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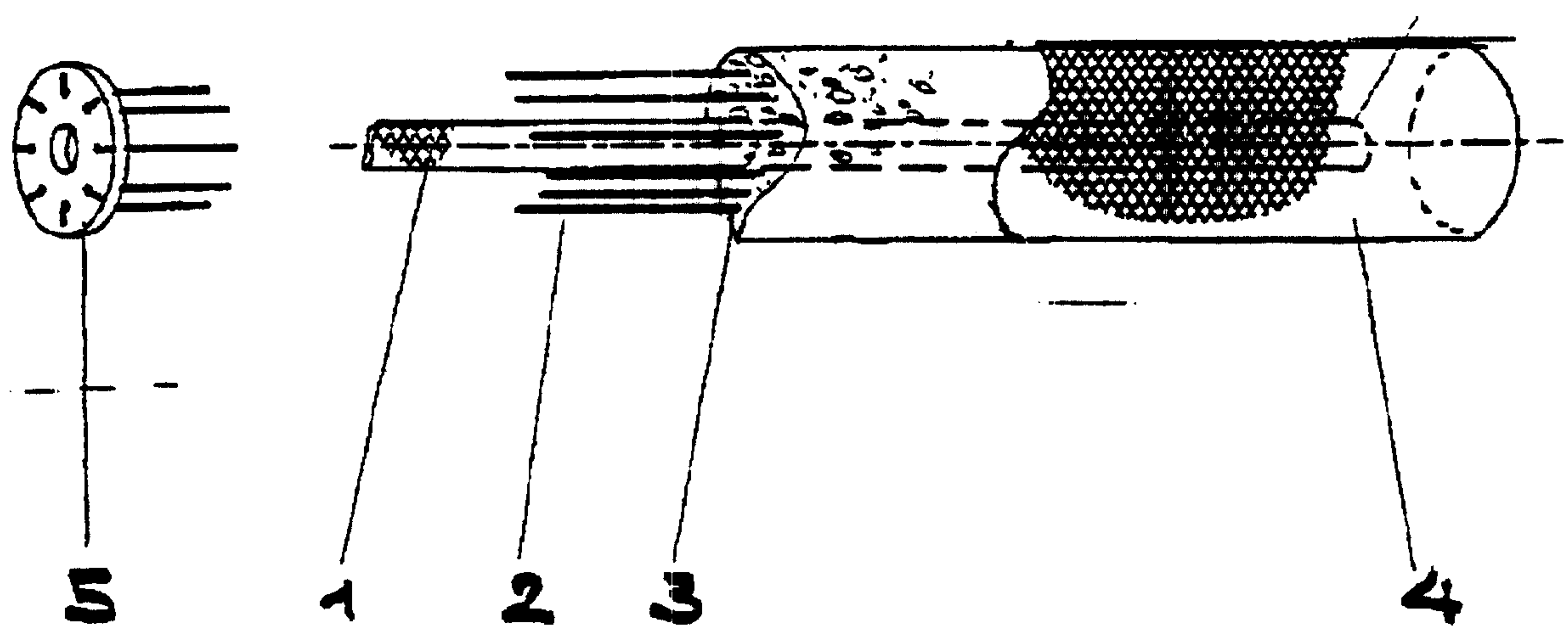
(54) Title: INJECTION-ANCHOR



(57) Abrégé/Abstract:
An njection or grouting body for the transfer of mechanical stresses in structures in above-ground or below-ground construction, and for insertion into a borehole, in slits or similar openings, has a centrally-arranged filling tube and at least one fabric stocking surrounding the filling tube. The filling tube is embodied as a fabric stocking and one or a plurality of reinforcing wires and/or rods, and/or pipes and/or ridged sheet metal strips are arranged on site so as to be adaptable, axis-parallel between the fabric stockings. An outer closed fabric stocking is arranged along the axis of the injection body about its inner filling tube (Fabric tube) that is open at its lower end. The reinforcing wires or rods are arranged on the outside of the inner fabric stocking and are attached to the fabric of the outer stocking in such a way that it can be ensured that, following filling or grouting, the reinforcement will remain in position.

ABSTRACT

An njection or grouting body for the transfer of mechanical stresses in structures in above-ground or below-ground construction, and for insertion into a borehole, in slits or similar openings, has a centrally-arranged filling tube and at least one fabric stocking surrounding the filling tube. The filling tube is embodied as a fabric stocking and one or a plurality of reinforcing wires and/or rods, and/or pipes and/or ridged sheet metal strips are arranged on site so as to be adaptable, axis-parallel between the fabric stockings. An outer closed fabric stocking is arranged along the axis of the injection body about its inner filling tube (Fabric tube) that is open at its lower end. The reinforcing wires or rods are arranged on the outside of the inner fabric stocking and are attached to the fabric of the outer stocking in such a way that it can be ensured that, following filling or grouting, the reinforcement will remain in position.

INJECTION-ANCHOR

The invention relates to an injection or grouting body which, comprising a centrally-arranged filling tube and at least one fabric stocking surrounding the filling tube, is inserted into a borehole, into slits or similar openings in order to transfer mechanical stresses in structures in above- and under-ground construction.

So-called injection or grouting anchors are used to secure construction components to unstable backgrounds, strengthen structures on construction sites and render safe buildings that have been threatened by damage caused by mining. As disclosed in DIN 4125, used in such cases are construction elements in respect of which a grouting body, having been created by the forcing of grout around the rear part of a steel stress member installed in the ground, is attached via steel stress members and anchor head to the construction component or mine component to be anchored.

Another important application is the anchoring of damaged masonry or concrete sections in above-ground construction, bridge construction or below-ground construction. Injection or grouting anchors are also used in tunnel construction to anchor inner tunnel linings, and in mines to help compact galleries and secure suspended ceilings. This type of grouting anchor is described, for example, in DIN 4125 and 4128.

If, for example, excessive loads or moments have to be dispersed in certain regions over predetermined lengths or borehole depths, the prior art injection or grouting anchors are not suitable or not particularly suitable. The prior art injection or grouting anchors are factory manufactured, which means that the borehole depths, which are selected to ensure special stress or load dispersal, must be known at the time the anchor is being manufactured, which entails significant production problems, since the anchors have to be made to order. Mass production is not possible in this case.

The object of the invention is the creation of an injection or grouting body that can be adapted on site to local requirements and be easily assembled, installed and immediately employed at the construction site.
It is proposed that this object be addressed by an injection or grouting body of the type first described, wherein the filling tube is designed as a tube of fabric and wherein arranged axis-parallel between the fabric stockings are at least two reinforcing wires and/or rods and/or pipes/ and/or ridged sheet metal strips.

This type of injection or grouting body thus comprises a small number of conventional elements that can be readily installed at the construction site and adapted to local conditions.

Both the length of the grouting body and the adaptation to the desired stress or load dispersal can be easily determined on site, for example through the selection of the number and cross sections of the reinforcing elements to be employed.

Since the design of the fabric stocking mesh permits only a small amount of filler to escape radially, the latter expands to force the reinforcing wires, rods, pipes or ridged sheet metal strips, which are disposed around the fabric stocking, against the outer circumference.

In another embodiment of the invention, the reinforcing wires and/or rods and/or pipes disposed on the outside of the inner fabric stocking are attached at points to the fabric of the stocking so as to ensure that the reinforcing elements will remain in position after the anchor has been filled.

It is proposed that the outer and/or inner fabric stocking be designed to expand and adapt to the borehole, which must be laid out in anticipation of the loads to be dispersed or the stresses to be displaced. This arrangement permits the same basic elements considerable scope for adapting the injection or grouting body.

In a further embodiment of the invention, the fabric stockings are embodied at least in sections as a metal fabric mesh, an arrangement that broadens considerably the range of applicability. The mesh fabric in this arrangement is, for example, designed of very fine wires or metal fibres which, owing to their looped arrangement, can expand up to 20% of the circumference of the stocking.

The inner fabric stocking is advantageously slightly shorter than the reinforcing wires, rods, pipes or ridged sheet metal, so that the filler is permitted to flow up to the end of the inner fabric tube, from thence out to the inside of the outer fabric tube, which, being closed, causes the filler to flow back up into the region of the filling entrance and out of the borehole, an indication that filling of the injection body has been successfully completed.

In a further variant of the invention, the wires and/or rods are designed in a U-shape, whereby their bent portions are preferably arranged at one end of the injection or grouting body. The reinforcing elements of the injection or grouting body are disposed in its peripheral region. Further advantages of this variant are realised because of the significantly increased resistance afforded by such a wire or rod bundle against being pulled out.

In order to increase resistance against being pulled out, the reinforcing wires and/or rods and/or pipes are designed to be at least partially deformed over at least a part of their length.

