COUPLING JOINT FOR PIPE

This invention relates to methods and apparatus for formingpipe joints, for example, for forming plastics-lined junctions in plastics lined pipe or conduit as commonly used for handling acids, caustics salt water and other corrosive fluids. One object is to provide a method and apparatus for joining uncoated ends of plastics lined pipe and coating the end facings of said plastics lined pipe to provide a fully lined conduit when joints or sections of lined pipe are joined

However, the invention may be used to join sections of either lined or un-lined pipe.

Plastics-lined pipe has long been used for conducting acids, caustics, salt water and other corrosive or abrasive fluids which cause deterioration of metal pipes.

Frequently it is necessary to remove a portion of a length of plastics-lined metal pipe after the pipe is installed to insert a 'T' or other conduit means or remove and replace a ruptured or faulty pipe section. When such repairs or alterations are made in a pipe string, the pipe must be cut and the open end thereof jointed with another pipe or other conduit means.

When the pipe has been cut, the end facing of the metal pipe is exposed. Accordingly, unless special precautions are taken to protect the exposed end facing of the pipe, the exposed end will be in fluid communication with the interior of the conduit when the conduit is rejoined.

A conventional flange cannot be welded directly to pipe which has a plastic lining since the heat

generated by the welding process will ordinarily destroy the plastic lining. Furthermore, when pipe repair must be made in the field, particularly in thin-walled pipe or in conduits which have been buried, the open ends cannot be conveniently threaded to attach a flange or nipple.

In accordance with the present invention, a coupling joint interconnecting the open ends of two pipe sections, having opposed radially-extending end faces, comprising a pair of axially-elongate compression collars of multi-segment or expandable split-ring type, one of which encircles each pipe section adjacent to its open end, each compression collar having one or more radially-inwardly-projecting formations which grip or positively engage with the associated pipe section when the collar is radially-inwardly compressed, and couple the pipe section positively to the collar for axial movement therewith towards the other pipe section, and each collar having a tapered external circumferential surface decreasing in diameter in a direction away from the open end of the pipe section, and a radially-extending end face lying substantially in the plane of the end face of the associated pipe section; a rigid flange member encircling each pipe section and its associated compression collar, each flange having a tapered internal circumferential surface opposed to and mating with the tapered external surface of the respective collar and having an abutment surface which faces axially-towards the other pipe section and engages an oppositely-facing abutment on the

collar encircled by that flange member; a sealing gasket interposed between the opposed end faces of the two pipe sections and between the two compression collars; and means for holding the two flange members drawn axially towards one another whereby each compression collar is radially-inwardly compressed by the wedging action of the respective opposed tapered surfaces to effect the said positive coupling of its associated pipe end, and transmits axial thrust positively from the associated flange member to that pipe section in the direction towards the other pipe section, to hold the sealing gasket abutted by and between the opposed end faces of the pipe sections and by and between those of the compression collars.

In one form of the invention, the inwardly-projecting formation of each collar comprises a lip which enters an annular circumferential groove formed in the external surface of the respective pipe section.

Where the joint is used to interconnect open ends of sections of plastics-lined pipe, a plastics end face liner may be positioned within the open end of each pipe section, said end face liner comprising an open-ended tubular body having outer cross-sectional dimensions substantially conforming to the internal dimensions of the plastics lining of the pipe section in which it is inserted and having a radially-outwardly-projecting flange at one end of its body, which flange overlies the end face of the associated pipe section, the flanges of the two end

face liners constituting the sealing gasket. Abutting ends of lined pipe with exposed metal end faces may thereby be joined to form a fully lined junction, the flanges of their end face liners overlying the end faces of the pipes, and of their collars between which the said flanges are abutted by the drawing together of the rigid flange members.

Preferably each plastics end face liner is bonded to the interior of the plastics lining of the respective pipe end, and its flange is bonded to the metal pipe end faces which it overlies. The cylindrical body of each end face liner may extend into the pipe past the external annular groove referred to above, to ensure that any damage to the lining caused by the grooving is covered with plastic.

The coupling joint of the invention may also be used between a pipe end and some other conduit means such as a T.

