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(58) Field of search
F2G

(54) Pipe junction—internal insulation

(57) A pipework junction 10, 11 has internal insulation to limit the effect of thermal shock in the form of a two part 14, 15 internal sleeve in which the parts of the sleeve are joined 34 and are, for the most part of their external surfaces, spaced from the junction by a small clearance 20 adequate to ensure that they do not lock to the junction when subjected to thermal shock. Piston ring seals (50—Fig. 5) may be provided to restrain flow along the small clearance and the sleeve may be stabilised in the junction by having an expanded part (63 Fig. 6) engaging a recess (64 Fig. 6), which also serves to restrain flow along the small clearance.

Fig.1.

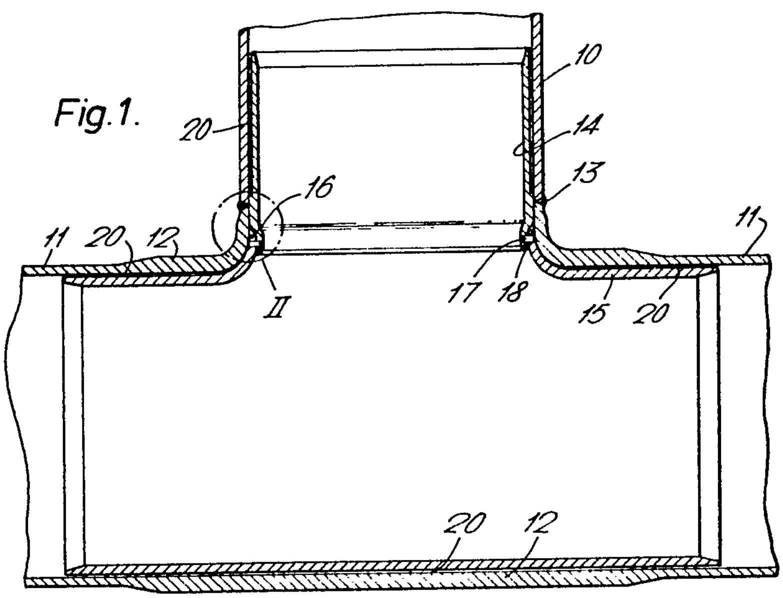
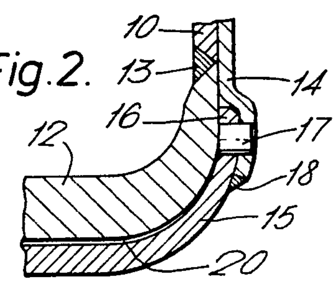


Fig.2.



