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(72) Inventeur/Inventor:
SCHOTTLI, THEODOR, CH
(73) Propriétaire/Owner:
SCHOTTLI, THEODOR, CH
(74) Agent: GOWLING LAFLEUR HENDERSON LLP

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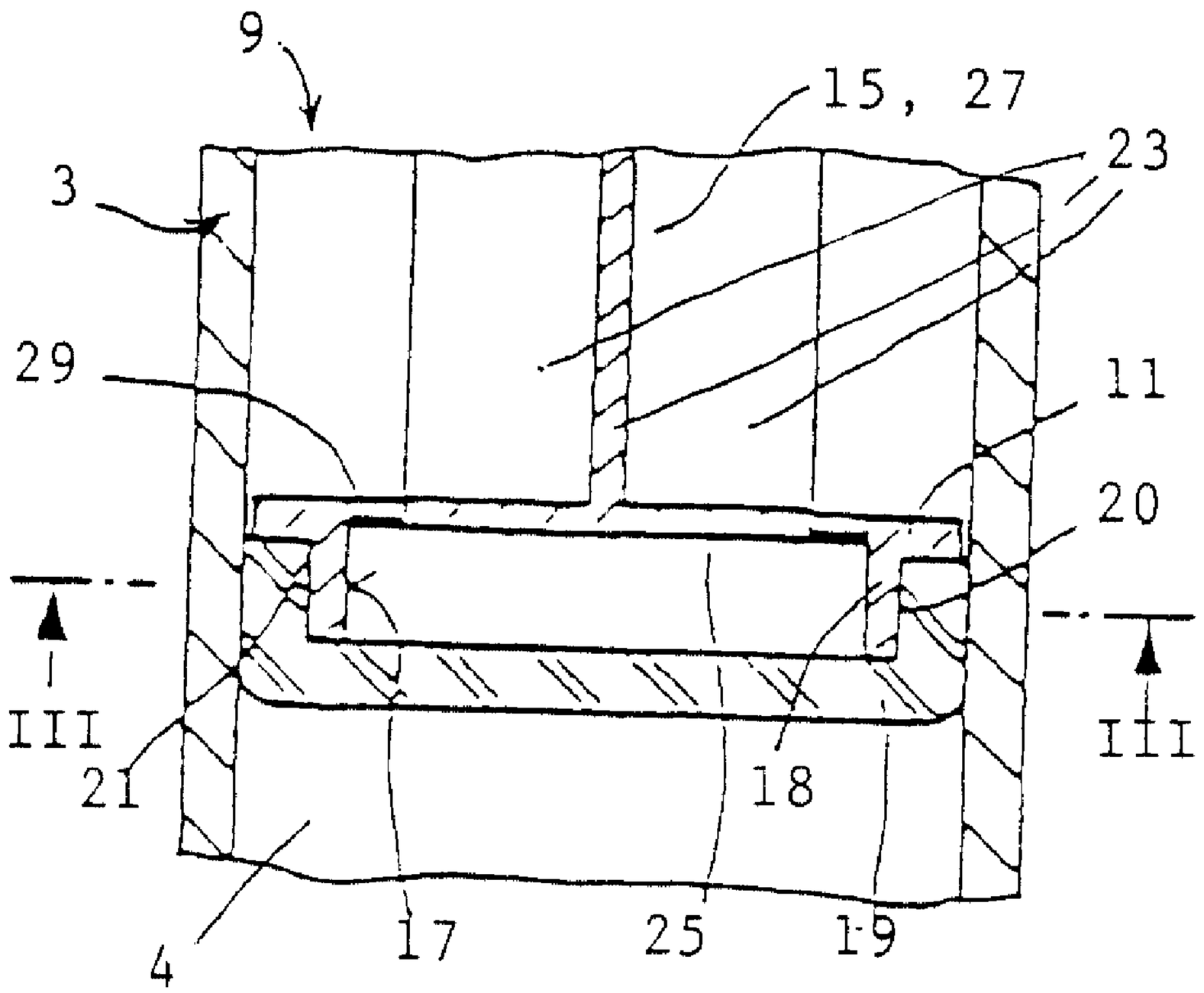
(54) Title: INJECTING SYRINGE



(57) Abrégé/Abstract:
According to the invention the plunger head (11) of the injecting syringe is connected to the shaft (15) by fine links (29) which break at the very latest at the end of the injection process. The plunger head (11) can no longer pulled back and is lost in the syringe barrel (3) so that the syringe (1) cannot be reused.

Abstract

According to the invention the plunger head (11) of the injecting syringe is connected to the shaft (15) by fine links (29) which break at the very latest at the end of the injection process. The plunger head (11) can no longer pulled back and is lost in the syringe barrel (3) so that the syringe (1) cannot be reused.

Injecting Syringe

Field of the Invention

The subject-matter of the present invention is a single-use injection syringe.

Related Art

Injection syringes are known in many embodiments. They comprise a syringe cylinder with a coupling device for an injection needle and a plunger with a plunger head and a plunger shank as well as a thumb rest for actuating the plunger. Such injection syringes are not exclusively used by qualified personnel, but are increasingly used for injecting intoxicants and on account of this get into the hands of non-trained people who do not pay attention to the sterility.

For this reason there are already known injection syringes with which the first usage is to be indicated or which are only to be usable once. The possibility of using the syringe only a single time, apart from protecting drug addicts, also protects other sick people above all in developing countries from getting into contact with contaminated blood on already used syringes.

From EP-A-0,438,453 there is known an injection syringe whose plunger head comprises an axial bore which on the side of the plunger base is closed by a disk with a circumferential break-off location. Alternatively to a disk with a break-off location from the same document it is known to place in the base of the plunger a ring with a central break-off location. On the rear side of the syringe cone onto which the injection needle may be placed there is formed a cutter which projects into the plunger-swept volume and which with a complete emptying of the syringe, that is to say with the complete advance of the plunger

head, separates the disk from the plunger base along the break-off location. The redrawing of a medicament is then prevented since on account of the breaking-through of the base of the plunger a vacuum may no longer be built up within the injection syringe. This known injection syringe has the disadvantage that for breaking through the base of the plunger a feelable resistance must be overcome. Skillful addicts or skillful medical personnel in hospitals in developing countries are therefore without further ado in the position of emptying the contents only to the extent that a destruction or perforation of the plunger base is not effected. The syringe as a result may be re-used as often as possible.