Another variant comprises that each reinforcing wire and/or rod and/or pipe or a group of wires and/or rods and/or pipes feature deformations at predetermined locations over a predetermined length for the purpose of stress displacement or load and/or moment dispersal from defined zones.

If, for example, load or moment dispersal is required in certain serially-disposed regions of varying sizes, wires, pipes or rods, whose thickness and number can be selected in accordance with load or moment dispersal requirements, can be selected for each region, in which case a bundle of wires or rods is assembled for the purpose of dispersing load from a single region, while a further bundle of wires, pipes or rods takes over load or moment dispersal from another region. The great advantage of this proposed solution is that the tensile strength of a wire, pipe or rod bundle can be designed to meet the requirements and be fully exploited; in such a case, no further loads act on this wire or rod bundle. In such an arrangement, even the individual load regions are not influenced by one another and a single injection body can thus displace or transfer loads or moments from various regions independently of other regions.

In order to increase resistance against pulling-out, the wires and/or rods and/or pipes have corrugations in the manner of a hair pin, and/or are twisted, in which case the deformations are preferably provided in those locations and zones in which the individual loads or moments occur. Advantageously, in addition, either steel or glass wool can be twisted into the existing twists.

The injection body as proposed also permits improvement of the filling procedure in that provided at the anchor head is an endplate or an adapter which, being attached to the reinforcing elements, can be connected to a vibrating device, an arrangement that permits the mechanical vibrations thus produced to be transmitted to the reinforcing elements.

This arrangement, by permitting transmission of vibrational energy to all regions of the injection anchor, also improves the flow capability of the filler. This arrangement permits the injection bodies to be produced in long lengths, without hampering filler injection. This procedure permits the production of anchors in lengths of 50 m or longer. This is one advantage attending the fact that this type of injection body can be produced on-site.

The invention will next be described in greater detail with the aid of drawings. Shown are:

Figure 1: an exploded perspective view of an injection body featuring a plurality of partial sections;

Figure 2: a perspective view of the end of an injection body;

Figure 3: various types of reinforcing elements;

Figure 4 A-H: stages in the procedure for installing a reinforced injection body (A-D) and for installing an injection body employing reinforcing elements having predetermined break points (E-H); and

Figure 5: a variety of application examples
A) annular anchor having different cross sections and a ministake, used as a support, which can be grouted in two stages,
B) crack bridging, injection body, inserted into a slit, and
C) a section from Figure 5B.

Figure 1 shows in perspective an exploded view of an injection body as proposed in the filled state. The inner fabric tube 1 is surrounded by reinforcing elements 2, which can comprise rods, wires, pipes or ridged sheet metal. Reinforcing elements 2 in the present embodiment example comprise rods or bars, each of which is slightly shorter than the integral length of the injection body or can comprise partial pieces that are not indicated in greater detail. The length and cross section of the reinforcing elements 2 are determined at the construction site on the basis of the data available. Next, the assembled injection body is also installed. An additional fabric tube 4, which is closed at the foot-end of the injection body, surrounds the entire body. The inner fabric tube is correspondingly shorter, so that the mortar, which has been introduced via the inner fabric tube, exits the inner fabric tube at the foot-end of the injection body, and runs along the inner wall of the outer fabric tube up to the head of the injection body, where it exits, thus signalling that the grouting of the anchor has been completed. In order to ensure the even or predetermined arrangement and position of the reinforcing elements, the latter can be attached to the outer wall of the inner fabric tube. The means of securing can comprise the same material as that of the fabric tube, for example, loops, into which the reinforcing elements are inserted. In this illustrated embodiment example, the reinforcing elements 2 are connected to an endplate 5 at the head-part of the injection anchor. This arrangement, first of all, permits fixing of the position of the reinforcing elements, as well as transmission of vibration energies so as to facilitate the installation process and also ensure the distribution and solidification of the mortar. All types of known fibre materials can be used for the fabric tube, even metallic meshes. Inner and outer fabric tubes can also comprise different materials. Similarly, the outer fabric tube can be more elastic than the inner tube. This arrangement, for example, ensures that the inner tube completely fulfils its transport function, while the outer fabric tube readily adapts to the unevenness of its surroundings and thus for example completely fills in its borehole so that a transfer of the stresses or loads from the structure to the injection body is also ensured.

Figure 2 shows a variation of an embodiment example in accordance with Figure 1. In this case, the reinforcing elements 6, here in the shape of wires, bars or rods, are bent into a U-shape at one end 7 and extend over the entire length of the injection body.

Figure 3 shows a number of different embodiments of the reinforcing elements. Thus, Figure 3a shows a deformed rod. The deformations can be made on a section-by-section basis or can be provided over the entire length.

Figure 3B shows a length of ridged sheet metal in the form of a narrow strip.

Figure 3C shows a corrugated pipe or a corrugated rod.

Figure 3D shows twisted wires, into which steel wool 8 can be twisted. This arrangement permits an intensive and interlocking connection with the injected mortar, the result of which being that forces can be readily taken up from the construction structure by the injection body and transferred onward.

Figure 3A illustrates a smooth piece of steel 9 with a loop for attachment.

The reinforcing elements shown in Figures 3A to 3E can be employed in any combination in accordance with local objectives.

Figures 4A to D show the individual phases of the injection process.

In accordance with Figure 11A, featured in construction structure 11 is a borehole 10 that is to filled in by means of an injection body in accordance with the invention, in order for example to direct forces away from stress fields. Once the objective has been identified, the most suitable injection body for the task is selected, the reinforcing elements, their type, size and number are chosen on site and inserted into borehole 10. Next, as shown in figure 4B, mortar is poured in, and the inner filling-or-fabric tube is expanded up to its normal size. Thus, the reinforcing elements 2 as well assume their final location and predetermined position. It is thus ensured that even the predetermined distribution of the reinforcing elements is maintained. After having reached the end of the filling-or-fabric tube 1, the mortar flows from the open end of the latter, and is guided by means of the outer fabric tube 4 in the opposite direction as indicated by arrows 12, until it regains the entrance, as can be seen in Figure 4D. Since the outer fabric tube has sufficient elasticity, the borehole is completely filled in, the fabric pressing tightly against the wall of the borehole. If the fabric tube has attained its full expansion and there remain uneven regions inside the borehole into which the fabric is unable to expand, the mortar is capable of pressing through the mesh of the tube to fill in the unevenness. Forces arising in such regions are thus readily taken up by the injection body and either distributed or transferred.

Figures 4E to H show the final assembly stages of an injection body 13, which, already occupying a borehole 10 and filled with mortar, has reinforcing bars 2, each of which features at its end a predetermined breaking point 14. This arrangement permits the reinforcing elements 2, which protrude from borehole 10, to be tested and broken by means of a simple tool 15 and bent together by means of another tool 16 (see Figure 4G) , so that the filling out and sealing of the borehole will have both sufficient support and attachment to the injection body (see Figure 4H).

Figures 5 A and B show further application examples of the present invention.

In this arrangement, a building 17 features vertically-running settling cracks 18, the stresses causing which are to be taken up and distributed with the assistance of the injection body. For this purpose, injection body 13 is constructed as an annular anchor 19 having a variety of different reinforcing elements. Thus, annular anchor 19 has a thicker construction in the region of the cracks 18, while the remaining regions of the anchor are less strongly reinforced.

In the example shown, the cracks 18 of building 17 have arisen due to different subsoils. While the right side of the house rests on solid soil, the soil has sunk underneath the left-hand part, a condition which necessitates stabilization. The proposed injection body can also be used in this situation. The mortar, which flows back following filling of the injection body, is prevented from exiting by means of an annular plate 5 located at the head part, whereby additional mortar is injected in a second pressure stage at, for example 10 bar, the result of which being that the outer fabric sleeve expands further, thus solidifying the subsoil and improving pile stability. It is proposed that the outer fabric sleeve feature, depending on soil solidity, varying expansion radii along the length of its axis. Thus, for example, the lower portion of the outer sleeve can be pear-shaped, a shape that is particularly suitable for piles and soils into which piles are driven.

Figure 5B shows an enlarged view of a wall structure, which is split by a vertical crack 18. Figure 5C shows a section of this situation. Injection anchor 13 has a stronger construction in the region of the crack 18, while the remaining region of the annular anchor is provided with a basic reinforcement 22.

A further area of application is afforded by the lack of temperature sensitivity of the stainless steel of the reinforcement, the mineral mortar filling and the steel stocking. In particular:

Construction of industrial ovens, construction of smokestacks, and employment in firewalls.

The present invention discloses an injection or grouting body that admits a wide variety of applications in above-and-below ground construction, all of which cannot be described here at length. The great advantage of the invention is that the injection anchor can be maximally adapted to the locally-required conditions at the construction site. Such requirements can be highly variable.

