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(54) **Method for arranging an expansion joint and expansion joint obtained via this method**

(57) Method for arranging an expansion joint between adjoining parts of a road construction consisting of for instance asphalt or concrete, the upper surfaces of which parts are situated in one main plane, particularly at the location of bridges, viaducts and other engineering structures, which method comprises the following steps of:

- (a) placing the adjoining parts with some mutual transverse distance relative to the road construction, for instance by separating a continuous construction into parts;
- (b) arranging or recessing a groove on the relevant mutually adjoining transverse edge of the parts prior to or following step (a) such that an elongate space extending in transverse direction is bounded by adjoining grooves;
- (c) placing in said space a flexible and stretchable hose extending substantially over the whole length of this space;
- (d) causing the hose to contract in transverse direction by suction prior to or following step (c);
- (e) applying glue between the walls of the space and the hose prior to or following steps (c) and (d);
- (f) causing the hose to expand by inflation such that it is brought into contact with the glue along a substantial part of its side surfaces;
- (g) subsequently allowing the glue to cure;
- (h) finally releasing the expansion of the hose such that the hose forms a joint element between said parts, which joint element can follow changes in the mutual distance between these parts and thus in the side walls of said space while retaining the con-

tact therewith.

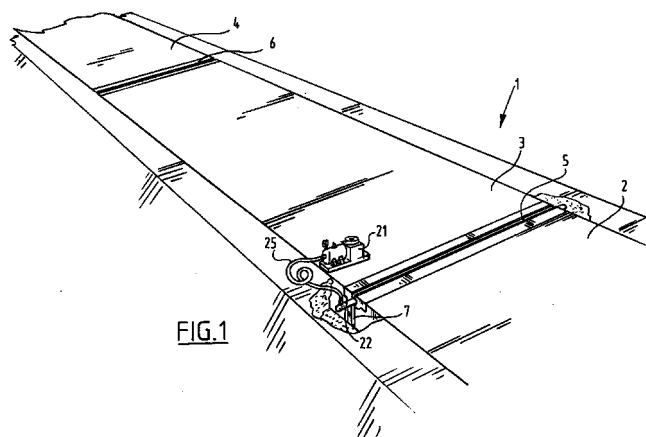


FIG. 1

Description

[0001] It is known that particularly at the location of so-called engineering structures, such as viaducts and bridges, expansion joints in a road surface are necessary so as not to allow thermal expansion to have essentially any influence on thermal stresses which could result in cracking and fracture. Use is for instance made of edges on parts of a road construction consisting of for instance asphalt or concrete in the form of metal edges which engage with mutually staggered teeth.

[0002] It is an object of the invention to provide a method with which in very simple, inexpensive but nevertheless very reliable manner a join between adjoining parts of a road construction can be manufactured.

[0003] This objective is achieved according to the invention with a method for arranging an expansion joint between adjoining parts of a road construction consisting of for instance asphalt or concrete, the upper surfaces of which parts are situated in one main plane, particularly at the location of bridges, viaducts and other engineering structures, which method comprises the following steps of:

- (a) placing the adjoining parts with some mutual transverse distance relative to the road construction, for instance by separating a continuous construction into parts;
- (b) arranging or recessing a groove on the relevant mutually adjoining transverse edge of the parts prior to or following step (a) such that an elongate space extending in transverse direction is bounded by adjoining grooves;
- (c) placing in said space a flexible and stretchable hose extending substantially over the whole length of this space;
- (d) causing the hose to contract in transverse direction by suction prior to or following step (c);
- (e) applying glue between the walls of the space and the hose prior to or following steps (c) and (d);
- (f) causing the hose to expand by inflation such that it is brought into contact with the glue along a substantial part of its side surfaces;
- (g) subsequently allowing the glue to cure;
- (h) finally releasing the expansion of the hose such that the hose forms a joint element between said parts, which joint element can follow changes in the mutual distance between these parts and thus in the side walls of said space while retaining the contact therewith.