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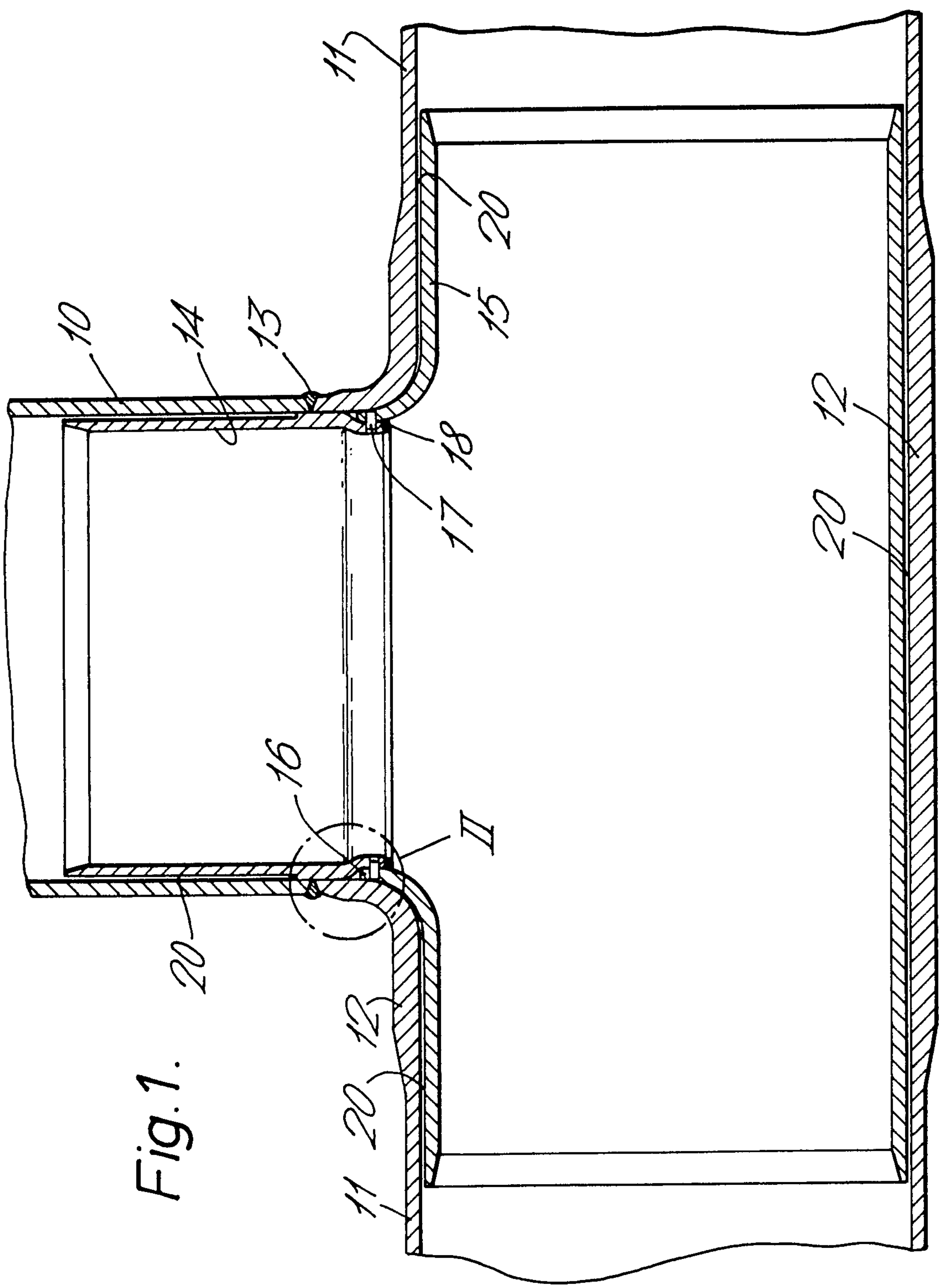


Fig.1.

Fig.2.

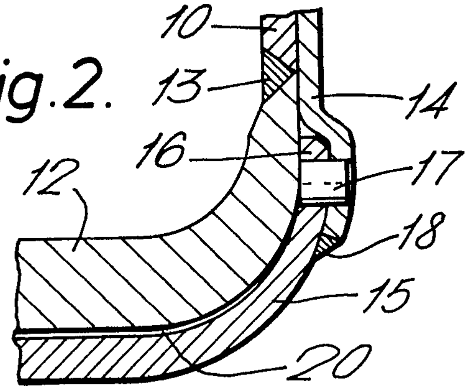


Fig.3.