List of Drawing Captions

1. inner fabric tube
2. reinforcing elements
3. mortar filling
4. outer fabric tube
5. end plate
6. U-shaped reinforcing elements
7. end of the injection body
8. twisted steel wool
9. a reinforcing loop
10. borehole
11. structure
12. arrow, backflow of the injected mortar
13. injection body
14. predetermined break point of a reinforcing element 2
15. tool

16. tool
17. building
18. cracks
19. injection body embodied as an annular anchor
20. strengthening of the injection anchor in the region of the cracks
21. minipile in two pressure stages
22. minimal basic reinforcement

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. Injection or grouting body for the transfer of mechanical stresses in structures in above-ground or below-ground construction, and for insertion into a borehole, in slits or similar openings, having a centrally-arranged filling tube and at least one fabric stocking surrounding the filling tube, characterized in that filling tube (1) is embodied as a fabric stocking and that one or a plurality of reinforcing wire or rods, or pipes, or ridges sheet metal strips (2) are arranged on site so as to be adaptable, axis-parallel between the fabric stockings (1 and 4) and that an outer closed fabric stocking (4) is arranged along the axis of the injection body about its inner filling tube (1) that is open at its lower end, and that the reinforcing wires or rods (2) are arranged on the outside of inner fabric stocking (1) and are securely attached to the fabric of the outer stocking.

2. Injection or grouting body in accordance with Claim 1, characterized in that the fabric stockings (1,4) are designed as expandable metallic mesh section-by-section.

3. Injection or grouting body in accordance with Claim 1 or 2, characterized in that the inner fabric stocking (1) is slightly shorter than the reinforcing wires, pipes, rods or ridged sheet metal (2).

4. Injection or grouting body in accordance with any one of Claims 1 to 3, characterized in that the reinforcing wires or rods (2) have a U-shape, whereby their parts that have been bent into a U-shape are arranged at the foot or at one end of the body.

5. Injection or grouting body in accordance with any one of Claims 1 to 4, characterized in that each of the reinforcing wires or reinforcing twisted steels or rods or extensions (2) is designed to be deformed over at least one part of its length and whereby such reinforcing elements differ in length from one another.

6. Injection or grouting body in accordance with any one of Claims 1 to 5, characterized in that each reinforcing wire or rod or pipe or a group of reinforcing wires or rods or pipes are, for the purpose of dissipating or displacing stresses away from defined zones, deformed at predetermined locations over a predetermined length in such a way that the reinforcing elements are corrugated or twisted in defined regions and are attached to load-dissipating steel or glass wool.

7. Injection or grouting body in accordance with any one of Claims 1 to 6, characterized in that the reinforcing wires or rods are frictionally clamped or tightened by means of a clamping device and thus are connected under tension, whereby the reinforcing elements located outside of the borehole feature predetermined breaking points for the purpose of determining the minimum load that can be applied.

8. Injection or grouting body in accordance with any one of Claims 1 to 7, characterized in that the reinforcing wires, rods, pipes or strips of ridged sheet metal are attached at the head of the body to an endplate or an adapter that can be attached to a vibrating device, in such a way that the mechanical vibrations produced can be transferred to the reinforcing wires, rods and strips of ridged sheet metal.

9. Injection or grouting body in accordance with any one of Claims 1 to 8, characterized in that the radius of the outer fabric sleeve varies along the axial radius.

10. Method for producing an injection or grouting body in accordance with any one of Claims 1 to 9, characterized in that depending on the values obtained for the tensile forces, the stresses to be displaced or loads to be dispersed, the location and expansion of the stress fields, a calculated number and thickness of reinforcing wires or pipes or rods are, in accordance with the desired borehole depth or slit size, cut to length and assembled on site, and are inserted into the bore or slit and grouted.

11. Method in accordance with Claim 10, characterized in that, depending on the position and size of the load fields to be dispersed or transferred in the construction structure, the calculated number of reinforcing wires or rods are provided with deformations, whereby a fabric stocking is pulled over the entire arrangement and is connected under tension to the external periphery of an endplate or an end pipe, in whose centre is located a bore, whose periphery is connected to the filling tube or the inner fabric tube.