[0004] The method is preferably embodied such that the wall of the hose has a substantially prismatic, general wave shape on its upper side and/or underside, such that the hose can follow said changes during operation of the joint element without substantial tensile forces in tangential direction in this wall and tearing

forces between the glue on the one hand and the hose and the side walls of said space on the other. The essential absence of significant tensile forces in the wall of the hose and between the hose and the glue respectively the glue and the walls of the space ensures a very long lifespan of the joint.

[0005] A preferred embodiment further has the special feature that the space is defined by two elongate, generally prismatic insert edge elements which are connected non-releasably to the relevant edges of the parts and have a form such that their upper surfaces form part of said main plane, which insert edge elements have a composition such that they have a high resistance to cracking, crumbling, ageing and other forms of mechanical and chemical degradation. This embodiment is recommended above a simple variant, in which the space is determined by the road surface elements themselves. Both asphalt concrete and concrete, certainly in the case of longer use, cannot withstand without problems the sustained impact load from passing traffic. The edges can hereby crumble away, cracking can occur and an increasing noise load can further occur due to the increasing width of the free space between the road surface parts.

[0006] It is noted that it is necessary to avoid the free distance at the height of the upper face of the road surface between the road surface elements becoming larger than is strictly necessary, and it is certainly necessary to avoid this happening in uncontrolled manner. The above described variant provides for this. The distance between the road surface elements, even in the case of extreme cold, can be substantially smaller than in known joint constructions. The noise load by passing traffic is hereby substantially smaller in the case of the joint according to the invention than in known constructions.

[0007] The above stated variant can advantageously have the special feature that the insert edge elements consist of plastic-bonded mortar, wherein the plastic is for instance polyurethane, ethyl acrylate or epoxy.

[0008] An alternative consists of the insert edge elements consisting of mortar with steel fibre reinforcement.

[0009] In this latter embodiment the method can have the special feature that the steel fibers have lengths in the range of about 5-30 mm.

[0010] A specific embodiment makes use of the insert edge elements which, by casting using a formwork, are formed from a material which when curing adheres to the material of the parts, for instance with an adhesive strength of about 3 N/mm².

[0011] The method is preferably performed such that a wall of the space is provided with a covering which is connected non-releasably to the relevant part, optionally via an intermediate layer, a glue, or an insert edge element as stated above, as well as having good adhesive properties with said glue for coupling to the

hose.

[0012] This embodiment can advantageously be embodied such that the covering consists of a plastic, for instance a material based on epoxy, a polyester or the like, optionally with a reinforcement of fibers, for instance glass fibers.

[0013] The hose can be of any suitable material, provided the hose is flexible and stretchable. The elasticity is important in respect of the necessary expansion by inflation during the arranging of the hose as joint element. The ability to stretch is important in respect of the requirement that in mounted form the hose can follow the variations in distance between the parts for bridging under all conditions.

[0014] The hose can be of rubber or a rubber-like material. In respect of the requirement that the hose can have a very long lifespan and is further little susceptible to thermal influencing of its relevant properties, the method according to the invention can be embodied such that the hose consists of SBR or EPDM.

[0015] In order to enable easy arrangement of the hose and to ensure that it retains its position in a natural manner under all conditions, the method can be embodied such that the space on both its underside and its upper side has a form tapering toward the free space between said parts. This method also has the advantage that the free distance between the adjoining parts at the position of the joint at the level of the main plane, which after all defines the road surface, can be very small.

[0016] Finally, the invention relates to an expansion joint obtained by applying the method as specified above and in the relevant claims.

[0017] The invention will now be elucidated with reference to the accompanying drawings. In the drawings:

figure 1 shows a partly broken away perspective view of a part of the road surface with expansion joints according to the invention;

figures 2, 3, 4 and 5 show the expansion joint according to figure 1 in four successive phases of the method according to the invention; and

figures 6, 7 and 8 show respective cross-sections through three random embodiments of a hose which can be used as joint element in the method according to the invention.

