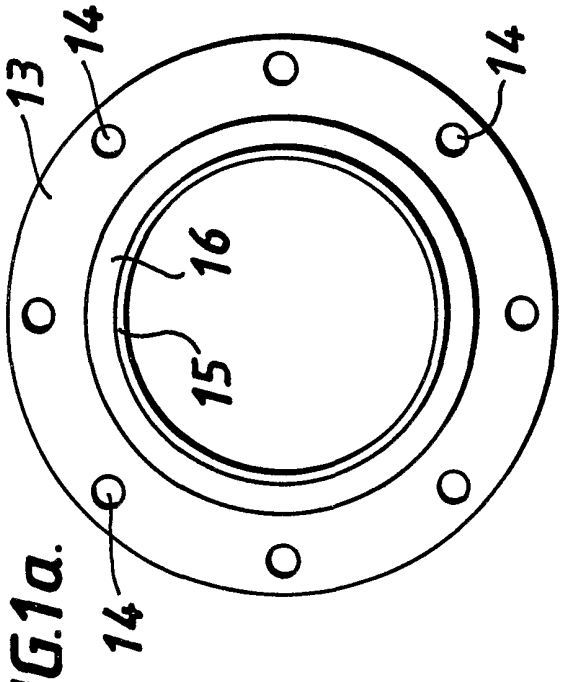


FIG.1a.

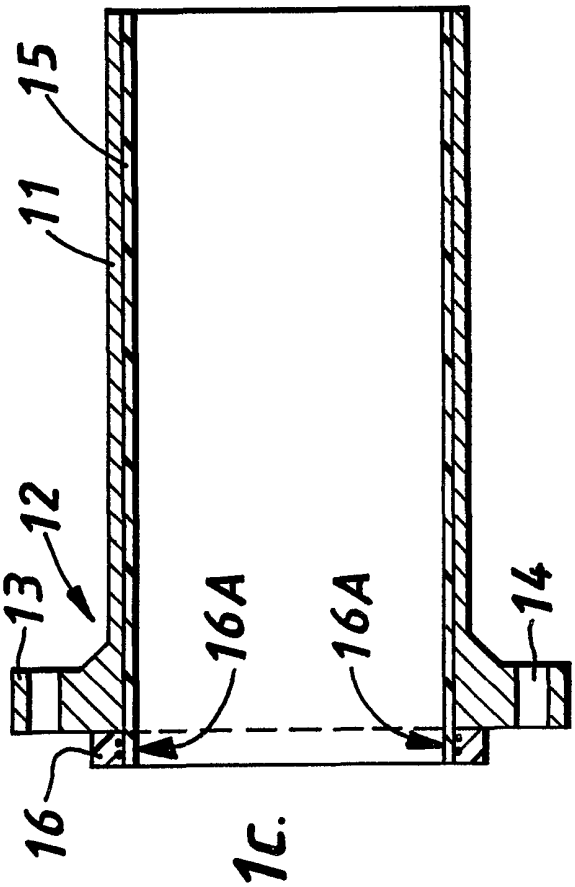


FIG.1c.

FIG. 2.