FIG 1

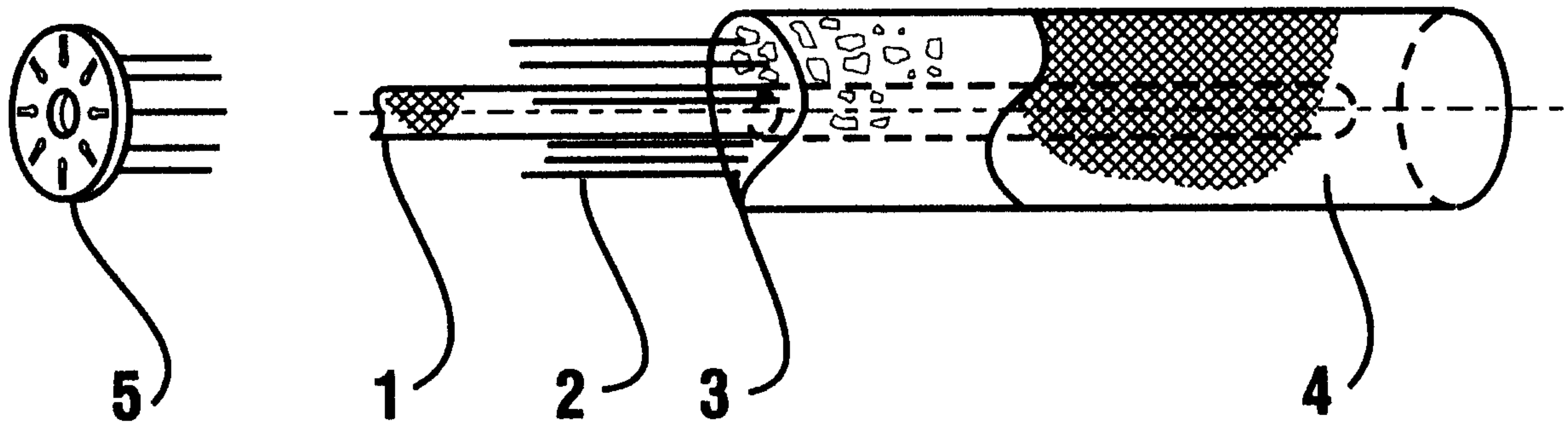


FIG 2

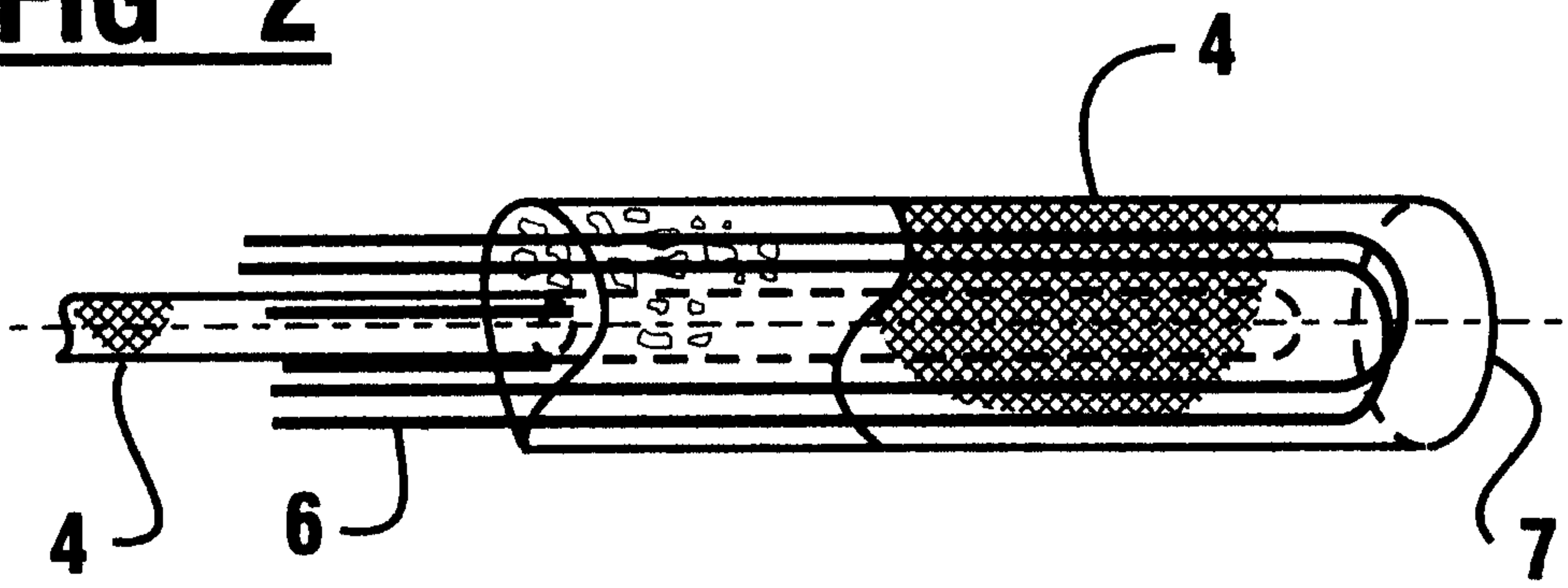


FIG 3A

FIG 3B

FIG 3C

FIG 3D

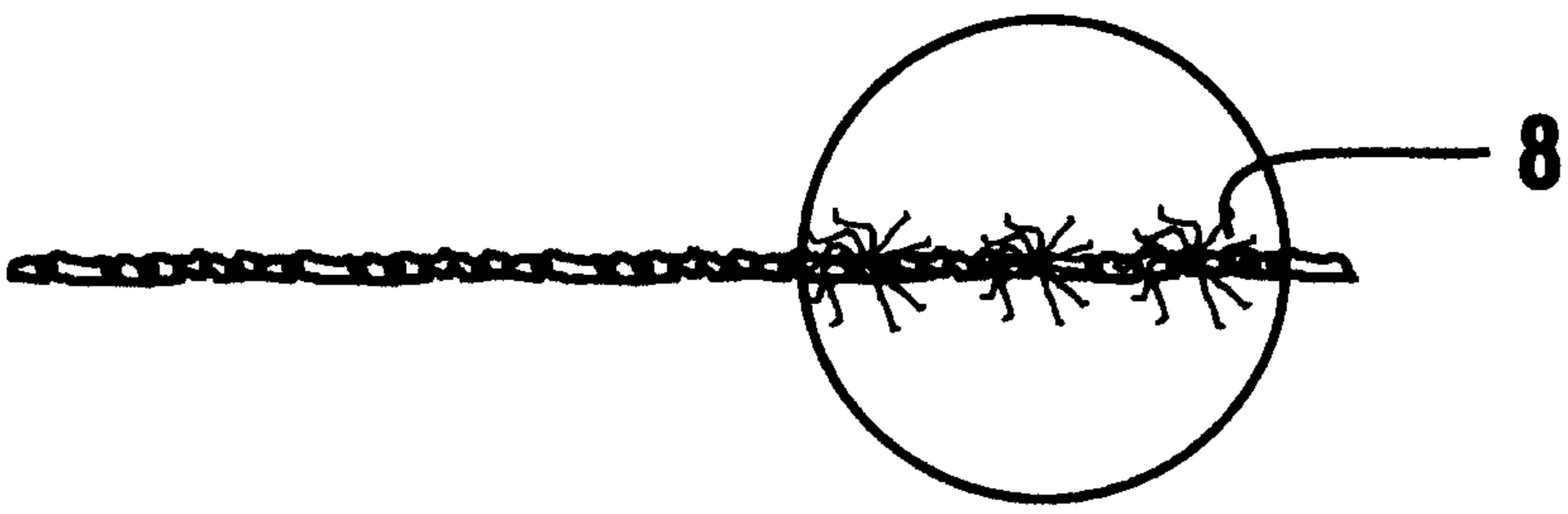