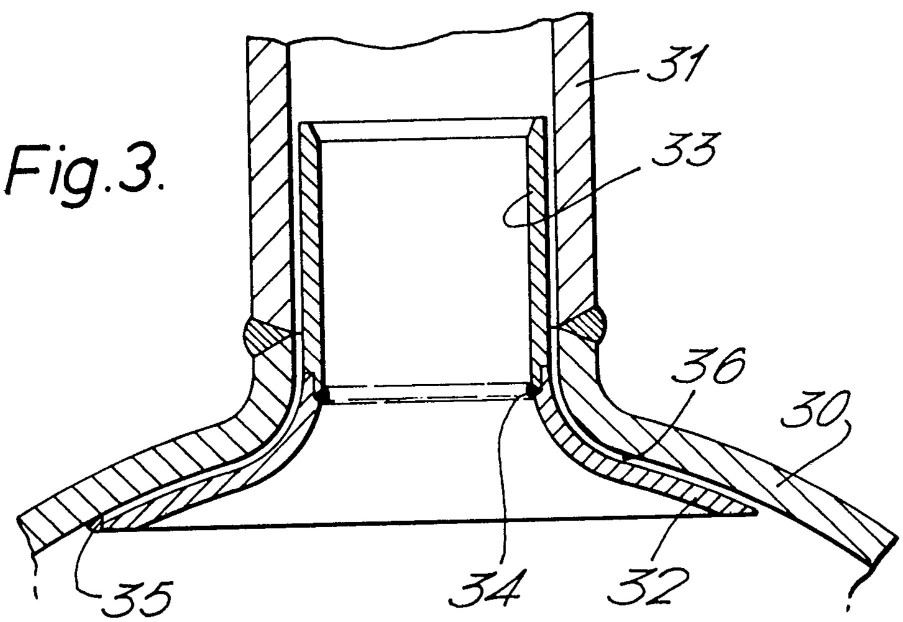


Fig.4A.

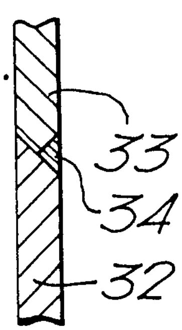
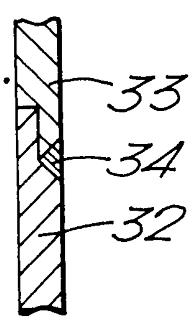


Fig.4B.