The invention from another aspect comprises a method of forming a joint between adjacent ends of two sections of pipe, which comprises forming a circumferential groove in the outer surface of each pipe section at a predetermined distance from the open end thereof; encircling the end portion of each pipe section with an axially-elongate

compression collar of multi-segment or expandable split-ring type, made of substantially rigid material, the collar extending from the groove to the end face of the open end of the pipe section; each collar having an inwardly-projecting tip which enters the groove when the collar is radially-inwardly compressed around the associated pipe section to couple the pipe section positively to the collar for axial movement therewith in the direction towards the other pipe section, and having a tapered external circumferential surface which increases in diameter in the direction from the groove towards the open end of the encircled pipe section; encircling each pipe section and its encircling collar with a rigid flange member having a tapered internal circumferential surface which is opposed to and mates with the tapered external surface of the collar, and having an abutment surface which faces axially towards the end surface of the encircled pipe section and engages a co-operating oppositely-facing abutment on the collar encircled by that flange member; bringing the ends of the two pipe sections into opposed relationship and interposing a sealing gasket between the opposed end faces of the two pipe sections and of their associated collars; and drawing the two flange members axially together and holding them drawn together so that each compression collar becomes radially inwardly compressed by the wedging action of the opposed tapered surfaces to effect the said positive coupling of its associated pipe end, and transmits axial thrust positively from the associated flange member to that pipe section to hold the sealing gasket abutted by and between the opposed end faces of the pipe section and by and between those of the compression collars.

A similar method may be used for forming a joint between the open end of a pipe and some other conduit means.

It will thus be observed that when repairs or alterations must be made in string of buried pipe, an entire pipe section need not be removed. Instead only a small portion of the pipe need be exposed and removed from the conduit and a new portion substituted for the portion removed. Using the teachings of this invention, a fully lined conduit is formed which includes the short joint or other conduit means spliced into the conduit. Furthermore, if a T or other apparatus must be installed in the pipe string, only the immediately affected portion of the conduit need be exposed. Therefore extremely rapid repairs and alterations may be made in a lined conduit and, using the teachings of the invention, a fulled lined repair or alteration performed. An annular groove may be provided in the inner surface of the flange member to carry sealing means, such as an O-ring to form a seal between the flange and the pipe section, thereby preventing leakage of fluids from the environment surrounding the junction into the junction formed.

The invention may be carried into practice in various ways, but three specific embodiments thereof will now be described by way of example only and with reference to the accompanying drawings in which:-

FIGURE 1 is a sectional view of the open end portions of two lined pipe sections joined in accordance with one embodiment of the invention;

FIGURE 2 is a sectional view of the open end portion of a pipe section employing an alternative embodiment of the invention; and

FIGURE 3 is a sectional view of the open end of a pipe section employing yet another embodiment of the invention.

As illustrated in the drawings the opposed open ends of two sections of lined metal pipe may be joined in accordance with the invention to form a fully lined junction. Each pipe section 10 may be the open endof any conventional conduit formed from either threaded or non-threaded pipe having a lining 11 on the internal surface thereof. Lining 11 may be a conventional tubular lining formed of thermoplastic such as polyvinyl chloride or other plastic, or may be a protective lining formed in place as by spraying or the like as is well know in the art. Conventionally, lining 11 is bonded to the internal surface of the pipe 10 to form a plastic lined conduit.

When a section of a conduit formed by sections of pipe such as pipe 10 is removed, the removal is usually accomplished by merely cutting through the pipe. The pipe may be cut for any of various reasons, such as to remove a faulty, leaky or damaged section or to install a T or other apparatus. However, when a portion of the conduit is removed, such as by sawing or the like, the pipe 10 and the lining 11 are both severed in the same plane leaving an open end. The end face 12 of the metal pipe 10 is thus exposed and not coated with the lining.

If the pipe sections 10 are to be joined to each other or with a substitute pipe section or a means must be provided to protect the end faces 12 of the pipe 10.

As illustrated in the drawings, an annular groove 13 is formed in the external surface of pipe 10 at a predetermined distance from the end face 12. The groove 13 may be formed by a conventional grooving tool which cuts a relatively flat-bottomed rectangular groove 13 as illustrated in FIGURE 1 or may be a semi-circular groove formed by rolling or the like as illustrated in FIGURE 2. A plastic end face liner 14 is then positioned within the open end of pipe 10. End face liner 14 comprises an open-ended cylindrical body, the outer dimensions of which substantially conform to the internal dimensions of liner 11 in pipe 10. The end face liner 14 includes a radially extending flange 15 which radiates outwardly from one end of the body and mates with the end face 12 of the pipe 10.