[0018] Figure 1 shows a road construction 1 with a number of road surface elements 2, 3 and 4 which are mutually separated by respective expansion joints 5, 6. The parts 2,3 consisting of for instance asphalt or concrete are, as shown particularly in figures 2-5, mutually separated by a space 7. The upper surfaces 8,9 of road surface elements 2,3 lie in one main plane and define the roadway or road surface. Since asphalt concrete or concrete has the tendency to crumble and crack under repeated impact load, as occurs when traffic passes, the mutually facing edges of parts 2,3 are provided with

prismatic insert edge elements 10,11 respectively of for instance steel fibre mortar. This material is cast in the form shown in figure 2 by means of a suitable formwork, wherein adhesion to part 2,3 respectively occurs through curing. This adhesion can have a value of about 3 N/mm².

[0019] The mutually facing surfaces 12,13 respectively of insert edge elements 10,11 are covered with a composite covering 14,15 respectively. As shown particularly clearly in figure 2, these coverings partly bound a substantially prismatic space 16, which on both its underside and its upper side has a form tapering toward the free space 7 between said parts 2,3.

[0020] It is noted that the word "prismatic" already used above defines a form in which the cross-sectional form is the same at any axial position.

[0021] In the first phase of the method according to the invention as shown in figure 2, a layer of glue 17,18 respectively is applied to coverings 14, 15 in the region of space 16. The recessed parts 19,20 in question can be seen as grooves or elongate recesses. These are important in respect of the following step according to the invention.

[0022] Figure 3 shows the second phase, in which a hose 22 for instance contracted beforehand by suction by means of a pump unit 21 (shown in figure 1) is placed in space 16. In practice the hose is pressed downward with the exertion of a small force such that it finally extends in space 16 along the whole length thereof.

[0023] Figure 4 shows the phase in which pump 21 is then operated such that hose 22 is inflated by air under pressure and thus expands into the form shown in figure 4. As will be apparent, the sides 23,24 of the hose are herein in intensive pressing contact with the glue, which is chosen such that it can adhere very well to both the material of the hose, for instance SBR or EPDM, and the material of coverings 14,15, for instance a composite material, such as epoxy material reinforced with glass fibers.

[0024] The glue can for instance be a two-component glue. Once the glue has cured to a sufficient extent, the pressure in hose 22 can be released and pump unit 21 can be removed. Connecting line 25, which connected hose 22 to pump unit 21, is removed and, if required, the free end of hose 22 is provided with a plug or protected in other suitable manner against the penetration of dirt, water or the like, at least insofar as this is necessary.

[0025] Finally, figure 5 shows joint 5 in the finished state.

[0026] Figure 6 shows hose 22 in non-tensioned state. It can clearly be seen that in cross-section its upper side has a general wave shape.

[0027] Hose 25 according to figure 7 has a wave shape on both its upper side and on its underside.

