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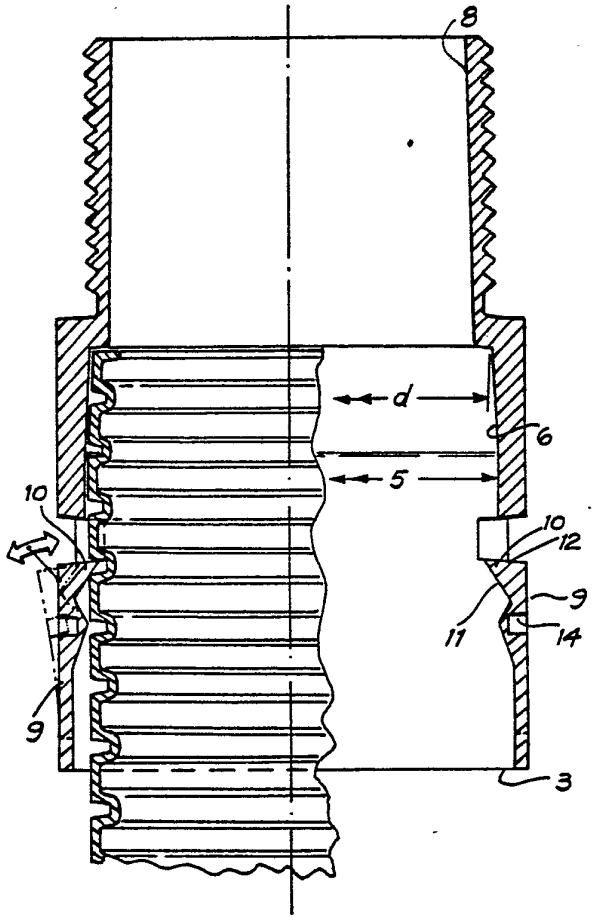
(54) Title: CORRUGATED PLASTIC PIPE CONNECTOR

(57) Abstract

A liquid tight connector for affixing, in a liquid tight manner, to a conduit having a ridge located adjacent to its end, wherein the conduit extends into a bore (5) and abuts against a sealing means (6) and is held in liquid tight engagement therewith by means of locking means (9) which project into the bore (5) to lock on to the ridge of the conduit.



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CORRUGATED PLASTIC PIPE CONNECTOR

The present invention relates to a liquid tight connector for corrugated piping or conduit.

With existing corrugated flexible conduit for drainage or electrical work, the only available methods of joining involves encasing the joint and gluing to ensure an adequate join. This type of joint must be left, so that the glue or adhesive sets, to ensure a successful join. This takes the tradesman additional time, and the chemistry of the glue weakens the conduit and the connector cannot be reused.

The present invention seeks to ameliorate this problem by providing a push-on connector which provides a liquid tight seal without the aid of adhesives, and which is reusable and adjustable during installation.

In one broad form the invention provides a liquid tight connector, for affixing, in a liquid tight manner, to a conduit having a ridge located adjacent to its end, comprising:

a body open at one end to receive a conduit in a bore communicating with said open end;

sealing means, in said bore, remote from said open end, which are adapted to seal against, in a liquid tight manner, the conduit pushed into the said bore; and

locking means located in said body so as to project into the said bore so as to lock onto the ridge of conduit in said bore, so as to hold in said bore said conduit in a liquid tight seal against the said sealing means.

Preferably the sealing means is a tapered section of said bore which is adapted to compress and seal against the flexible conduit pushed into said bore.

The connector of the present invention can be utilised with any form of fittings, such as elbows, junctions, Y and T pieces, terminators, junction boxes, or fittings joining corrugated piping to rigid piping or corrugated piping to corrugated piping.

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

Figure 1 illustrates a perspective view of a connector according to an embodiment of the present invention;

Figure 2 illustrates a sectional view of the connector illustrated in Figure 1 with a corrugated conduit connected therein; and

Figures 3a, 3b and 3c are part sectional views illustrating steps in the moulding of the locking means of the embodiment shown in Figure 1.

One embodiment of the present invention is illustrated in Figures 1 to 3 of the accompanying drawings. The connector 1 comprises a housing 2 having an open end 3 for insertion of the corrugated piping to effect connection thereto. The other end 4 is shown for threaded connection to a junction box or the like. However, this end could be designed for any type of connection or fitting. The bore 5 is chosen so as to be slightly oversize to the outer diameter of the corrugated flexible tubing.