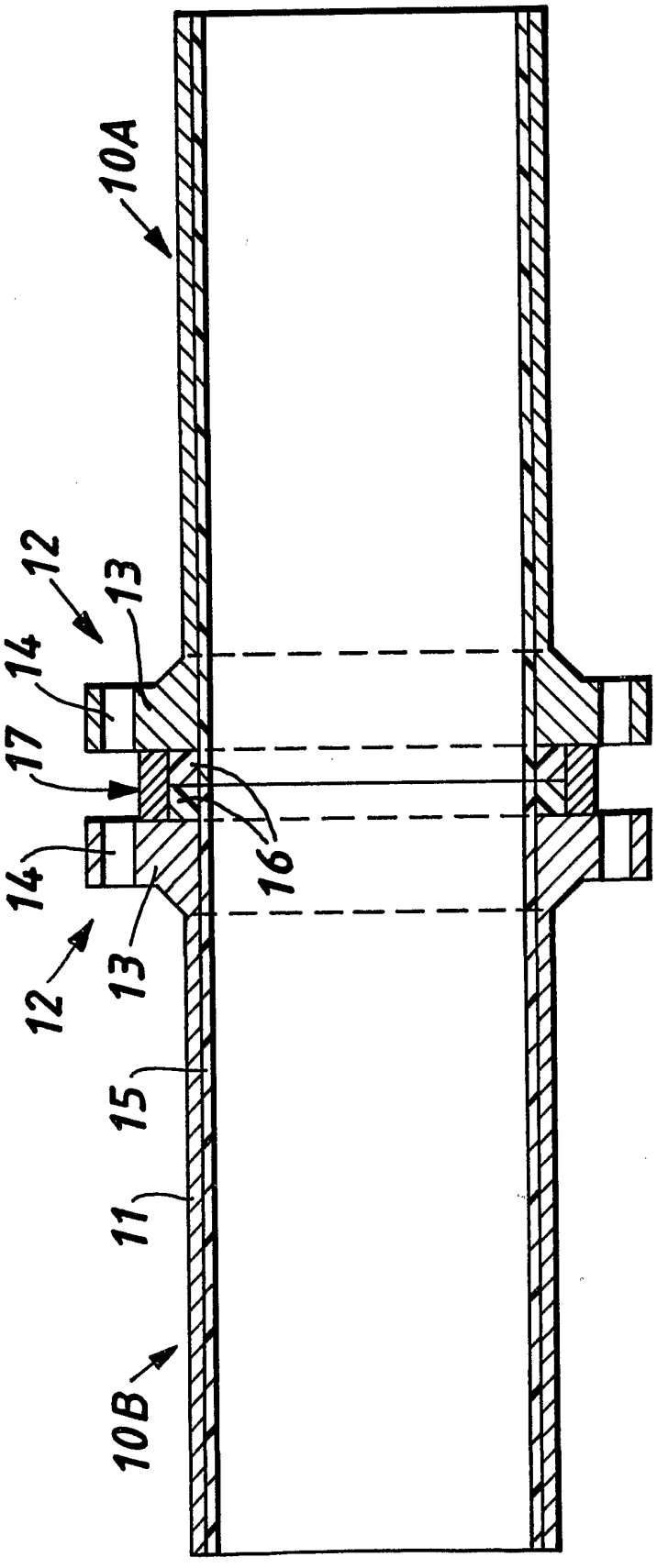
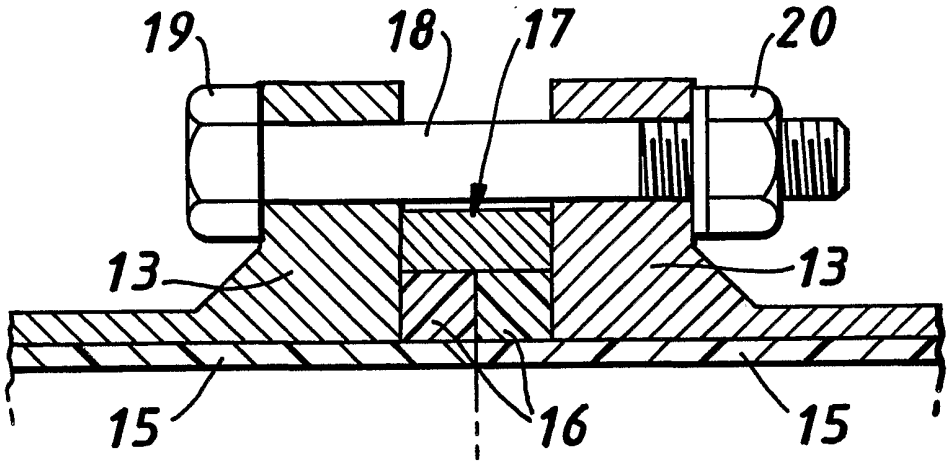


FIG. 3.



INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/GB 01/05407

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F16L23/12

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 7 F16L B29C

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)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
28 February 2002	07/03/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Cordenier, J

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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