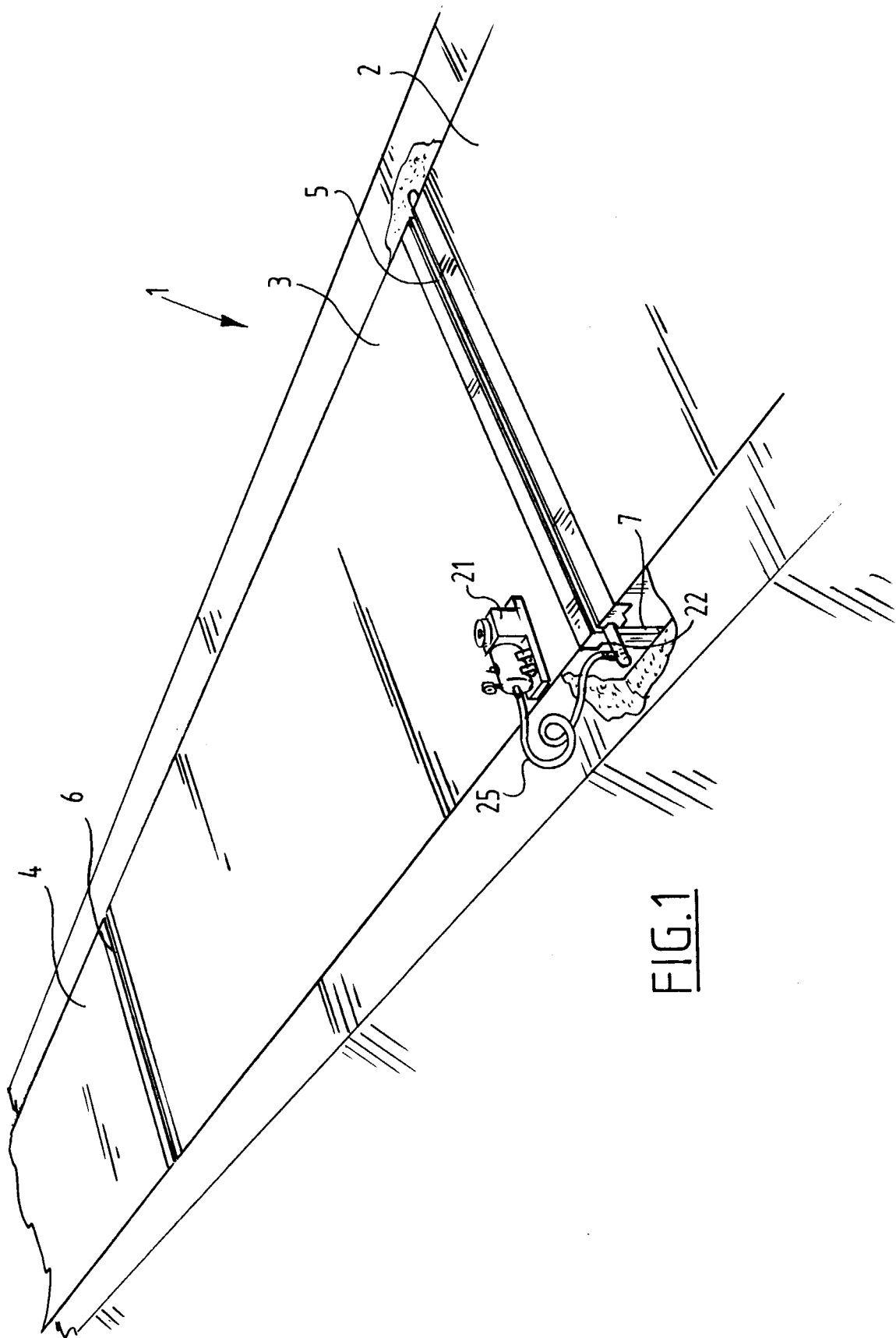
[0028] Figure 8 shows a hose 26 in which both the upper side and the underside have a multiple wave shape.

[0029] The object of the structures in question is to ensure that the upper and undersides allow a certain mobility due to their form, without thereby causing substantial tensile forces in the wall of the hose in question. These could after all result in premature degradation of the hose and its adhesion to the walls of space 16.

[0030] It will be apparent from the above description that the method according to the invention can be embodied in diverse ways, without the scope of the invention being thereby exceeded. The form of space 16 can for instance be other than shown, while the cross-sections of the hoses can also be chosen differently.