FIG 3E

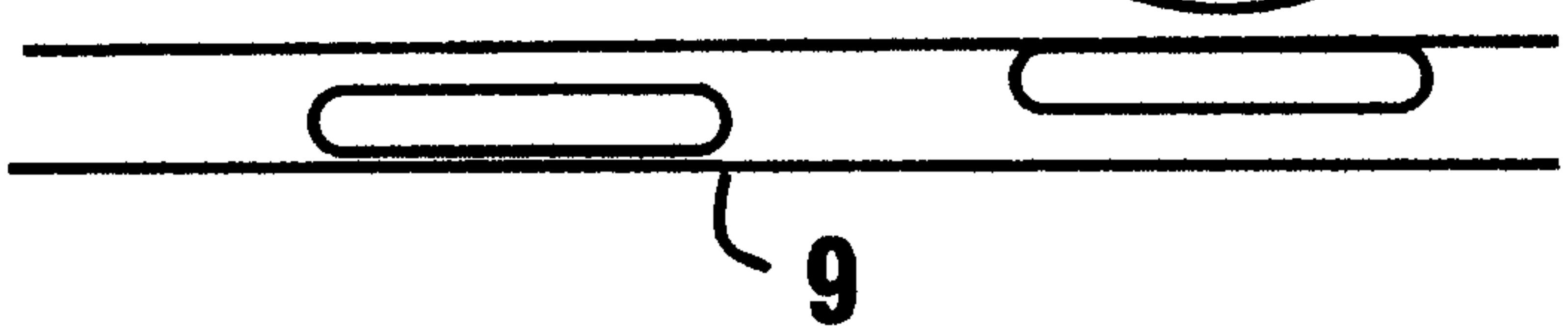


FIG 4A

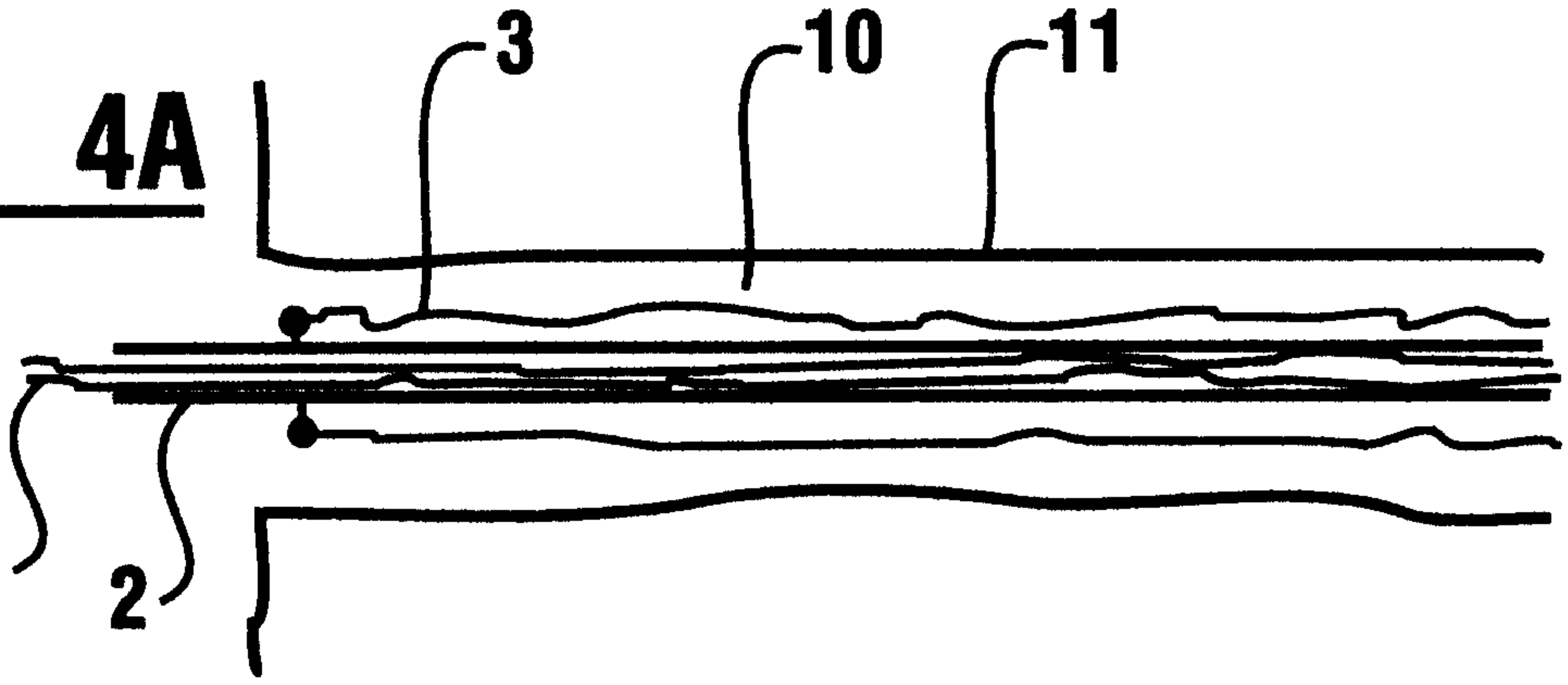


FIG 4B

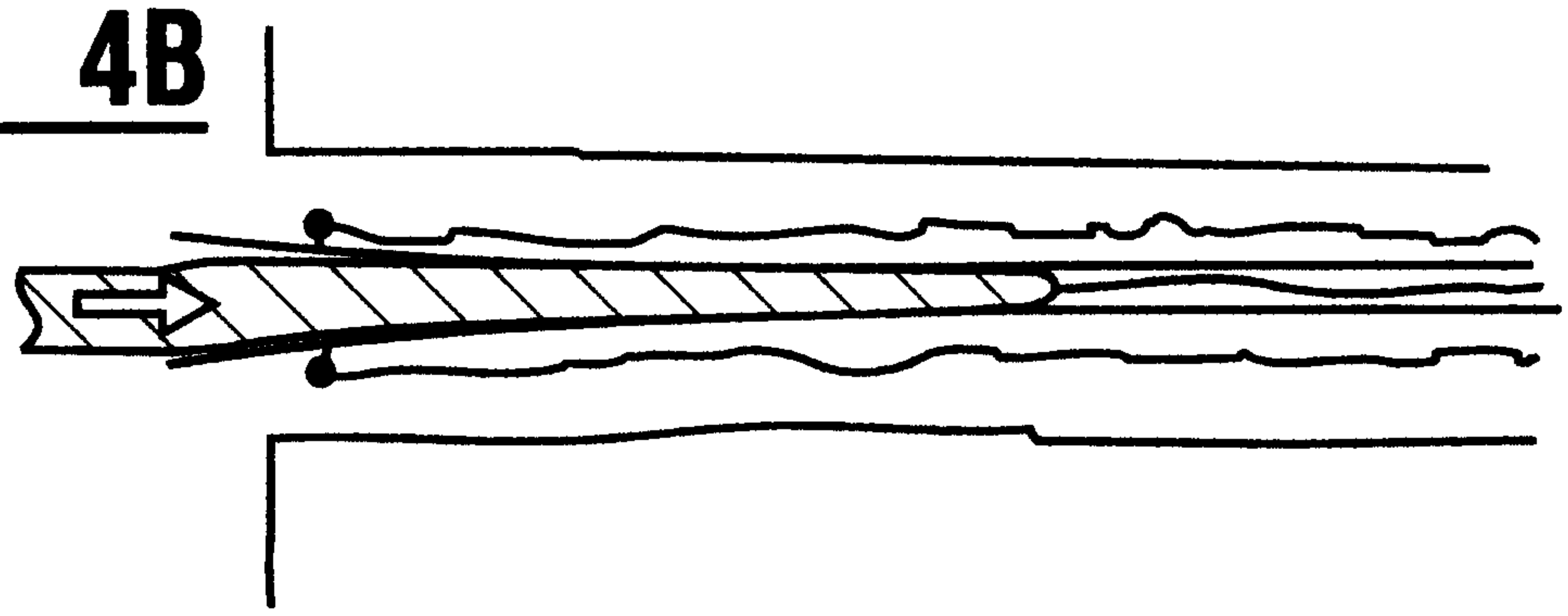


FIG 4C

