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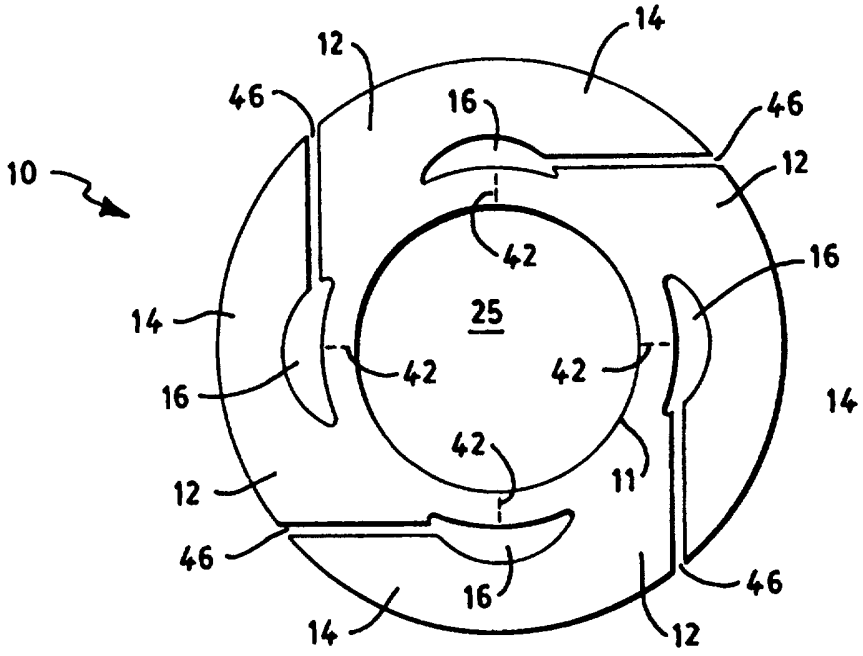
(54) Title: INJECTION TUBE DEVICE FOR SEALING STRUCTURAL JOINTS

(57) Abstract

An exemplary injection hose device (10) of the invention permits the structural joints of buildings and other civil engineering structures to be sealed, and is designed to remain permanently embedded in the mortar or cementitious matter forming the joint. An exemplary device (10) comprises an inner tube member (11) having an openable resin port (19), such as a rupturable groove (19) or a plurality of slits (40, 42), and at least one longitudinally extending flap member (13, 14) for protecting the openable resin port (19) and defining, between the flap and the tube member, a space (15, 16) communicating with the openable resin port. An exemplary method of making the device is also disclosed.



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INJECTION TUBE DEVICE FOR SEALING STRUCTURAL JOINTS

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Field of the Invention

The present invention relates to an injection hose or tube device which is permanently placed in and used for sealing structural joints of building and other civil engineering structures, and more particularly to an injection tube device having structural features for improved injection despite the constricting pressure of the surrounding concrete or mortar in the joint to be sealed.

Background of the Invention

A problem in construction is the reliable sealing of the joints between a floor and walls, or between walls or wall segments, of a building structure. Previously, so-called water-barrier seals, made of a plastic or sheet material, were used for sealing the joints. However, such water barriers have not always sealed the entire thickness of the joint satisfactorily. Such joints sometimes needed to be drilled partly open to permit a sealant material, such as polyurethane, to be injected into the joint.

Injection tubes have been employed which require the tubes to be left in the joint during construction, so that sealing material can be subsequently injected into the joint. Such tubes are disclosed, for example, in Finnish Patent Application Nos. 910698, 914141, 923345, and 923163, and German Patent Application No. 4340845.

In Finnish Patent Application No. 923163, an injection tube composed of several pieces is disclosed. The injection tube has a trunk piece in which several outlet holes are made for passing injection fluid. Sealing pieces are fitted onto the outlet holes, and the entire structure is surrounded by a filter cloth or the like. The outlet holes for the injection fluid are, according to the patent, purportedly opened by high-pressure in the tube and closed during low internal pressure. While the operation of the tube can be considered acceptable, one disadvantage is the expense of making the tube structure.

In Finnish Patent Application No. 914141, an injection tube is disclosed having an inner layer and outer surrounding covering layer through which holes are made for the injection fluid.

In Finnish Patent Application No. 923345, an injection tube is disclosed which includes a basic trunk tube with a ridge profile in the shape of a helix, in which outlet holes are made for the injection fluid. The main trunk is surrounded by a protective membrane.

In Finnish Patent Application No. 910698, an injection method is described in which an injection tube with an intact wall is used for the injection. The tube is left in the joint when the concrete is poured. Pressure inside the injection tube is increased by means of the injection material until the tube breaks, at which time the injection material is able to flow.

In German Patent Application No. 4340845, an injection tube is disclosed having a profile in which a hole is made for the injection fluid so that it can break through and flow out when injected. The profile of this injection tube is further equipped with a closing device, which closes the hole in question when injection is not being performed, thus preventing the tube from clogging.

A disadvantage of the last two patents is that, because the tube remains in the concrete during pouring, the tube, in principle, is tightly surrounded by concrete. It would seem that in Finnish Patent Application No. 910698, the rupturing of the tube would not be certain at all because the tube could not expand, despite the exertion of internal pressure. In principle, this also appears to be the case in German Patent Application No. 4340845, because during the pouring phase, the closing device in the profile is pressed tightly against the hole in the profile, in which case passage of the injection fluid from the profile into the joint would require an essential change in the shape of the profile structure.