Claims

1. Method for arranging an expansion joint between adjoining parts of a road construction consisting of for instance asphalt or concrete, the upper surfaces of which parts are situated in one main plane, particularly at the location of bridges, viaducts and other engineering structures, which method comprises the following steps of:
 - (a) placing the adjoining parts with some mutual transverse distance relative to the road construction, for instance by separating a continuous construction into parts;
 - (b) arranging or recessing a groove on the relevant mutually adjoining transverse edge of the parts prior to or following step (a) such that an elongate space extending in transverse direction is bounded by adjoining grooves;
 - (c) placing in said space a flexible and stretchable hose extending substantially over the whole length of this space;
 - (d) causing the hose to contract in transverse direction by suction prior to or following step (c);
 - (e) applying glue between the walls of the space and the hose prior to or following steps (c) and (d);
 - (f) causing the hose to expand by inflation such that it is brought into contact with the glue along a substantial part of its side surfaces;
 - (g) subsequently allowing the glue to cure;
 - (h) finally releasing the expansion of the hose such that the hose forms a joint element between said parts, which joint element can follow changes in the mutual distance between these parts and thus in the side walls of said space while retaining the contact therewith.
2. Method as claimed in claim 1, wherein the wall of the hose has a substantially prismatic, general wave shape on its upper side and/or underside, such that the hose can follow said changes during operation of the joint element without substantial tensile forces in tangential direction in said wall and tear away forces between the glue on the one hand and the hose and the side walls of said space on the other.
3. Method as claimed in claim 1, wherein the space is defined by two elongate, generally prismatic insert edge elements which are connected non-releasably to the relevant edges of the parts and have a form such that their upper surfaces form part of said main plane, which insert edge elements have a composition such that they have a high resistance to cracking, crumbling, ageing and other forms of mechanical and chemical degradation.
4. Method as claimed in claim 3, wherein the insert edge elements consist of plastic-bonded mortar, wherein the plastic is for instance polyurethane, ethyl acrylate or epoxy.
5. Method as claimed in claim 3, wherein the insert edge elements consist of mortar with steel fibre reinforcement.
6. Method as claimed in claim 5, wherein the steel fibers have lengths in the range of about 5-30 mm.
7. Method as claimed in claim 3, wherein by casting using a formwork the insert edge elements are formed from a material which when curing adheres to the material of the parts, for instance with an adhesive strength of about 3 N/mm².
8. Method as claimed in claim 1, wherein a wall of the space is provided with a covering which is connected non-releasably to the relevant part, optionally via an intermediate layer, a glue, or an insert edge element as claimed in claim 3, and also has good adhesive properties with said glue for coupling to the hose.
9. Method as claimed in claim 8, wherein the covering consists of a plastic, for instance a material based on epoxy, a polyester or the like, optionally with a reinforcement of fibers, for instance glass fibers.
10. Method as claimed in claim 1, wherein the hose consists of SBR or EPDM.
11. Method as claimed in claim 1, wherein the space on both its underside and its upper side has a form tapering toward the free space between said parts.
12. Expansion joint obtained by performing the method as claimed in any of the foregoing claims.