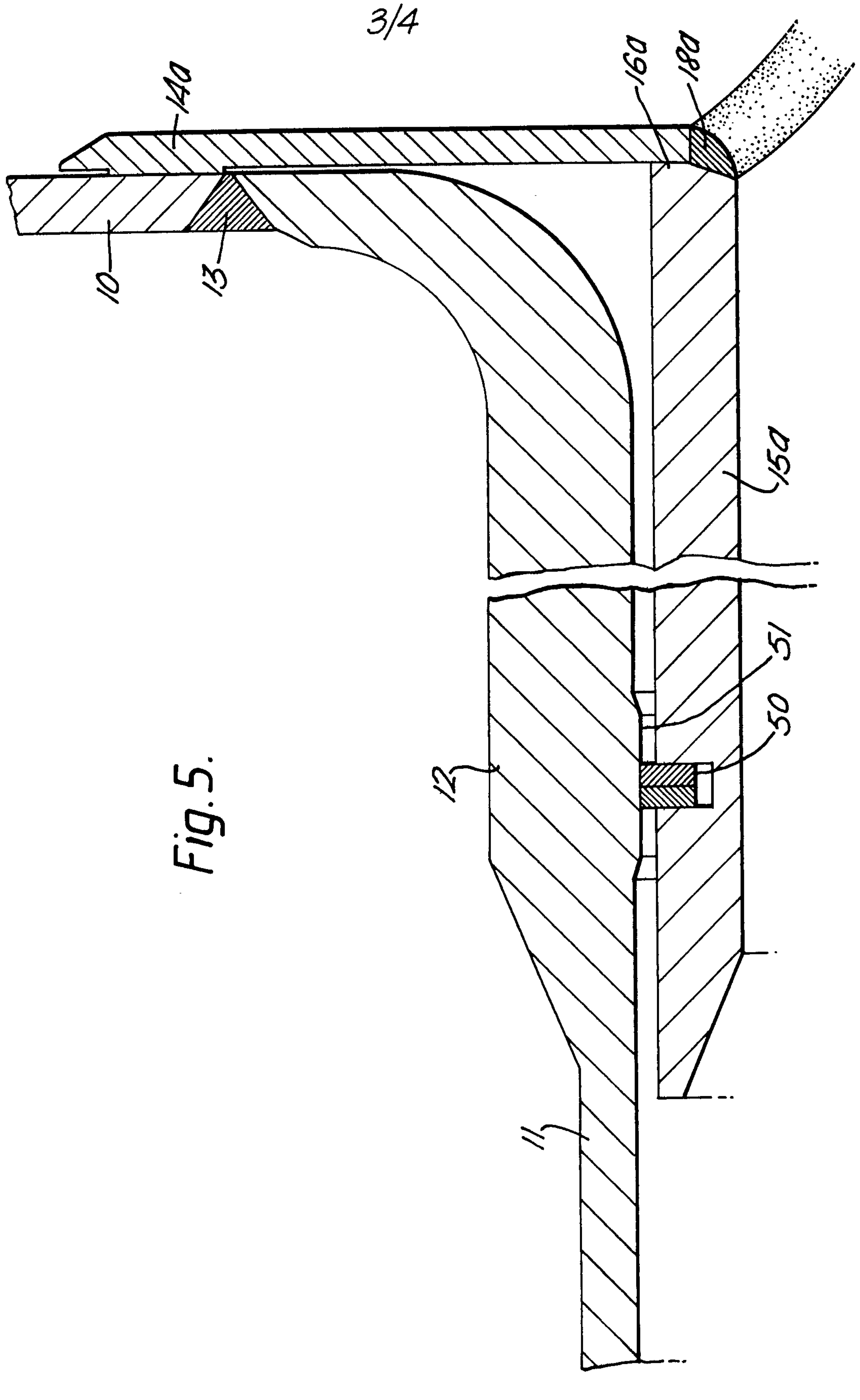


Fig. 5.

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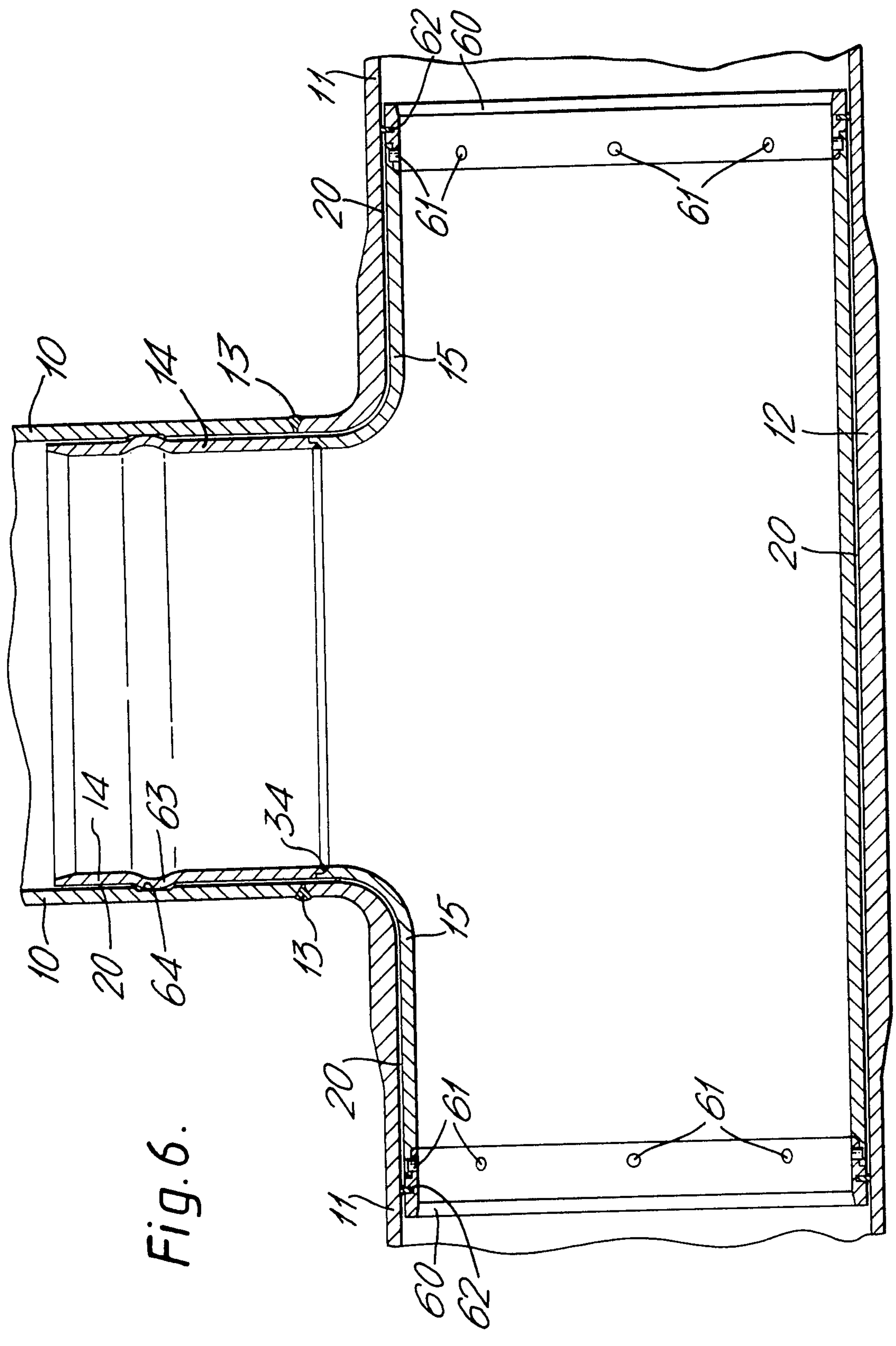