In addition to the designs mentioned above, an injection tube is previously known which includes a perforated plastic tube or steel spiral, acting as an injection-tube trunk, which is surrounded by a filter cloth. The filter cloth prevents the concrete from clogging the tube, but permits the injection fluid to pass through it to seal the joint.

In Finnish Patent No. 94157, an injection tube with a three-layer structure is disclosed which includes a spiral tube of plastic or rubber forming an inner layer, an intermediate layer fitted onto the inner layer and forming a sealing layer, and an outer layer that holds the entire structure together. While this solution is acceptable from the standpoint of operation, from a manufacturing standpoint it is believed to be weak in that the tube must be composed of three different parts joined to each other.

In view of the disadvantages of the prior art, a novel injection hose or tube is needed for sealing joints in building and other civil engineering structures.

Summary of the Invention

In surmounting the disadvantages of the prior art, the present invention provides an injection hose device which does not require an outer filter cloth, tightly fitting concentric tubes, or separate spiral structures for injecting a hardenable sealant material, or resin, into the construction joint wherein it is permanently embedded. Nevertheless, the injection hose of the invention provides ease in manufacturing. Its design resists the constrictive forces of the surrounding mortar or concrete in the joint to be sealed, and minimizes entry of the mortar or concrete into the hose.

An exemplary injection hose device of the invention comprises a tube member having an elongate channel wall and two end openings for flowing therethrough a hardenable sealant material, the wall having at least one openable resin port through which sealant material can flow out of the tube member when pressurized; and at least one longitudinally-extending flap member for protecting the openable resin port. The flap and tube members define a space or cavity which extends longitudinally within the injection hose device, and facilitates operation of the openable resin port. The space is in communication with the openable resin port, and facilitates its operation by allowing expansion of the tube member in the vicinity of the port, in contrast to prior art designs wherein the inner tube was not given room to expand. In this manner, the flap members act to minimize ingress by mortar when the injection hose device is embedded in a joint, and to facilitate the egress of hardenable sealant material from the openable port or ports when the sealant material is under pressure. The openable resin ports can comprise slit openings or rupturable grooves which open when the sealant material reaches a sufficient pressure level.

In preferred embodiments, tube and flap members are integrally connected, such as by being formed in one extruded piece. In addition to ease of manufacturing, the one-piece design provides a tube member, flap members, openable resin ports, and longitudinally-extending spaces fixed in spatial relationship to each other, so that the operation of the device is designed to be uniform along the length of the hose device, even though it may be installed in a twisted or bent configuration when installed in the joint to be sealed.

An exemplary method of the invention for making injection hose devices comprises extruding the tube and flap members, preferably in one integrated piece. Other advantages and features of the invention are described hereinafter.

Brief Description of the Drawings

An understanding of the following detailed description of exemplary embodiments of the present invention may be facilitated by reference to the appended drawings, wherein:

Fig. 1 is a cross-sectional view of the placement in the structural joint between a floor and wall of an exemplary injection hose (or tube) of the present invention;

Fig. 2 is a cross-sectional view of an exemplary injection hose of the present invention;

Fig. 3 is a cross-sectional view of the placement between adjoining slabs of another exemplary injection hose device of the present invention;

Fig. 4 is a cross-sectional view of another exemplary injection hose device of the present invention;

Fig. 4A is a cross-sectional view of a further exemplary injection hose device of the present invention;

Fig. 5, 5A, and 5B are enlarged, cross-sectional views of yet further exemplary injection hose devices of the present invention;

Fig. 6 is a cross-sectional view of another exemplary injection hose device of the present invention; and

Figs. 7 and 8 are cross-sectional views of further exemplary injection hose devices of the present invention.

Detailed Description of Exemplary Embodiments

As shown in Fig. 1, an exemplary injection hose or tube device of the invention 10 is useful for sealing joints, when a structure is built. For example, after a floor 1 is poured, the injection hose device 10 is place on the floor 1 at the point where a wall 2 or wall element is fitted. The wall 2 is poured or fitted in such a way that the injection hose device 10 remains permanently in the joint between the floor and wall (or between wall) elements. (The words "hose" and "tube" may be used interchangeably herein when referring to the device 10 of the invention).

In addition to horizontal joints, the injection hose 10 of the present invention can be used to seal vertical joints.

As shown in Fig. 2, an exemplary injection hose 10 of the present invention has a relatively uniform cross-sectional profile, and is preferably made of a thermoplastic, such as PVC (polyvinyl chloride), or other plastic and/or rubber, or other suitable material. If the material is thermoplastic, it would be relatively convenient to fabricate a one-piece injection hose 10 through extrusion.

As shown in Fig. 2, an exemplary injection hose device 10 of the invention comprises at least one tube member 11 and at least one rib member 13 (when seen in cross-sectional profile) which may also be described alternatively herein as a longitudinally-extending flap member 13. The flap member 13 has a longitudinally-extending edge which is moveable between an closed and open position; and, in preferred embodiment, the flap member 13 is integrally connected to the tube member 11. In closed position, the flap member 13 minimizes the entry of mortar or concrete (*See e.g.,* Fig. 1) into the injection hose 10 when embedded within the joint. In open position, the flap member 13 allows hardenable sealant material to exit from the tube member 11 into the surrounding joint. The exemplary injection hose device (Fig. 2) has two longitudinally-extending flap members 13 and 14 each with a longitudinally-extending edge moveable between closed and open positions. Preferably, a common neck 12 or thickened portion joins at least one rib or flap member 13 to the inner tube member 11. As shown in Figs. 2 and 5, two longitudinally-extending flap members (or ribs) 13 and 14 open in opposite directions, such that the flap members 13 and 14 surround the inner tube member 11 and partially overlap each other 13/14 in such a way that they form an outer layer or jacketing member which serves to protect the

inner tube 11. An essential and important feature of the injection hose device 10 is that a flap member 13 (or the jacketing member formed by the flap or flaps) and tube member 11 form an empty space or spaces 15 between them. The significance of the hollow spaces 15 and 16 appears in the following explanation.