The bore 5 as shown in Figure 2 has a tapered section 6 located, remote from the end 3 and terminating in an annular shoulder 7, with a smaller diameter bore 8, in communication therewith. The shoulder could be of any desirable width.

Located intermediate the ends of the bore, in the constant diameter section, are two resilient locking members 9 formed in
the walls of said bore 5, and having projections 10 which extend into the bore 5.

Thus, in clamping the connector 1 to a corrugated flexible piping as shown in Figure 2, the piping is pushed into the bore 5; the projection 10 being so shaped that the corrugations bear on the ramp 11 and force projections 10 back out of the bore. The piping is then pushed into the tapered section 6 where it may abut against the annular shoulder 7. As the piping is forced further into the tapered section 6, the piping is compressed by the increasingly narrowing diameter of the tapered section, to form a liquid tight seal therewith.

The projections 10 lock into a valley of the corrugations of the piping, such that the face 12 of the projection abuts up against a ridge of the corrugations, to prevent the piping from being withdrawn from the bore 5; the ridges being in a liquid tight seal against the walls of the tapered section.

In another form of the invention the tapered section of the bore could be replaced by a resilient seal which abuts against the end of the conduit or against the walls to form a liquid tight seal or the resilient seal could be utilized as well as the tapered section described before.

To assist in the working of the locking members 9, there is a recess 13 as shown in Figures 1 and 2 which produces a thin walled section joining the locking members to the connector. This greatly increases the resilience of the locking member, such that if the conduit is attempted to be removed, the force of the corrugations on the face 12 produces a bending moment on the locking member, drawing the projection 10 deeper into the valley of the conduit, to prevent withdrawal of the conduit from the connector.

With the above described locking means, the corrugated piping may be released by means of a suitable tool inserted in the opening 14, to force the projections out of the bore 5.

The present invention may be made from any suitable plastics such as PVC or nylon, polypropolene, ABS, and can be used with pipes of varying sizes, for example, flexible plastic corrugated electrical conduit. The connector, as described above, can be utilised to form any desired connector, and could have any desired number of locking means as required.

The connector of the present invention could be moulded to a wall or a portion of a junction box, which wall or portion is releasably held in liquid tight relationship with the junction box, i.e. a groove and mating projection, or be able to be connected to a recess in a junction box by any suitable means, such as tapered swaged fit.

Because the connector in the preferred embodiment is a unitary plastics moulding, a special method of moulding had to be developed to allow for the formation of the locking members 9.

This method will now be described by way of example with reference to Figures 3a, 3b and 3c, which shows a part sectional view of one embodiment of the connector in the area of the locking member during moulding.

The external mould 15 comprises a moving core 16 which forms the U-shaped cut-out 17, as shown in Figure 1. This projection mates with a recess in the internal mandrel 19, as shown in Figure 3a, to form the locking member 9.

In profile as shown in Figure 3a, the projection 10 extends into the bore 5 beyond the wall thickness 21, with the
ramp 11 tapering back beyond the wall thickness, and rising again to the apex 22 at the level of the wall thickness 21, where it forms a ramp 25 which slopes to the recess 13.

When the material of the thus moulded connector has sufficiently solidified, the external mould 15 and its projection 16 are withdrawn as shown in Figure 3b and the core pin 19 is withdrawn in the direction of the arrow 16. As the core pin 19 is withdrawn the ridge 23 as it bears on the ramp 24 forces the locking member outwardly from the bore 5, such that when the ridge 23 of the core pin 19 bears on the apex 22, the projection 10 is well clear of the core pin 19. Engagement of the ridge 23 with the slope 25 of the locking member as shown in Figure 3c prevents the projection 10 from interfering with the core pin 19 as it is removed from the bore 5. This thereby ensures that the locking edge 26 of the projection 10 is not damaged by the core pin 19.

It shall be obvious to people skilled in the art that the present invention could be used with corrugated conduit of any profile or could be used with non corrugated pipes having a ridge running around the pipe at a suitable distance from the end. The connector has

applications for connection of electrical insulation piping, pool filtration and vacuum connections, vacuum cleaners, irrigation corrugated piping and lawn mower cable protection.