From US-A-5,000,735 there is further known an injection syringe whose plunger head is manufactured of rubber and is placed on a plunger extension. The connection of the plunger head to the plunger extension is effected via a separate carrier ring with radialy inwardly directed stoppers which may be broken off. The carrier ring on account of a slot-shaped opening may be spread apart and pressed together. This known injection syringe has the disadvantage that the plunger is composed of several individual parts. By way of this the manufacturing as well as assembly costs are unnecessarily high. Furthermore it is difficult to place together the carrier ring, plunger head and plunger extension without at the same time bending off the stoppers.

US-A-4,950,240 likewise discloses an injection syringe whose plunger is preferably manufactured of rubber and comprises a hollow space open at the top. An annular planar beam plate with two radialy inwardly directed beams connected to this beam plate via joint locations is placed on the plunger head such that the beams partly cover the

opening of the hollow space. On the inner side of the opening there is located a flat, cylindrical reactor head which by way of a long cylindrical reactor shank is inserted into the opening of a breaking ring attached on the underside of the drive shank. At the same time the reactor shank is led through a central opening between the beams of the beam plate. A disadvantage of this known injection syringe is to be seen in that again several parts must be manufactured and put together. The manufacturing and assembly costs of such a syringe are relatively high. Above all there exists the danger that on putting together the individual parts the beams on the beam plate bend or break off. It is even questionable whether the at least four required parts in practice may also actually be put together.

In US-A-5,163,908 there is known a further injection syringe. On the upper side of the plunger head there is attached a cone on whose tip there is seated a receiver with a ball-shaped end. The front end of the shank is by way of radially outwardly running incisions divided up into several segements bearing tightly on one another. In the middle of the front end there is admitted a central opening which accommodates the receiver with the ball-shaped end. On injecting, the front end of the shank is pressed against the cone and at the same time disintegrates into a multitude of individual segments. A disadvantage of this injection nozzle lies in the fact that for the manufacture of the plunger there are required several parts and the manufacturing costs are correspondingly high. Furthermore the shank described in the application is not manufacturable with the injection moulding method.

Summary of the Invention

It is the object of the present invention to develop an injection syringe such that after the use for the first time a renewed drawing-in of fluid is impossible.

Advantageous formations of the invention are defined in the dependent claims.

The plunger head designed according to the invention during the injection or at the latest at the end of the injection procedure breaks from the plunger rod and may no longer be retracted. It remains stuck in the syringe cylinder.

In the embodiment of the syringe according to the invention with webs which lie in a surface area of a truncated cone, the breaking load may be designed differently large depending on the displacement direction of the syringe plunger. This permits the drawing up of the fluid without running the danger that the webs break. With the subsequent injection on the other hand the webs break already with a small pushing force, for example 7 - 10 Newtons. This does not compromise the function of the syringe since the syringe contents may still be ejected. The shank end displaces the plunger in any case to the front. The shank end then bears on the sealing cap which covers the bore.

The manufacture of the syringe, i.e. of the cylinder and of the plunger and, if the plunger comprises a rubber seal, also of the rubber cap is inexpensive since only two or three parts need to be manufactured and assembled.

Brief Description of the Drawings

By way of illustrated embodiment examples the invention is described in more detail. There are shown in

Figure 1 a perspective representation of a disposable syringe with a partly inserted plunger head,

Figure 2 a longitudinal section through a syringe with a plunger head located in the start position,

Figure 3 a cross section through the plunger head and the shank end along line III-III in Fig. 2,

Figure 4 a longitudinal section through the plunger head

Figure 5 a longitudinal section through the syringe with a completely advanced plunger head which is separated from the shank,

Figure 6 a longitudinal section through the plunger head in a further formation of the invention,

Figure 7 a longitudinal section through the plunger head in a further formation of the invention,

Figure 8 a longitudinal section through a syringe with a plunger head located in the starting position, without an additional sealing cap,

Figure 9 a plan view of a plunger of a further embodiment form of the invention.

Detailed Description of the Preferred Embodiments

In the perspective overview representation according to Figure 1 there is indicated a disposable syringe with the reference numeral 1. This comprises a syringe cylinder 3 with a coupling device for an injection needle (not placed on), e.g. a needle cone 5, as well as two radially protruding grip plates 7. In the syringe cylinder 3 there

is shown a syringe plunger 9 which is partly advanced and on whose front shank end there is placed on a plunger head 11 and on whose rear shank end there is formed a thumb rest 13. Beween the plunger head 11 and the thumb rest 13 there lies a shank 15 which has for example a cross-shaped cross section. The two main parts, the syringe cylinder 3 and the syringe plunger 9 are manufactured of plastic by injection. In the piston head 11 there is admitted an axially running bore 17 which passes through the plunger head 11 completely (cf. Figs. 2 to 7) or only partly (Figs. 8 and 9). A preferably cap-shaped seal 19 surrounds in the first embodiment form the plunger head 11 peripherally and its end-face base surface. The cap-shaped seal 19 extends over at least one part of the periphery 20 of the sealing plunger 11 and here lies embedded within a circumferetial shoulder (cf. Figure 5). The cross-shaped shank 15 at least in the front section has a diameter which is smaller than the diameter of the bore 17.

In one formation of the invention on the end of the shank 15 there is seated a disk 25 whose diameter is equal or larger than the diameter of the beam 23 of the shank 15, but smaller than the diameter of the bore 17.

Between the periphery of the disk 25 or the front shank section 27 preferably having a smaller thickness and the bore 17 there results a gap 28.

The connection between the shank section 27 or the disk 25 and the plunger head 11 is effected by fine, thread-like, rodlet-like or film-like webs 29 which extend radially from the beam 23 on the shank section 27 or from the periphery of the disk 25 radially onto the walling of the bore and are conneted to this. The connection of the webs 29 which in cross section are round or polygonal may

be effected at the end of the bore 17 or axially displaced in the inside of this bore. The strength of the webs 29 is dimensioned in a manner such that on exceeding a predeterminable axial force, e.g. 10N they are sheared off from the shank 15 or the disk 25. A more detailed explanation of this procedure is made with the desription of the function.

In the plunger-swept space of the syringe plunger 3 at a distance to the syringe cylinder base, which is larger than the axial extension of the plunger head 11, there may be formed a circumferential bulge 33 which projects into the plunger-swept space of the cylinder 3 and thus into the displacement path of the plunger head 11 and which reduces its cross section. The radial extension of the bulge 33 is very slight and depends on the diameter of the syringe cylinder 3.