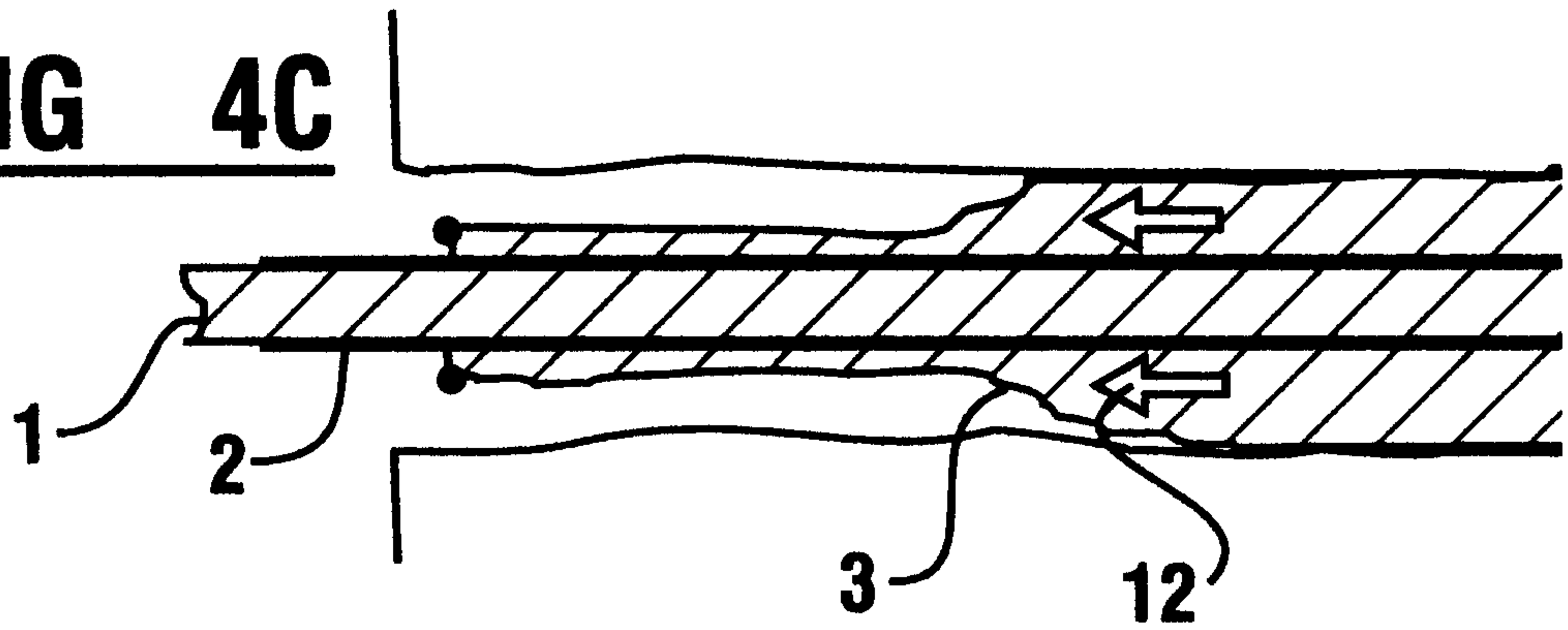


FIG 4D

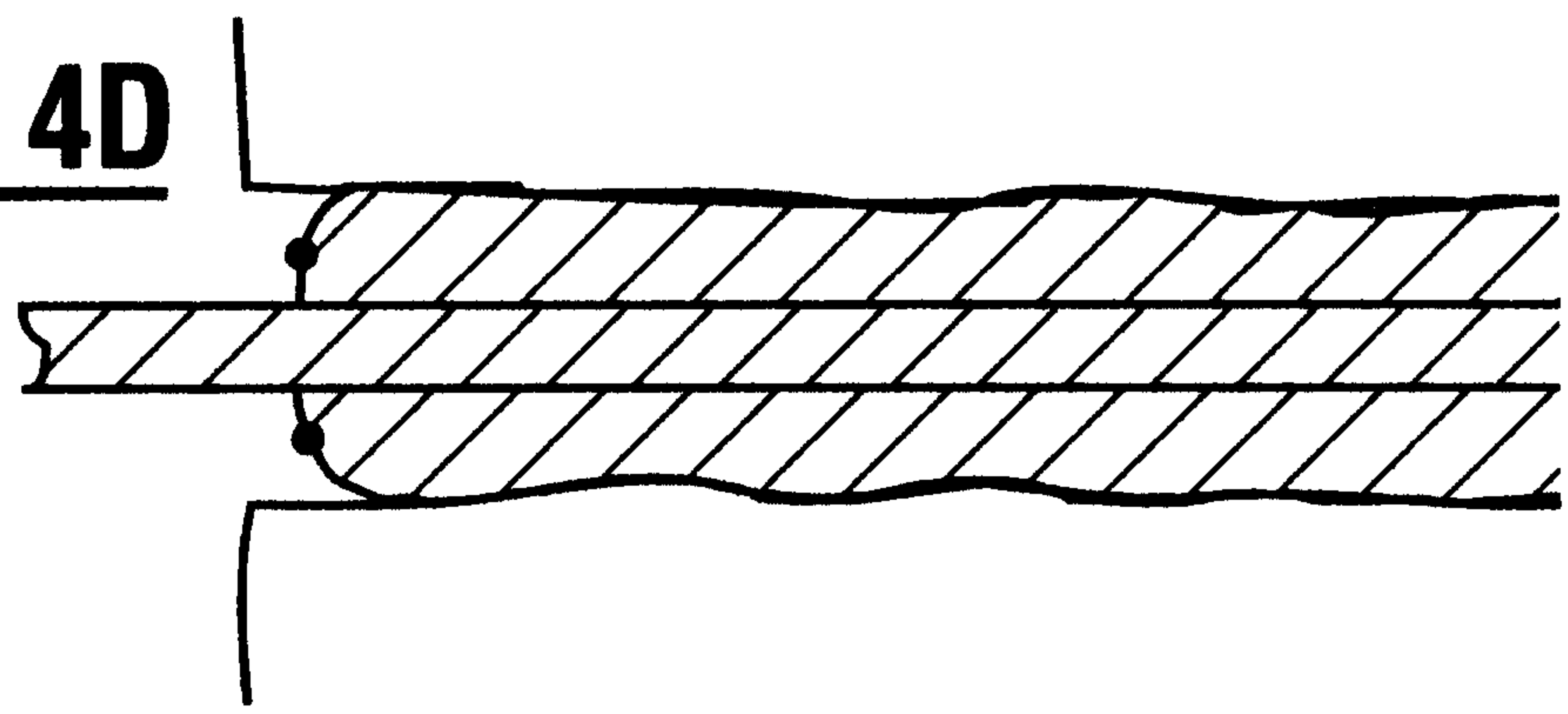


FIG 4E

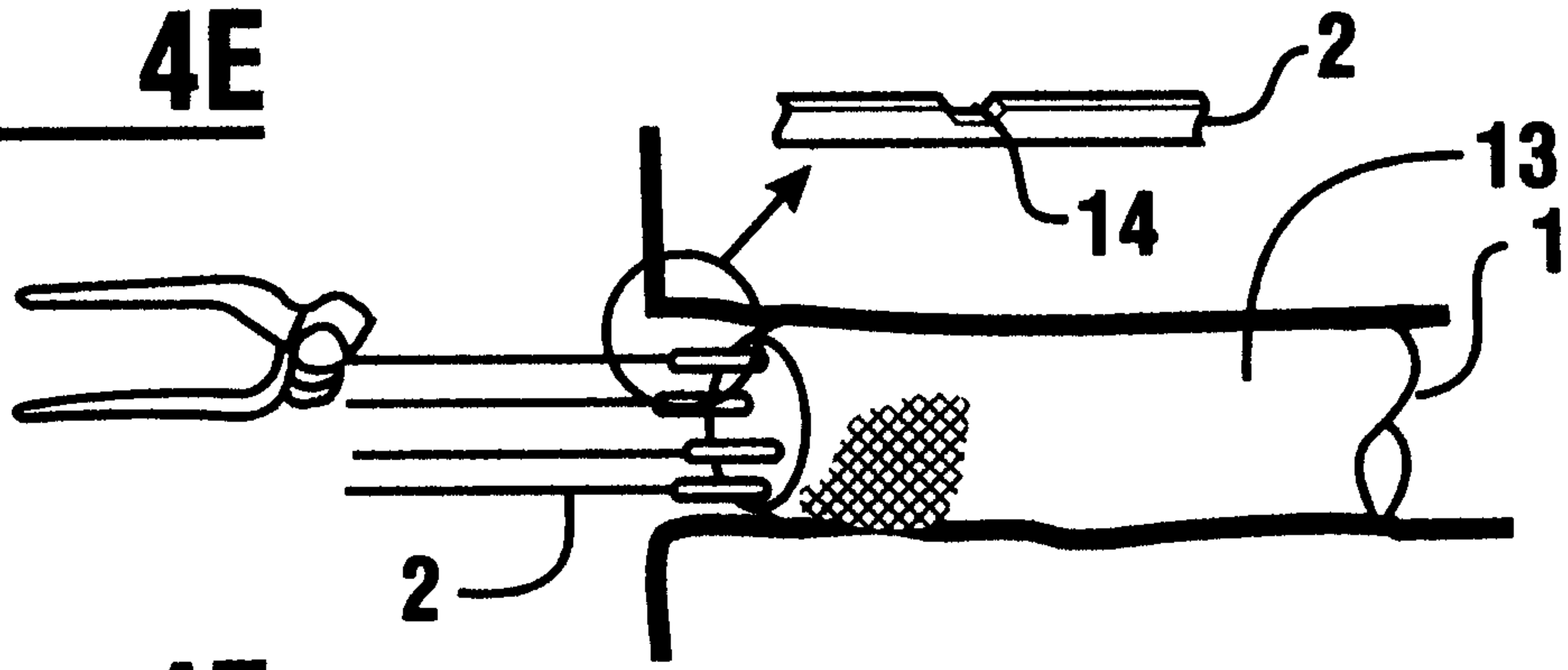


FIG 4F