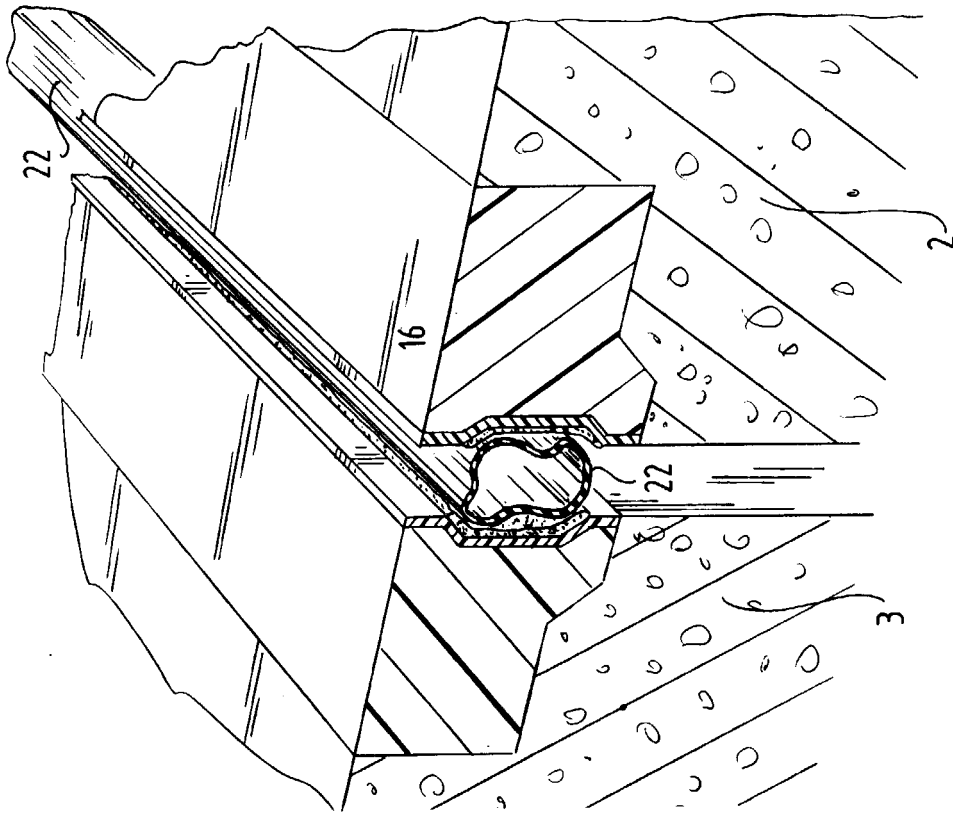


FIG. 3

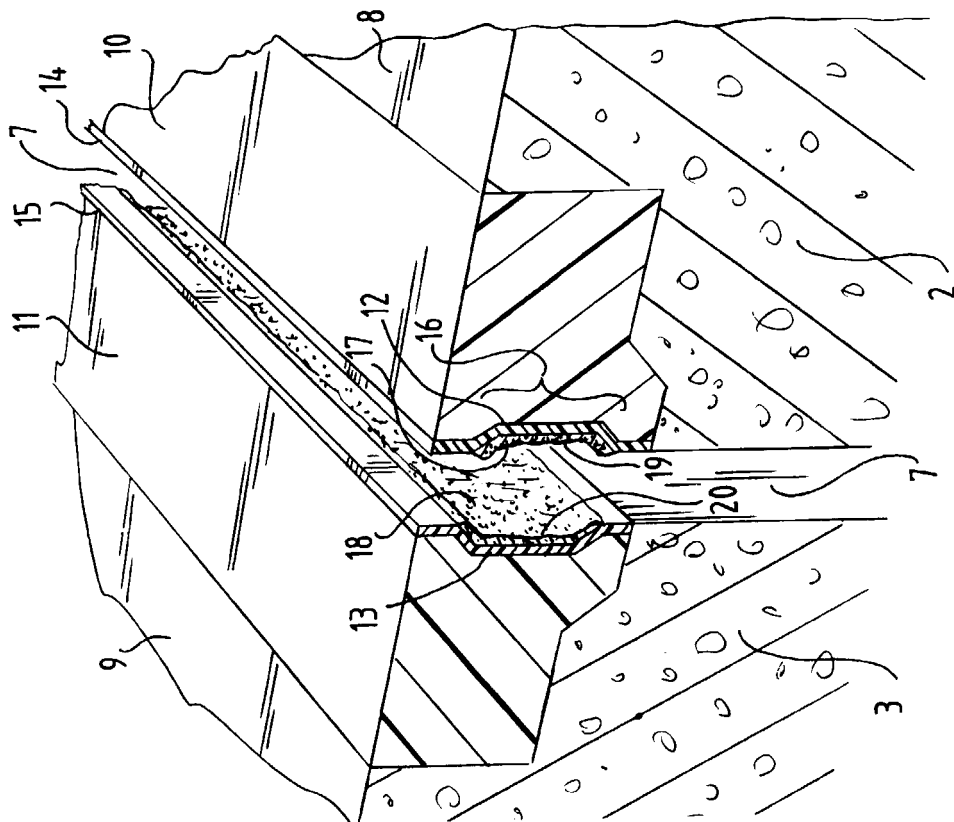