The end face liner 14 is preferably of the same material as lining 11. Therefore end face liner 14 may be bonded to lining 11 with a suitable solvent such as methyl ethyl ketone or any other suitable solvent or conventional epoxy cement depeending upon the material of the lining 11 and end face liner 14. A metal compression collar 16 is then fitted over the outer surface of the open end of pipe 10.

Compression collar 16 preferably comprises a pair of semi-circular section steel bodies which mate

to form an axially elongate ring or band. Alternatively compression collar 16 may be a unitary split ring which is expandable to fit over the end of the pipe 10. The internal diameter of the compression collar 16 is preferably the same as the external diameter of the pipe 10 and includes an inwardly projecting means to position the collar 16 and prevent axial movement of the collar 16 with respect to the pipe 10. The inwardly projecting means may be a flange or lip 17 which mates with groove 13 where a groove 13, either rectangular or rounded as shown in FIGURES 1 and 2, respectively, is formed. The axial length of compression collar 16 is preferably identical with the predetermined distance of the groove 13 from the open end face 12 of the pipe so that the end face of the compression collar opposite the lip 17 lies in the same plane as the end face 12 of the pipe 10.

In the embodiment illustrated in FIGURE 3 instead of the groove 13 and lip 17, all or part of the internal surface of the compression collar 16 is provided with gripping ridges or teeth 17a which grippingly engage the outer surface of the pipe. In all three embodiments, the outer surface 18 of compression collar 16 is tapered, the external diameter increasing in the direction of the end thereof lying in the plane of end face 12 of pipe 10.

A rigid flange 20 having a central opening 21 is positioned over the end of pipe 10 prior to assembly of the compression collar 16 and insertion of the end face liner 14. The rigid flange 20 has

a centrally located opening 21 of non-uniform diameter. The smaller internal diameter of the opening in flange 20 is substantially the same as the external diameter of pipe 10 and is located in the portion thereof at the edge removed from the open end of the pipe 10. The internal diameter of the flange 20 is greatest at the face thereof lying in the plane of the open end face 12 of the pipe 10. The larger internal diameter portion of the opening 21 is tapered in the same direction as the outer surface 18 of the compression collar 16 so that the tapered internal surface 27 mates with the tapered external surface 18 of the compression collar 16 and further forms a shoulder 19 which mates with the edge of the compression collar 16 adjacent the lip 17 in the cases of FIGURES 1 and 2. The axial length of the tapered internal diameter surface 27 of the flange 20 is substantially the same as or slightly less than the axial length of compression collar 16.

Flange 20 includes a plurality of holes 22 parallel with the central opening 21 and disposed around the periphery thereof through which connector bolts 23 may be passed to accomplish coupling of one pipe section to another pipe section or other apparatus.

For connecting two open pipe ends, each having an exposed end face 12 as illustrated in the drawings, the coupling may be formed by abutting the ends of the pipes. The faces of the radially extending flanges 15 on end face liners 14 are drawn together by bolts 23 passing through the holes 22 in the members 20. It will be observed that as the flanges 20 are drawn together by connector bolts, 23, the tapered internal

surfaces 27 mate with the tapered external surfaces 18 on the compression collars 16. Thus the compression collar 16 is radially compressed inwardly by the flange 20 to maintain the lip 17 securely engaged in groove 13. The lip 17 thus exerts axial force on the pipe 10 through shoulder 19 on the internal surface of the flange 20 engaging the end face of the compression collar 16 to draw the end face liners 14 uniformly and snugly into mutual contact. Alternatively, in the embodiment of FIGURE 3, radial compression of the collar 16 causes teeth 17a to securely engage the pipe 10 and axial force is applied to the collar 16 through should 19 to draw the ends of the pipe sections 10 together.

It will be readily appreciated that the flanges 15 on end face liners 14 mate not only with the end faces 12 of pipes 10, but also with each other and with the end faces of compression collars 16 and the opposing faces of flanges 20. Accordingly, a suitable solvent or cement may be applied to the flanges 15 immediately prior to assembly to form a fully bonded and sealed plastic lined coupling.

In some cases, particularly, those involving relatively thin-walled pipe internally coated with a formed-in-place lining such as a sprayed coating, formation of the groove 13 in the external surface of the pipe may cause damage to the lining 11 on the internal surface of the pipe in the immediate vicinity of the groove 13. For example, the lining may crack or become disengaged

from the pipe wall, thus exposing the metal pipe wall to fluid passing through the conduit. In order to protect the pipe wall from any such damage which may occur, the tubular body portion of the end face liner 14 should extend into the lined pipe 10 well past the groove 13 and be securely bonded to the liner 11. In this manner, any cracks formed in the lining 11 by formation of the groove 13 will be covered by the end face liner 14 thus ensuring the formation of a fully lined conduit.

