

PATENT SPECIFICATION

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(54) PIPE JOINTING ARRANGEMENTS AND PIPES THEREFOR

(71) We, REED INTERNATIONAL LIMITED, a Company incorporated under the laws of Great Britain, of 82 Piccadilly London W.1., do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to jointing arrangements between two interconnected pipe lengths of equal internal diameter and in particular to jointing arrangements which permit a variable angular orientation of the two pipe lengths. The invention also relates to pipe lengths for use in such jointing arrangements and to methods of forming such jointing arrangements.

The invention has particular, but not exclusive application to jointing arrangements for plastics pipes used in underground service conduits, for example soil pipelines.

According to a first aspect of the invention there is provided a jointing arrangement between two interconnected pipe lengths of equal internal diameter, the adjacent end faces of the two pipe lengths lying in planes oblique to their respective longitudinal axes and abutting each other, wherein the wall thickness of each of said pipe lengths adjacent its said end face varies circumferentially without stepped interruption of the internal surface of the pipe length so that the internal surfaces of said pipe lengths at said end faces are circular in said oblique planes. Thus by the invention the elliptical internal cross-sections which would result from simply cutting the end faces of the pipe lengths obliquely are converted to circular cross-sections to obviate the stepped joint which would occur between the internal surfaces of the pipe lengths.

Advantageously the jointing arrangement includes coupling means between the pipe lengths, which coupling means permit rotation of one of said pipe lengths about its longitudinal axis relative to the other pipe length to cause said abutting end faces to slide one over the other and so vary the angular orientation of the two pipe lengths.

The pipe lengths may be sealed together

either by bonding (e.g. solvent welding) after the pipe lengths have been set to the desired angular orientation or through sealing rings.

According to a second aspect of the invention there is provided a pipe length for a jointing arrangement according to the first aspect, wherein an end face of said pipe length extends in a plane oblique to its longitudinal axis and the wall thickness of said pipe length adjacent said end face varies circumferentially without stepped interruption of the internal surface of said pipe length so that the internal surface of said pipe length at said end face is circular in said oblique plane.

According to a further aspect of the invention there is provided a method of forming the jointing arrangement according to the first aspect of the invention wherein the said end faces are brought into abutment and the pipe lengths coupled together and one said pipe length is rotated about its longitudinal axis relative to the other to set the pipe lengths at a desired angular orientation.

The invention will now be further explained by way of example with reference to the accompanying drawings in which Figures 1 to 4 illustrate the principle of the invention and Figures 5 to 11 illustrate embodiments of the invention.

Thus:—

Figure 1 is an end elevation of one of the pipe lengths in the plane of its oblique end face,

Figure 2 is a section on the line A—A of Figure 1.

Figure 3 is a view in the direction of arrow Z in Figure 2.

Figure 4 illustrates various angular orientations in which the two pipe lengths can be jointed together.

Figure 5 is a sectional view of a first embodiment of the invention in a solvent welded type coupling.

Figure 6 is a view in the direction of the arrow Y in Figure 5 of one of the pipe lengths.

Figure 7 is a sectional view of a second embodiment.

Figure 8 shows to an enlarged scale a sec-

tional view of part of the second embodiment on the line B—B of Figure 9.

Figure 9 shows a sectional view on the line C—C of Figure 8.

Figure 10 shows a sectional view of a third embodiment of the invention on the line D—D of Figure 11, and

Figure 11 shows a sectional view on the line E—E of Figure 10.

Referring to Figures 1 to 4, the end faces of two pipe lengths 1 and 2 of plastics material are formed so that they extend in planes which are oblique to the respective longitudinal axes 3 and 4 of the pipe lengths and have the same angle of obliqueness. Hence if the two pipe lengths are fitted together with the two end faces abutting and the pipe length 2 is rotated about its longitudinal axis, the end faces will ride over each other to cause the pipe length 2 to assume different angular orientations with respect to the pipe length 1. Three such orientations are shown in Figure 4. In fact in one complete revolution, the axis 4 of the pipe length 2 will generate a cone.

If the wall thickness of the pipe lengths 1 and 2 at the end faces is uniform, then due to the elliptical cross-sections of their oblique end faces, a step will occur at the joint between the two pipe lengths when the two pipe lengths are other than coaxial. To avoid this the wall thickness of the pipe lengths is varied circumferentially and without stepped interruption of their internal surfaces so that as seen in the planes of the oblique end faces the internal surfaces of the pipe lengths are circular. The way that this is done can be appreciated from Figures 1, 2 and 3. With a uniform wall thickness the major axis of the elliptical internal cross-section is KL and the minor axis M N. To form a circle centred at O and of radius OK it is necessary to thin the wall as shown from dotted line so that $M^1N^1=KL$.