Fig. 6.

SPECIFICATION

Improvements in or relating to pipework

This invention relates to pipework.

This invention is particularly concerned with junctions in pipework for heat transport systems using liquid sodium as seen, for example, in fast fission nuclear reactors.

One of the problems involved with sodium-conducting pipework is that of thermal shock. The heat transfer capacity of sodium is so high that a sudden change of sodium temperature (such as may arise from a reactor trip) would give rise to severe stresses. The problem is ameliorated to some extent by the fact that the sodium is usually not operating at any substantial pressure and hence pipework, for the most part, can be of thin wall and hence is more tolerant to sudden temperature changes. However, this amelioration is not so significant at junctions where it may be essential to thicken the pipe wall to accommodate mechanical working during manufacture and where other stresses might have to be met such as those arising from different loadings or restraints on the pipes at the junction.

The known approach to the problem discussed above is to impose some form of internal insulation in sodium-conducting pipework at regions, such as junctions, where thermal shock may impose unacceptable stresses. However, insulation itself can be difficult to attach internally to a pipe and may itself cause problems by deteriorating or becoming detached.

The present invention continues to deal with the stated problem on the basis of internal insulation at the junction but provides a novel and improved form of insulation by providing a two part internal sleeve in which the parts of the sleeve are joined, in which the two joined parts follow closely the form of the junction, and in which the joined parts are, for most of their external surfaces, spaced from the junction by a small clearance adequate to ensure they do not lock to the junction under normal service loading and when subjected to thermal shock.

The invention will now be described further, by way of example, with reference to the accompanying drawings in which:

Figure 1 shows a sodium-conducting pipework T-junction in section;

Figure 2 shows an enlarged detail at the circle II of Fig. 1;

Figure 3 shows a sodium-conducting branch to the main pipe in section;

Figure 4A and *4B* illustrate alternative joints;

Figure 5 shows a modified detail at circle II; and

Figure 6 shows a modified sodium-conducting pipework T-junction in section.

In Fig. 1, the basic sodium-conducting pipework comprises a vertical inlet branch pipe 10 making a T-junction with a horizontal main pipe 11. The pipe 11 has a thickened region 12 to provide sufficient strength for service mechanical loads. Pipes 10 and 11 are joined at a weld 13 thus making a T-junction.

Inside the T-junction there is an internal sleeve formed as two parts, namely the vertical sleeve part 14 and the horizontal sleeve part 15. These two parts overlap at a band 16, are located with one another by dowels 17, and joined at a weld 18. (Alternative forms of this joint are shown in Figs. 4A and 4B).