The joint is sealed in such a way that the sealing material intended to seal the joint, such as an injection resin, microcement, or the like, is fed into the tube member 11 of the injection hose 10 until the tube member 11 is filled with injection fluid along its entire length. Then, the injection hose device 10 is closed at one end opening, and injection sealant material is fed into the injection tube member 10 under pressure at the other end opening, such that the tube member 11 ruptures at openable resin ports 19, shown in Fig. 5 as grooves extending longitudinally in the channel wall of the inner tube member 11. The grooves can be formed, preferably during the extrusion process, so that rupturing of the grooves occurs at a relatively low injection pressure. (Alternatively, the openable resin ports 19 may comprise slit openings which are formed after extrusion, such as by cutting the inner tube member 11 at intervals along the length of the hose 10). When the tube member 11 ruptures at grooves 19, injection sealant material passes unimpeded into the empty spaces 15 and 16 between the ribs or flap members 13 and 14, and the concrete shell formed on the injection hose device 10 does not prevent the inner tube member 11 from rupturing. The pressure of the concrete does not act to clog the hollow spaces 15 and 16 completely. Instead, the rib or flap members 13 and 14 may increasingly overlap, but the ability of the inner tube member 11 to expand and rupture at the grooves 19 (or to open at slit openings if such are employed) is not defeated. After the inner tube member 11 is ruptured, the injection sealant material thus passes into the hollow spaces 15 and 16 due to the effect of the injection pressure. The injection sealant material then breaks through from the hollow spaces 15 and 16, through the overlap between the ribs or flap members 13 and 14, and then into the joint to be sealed.

The hollow spaces 15 and 16 defined by the ribs or flap members 13 and 14, as shown by the illustrations in Figs. 2 and 5, thus act as rupture (or expansion) channels for the injection material along the length of the injection hose device 10. Thus, independent of the precise location at which the tube member 11 ruptures or opens (e.g., regardless of where the openable resin port or ports are formed or

located), the injection sealant material passes to fill the hollow space or spaces 15 and 16 along the entire length of the injection hose device 10. In the double flap design exemplified in Figs. 2 and 5, even if concrete or mortar from the joint were to enter a hollow space 15 or 16 defined between the tube member 11 and ribs 13 and 14, the tube member 11 can rupture or otherwise open on either side of the clogged region, in which case the injection material could continue to pass freely from the hollow spaces 15 and 16 through the break and into the joint to be sealed.

If large cracks or holes existed in the joint, through which injection material too freely passes, the injection hose device 10 can be emptied by suction. In such a case, the overlapping flap members 13 and 14 operate to overlap and press against each other, thereby acting as a valve to prevent injection material which has already been injected into the surrounding joint from being passed back into the injection hose device 11. Emptying of the injection hose device 10 is important so that injection material does not harden inside the tube member 10. The device 10 may preferably be flushed clean, as known in the art, and preferably using pressures lower than those required for opening or rupturing the openable resin ports 19. When the injection material that has already passed into the structural joint has hardened, the sealing operation can be performed again in the manner described.

The injection hose of the present invention 10 is suitable for use in connection with all known sealing materials. Thus, all known injection resins can be injected into the injection tube 10, including microcements and coarser cement materials, as well as polyurethane and acrylic based resins, and other polymeric materials.

In Figures 3, 4, and 4A, applications of the present invention using an expansion joint tape (or so-called waterstop body) are presented. Figure 3 schematically illustrates the installation of an expansion joint tape or body 20 between two structural elements 3 and 4. Installation of the expansion joint device 20 is generally laborious and difficult to perform in concrete structures, and subject to errors. Most often, installation and concrete errors occur at the base of the expansion joint tape 20. Reasons for this include, among others, the fact that the pouring is difficult to perform, and installation of the expansion joint tape is difficult because of the reinforcements, etc. For these reasons, the expansion joint tape may need to be

secured by injecting an injection material into the base of the expansion joint tape. Until now, traditional injection tubes have been used for this purpose.

In the present invention, securing of the expansion joint tape is solved in such a way that the structure of the injection tube according to the invention is integrated into the expansion joint tape 20 itself, and this is illustrated schematically by means of Figures 4 and 4A. In Figure 4, the inner tube member 21 of the injection hose is formed from the same material as the expansion joint tape 20, and ribs or longitudinally extending flap members 22 are also preferably formed of the same material to protect and surround the inner tube member 21. Operation of the system is similar to that explained in connection with Fig. 2 above. In Figure 4A, the injection hose of Fig. 4 is modified such that a separate inner tube member 25 (e.g., which is not integrally connected to the outer ribs 22) is used and protected by an outer flap or rib member 22. The inner tube member 25, with respect to the expansion joint tape 20, which may also be referred to as a waterstop body, is always in a place where the hardenable injection sealant material passes easily to penetrate into the critical areas to be sealed.