For a pipe length of for example 103 mm internal diameter and an angle of obliqueness α of $11\frac{1}{2}^\circ$ for the end faces it can be calculated that $KL=M^1N^1=105.02$ mm.

Referring now to Figures 5 and 6 this shows a first embodiment of the invention in a solvent-welded type coupling. To effect coupling of the two pipe lengths 1 and 2 the pipe length 1 is provided with an integral male formation 6 comprising a cuff surrounding the pipe length 1 and the pipe length 2 is provided with an integral female formation 7 comprising a socket-form extension from the end face of the pipe length. To permit rotation of the pipe length 2 about its longitudinal axis 4 relative to the other pipe length 1 in order to set the pipe lengths at a desired angular orientation, the mating surfaces of the formations 6 and 7 define a cone whose axis is aligned with the axis of the cone generated by the longitudinal axis 4 of the pipe length 2

as the pipe length 2 is rotated.

The socket-form extension 7 is provided at its outer edge with a lip 8 which snaps behind the rearward edge of the cuff 6. To increase the flexibility of the lip 8 it is formed with interruptions 8¹ as shown in Figure 6.

Solvent is applied to the mating surfaces of the formations 6 and 7, so that after the pipe lengths have been set to the desired angular orientation they become welded together.

As shown in Figure 5 the pipe length 2 is formed at its end remote from the joint with the pipe length 1 as a conventional socket for receiving the spigot of another pipe length. Alternatively it could be formed as a spigot, as is the remote end of the pipe length 1. The actual pipe lengths 1 and 2 can be formed of different lengths, but advantageously they will be fairly short as shown so that they conveniently form an elbow piece of varying angle between two straight pipe lengths.

Referring to Figures 7 to 9 a second embodiment of the invention is shown. In this embodiment the pipe lengths 1 and 2 are formed at their abutting end faces with flanges 9 and 10 which when the two pipe lengths are fitted together define a channel for locating a sealing ring 12. The two pipe lengths 1 and 2 are coupled together by a coupling assembly which comprises a collar 13 of channel cross-section whose side walls 14 and 15 engage the remote side surfaces of the flanges 9 and 10. The collar 13 is a split collar to enable it to be fitted around the pipe lengths 1 and 2, one half of this collar being shown in Figures 7 to 9. The collar 13 is held together by a circumferential plastics band 16 which is push-fitted over the collar so that it locates on either side of collar 13 by its two beads 17 and 18. The inherent resilience of the band 16 permits it to deform sufficiently for one of the beads to pass over the collar.

Referring to Figures 10 and 11 these show an embodiment similar to that of Figures 7 to 9 in that the flanges 9 and 10 and sealing ring 12 are again provided. A split collar 20 performing the same function as the collar 13 is also provided. However in this embodiment the two parts of the collar at their diametrical join are provided with projections which come together to form a dovetail 22 as seen in Figure 11. Plastics clips 23 having complementary dovetail channels are slid over the dovetails 22 to hold the collar 20 together. As can be seen from Figure 10 the clips 23 locate at their ends on the collar by a small bead 24 and end wall 25.

WHAT WE CLAIM IS:—

1. A jointing arrangement between two interconnected pipe lengths of equal internal diameter, the adjacent end faces of the two pipe lengths lying in planes oblique to their respective longitudinal axes and abutting each



tional view of part of the second embodiment on the line B—B of Figure 9.

Figure 9 shows a sectional view on the line C—C of Figure 8.

5 Figure 10 shows a sectional view of a third embodiment of the invention on the line D—D of Figure 11, and

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15 if the two pipe lengths are fitted together with the two end faces abutting and the pipe length 2 is rotated about its longitudinal axis, the end faces will ride over each other to cause the pipe length 2 to assume different
20 angular orientations with respect to the pipe-length 1. Three such orientations are shown in Figure 4. In fact in one complete revolution, the axis 4 of the pipe length 2 will generate
25 a cone.

If the wall thickness of the pipe lengths 1 and 2 at the end faces is uniform, then due to the elliptical cross-sections of their oblique end faces, a step will occur at the joint between the two pipe lengths when the two
30 pipe lengths are other than coaxial. To avoid this the wall thickness of the pipe lengths is varied circumferentially and without stepped interruption of their internal surfaces so that
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40 elliptical internal cross-section is KL and the minor axis M N. To form a circle centred at O and of radius OK it is necessary to thin the wall as shown from dotted line so that $M^2N^2=KL$.

45 For a pipe length of for example 103 mm internal diameter and an angle of obliqueness α of $11\frac{1}{2}^\circ$ for the end faces it can be calculated that $KL=M^2N^2=105.02$ mm.