In the formation of the invention according to the Figures 6 and 7 the webs 29 have a rectangular cross section wherein the first edge 37, of the webs, which is proximal to the plunger head base runs inclined. The second edge 39 distant to the plunger head base may run parallel to the plunger head base or parallel to the first edge 37. The connecting regions of the webs 29 on the plunger head 11 and on the shank section 27 or on the disk 25 seated on the shank section 27 may run parallel or - as is represented in the examples in the Figures 6 and 7 - the bore 17 in the region of the webs 29 may have a conically running section 39. Analogously also the periphery of the disk 25 may be designed running conically, i.e. the disk 25 has the shape of a truncated cone (Fig. 6).

In the formation of the invention according to Figure 8, on the plunger head 11 there is attached no additional

elastic seal, but the plunger head 11 bears with its periphery directly on the walling of the syringe cylinder 3. The shank section 27 is in turn connected to the plunger head 11 by way of fine webs 29, wherein in the plunger head 11 there is formed a pocket bore 17 into which the shank section 27 after breaking the webs 29 may move and abut on the base 28.

In the formation of the invention according to Figure 9 at the shank end again there is shown a plunger head 11 which directly with its periphery sealingly bears on the walling of the syringe cylinder. The connection between the plunger head 11 which here is designed disk-shaped, and the shank section 27 is effected by way of for example three feet 30 which on the one side are rigidly connected to the disk-shaped part of the sealing head 11 and on the other side in each case by way of a web 39 to the front end of the shank section 27 or to the disk 25. Preferably the length of the feet 23 corresponds to the distance of the disk 25 from the lower end of the upper part of the shank 15.

In the following the manner of functioning of the disposable syringe 1 is explained in more detail.

At the manufacturer's the syringe 1 after the injection moulding of the individual parts with the three-part design the seal 19 is placed over the plunger head 11 and subsequently the syringe plunger 9 is inserted into the syringe cylinder 3, and specifically only so far so that the seal 19 does not yet project into the bulge 33, i.e. the two parts do not contact. The insertion of the syringe plunger 9 into the syringe cylinder 3 is effected usually by way of an assembly and handling apparatus so that the position of the syringe plunger may be exactly adjusted. In

the formation of the invention according to Figures 8 and 9 which make do without the sealing cap 19, after the manufacture of the syringe plunger 9 this is directly inserted into the syringe cylinder 3. The insertion however is effected only until the front end of the plunger head has reached the start of the conical region A (see Figure 8), inasmuch as the syringe cylinder 3 is equipped with a region A having a cone angle alpha. With a continuous cylindrical syringe cylinder 3 the plunger 9 may be advanced up to the plunger base 4.

The user of the syringe fills this in a conventional manner in that he retracts the syringe plunger 7. After the bleeding by blowing out the air in the front part of the syringe cylinder 3, the injection is effected, wherein the plunger head 11 for the complete emptying is advanced up to the abutment at the base 4 on the needle-side end of the syringe cylinder 3. With the last millimetres of the advance with the traversing of the bulge 33, if one is provided, or with the traversing into the conical region A and/or with the pressing out of the last remains of the fluid on account of the increased resistance, the webs 29 break and the shank 15 slides in the bore 17 or between the feet 30 (Fig. 9) forwards and abuts on the base 28 of the bore 17 or the feet 30 at the end of the shank.

The plunger head 11 may thus be securely advanced up to the end of the plunger-swept space at the base 4 of the syringe cylinder 3 although the webs 29 are broken.

A renewed drawing of fluid is ruled out. The disposable syringe 1 is thus made unusable.

What is claimed is:

1. A single-use syringe, comprising:

an elongated tubular barrel having an open first end portion and a second end portion arranged to support a needle;

a plunger reciprocably received in and defining with said barrel a variable-volume fluid-receiving chamber adjacent said second end portion of the barrel;

an elongated shank having a distal end adjacent said plunger and a manually shiftable proximal end at the first end portion of said barrel; and a coupling connecting said plunger with said distal end of said shank, said coupling including an array of circumferentially spaced-apart breakable spokes each of which is of one piece with said plunger and with said distal end of said shank.

2. The syringe of claim 1, wherein said spokes are arranged to break in response to movement of said shank toward said second end portion of said barrel to thus cause said plunger to expel fluid from said chamber through the needle at said second end portion of the barrel.

3. The syringe of claim 2 wherein, upon breakage of said spokes, said distal end of said shank is movable (a) against said plunger to move the plunger toward the second end portion of said barrel, and (b) away from said second end portion of said barrel and away from said plunger.

4. The syringe of claim 3, wherein said plunger has a recess which is arranged to receive said distal end of said shank upon breakage of said spokes in response to further movement of said shank toward said second end portion of said barrel.

5. The syringe of claim 4, wherein said recess is a circular recess having a first diameter and said distal end of said shank has a second diameter less than said first diameter so that said distal end can enter said recess upon breakage of said spokes.

6. The syringe of claim 3, wherein said plunger has projections, at least one for each of said spokes and each integral with the respective spokes at least prior to breakage of said spokes.

7. The syringe of claim 6, wherein said projections are of one piece with said plunger and extend in said barrel in a direction away from said second end portion of said barrel.

8. The syringe of claim 1, wherein said spokes extend from said shank at least substantially radially outwardly toward said plunger.

9. The syringe of claim 1, wherein said distal end of said shank includes a disc and said spokes extend at least substantially radially outwardly of and from said disc toward said plunger.

10. The syringe of claim 1, wherein at least one of said spokes has surfaces which converge toward each other radially outwardly of said shank and toward said plunger.

11. The syringe of claim 1, wherein the areas of contact of said spokes with said plunger are smaller than the areas of contact of said spokes with said distal end of said shank.

12. The syringe of claim 1, wherein said spokes form part of a hollow conical frustum.

13. The syringe of claim 1, wherein said plunger has a recess and said spokes are disposed in said recess not later than upon breakage of said spokes in response to further movement of said shank toward said second end portion of said barrel.

14. The syringe of claim 1, wherein said plunger is spaced apart from said distal end of said shank and said spokes are elongated and extend longitudinally of the shank between said distal end and said plunger.

15. The syringe of claim 1, wherein said plunger has a recess and a conical surface bounding said recess, said conical surface being connected with said spokes at least prior to breakage of the spokes.

16. The syringe of claim 1, wherein said plunger includes a first portion connected with the distal end of said shank by said spokes, and a second portion at least partially surrounding said first portion and sealingly engaging said barrel.