Thus, injection hose devices 10 of the invention may be integrally connected to planarly extending members, such as waterstop devices, waterbars, joint filler devices, and other known devices used in the art for stopping, filling, and/or selling structural joints in floor/wall or wall/wall segments. Such devices can be made by extruding the injection hose flap member, or even a plurality of such flap members, with the planarly extending member in a one-piece unit. Such planarly extending members which can be formed with the injection hose devices 10 of the invention may even include crack-inducing devices, as well-known in the art, which are embedded in a concrete or mortar so as to create a fault plane in the concrete or mortar (when set) for creating a crack in the building or civil engineering structure being built. Such crack-inducing devices are used for purposefully inducing the formation of a crack in the building or other structure, to relieve stresses induced by temperature changes, or such as by shifting in the ground. Since it is nevertheless important to prevent water leaks through such induced cracks, the injection hose device 10 of the present invention is particularly beneficial when combined with planarly extending bodies, such as waterbars and crack-inducers.

Fig. 5 is an enlarged, cross-sectional illustration of an exemplary injection hose device 10 similar to the one-piece embodiment shown in Fig. 2. The hose 10 will be seen to comprise a tube member 11 having an elongate channel wall defining a conduit or channel 25 (between two end openings) for flowing therethrough a hardenable sealant material. The wall of the tube member 11 has at least one openable resin port 19, such as one or more longitudinally-extending grooves, by which the sealant material can flow out of the inner tube member 11 when the sealant material is flowed into the channel 25 and the tube end opening is blocked, such that pressure in the tube builds to to the point at which the openable injection ports 19 open or otherwise rupture. The grooves 19 are shown with the "V" portion located outside of the inner tube channel 25, but it may be more preferable to have the "V" portion located within and connecting the inner channel 25, because this latter orientation may be easier to rupture by pressure build-up within the channel 25 and also because it may be easier to have the "V" part of the groove close when sealant material or concrete happens to enter the space under the flap and push against the inner tube member 11. Additionally, Fig. 5 illustrates that the two longitudinally extending flap members 13 and 14 in combination with the shoulder portions 31 and 32 form an outer jacketing member 18, or protective curved sheaths, in combination with the neck (or thickened) portion designated as at 12.

The exemplary injection hose device 10 shown in Fig. 5 is strengthened by the neck portion 12 which integrally connects the tube member 11 to longitudinally extending flap members 13 and 14. The neck portion 18 is thicker than the thinnest portion of the inner tube 11 and, as such, helps to resist collapsing of the tube 11 in the "x" direction (see arrows); this thickened portion may also be considered to be a "spine" member which runs longitudinally along the length of the injection hose 10 and is attached to the "shoulder" portions 31 and 32 (which help to create spaces 16 and 15 between the rib or flap portions 14 and 13) which are thicker than the distal ends of the ribs or flaps 14 and 13. Preferably, the portion of the rib or flap closest to the neck 12 is thicker (as illustrated in the portion designated as at 40) than the thinnest portion of the inner tube 11. It will be seen that the neck portion 12, spine 30, shoulder portions 31 and 32, and thickened flap portion 40 (as illustrated in Fig. 5)

help to resist compressive forces in the "y" direction, and therefore resist collapse of the tube member 11 when the injection hose 10 is installed in a joint.

Preferably, the average thickness of the spine 30 (measured from the inner surface of the channel 25 to the outer surface of the hose device 10) is at least twice, and preferably at least four times, the average thickness of the inner tube member 11 (when measured at a portion between adjacent grooves 19). In further exemplary injection hoses of the invention, the spine 30 and neck portion 12 of the outer jacketing member 18 should be in width approximately at least one-half the mean diameter of the channel 25, and more preferably at least the mean diameter of the channel 25.

As shown in Fig. 5A, a further exemplary injection hose comprises rib or flap member 14 having ridges or teeth 34 corresponding to ridges or teeth 33 on the other rib/flap member 13 near or at the point of overlap. The ridges 34/33 help to resist the the constricting forces in the joint. This can help to minimize the amount of concrete that can be pushed from the joint surroundings into the internal expansion spaces 15 and 16 defined between the rib/flaps 13/14 and tube 11 members. Fig. 5B illustrates another exemplary arrangement in which a notch 44 on one flap member 14 corresponds to a notch 43 on the other flap member 13.

It is preferable to manufacture the injection hoses of the invention 10 as one extruded piece, such as by extruding PVC through a die, because the inner expansion spaces 16 and/or 15 defined by and between the rib portions 14 and 13 will be fixed relative to the inner tube channel wall 11, and this will remain so regardless of whether the injection hose is installed in the joint in a curved, bent, twisted, or otherwise contorted shape. However, it is possible though less preferred to manufacture a tube member 11 which is separate from any rib or flap members, so long as the longitudinally extending flap member or members are fashioned so as to maintain a space between the flap and inner tube to ensure the inner tube member can expand and, consequently, that the openable resin ports, whether they are rupturable grooves or slit opens, can indeed open to permit sealant material to be expelled from the inner tube member under pressure. One advantage of using separate inner tube and flap members is that different materials can be employed. For example, it would be possible to manufacture an outer jacketing member 18 (including flap members 14

and 13) using a rigid material to resist compressive forces which may threaten to collapse the inner tube and expansion spaces (e.g., 16); while the inner tube member could be made of relatively more flexible material (e.g., rubber, silicone, PVC containing relatively more plasticizer than outer jacket made of PVC) to facilitate the operation of the openable resin ports.