Over most of their external surfaces the parts 14, 15 are spaced from the pipework 10, 11. This is indicated by the reference numeral 20 which represents spaces of about 1–3mm. (The branch pipe diameter is typically 640mm and the main pipe diameter is 820mm). To avoid looseness of the parts 14, 15 the three ends are dimensioned to minimise the spaces 20 in their locality. There will be inevitably some small contact areas between sleeve parts 14, 15 and pipe parts 10, 11.

To manufacture the construction described above the pipe 11 is first taken, a hole is cut and a former is drawn through the hole from inside the pipe to create an upstanding collar which can be end prepared to accept the weld 13 and pipe 10.

The sleeve part 15, with an appropriate hole in the wall already made, is then inserted in the pipe 11 and another former is drawn through the hole to create an upstand collar which can be end prepared to accept, in overlap, the sleeve part 14. The sleeve parts 14, 15 are then drilled from inside to accept the dowels 17 and the dowels fitted. The weld 18 is then made followed by the weld 13.

In use, spaces 20, between sleeve parts and pipe parts, tend to fill with stagnant sodium but the insulation effect generated by the sleeve parts 14, 15 and stagnant sodium are adequate to reduce thermal stress in pipes 10, 11 and weld 13 to an acceptable level with rapid temperature changes in sodium flowing in the pipes.

The sleeve parts 14, 15, extending as they do away from the vital crotch of pipes 10, 11, tend to suppress sodium flow in spaces 20. A small degree of flow does take place in spaces 20 but this is at a rate such that it adjusts fairly closely to the temperature of the pipes 10, 11 so that the crotch does not see a temperature gradient as steep as exists in the sodium flow.

In Fig. 3 there is shown a main pipe 30 having a welded branch 31. The pipe and branch have a two part 32, 33 internal sleeve with the parts joined at a weld 34. The sleeve formed by parts 32, 33 have spaced welds 35 to retain it in position. A small gap 36 is shown. Figs. 4A and 4B show two alternative forms of weld 34.

In Fig. 5, components 10, 11, 12 and 13 are as shown in Fig. 1. The internal sleeve has a vertical sleeve part 14*a* and a horizontal sleeve part 15*a* overlapping at a band 16*a* and joined by a weld 18*a*.

The part 15*a* is provided with a piston ring type seal 50 and the thickened region 12 of pipe 11 has a prepared surface 51. In this way tolerances between pipe and internal sleeve (which typically may have to be provided on diameters of 850mm) are not so critical.

In Fig. 6 reference numerals 10, 11, 12, 13, 14, 15 and 20 are used as in Fig. 1. Reference numeral 34 is used as in Fig. 4B. Additionally there is shown a piston ring housing 60 attached by dowels 61 to the sleeve part 15. The housing supports a piston ring 62. This ring serves to further restrict flow along the space 20.

The internal sleeve provided by parts 14, 15 is stabilised in the T-junction by an expanded region 63 on the sleeve part 14 engaging a recess 64 in the branch pipe 10. This also serves to further restrict flow along the space 20.

CLAIMS

1. A pipework junction having internal insulation to limit the effect of thermal shock characterised in that the insulation comprises a two-part internal sleeve in which the parts of the sleeve are joined and are, for most part of their external surfaces, spaced from the junction by a small clearance adequate to ensure that they do not lock to the junction under normal service loading and when subjected to thermal shock.

2. A junction as claimed in claim 1 in which the sleeves are joined at dowelled overlapping parts.

3. A junction as claimed in claim 1 or 2 in which the internal sleeve has a piston ring to restrain flow in the space between junction and sleeve.

4. A junction as claimed in claim 3 in which the piston ring is carried in a housing secured at the end of the sleeve.

5. A junction as claimed in claim 1 in which the internal sleeve is stabilised at the junction by an expanded part engaging a recess in the junction, which expanded part and recess act also to restrain flow in the space between junction and sleeve.

6. A pipework junction substantially as hereinbefore described with reference to Fig. 1 and 2 taken with Figs. 4A and 4B, or Fig. 3, or Fig. 5 or Fig. 6.

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