17. The syringe of claim 16, wherein said second portion of said plunger is cup-shaped.

18. The syringe of claim 1, wherein said barrel has an internal surface including a first portion offering a first resistance to movements of said plunger toward and away from said second end portion of said barrel, and at least one second portion offering a greater second resistance to said movements of said plunger.

19. The syringe of claim 18, wherein said at least one second portion of said internal surface is provided on an annular internal constriction of said barrel, said at least one constriction at least partially surrounding said shank.

20. The syringe of claim 1, wherein said barrel has an internal surface along which said plunger is slidable toward and away from said second end portion of the barrel, said internal surface having an at least substantially frustoconical portion adjacent to and tapering toward said second end portion of said barrel to offer a progressively increasing resistance to movement of said pluger toward said second end portion of said barrel.

21. The syringe of claim 1, wherein said barrel is a one-piece extrusion.

22. The syringe of claim 1, wherein said shank, said spokes and at least a portion of said plunger constitute a one-piece extrusion.

23. The syringe of claim 1, wherein at least a portion of said plunger consists of a resilient material.

24. The syringe of claim 1, wherein at least a portion of said shank has an at least substantially cruciform cross-sectional outline.

25. The syringe of claim 1, further comprising means for preventing tilting of said plunger in said barrel.

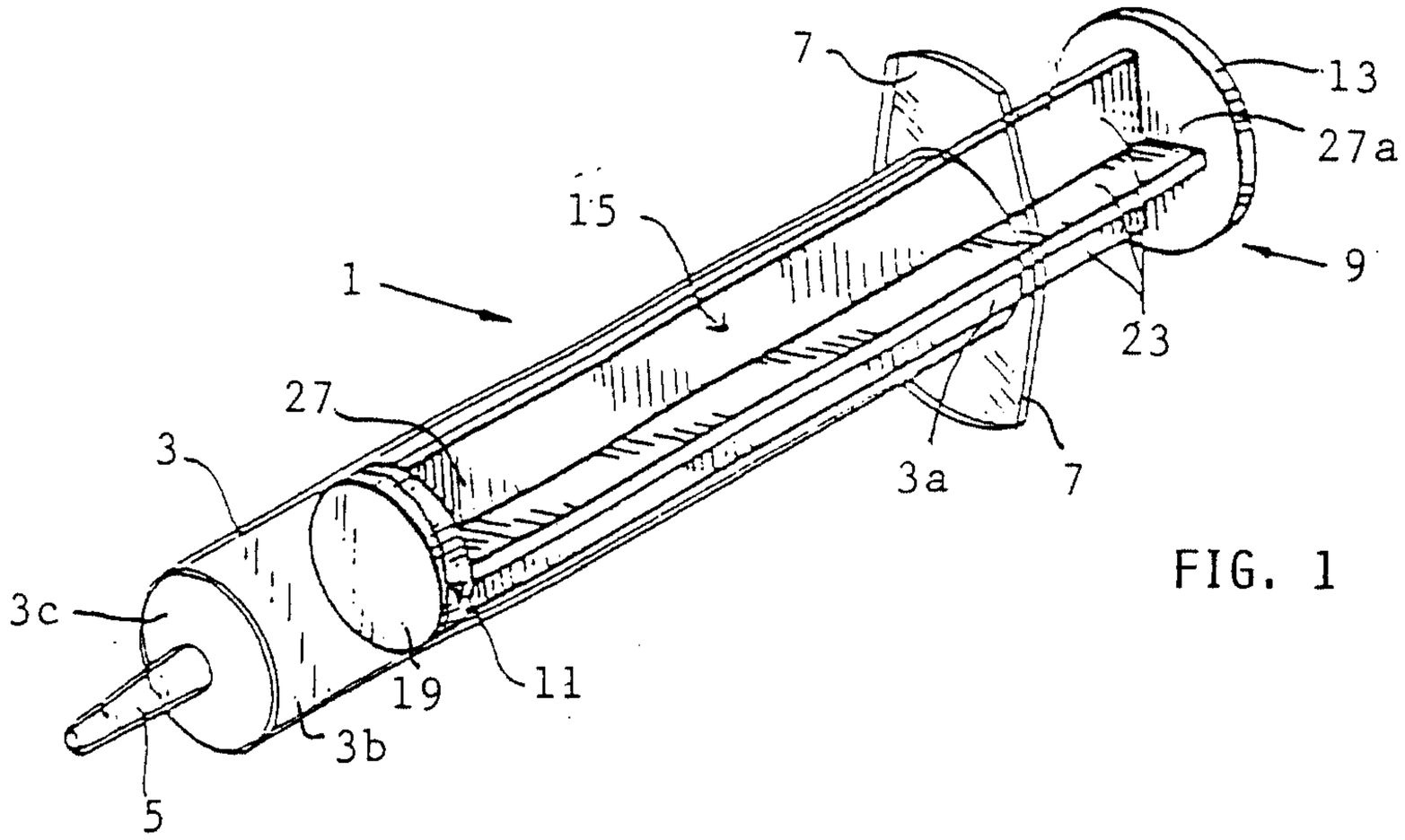


FIG. 1

FIG. 3

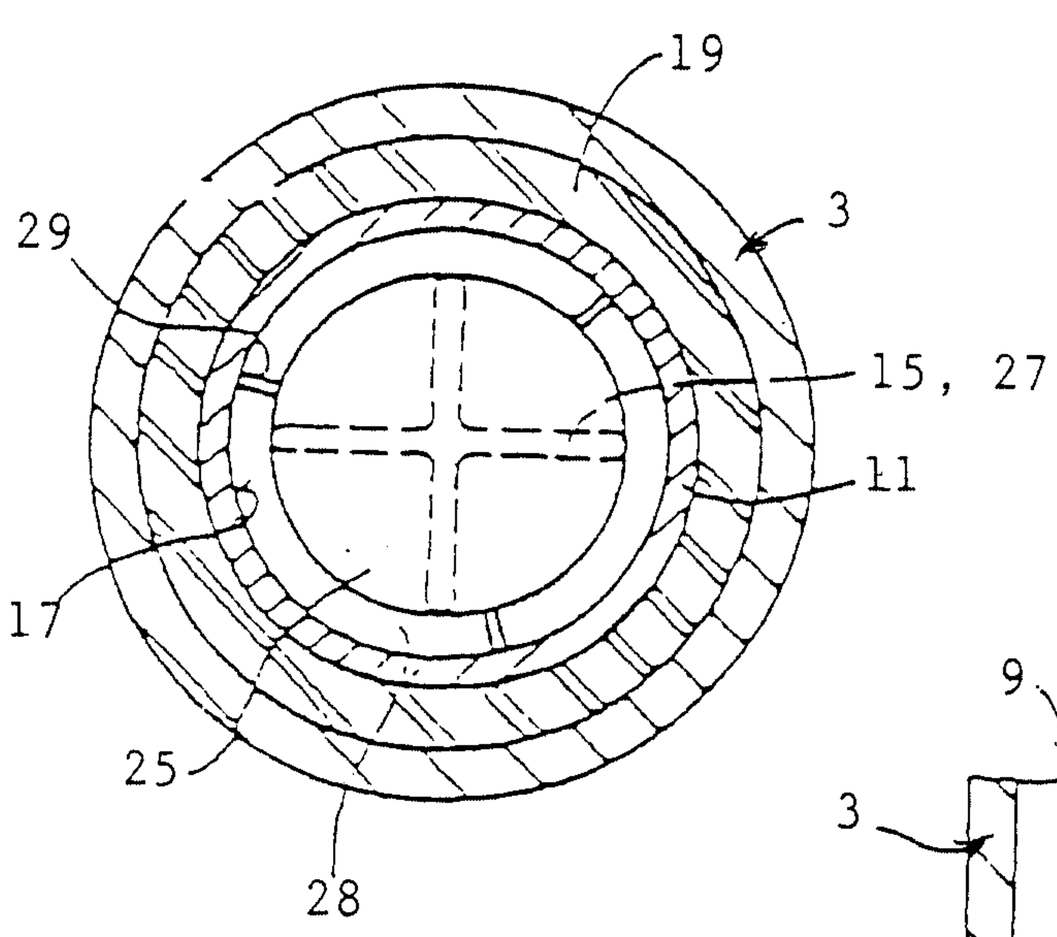
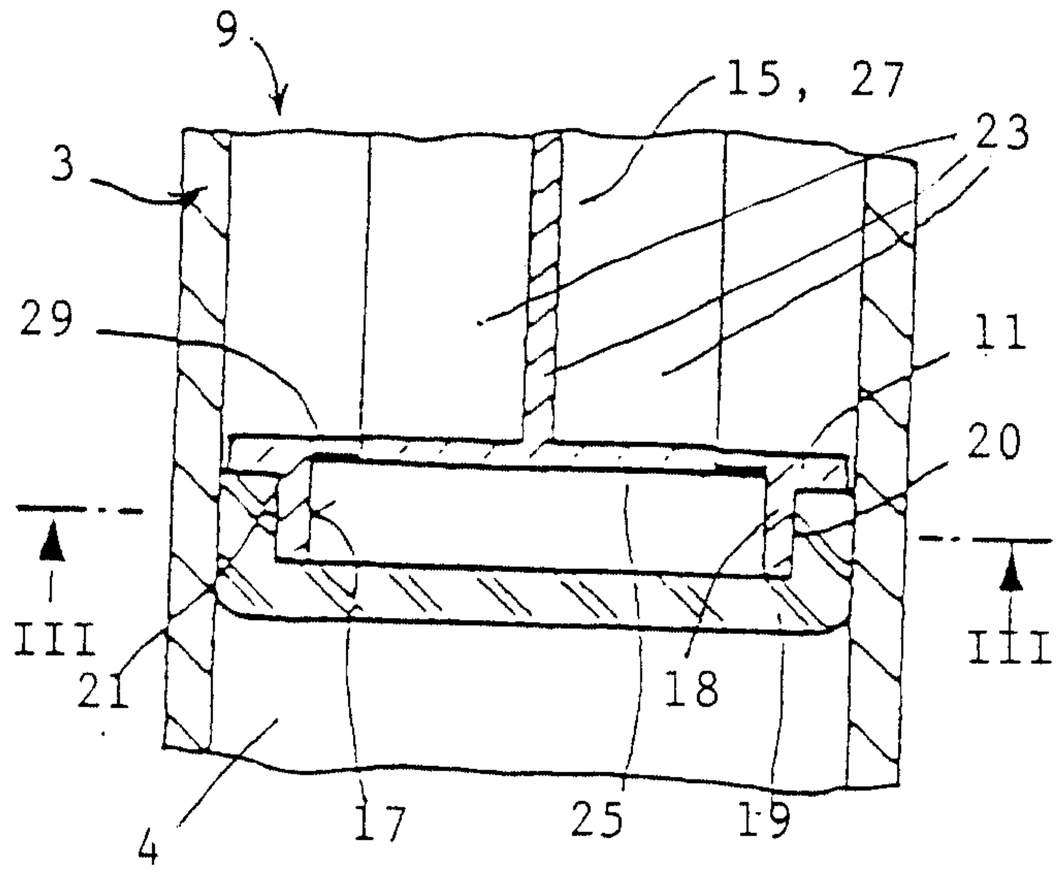
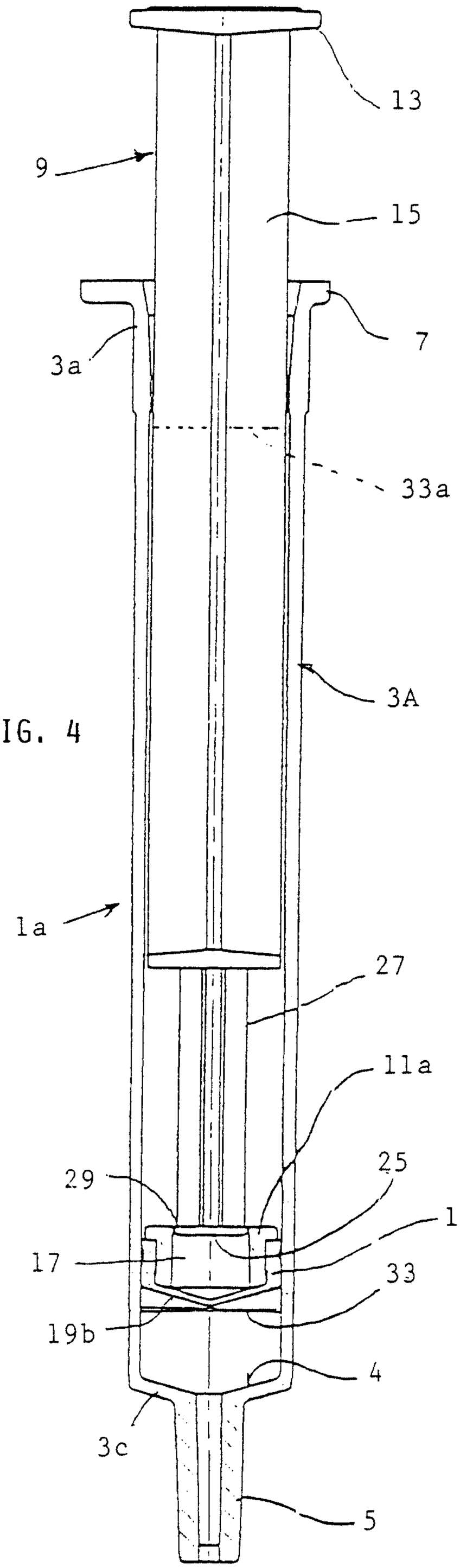