Fig. 6 illustrates another exemplary injection hose device 10 in which the tube member 11 is connected to two flap members 14 and 13 through a neck portion 12 (which is thickened with respect to the thinnest portions of the tube walls 11), and openable resin ports 40 and 42 are located in a portion of the neck 12. The openable resin ports 40 and 42 comprise slits (illustrated by dotted lines) which are cut at intervals along the length of the injection hose device 10. (The slits may be located directly on the inner tube member channel wall 11, similar to the grooves 19 shown in Fig. 5, but this is less preferable). The slits 40/42 (or holes) can be made such as by using a knife blade, or other piercing object, at intervals (e.g., every 10-30 cms.) along the length of the injection hose 10, to form the openable resin ports connecting the inner tube channel 25 to spaces 15 and 16 defined between the neck 12 and flap members 13 and 14. The length of the slits and the distance between the slits can be determined without undue experimentation, and will depend upon the nature and pliability of the material used. The slits should preferably remain closed at pressures used for flowing the joint sealant material initially through the length of the inner tube member 11, and also at pressures needed for flushing the tube; but the slits should be able to open when the tube end opening is stopped and the sealant material is put under pressure, as used in the industry, to force the slits (40 and 42) to open so that sealant material can flow into the spaces 15 and/or 16 formed between the flap and tube members and ultimately out of the injection hose 10. When the internal pressure is decreased, the slits or openings 40 and 42 revert to a closed position, to minimize entry of joint sealant material (or mortar or other cementitious material from the joint) into the tube channel 25.

Fig. 7 illustrates another exemplary injection hose device 10 of the invention having at least two longitudinally extending flap or rib members 13 and 14 which are conformed to open in the same direction relative to the longitudinal axis of the hose. Each of the flap members 13 and 14 defines longitudinally-extending spaces 15 and

16 which are in communication with respective openable resin ports (such as slit openings illustrated by dotted lines as at 40 and 42) on the tube member 11, which in this case is integrally connected to flap members 13 and 14. Exemplary spaces 15 and 16, formed in this case by the concave shape of the radially innermost wall of the flap members 13/14, facilitate the opening of the slits 15/16 (due to sealant material being forced out of the tube member by application of pressure); the sealant flows through and along the (longitudinally-extending) spaces 15 and 16 and pass through passageways 45 and 46 defined between flap member 13/14 ends and various neck indicated as at 12.

The exemplary passageways 45 and 46 are arranged, as shown in Fig. 7, such that the constrictive forces of the joint tend to force the passageways closed, while the pressure exerted by forced sealant material would operate to force the surfaces of the neck portions and flap member ends apart, and a desirable one-way valve action is achieved. As shown in Fig. 7, longitudinally-extending cavities can be formed in thick portions, such as the neck, to decrease overall weight and conserve material, and may be located preferably so as to improve the flexility characteristics of the hose 10.

Further exemplary injection hoses 10 of the invention may comprise at least three, and preferably four, longitudinally extending flap members as shown in Fig. 8. Such a hose 10 comprises three or four flaps 14 integrally connected by neck portions to tube member 11, the flaps 14 defining spaces 16 allowing sealant material expelled through the grooves or slits 42 to pass through the passageways 46 and out of the injection hose.

A preferred method of the invention for making an injection hose device 10 comprises extruding in one continuous operation a tube member 11 integrally connected to at least one longitudinally-extending flap member or rib, preferably by the use of a neck (or thickened) portion, whereby at least one longitudinally extending space is defined between the flap(s) and tube member, and forming openable resin ports 19 in the tube member to permit sealant material to escape from the tube member when forced under pressure. The ports 19 may be formed during initial extrusion such as by forming grooves or thinned channel wall portions which rupture at elevated pressures exerted on sealant material within the tube member. The ports 19 may also be formed by subsequently pulling back the flap members (e.g., 14) and

slitting the tube member (and/or neck into the tube) at intervals along the length of the hose 10. Preferably, a thermoplastic material, such as PVC is used. The hose may also be made using separate extrusions, and also by using different materials for the inner tube 11 and jacketing member 18.

The invention is not limited by the foregoing illustrations which have been provided for example only and are not intended to limit the scope of the invention.

We claim:

1. An injection hose device for sealing a joint, comprising: a tube member having an elongate channel wall and two end openings for flowing therethrough a hardenable sealant material, said wall having at least one openable resin port through which sealant material can flow out of said tube member when pressurized; and at least one longitudinally-extending flap member for protecting said at least one openable resin port; said flap and tube members defining therebetween a longitudinally-extending space communicating with said at least one openable resin port.

2. The injection hose device of claim 1 wherein said longitudinally-extending flap member comprises a longitudinally-extending edge moveable between a closed position and an open position.

3. The injection hose device of claim 1 wherein said tube member is integrally connected to said longitudinally-extending flap member.

4. The injection hose device of claim 3 wherein tube member is connected to said protective flap member by a neck member.

5. The injection hose device of claim 1 further comprising at least two longitudinally-extending flap members.

6. The injection hose device of claim 5 wherein said tube member is connected to said at least two longitudinally-extending flap members by a neck portion, said at least two flap members each defining a space between said tube and flap members.

7. The injection hose device of claim 6 wherein said at least two longitudinally-extending flap members have longitudinally-extending edges which partially overlap each other when said hose is embedded in a joint to be sealed.

8. The injection hose device of claim 7 wherein each of said at least two partially overlappable flap members has a ridge or notch corresponding to a ridge or notch in the other.

9. The injection hose device of claim 1 further comprising at least two longitudinally extending flap members integrally connected with said tube member and defining therebetween a space between said flap members and said tube member,

said at least two longitudinally-extending flap members openable in the same direction with respect to the longitudinal axis of said injection hose.