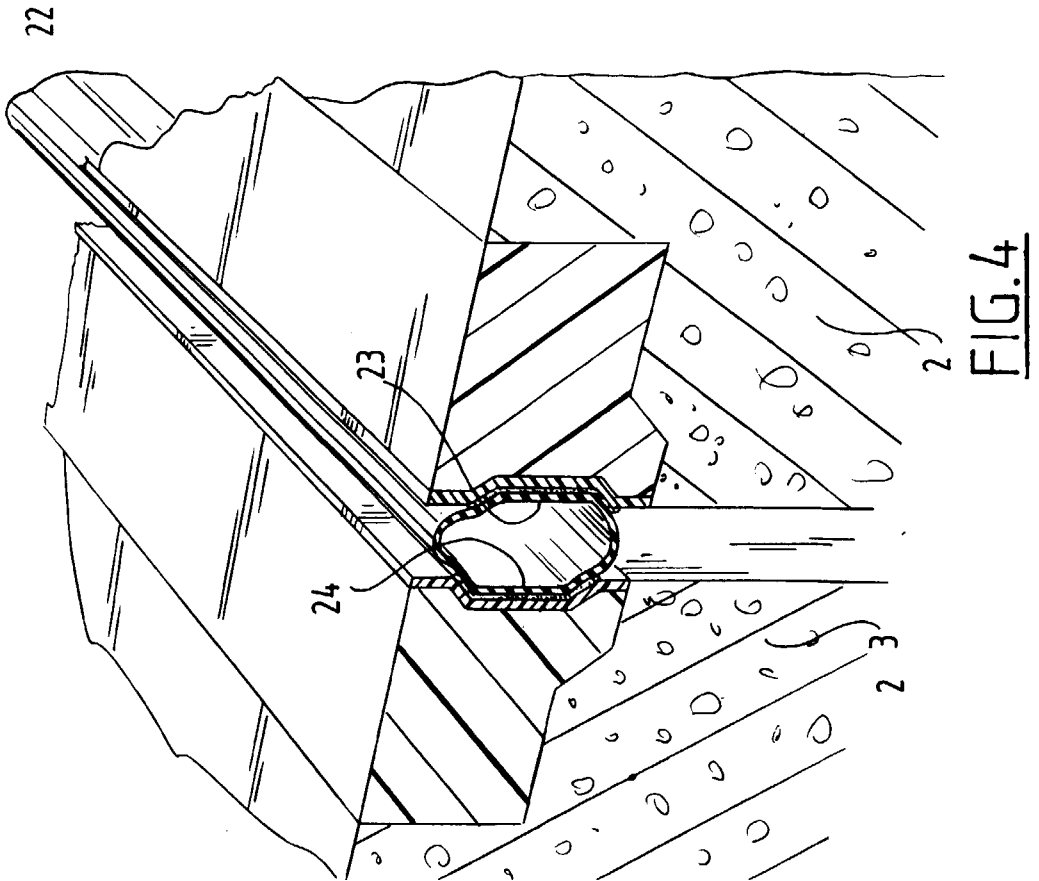
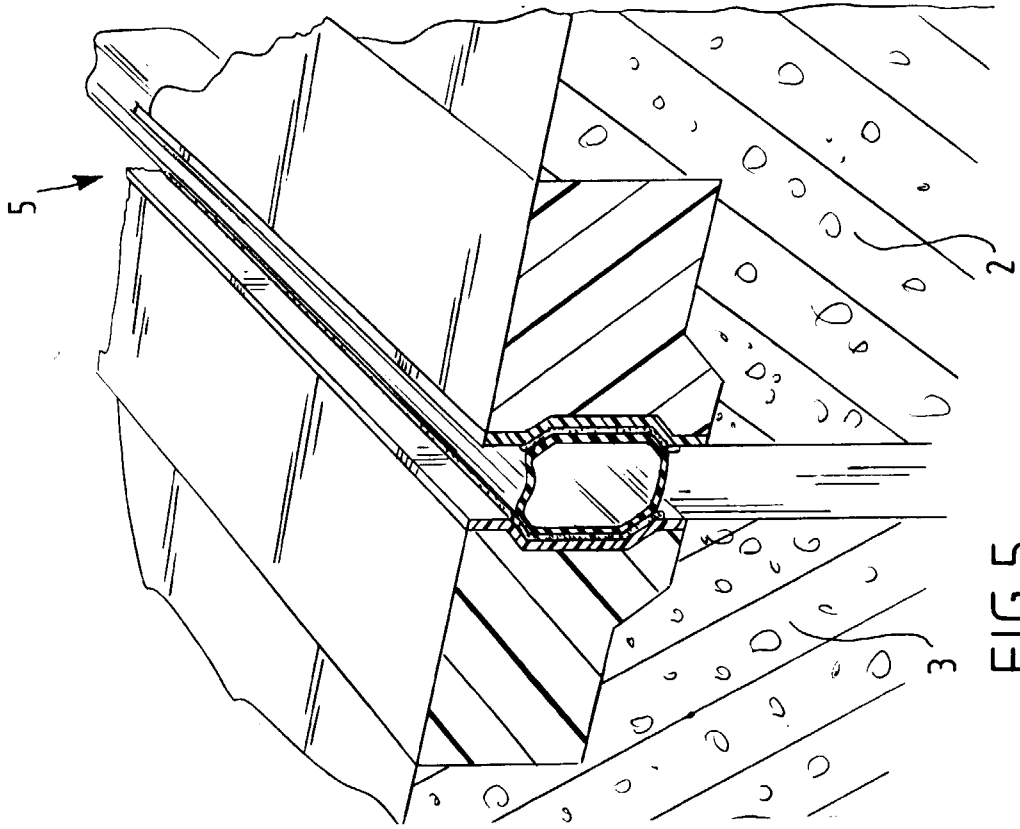