As illustrated in FIGURE 3, an annular groove 30 may be formed in the internal surface of the opening 21 in flange 20 which engages the pipe 10 and sealing means, such as an O-ring 31 or the like, fitted therein. The seal formed by the O-ring 31 provides an external seal to prevent fluids from the external environment from entering the joint formed. Thus, when the conduit is used in a corrosive environment or buried, etc., external fluids may not leak into the coupling mechanism to contaminate and corrode the joint forming mechanism.

It will be apparent that the groove and O-ring feature may be used in combination with any embodiment of the compression collars 16 shown and described. When used in formed lined junctions in lined pipe, the sealing groove and O-ring serve primarily to prevent leakage of external fluids into the joint-forming apparatus. However, it should be observed that the elements of the invention shown may be used as shown and described without the plastic end face liner 14

to form junctions between un-lined pipe sections. In the case, a gasket (not shown) may be placed between the abutting faces of flanges 20 to replace flange 15 and the sealing gasket and the O-ring 31 form a fluid tight seal between the abutting ends of the pipe sections.

The inter-relationship between the collar 16, the flange 20 and the ends of the pipe 10 are, of course the same for lined as well as un-lined pipe. Thus, the hardware designed in accordance with the invention for forming fully lined joints may also be used for forming un-lined joints.

It will be observed that the method and apparatus described herein may be used on practically any size of metal pipe, either threaded or unthreaded. The coupling may readily be performed in the field on buried pipe with only minimum exposure of buried line. Furthermore, the rigid flanges 20 may be adapted to be coupled to each other, as shown in FIGURE 1, or adapted to be coupled to other apparatus such as a T which already has an end face liner. Since the collar 16 extends axially from the shoulder 19 in the flange 20 to the open end face 12 of pipe 10, the collar 16 reinforces the end of the pipe so that the coupling formed by the flange 20 is rigid and stable. Furthermore, since the outer surface 18 of the collar 16 is tapered to mate with the tapered inner surface 27 of the flange, the collar 16 is radially compressed about its full radial periphery to form intimate contact with the pipe yet prevent crushing of the pipe,

CLAIMS

1. A coupling joint interconnecting the open ends of two pipe sections having opposed radially-extending end faces, comprising a pair of axially-elongate compression collars of multi-segment or expandible split-ring type material, one of which encircles each pipe section adjacent to its open end, each compression collar having one or more radially-inwardly-projecting formations which grip or positively engage with the associated pipe section, when the collar is radially-inwardly compressed and couple the pipe section positively to the collar for axial movement therewith towards the other pipe section, and each collar having a tapered external circumferential surface decreasing in diameter in a direction away from the open end of the pipe section, and a radially extending end face lying substantially in the plane of the end face of the associated pipe section; a rigid flange member encircling each pipe section and its associated compression collar, each flange having a tapered internal circumferential surface opposed to and mating with the tapered external surface of the respective collar and having an abutment surface which faces axially-towards the other pipe section and engages an oppositely-facing abutment on the collar encircled by the flange member; a sealing gasket interposed between the opposed end faces of the two pipe sections and between the two compressioncollars; and means for holding the two flange members drawn axially towards one another whereby each compression collar is radially-inwardly compressed

* C L M S *

by the wedging action of the respective opposed tapered surfaces to effect the said positive coupling of its associated pipe end, and transmits axial thrust positively from the associated flange member to that pipe section in the direction towards the other pipe section, to hold the sealing gasket butted by and between the opposed end faces of the pipe sections and by and between those of the compression collars.

2. A joint as claimed in Claim 1 in which the larger diameter of the tapered external surface of each collar lies in substantially the same plane as the end face of the associated pipe section.

3. A joint as claimed in Claim 1 or Claim 2 in which the internal diameter of each flange member adjacent to its side axially remote from the open and of the associated pipe section substantially conforms to the external diameter of that pipe section, and in which the internal diameter of the flange member axially adjacent to the open end of that pipe section substantially conforms to the external diameter of the associated compression collar at its said end face.