10. The injection hose device of claim 9 further comprising at least three longitudinally-extending flap members openable in the same direction with respect to the longitudinal axis of said injection hose device.

11. The injection hose device of claim 1 wherein said channel wall further comprising a longitudinally-extending cavity separated from said tube member.

12. The injection hose device of claim 1 wherein said at least one openable resin port comprises a groove which is operative to rupture, and permit escape of hardenable sealant material from said tube member, when the hardenable sealant material is flowed through said tube member under pressure.

13. The injection hose device of claim 1 wherein said at least one openable resin port comprises a plurality of slits located at spaced intervals along the length of said device, said slits being operative to allow escape of hardenable sealant material from said tube member when the hardenable sealant material is flowed through said tube member under pressure.

14. The injection hose device of claim 13 further comprising a neck member for integrally connecting said inner tube member with said at least one longitudinally-extending flap member, said slits being located in a portion of said neck member.

15. The injection hose device of claim 1 wherein said at least one longitudinally-extending flap member is moveable in a direction away from the longitudinal axis of said device.

16. The injection hose device of claim 1 further comprises a planarly extending member integrally connected to said at least one longitudinally-extending flap member.

17. The injection hose device of claim 16 wherein said planarly extending member is integrally connected to another injection hose device comprising a longitudinally-extending flap member.

18. The injection hose device of claim 1 wherein said device comprises a single piece extruded from PVC.

19. An injection hose device comprising: at least one tube member for flowing therethrough a hardenable sealant material for sealing construction joints, said tube member having at least one openable resin port to permit escape of hardenable sealant material from said tube member, said flap member being integrally connected with said tube member and defining therewith a space communicating with said at least one openable resin port.

20. A method for making an injection hose device comprising: extruding a tube member for flowing therethrough a hardenable sealant material for sealing construction joints, said tube member having at least one openable resin port to permit escape of hardenable sealant material from said tube member, and a flap member operative to protect said at least one openable resin port and to define, between said tube member and said flap member, a space communicating with said at least one openable resin port.