FIG. 2

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9
15
7
3a
33a
3A
1a
27
11a
29
25
19a
17
33
19b
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3c
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FIG. 4

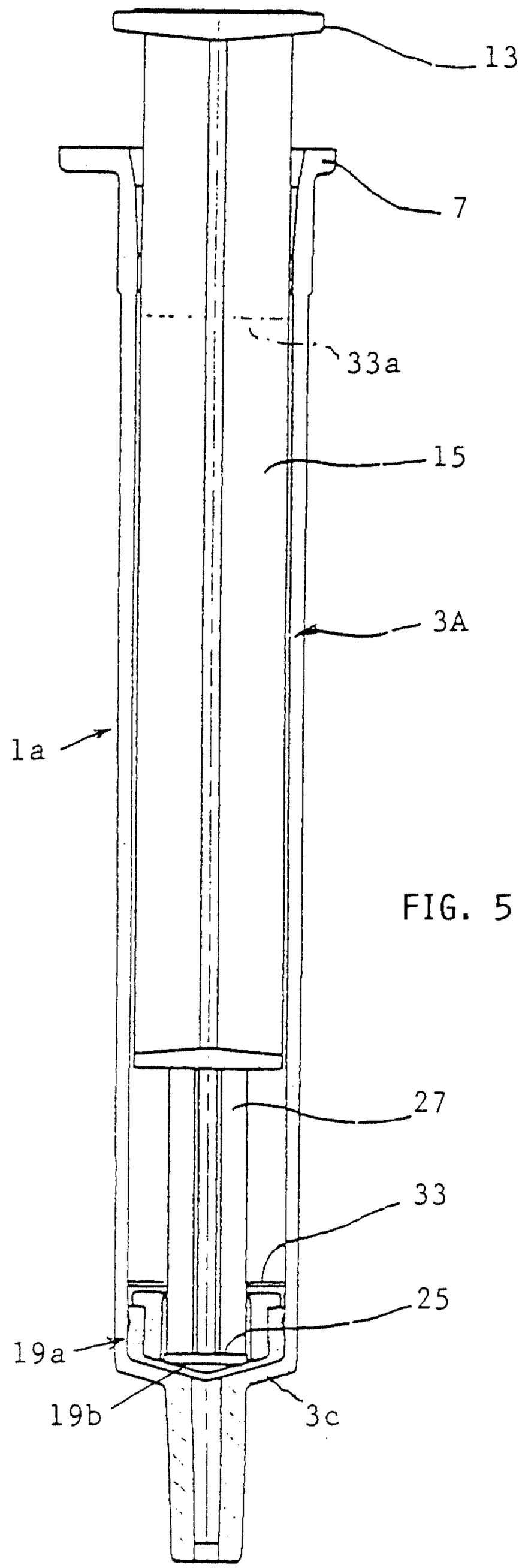
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FIG. 5