THE CLAIMS:

1. A liquid tight connector, for affixing, in a liquid tight manner, to a conduit, having a ridge located adjacent to its end, comprising:

a body open at one end to receive a conduit in a bore communicating with said open end;

sealing means, in said bore, remote from said open end, which are adapted to seal against, in a liquid tight manner, the conduit pushed into the said bore; and

locking means located in said body so as to project into the said bore so as to lock onto the ridge of conduit in said bore, so as to hold in said bore said conduit in a liquid tight seal against the said sealing means.

2. A liquid tight connector according to Claim 1 wherein said sealing means is a resiliently deformable seal adapted to abut against the end of the conduit in a liquid tight manner.

3. A liquid tight connector according to Claim 1 wherein said sealing means comprises a tapered section of said bore whereby said conduit which is pushed into said bore is compressed against and seals against the tapered section in a liquid tight manner.

4. A liquid tight connector according to Claim 3 wherein there is also located a resiliently deformable seal in said bore to seal in a liquid tight manner against the conduit pushed into said bore at or adjacent its free end.

5. A liquid tight connector according to anyone of the preceeding claims wherein said locking means comprises a resilient finger having a projection at its free end which projects into the bore, said projection having a substantially planar face, extending radially to the bore and facing away from the open end of the body, and a ramp extending from the projection to the finger.

6. A liquid tight connector according to Claim 5 wherein said resilient finger is joined to the connector body by a thin walled section of less thickness than the thickness of the wall of the body.

7. A liquid tight connector according to Claim 6 wherein said body has a thin walled section extending from the finger to the open end of the bore.

8. A liquid tight connector according to Claims 5, 6 or 7 wherein the finger has a second ramp rising from the finger to an apex, intermediate the ends of the finger, and a third ramp extending from the apex to the end of the finger remote from the projection, said apex extending into the bore a lesser distance than the projection.

9. A water tight connector according to Claim 8 wherein said apex has its height equal to that of the thickness of the wall of the connector body.

AMENDED CLAIMS
[received by the International Bureau on 2 July 1987 (02.07.87);
original claims 1-9 replaced by amended claims 1-15 (3 pages)]

1. A liquid tight connector, for affixing, in a liquid tight manner, to a conduit, having a ridge located adjacent to its end, comprising:

a body open at one end to receive a conduit in a bore communicating with said open end;

sealing means, in said bore, remote from said open end, which are adapted to seal against, in a liquid tight manner, the conduit pushed into the said bore; and

locking means located in said body so as to project into the said bore so as to lock onto the ridge of conduit in said bore, so as to hold in said bore said conduit in a liquid tight seal against the said sealing means.

2. A liquid tight connector according to Claim 1 wherein said sealing means is a resiliently deformable seal adapted to abut against the end of the conduit in a liquid tight manner.

3. A liquid tight connector according to Claim 1 wherein said sealing means comprises a tapered section of said bore whereby said conduit which is pushed into said bore is compressed against and seals against the tapered section in a liquid tight manner.

4. A liquid tight connector according to Claim 3 wherein there is also located a resiliently deformable seal in said bore to seal in a liquid tight manner against the conduit pushed into said bore at or adjacent its free end.

5. A liquid tight connector according to anyone of the preceeding claims wherein said locking means comprises an axially extending resilient finger having a projectionlocated along its length which

projects into the bore.

6 a liquid tight connector according to claim 5 wherein said projection has a substantially planar face, extending substantially radially to the bore and facing away from the open end of the body.

7 A liquid tight connector according to claim 6 wherein said substantially planar face extends at an angle inwardly away from the open end of the body.

8. A liquid tight connector according to Claim 5,6 or 7 wherein said resilient finger is joined to the connector body by a thin walled section of less thickness than the thickness of the wall of the body.

9. A liquid tight connector according to Claim 5 6,7 or 8 wherein said body has a thin walled section extends from the finger to the open end of the bore.

10. A liquid tight connector according to Claims 5, 6, 7, 8 or 9 wherein the finger has on its underside a ramp rising adjacent the projection from the finger to an apex, intermediate the ends of the finger,

11. A liquid tight connector according to claim 10 wherein said apex extending into the bore a lesser distance than the projection.