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60 by the longitudinal axis 4 of the pipe length 2

as the pipe length 2 is rotated.

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Solvent is applied to the mating surfaces of the formations 6 and 7, so that after the pipe lengths have been set to the desired angular orientation they become welded together.

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Referring to Figures 7 to 9 a second embodiment of the invention is shown. In this embodiment the pipe lengths 1 and 2 are formed at their abutting end faces with flanges 9 and 10 which when the two pipe lengths are fitted together define a channel for locating a sealing ring 12. The two pipe lengths 1 and 2 are coupled together by a coupling assembly which comprises a collar 13 of channel cross-section whose side walls 14 and 15 engage the remote side surfaces of the flanges 9 and 10. The collar 13 is a split collar to enable it to be fitted around the pipe lengths 1 and 2, one half of this collar being shown in Figures 7 to 9. The collar 13 is held together by a circumferential plastics band 16 which is push-fitted over the collar so that it locates on either side of collar 13 by its two beads 17 and 18. The inherent resilience of the band 16 permits it to deform sufficiently for one of the beads to pass over the collar.

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WHAT WE CLAIM IS:—

1. A jointing arrangement between two interconnected pipe lengths of equal internal diameter, the adjacent end faces of the two pipe lengths lying in planes oblique to their respective longitudinal axes and abutting each



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other, wherein the wall thickness of each of said pipe lengths adjacent its said end face varies circumferentially without stepped interruption of the internal surface of the pipe length so that the internal surfaces of said pipe lengths at said end faces are circular in said oblique planes.

2. A jointing arrangement according to claim 1, and including coupling means between the pipe lengths, which coupling means permit rotation of one of said pipe lengths about its longitudinal axis relative to the other pipe length to cause said abutting end faces to slide one over the other and so vary the angular orientation of the two pipe lengths.

3. A jointing arrangement according to claim 2, wherein said coupling means comprise a male formation on one of said pipe lengths and a complementary female formation on the other of said pipe lengths.

4. A jointing arrangement according to claim 3, wherein said male and female formations are formed integrally with said pipe lengths, said male formation comprising a cuff surrounding its associated pipe length and said female formation comprising a socket-form extension from said end face of its associated pipe length.

5. A jointing arrangement according to claim 4, wherein said cuff is a snap fit in said socket-form extension.

6. A jointing arrangement according to claim 2, wherein said pipe lengths are formed on their outer surfaces with circumferentially extending flanges and said coupling means engage said flanges to grip said pipe lengths together.

7. A jointing arrangement according to claim 6, wherein a sealing ring is held in compression between said flanges to seal off the joint between said pipe lengths.

8. A jointing arrangement according to claim 6 or 7, wherein said coupling means comprise a split collar of channel cross-section whose side walls engage the remote side surfaces of said flanges and means for holding the sections of said collar together after they have been fitted to said pipe lengths.

9. A jointing arrangement according to claim 8, wherein said holding means comprises a band extending circumferentially of said collar and which is push fitted on to said collar.

10. A jointing arrangement according to claim 9, wherein said band has beads formed around its two side edges and which locate

on either side of said collar to retain the collar in position.

11. A jointing arrangement according to claim 8, wherein the sections of said collar at a join together define a radially outward extending projection on to which said holding means is push fitted.

12. A jointing arrangement according to claim 11, wherein said projections are of dovetail shape in cross-section and said holding means comprise clips having complementary dovetail channels.

13. A pipe length for a jointing arrangement according to any preceding claim, wherein an end face of said pipe length extends in a plane oblique to its longitudinal axis and the wall thickness of said pipe length adjacent said end face varies circumferentially without stepped interruption of the internal surface of said pipe length so that the internal surface of said pipe length at said end face is circular in said oblique plane.

14. A pipe length according to claim 13 and provided with means on its outer surface forming part of or enabling it to associate with the coupling means specified in any one claims 2 to 12.

15. A method of forming a jointing arrangement according to any claims 1 to 12, wherein said end faces of said two pipe lengths are brought into abutment and the pipe lengths coupled together and one said pipe length is rotated about its longitudinal axis relative to the other to set the pipe lengths at a desired angular orientation.

16. A method according to claim 15, wherein said pipe lengths are bonded together after being set at the desired angular orientation.

17. A jointing arrangement substantially as hereinbefore described with reference to Figures 1 to 4 or Figures 5 and 6 or Figures 7 to 9 or Figures 10 and 11 of the accompanying drawings.

18. A pipe length for utilisation in a jointing arrangement substantially as hereinbefore described with reference to Figures 1 to 4, or Figures 5 and 6 or Figures 7 to 9 or Figures 10 and 11 of the accompanying drawings.

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