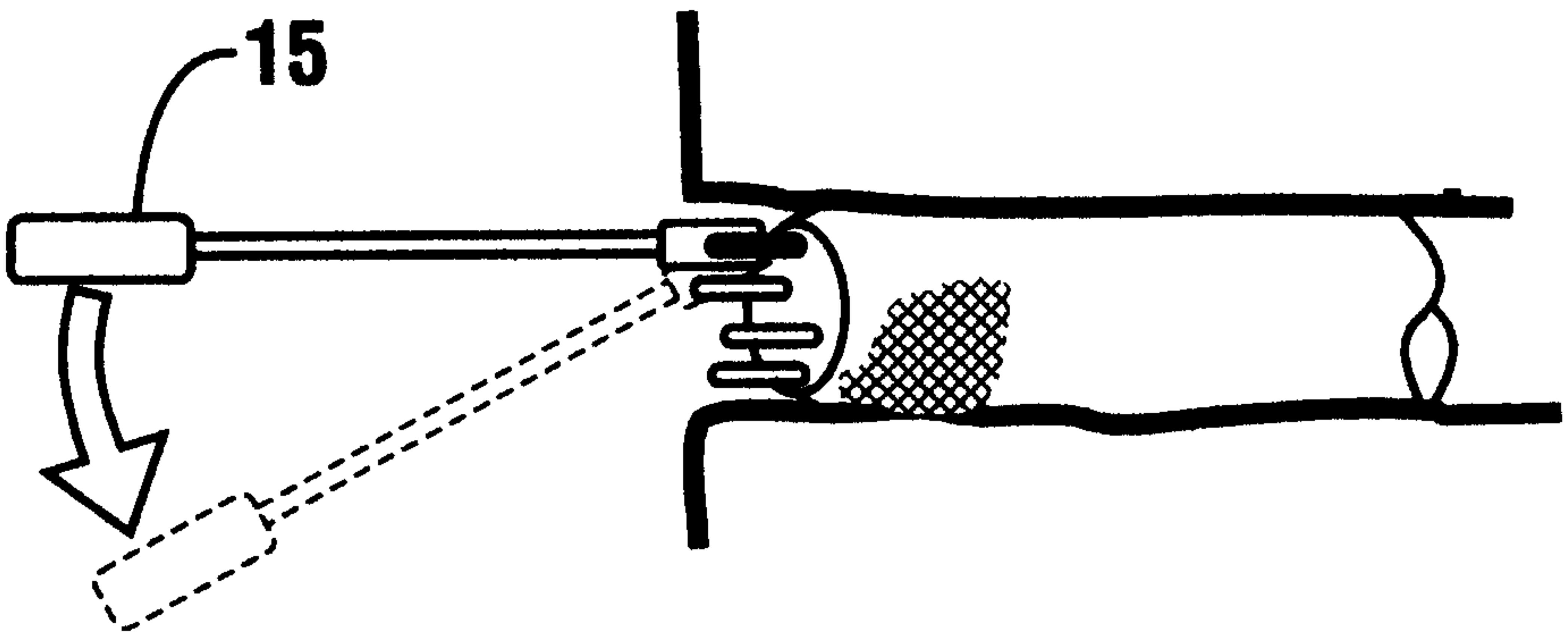


FIG 4G

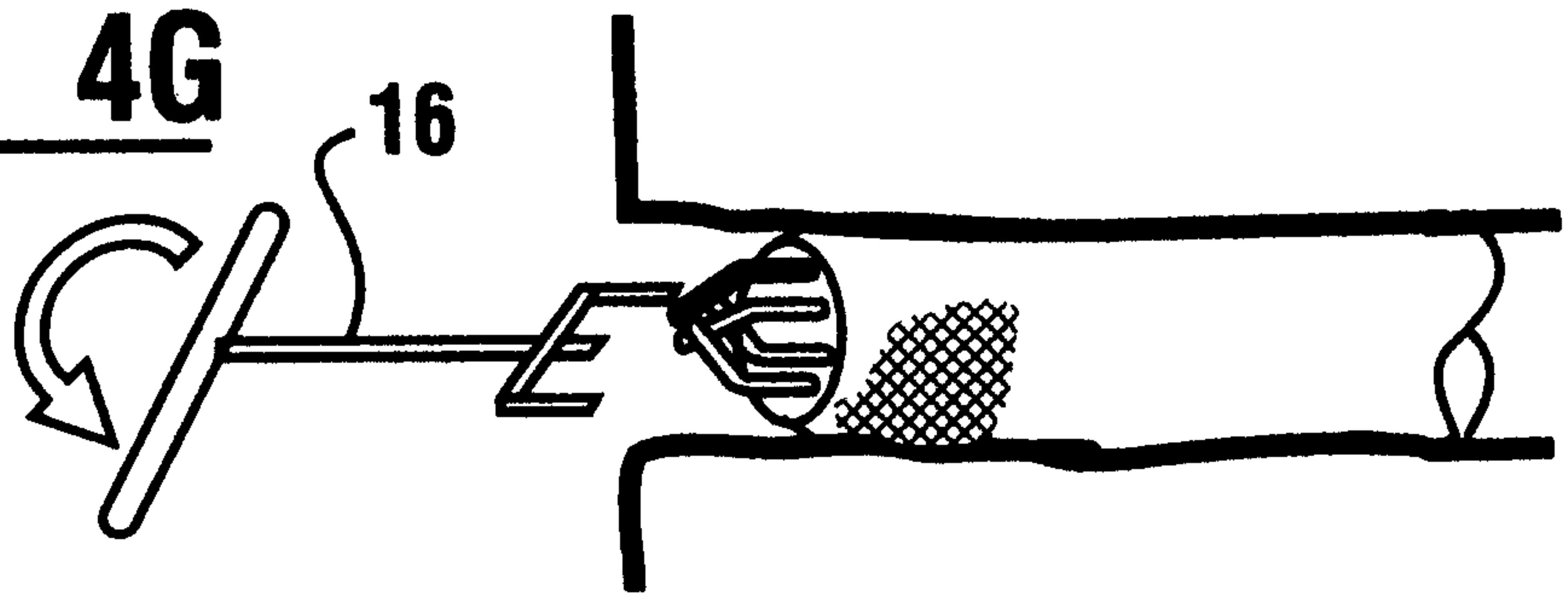


FIG 4H

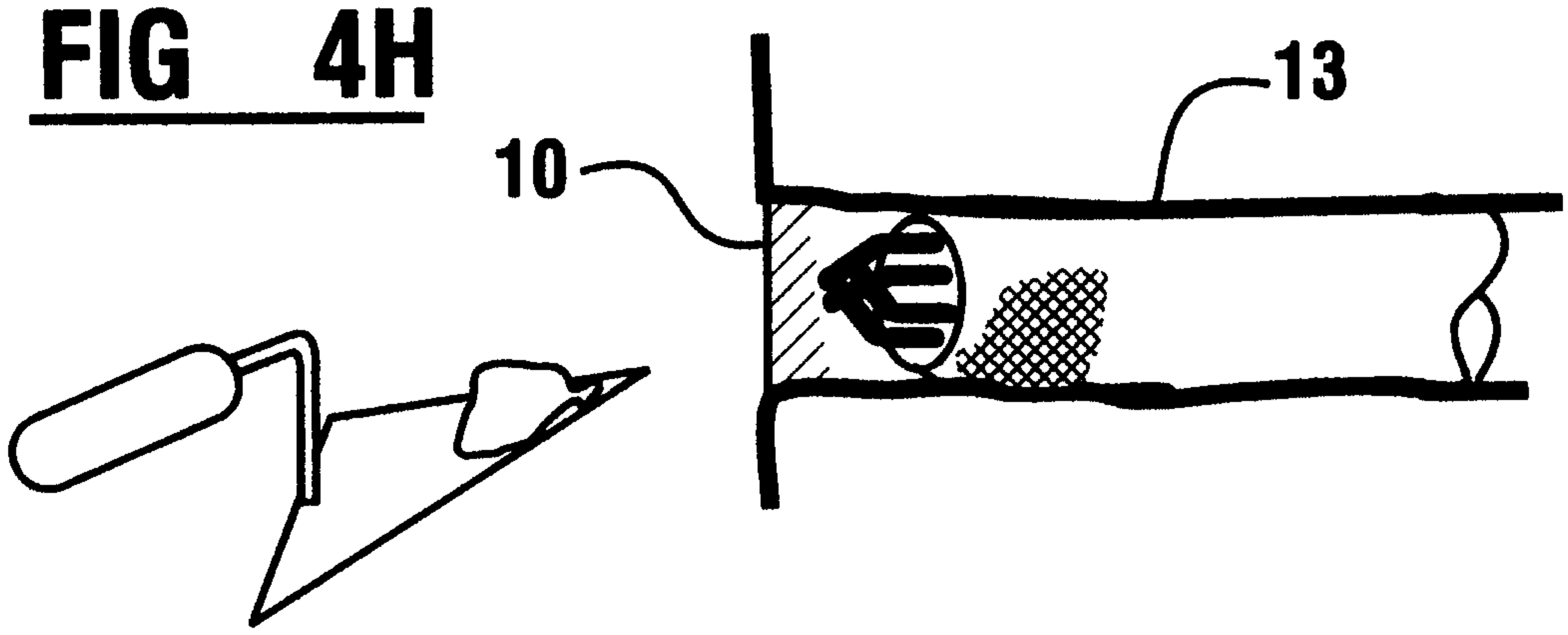
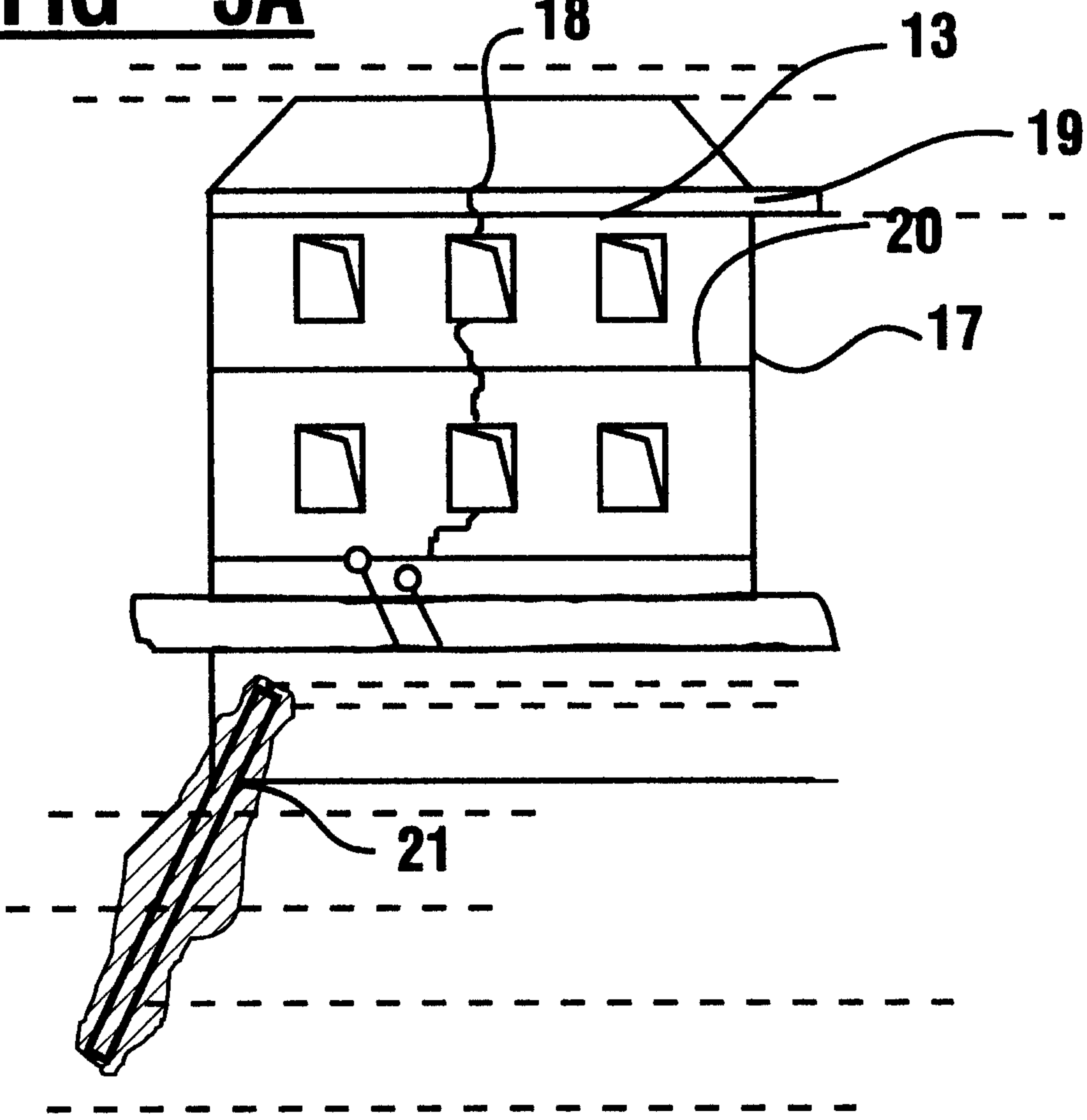