12. A method of moulding of a hollow plastic article having a longitudinal bore, with a recess in said article communicating with said bore, and longitudinally extending finger positioned in said recess with a projection, extending into said bore and having on its underside a substantially transversly extending ridge located on said finger with a first ramp extending

longitudinally from said ridge towards said projection forming a valley there between; utilising at least:
a movable side mould to form the recess, and to be part of mould to form the finger; and a central core to form the bore and the underside of said finger and containing a recess to receive the movable mould; and wherein after the movable side mould is withdrawn, on withdrawing of the central core, the portion of the central core, forming said valley of the underside of said finger, bears on the first ramp and as the central core is removed forces the projection clear of the central core whereby the projection remains free of the core at least until after the recess in the central core has passed the axial position of the projection.

13. A method of moulding a hollow article according to claim 12 wherein there is an exterior die as well a separately movable side mould.

14. A method according to claim 12 or 13 wherein said central core has means to hold said finger when said side mould or said side mould and said exterior die are removed.

15. A method according to claims 12,13, or 14 wherein said finger returns by "plastic memory" as the plastics cures to its moulded position when the central core is removed.

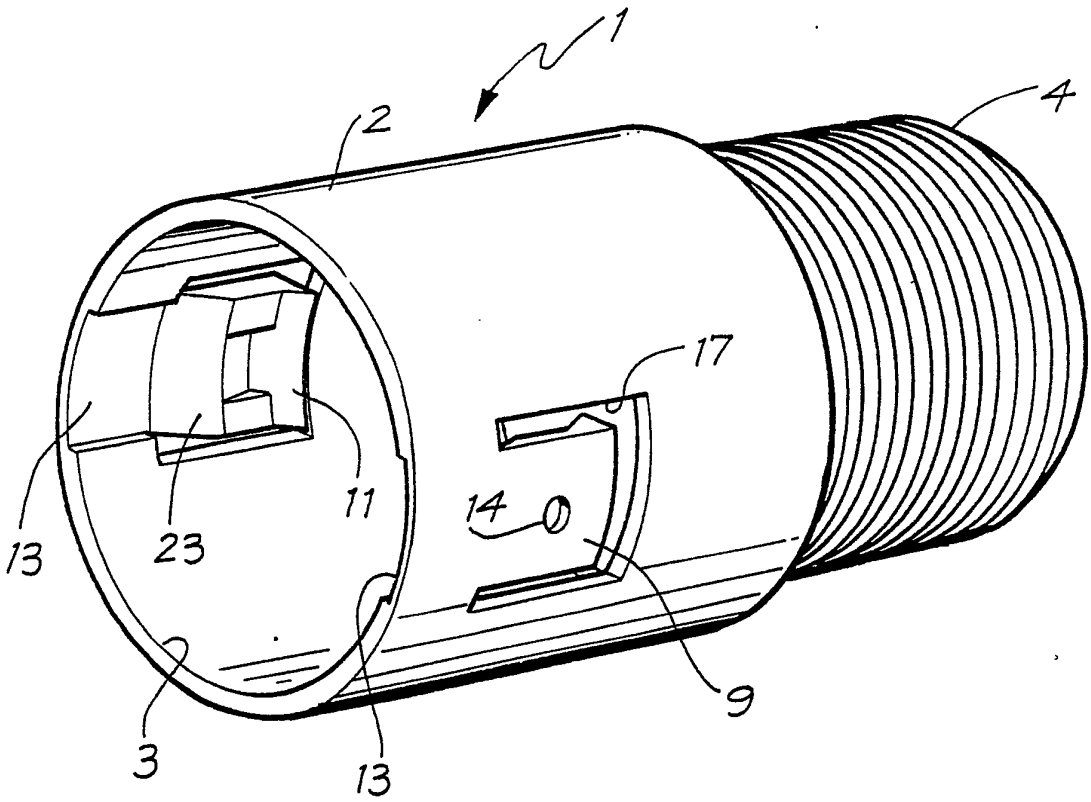

FIG. 1

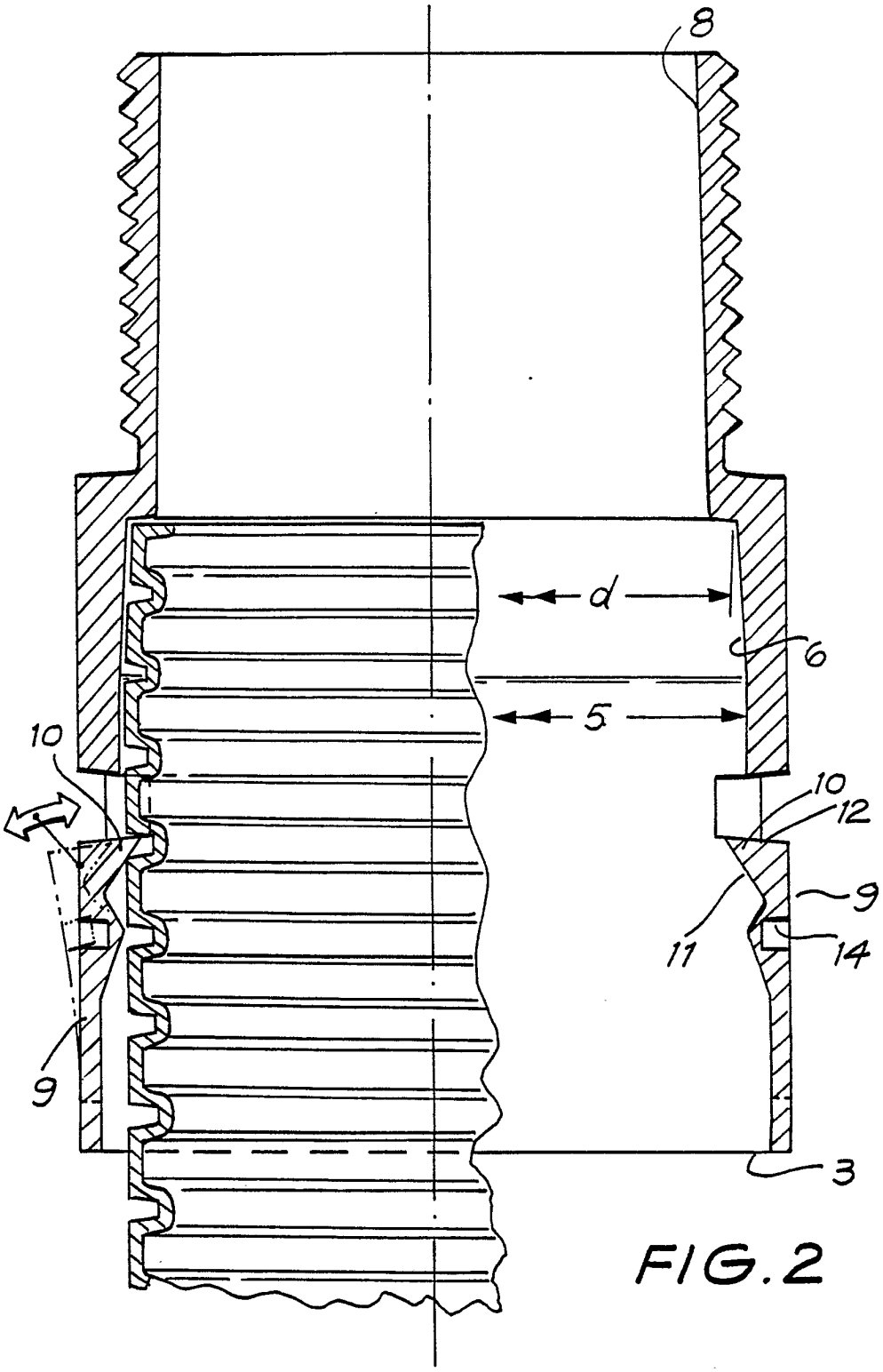

FIG. 2

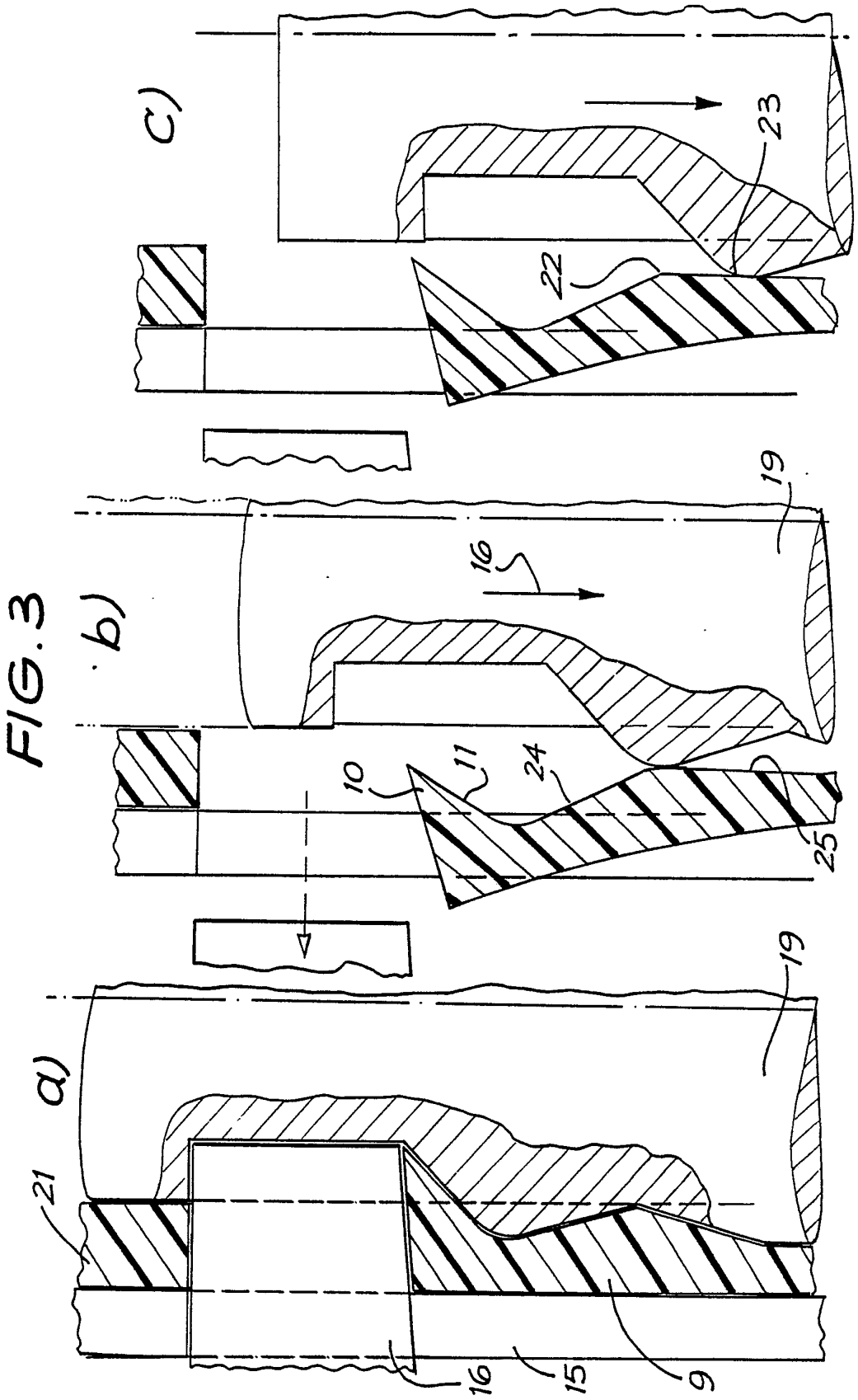

FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 87/00031

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[4] F16L 37/12, 37/08, 21/08

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	F16L 37/12, 37/08

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