4. A joint as claimed in any preceding claim including an annular circumferential groove in the external surface of each of said pipe sections at a predetermined distance from the open end, and in which the inwardly projecting formation on each collar comprises a lip which enters the groove radially.

* C L M S *

5. A joint as claimed in Claim 4 wherein said annular groove is rectangular in cross-section.

6. A joint as claimed in Claim 4 wherein said annular groove is semi-circular in cross-section.

7. A joint as claimed in any one of the preceding claims in which the abutment surface of each flange member comprises a shoulder which engages a rear end face of the associated compression collar opposite to its said radially-extending end face.

8. A joint as claimed in any one of the preceding claims in which an annular groove formed in a portion of the internal surface of each rigid flange member adjacent to the external surface of the associated pipe section carries sealing means in sealing engagement between said rigid flange member and said pipe section.

9. A joint as claimed in Claim 8 wherein said sealing means is an O-ring.

10. A coupling joint as claimed in any one of the preceding claims between two metal pipe sections whose bores are lined with plastics linings each pipe section having a plastics end face liner positioned within its open end each end face liner comprising an open-ended tubular body having outer cross-sectional dimensions substantially conforming to the internal dimensions of the plastics lining of the pipe section in which it is inserted and having a radially-outwardly-projecting flange at one end of its body, which flange overlies the end face of the associated pipe section, the flanges of the two end face liners constituting the sealing gasket.

* C L M S *

11. A joint as claimed in Claim 10 in which the flanges on the end face liners are held in abutted relationship between opposed radial faces of the two flange members.

12. A coupling joint as claimed in Claim 10 or Claim 11 in each case in combination with Claim 4, wherein the cylindrical body of each end face liner extends from the open end of said pipe section past said groove in the pipe section.

13. A coupling joint as claimed in any of Claims 10-12 wherein the cylindrical body of each end face liner is bonded to the internal surface of said plastics lining in the associated pipe section.

14. A coupling joint interconnecting the open ends of two pipe sections constructed and arranged substantially as herein specifically described with reference to any one of FIGURES 1-3 of the accompanying drawings.

15. Apparatus for joining the open end of a pipe to another conduit means, the pipe end having a radially extending end face, which apparatus comprises an axially-elongate compression collar of multi-segment or expandible split-ring type, made of substantially rigid material for encircling the pipe adjacent to its open end, the collar having one or more radially-inwardly-projecting formations which grip or positively

* C L M S *

engage with the pipe when the collar is radially-inwardly compressed around it and couple the pipe positively to the collar for axial movement in the direction faced by its open end, and the collar having a radially-extending end face which in use lies substantially in the plane of the end face of the pipe and a tapered external circumferential surface which decreases in diameter in the direction away from the said end face of the collar; a rigid flange member which in use encircles the pipe and its encircling compression collar and has a tapered internal circumferential surface which in use is opposed to and mates with the tapered external surface of the collar, and has an abutment surface which in use faces axially towards the other conduit and engages an oppositely-facing abutment on the collar; a sealing gasket for interposition between on the one hand the other conduit means and on the other hand the end faces of the pipe and its collar; and means for holding the flange member drawn axially towards the other conduit means whereby the compression collar is radially-inwardly compressed by the wedging action of the opposed tapered surfaces to effect the said positive coupling of the pipe, and transmits axial thrust positively from the flange member to the pipe in the direction towards the other conduit means to hold the sealing gasket abutted by and between the other conduit means and the end faces of the pipe and collar.

* C L M S *

16. Apparatus as claimed in Claim 15 in which the internal circumferential surface of the flange member adjacent its side which in use lies furthest from the open end of thepipe conforms to, and lies close to the external surface of the pipe.

17. Apparatus as claimed in Claim 15 or Claim 16 for use with a metal pipe having an internal plastics lining, and including a plastics end face liner comprising a tubular body which is a close fit in the open end of the lining of the pipe and which has at one end a radially-outwardly-projecting flange adapted to overlie the end face of the metal pipe and that of the encircling collar, said flange constituting the gasket.

18. Apparatus as claimed in Claim 15 or Claim 16, or Claim 17, wherein said inwardly projecting formation comprises a lip for entering an annular circumferential groove formed in the external surface of the pipe at a predetermined distance from the open end thereof.

19. Apparatus as claimed in Claim 17 and Claim 18 wherein the axial length of said cylindrical body exceeds said predetermined distance.