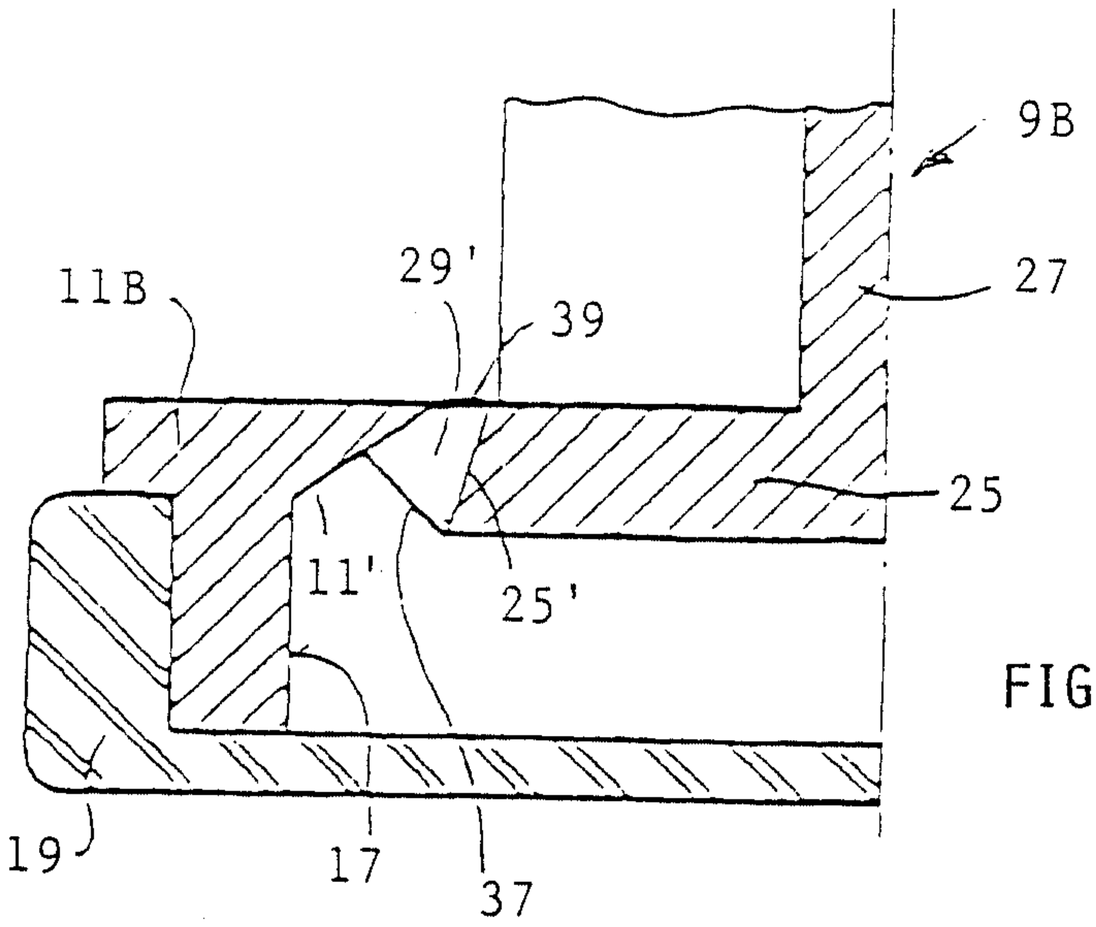

FIG. 6

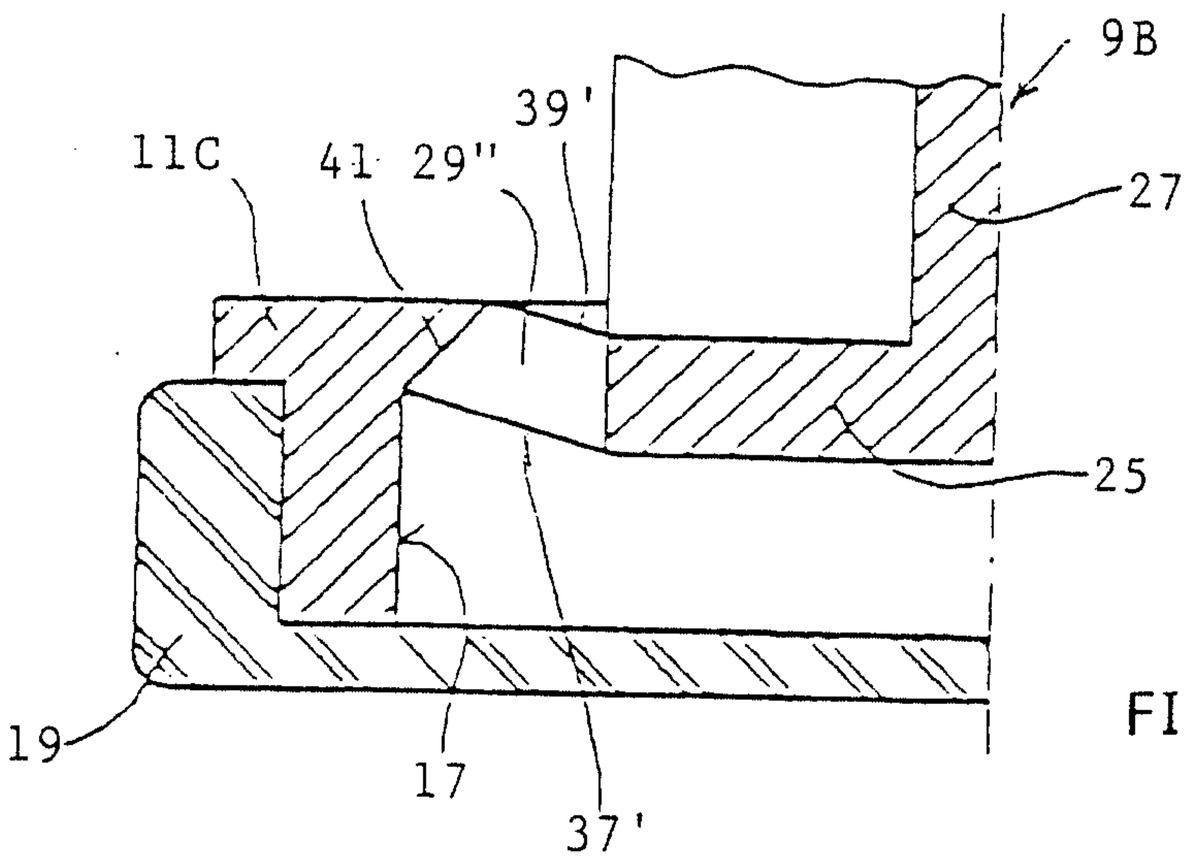

FIG. 7

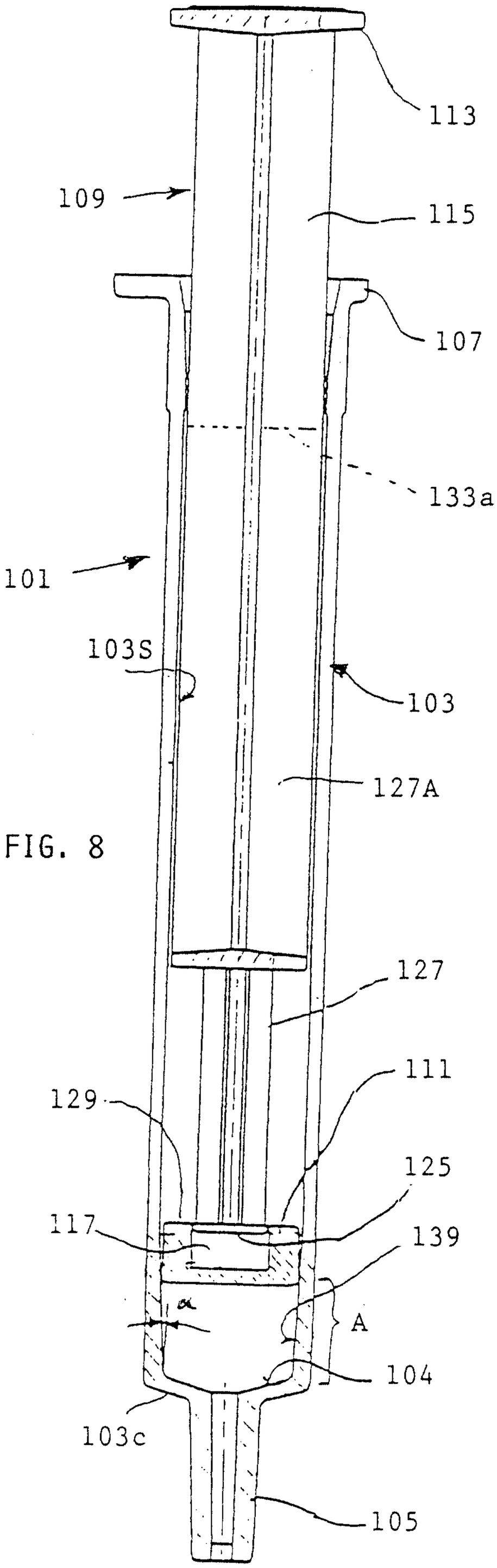
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FIG. 8