AU : IPC as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	AU,B, 1354/40 (112878) (CROSS et al) 24 April 1941 (24.04.41)	(1)
X	AU,B, 2522/41 (114982) (MILLS et al) 16 April 1942 (16.04.42)	(1)
X	AU,B, 28899/63 (268101) (SMITH) 1 October 1964 (01.10.64)	(1,2,5)
X	AU,B, 20720/70 (454905) (STEWART-WARNER CORPORATION) 13 April 1972 (13.04.72)	(1)
X	GB,A, 529172 (CADE et al) 15 November 1940 (15.11.40)	(1-4)
X	GB,A, 1282994 (GEORGE ANGUS & COMPANY LTD) 26 July 1972 (26.07.72)	(1,2)
X	US,A, 4441745 (NICHOLAS) 10 April 1984 (10.04.84)	(1,5)
X	DE,B, 1271473 (PERROT-REGNERBAU GmbH & CO.) 27 June 1968 (27.06.68)	(1,2)

* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
28 April 1987 (28.04.87)	(07.05.87) 7 MAY 1987
International Searching Authority	**Signature of Authorized Officer**
Australian Patent Office	(O.L. HAGGAR)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 87/00031

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Members					
US 4441745	DK	820223	EP	820303	JP	820525
	NL	8004770				

END OF ANNEX