FIG 5A



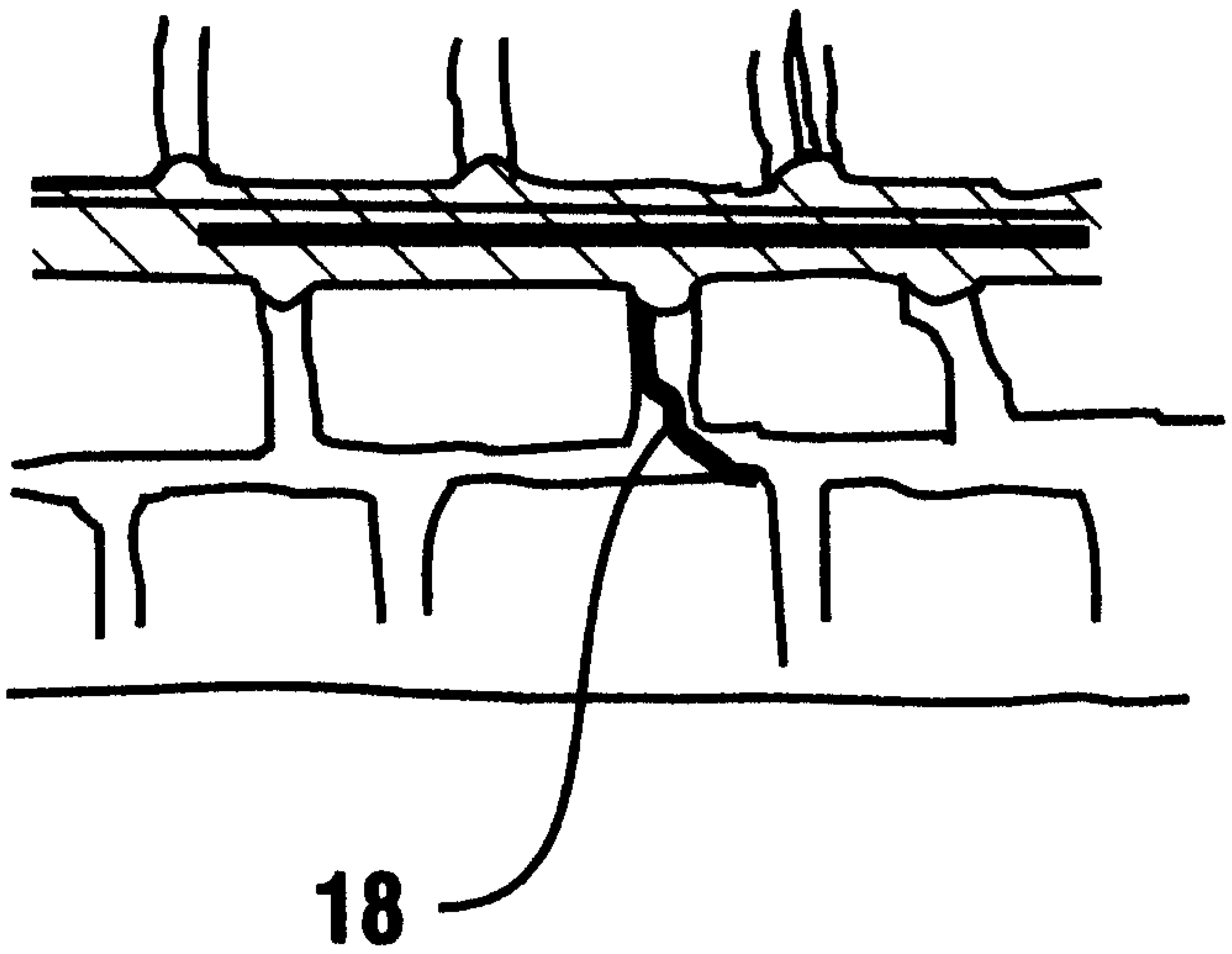


FIG 5B

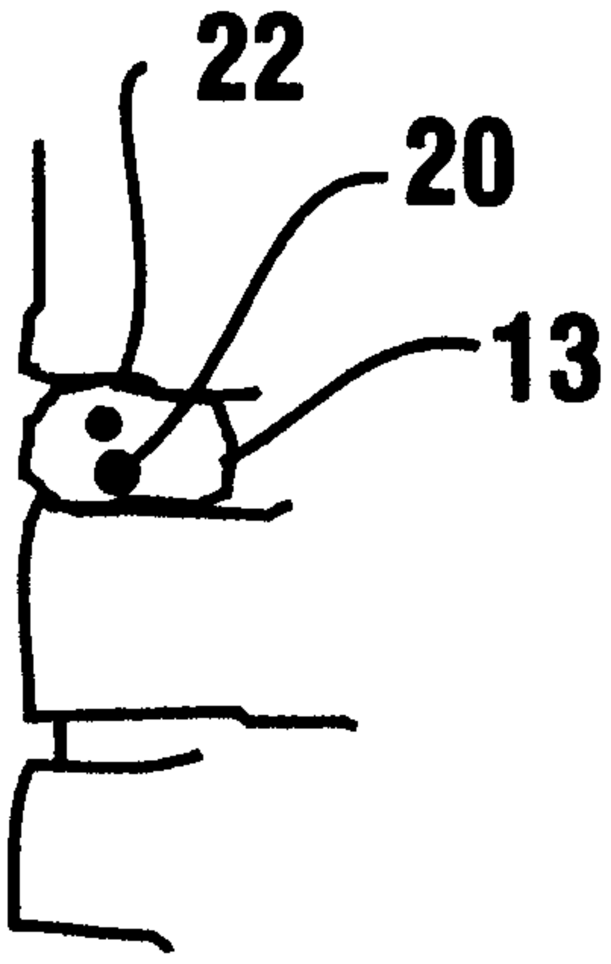
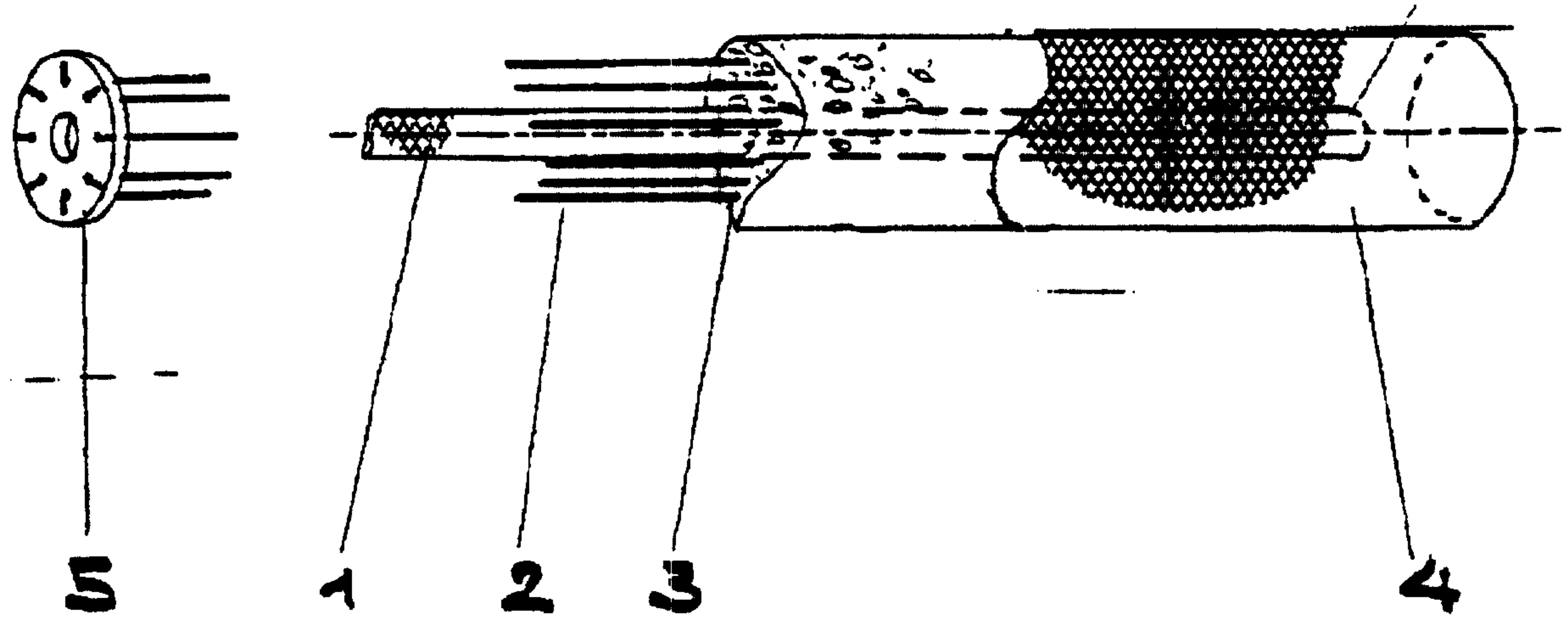


FIG 5C



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