FIG. 2



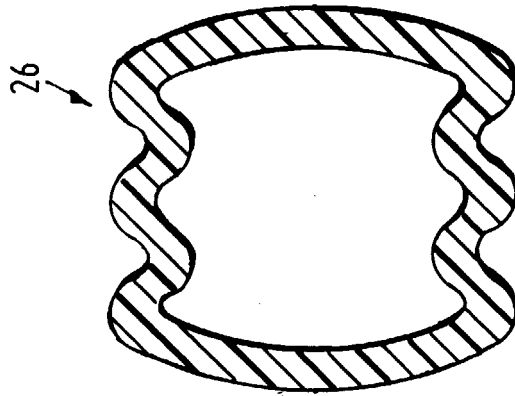


FIG. 8

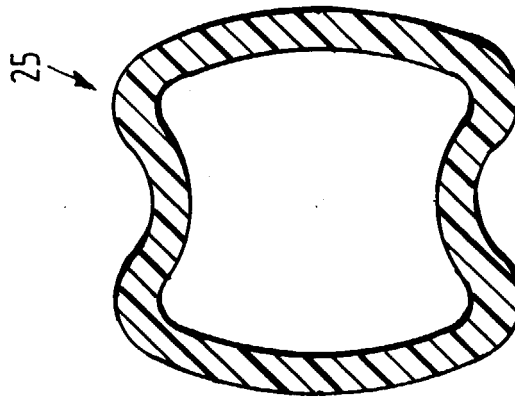


FIG. 7

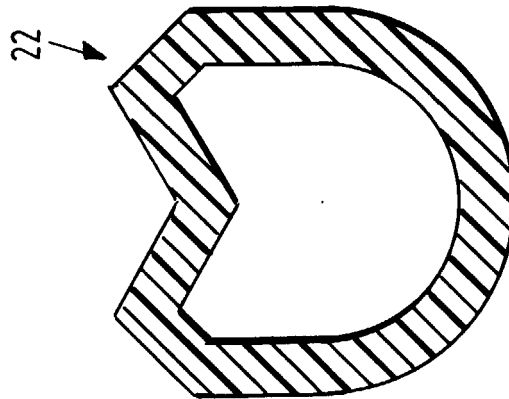


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 1552

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	US 4 285 612 A (BETTI PIER L) 25 August 1981 (1981-08-25)	1-4, 11, 12	E01D19/06 E01C11/10
A	* the whole document *	7	
Y	NL 111 319 C (RANOW) 15 March 1963 (1963-03-15)	1-4, 11, 12	
A	* the whole document *		
A	US 4 447 172 A (GALBREATH RICHARD N) 8 May 1984 (1984-05-08)	1, 8, 10	
	* column 3, line 35 - column 4, line 63; figures *		
A	US 4 884 381 A (BETTI PIER L) 5 December 1989 (1989-12-05)	1, 2, 12	
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A	DE 20 49 601 A (BROWN CO.) 13 April 1972 (1972-04-13)	11	
	* figures *		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E01D E01C E04B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 August 2000	Examiner Dijkstra, G
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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03-08-2000

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