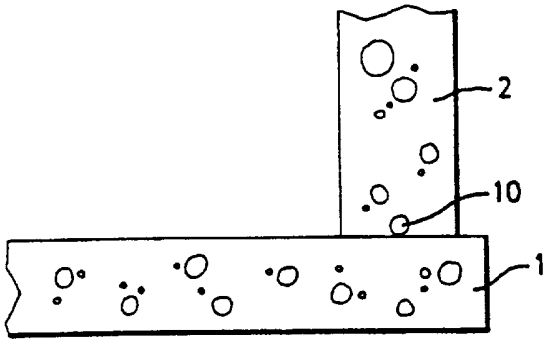

FIG. 1

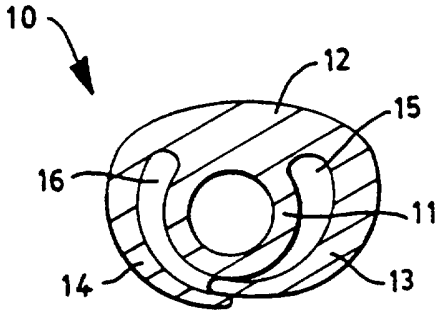

FIG. 2

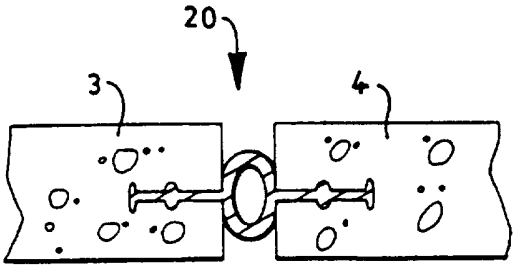

FIG. 3

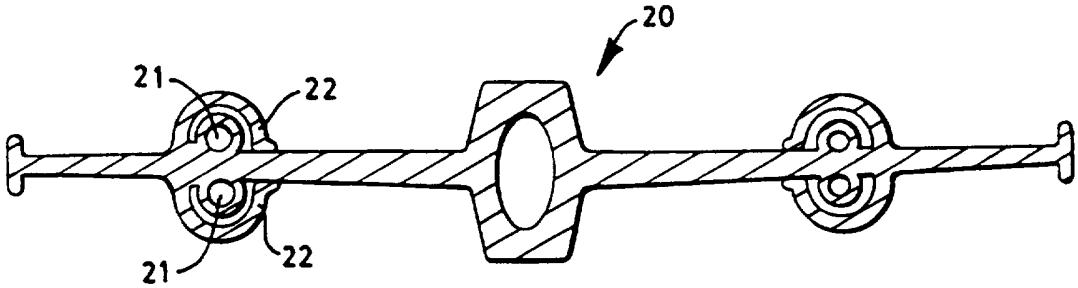

FIG. 4

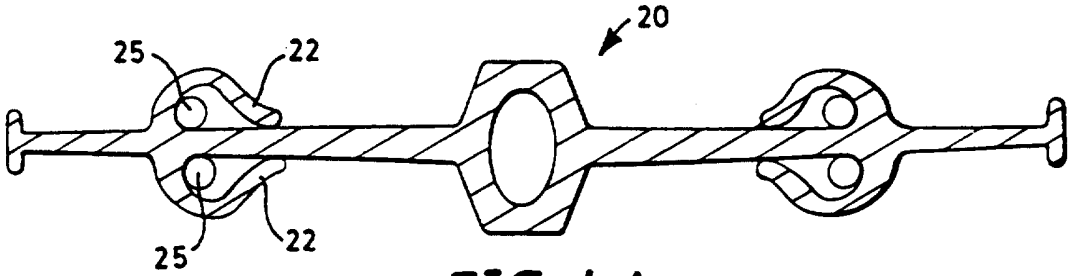

FIG. 4A

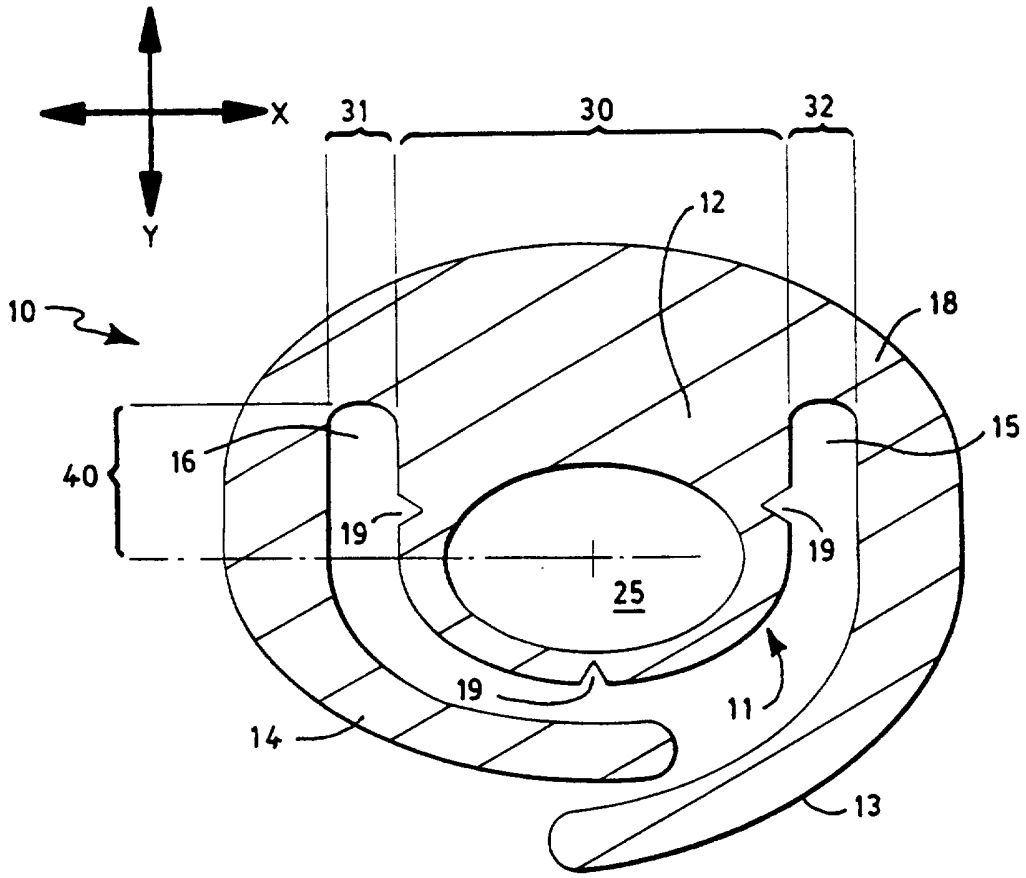

FIG. 5

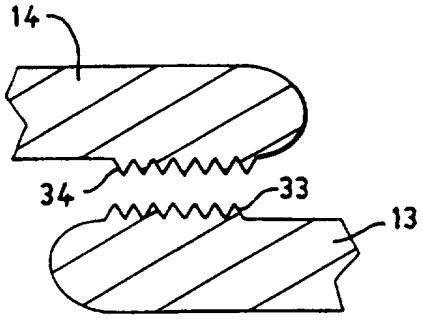

FIG. 5A

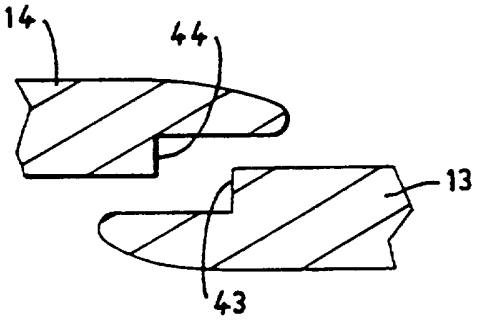

FIG. 5B

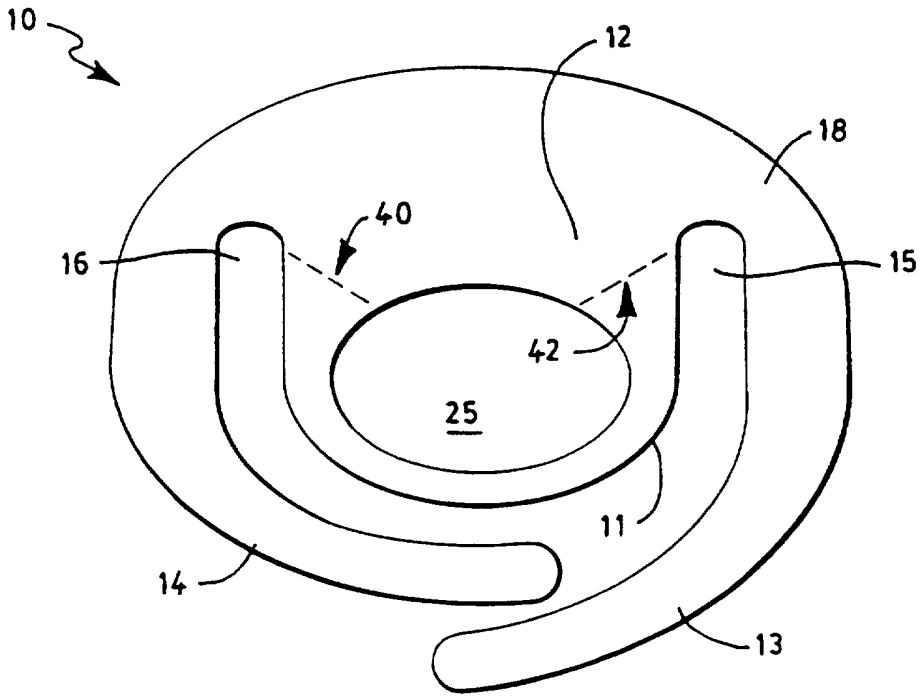

FIG. 6

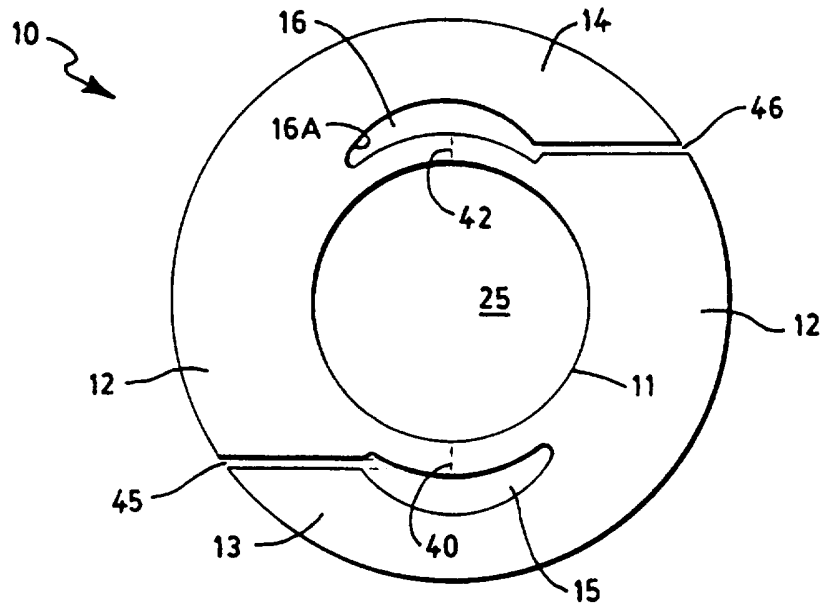
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FIG. 7

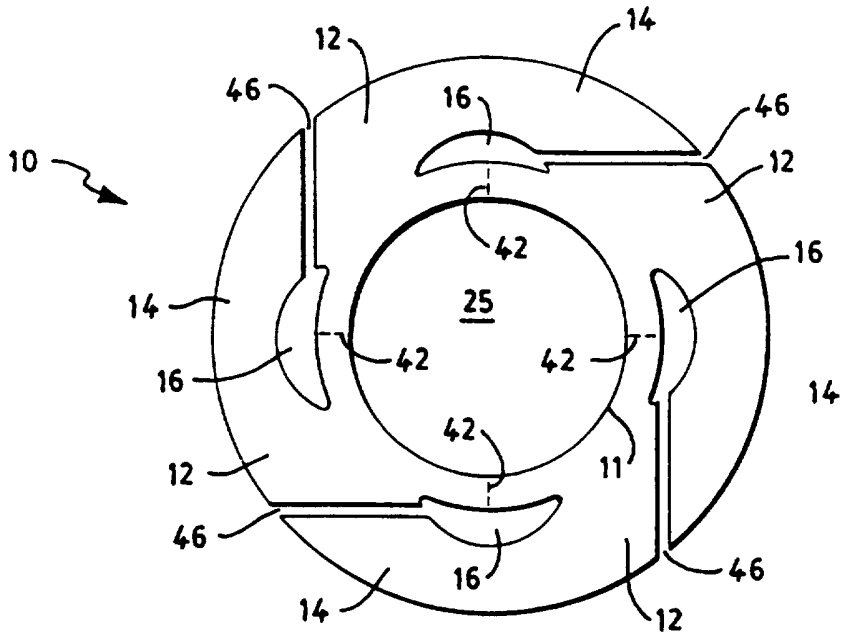
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FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/17646

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :E04B 1/68; F16J 15/48

US CL :Please See Extra Sheet.

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)

U.S. : Please See Extra Sheet.

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 practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, 5,290,045 A (TERAUCHI ET AL) 01 March 1994 (01.03.94), figures 1 and 4-5.	1-20
A	US, 4,790,544 A (KEMP) 13 December 1988 (13.12.88), figures 2-3.	1-20
A	DE 3,427,110 A1 (NELL) 23 January 1986 (23.1.86), see figures 1 and 7.	1-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 29 JANUARY 1997	Date of mailing of the international search report 19 FEB 1997
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer TIMOTHY KANG Telephone No. (703) 308-2168

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/17646

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

52/396.02, 742.15; 403/265; 277/72FM, 226

B. FIELDS SEARCHED
Minimum documentation searched
Classification System: U.S.

52/396.02, 742.15, 741.1, 741.41, 745.21, 742.15, 393, 396.01, 396.03, 742.14; 403/265, 266, 269; 277/72FM, 226, 201, 202