20. Apparatus as claimed in any one of Claims 16,17 and 19, or in Claim 18 when dependent on Claim 16,including an annular circumferential groove in the internal surface of the flange member adjacent to its side which in use lies furthest from the open end of the pipe, and sealing means carried in said annular groove for forming sealing engagement with the external surface of the pipe.

* C L M S *

21. A method of forming a joint between adjacent ends of two sections of pipe, which comprises forming a circumferential groove in the outer surface of each pipe section at a predetermined distance from the open end thereof; encircling the end portion of each pipe section with an axially-elongate compression collar of multi-segment or expandible split-ring type, made of substantially rigid material, the collar extending from the groove to the end face of the open end of the pipe section; each collar having an inwardly-projecting lip which enters the groove when the collar is radially inwardly compressed around the associated pipe section to couple the pipe section positively to the collar for axial movement therewith in the direction towards the other pipe section and having a tapered external circumferential surface which increases in diameter in the direction from the groove towards the open end of the encircled pipe section; encirling each pipe section and its encircling collar with a rigid flange member having a tapered internal circumferential surface which is opposed to and mates with the tapered external surface of the collar and having an abutment surface which faces axially towards the end surface of the encircled pipe section and engaged a co-operating oppositely-facing abutment on the collar encircled by that flange member; bringing the ends of the two pipe sections into opposed relationship and interposing a sealing gasket between the opposed end faces of the two pipe sections and of their associated collars; and drawing two flange members axially together and holding them drawn together so that each compression collar becomes radially inwardly compressed by the wedging action of the opposed tapered surfaces to effect the

* C L M S *

said positive coupling of its associated pipe end and transmits axial thrust positively from the associated flange member to that pipe section to hold the sealing gasket abutted by and between the opposed end faces of the pipe section and by and between those of the compression collars.

22. A method of forming a joint between an end of a pipe and another conduit means, which comprises forming a circumferential groove in the outer surface of the pipe at a predetermined distance from the open end thereof; encircling the end portion of the pipe with an axially-elongate compression collar of multi-segment or expandible split-ring type made of substantially rigid material, the collar extending from the groove to the end face of the open end of the pipe, and having an inwardly projecting lip which enters the groove when the collar is radially-iunwardly compressed around the pipe to couple the pipe positively to the collar for axial movement-therewith in the direction towards the other conduit means and a tapered external circumferential surface which increases in diameter in the direction from the groove towards the open end of the encircled pipe; encircling the pipe and its encircling collar with a rigid flange member having a tapered internal circumferential surface which is opposed to and mates with the tapered external surface of the collar, and having an abutment surface which faces axially towards the end surface of the pipe and engages a co-operating oppositely-facing abutment on the collar; bring the end of the pipe into opposed relationship to the other conduit means and

interposing a sealing gasket between the other conduit means and the end faces of the pipe and collar; and drawing the flange member and the other conduit means axially together and holding them so drawn together so that the compression collar becomes radially inwardly compressed by the wedging action of the opposed tapered surfaces to effect the said positive coupling of its associated pipe end, and transmits axial thrust positively from the flange member to the pipe to hold the sealing gasket abutted between the other conduit means and the end faces of the pipe and its collar.

23. A method as claimed in Claim 21 or Claim 22 for use with plastics-lined pipe, which includes the step of inserting prior to the said step of drawing together, a plastics end face liner into the open end of each plastics-lined pipe section to be joined or of the plastics-lined pipe to be joined to the other conduit means, the end face liner comprising a tubular body, which is a close fit into the open end of the lining of the pipe or pipe section, the tubular body having at one end a radially-outwardly-projecting flange which constitutes the sealing gasket or a part thereof.

24. The method set forth in Claim 23 including the step of bonding the/or each plastics end face liner to the end face of said pipe section or pipe and to the internal surface of its plastics lining.

* C L M S *

25. The method set forth in Claim 23 or Claim 24, wherein the tubular body of the/or each end face liner is inserted into said open end of the respective pipe section or pipe to extend past said annular groove.

26. A method of forming a joint between adjacent ends of two sections of plastics lined pipe or between a section of plastics-lined pipe and another conduit means, substantially as specifically described herein with reference to any one of FIGURES 1-3 of the accompanying drawings.

The text of the specification has been reprodcued by photocopying the applicants original typescript. It may contain a few amendments which are difficult to read. The original typescript containing these amendments may be inspected on the premises of the Patent Office

* C L M S *