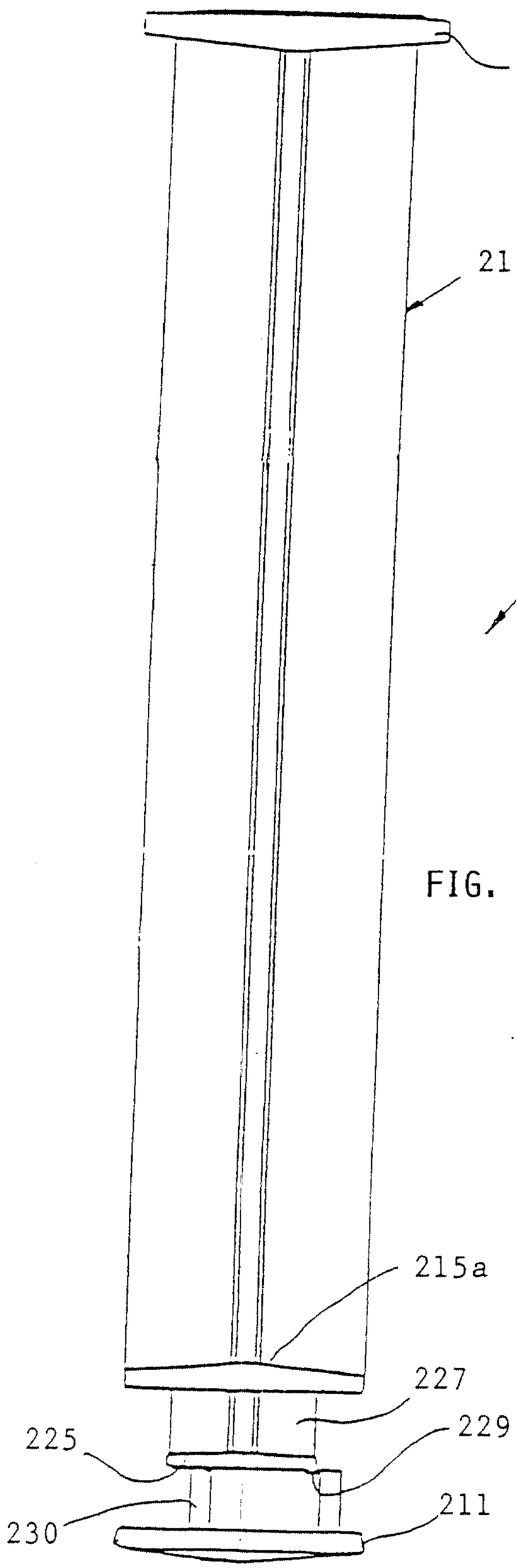
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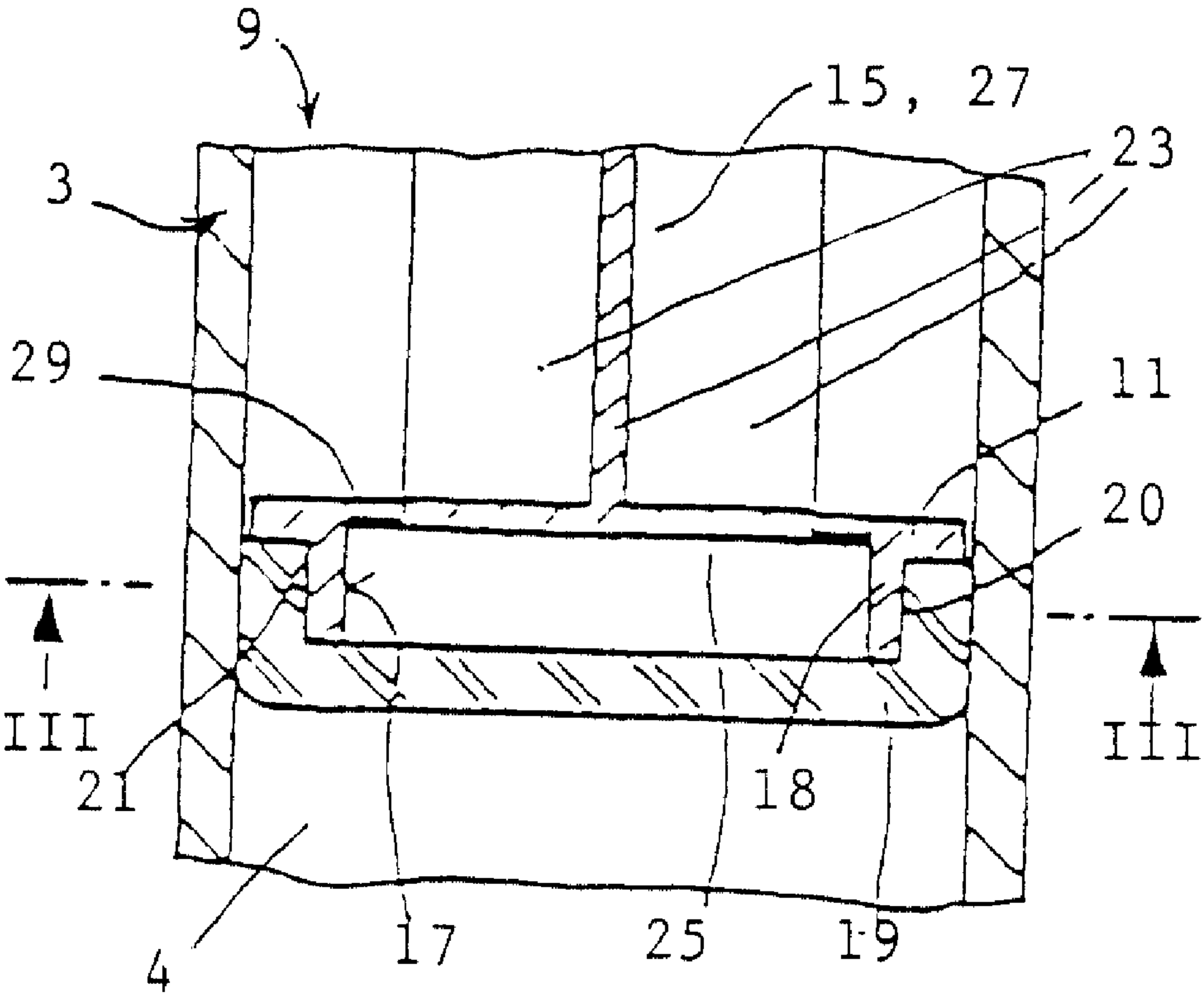
FIG. 9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