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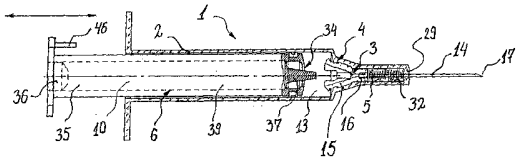
(54) Title: A RETRACTABLE NON-REUSABLE SYRINGE



(57) Abstract: A retractable non-reusable syringe (1) includes an elongate tubular container (2), a needle assembly (3), releasable locking means (4) for the needle assembly, resilient bias means (5) operable on the needle assembly, and a plunger (6) slidably disposed within the container. The container has an open front end (29), an open back end (10) and an inner surface (12) defining a chamber (13) to contain a liquid to be injected. The needle assembly includes a needle (14) having a support end (15) and a penetrating end (17), and a needle holder (15) having a distal end (21) adapted to support the needle and a proximal end (22). The needle assembly is movable between a projecting configuration wherein the penetrating end of the needle projects forwardly from the front end of the container and a retracted configuration wherein the penetrating end of the needle is enclosed within the chamber. The releasable locking means (4) are adapted to retain the needle assembly in releasable locking engagement with the front end of the container in the projecting configuration and maintain sealed fluid communication between the needle and the chamber. The resilient bias means are disposed to urge the needle assembly toward the retracted configuration. The plunger has a forward actuating end (34) sealingly engageable with the inner surface of the container, and a rear end (35). The actuating end is adapted for sealing engagement with the proximal end of the needle holder and is adapted to disengage the releasable locking means. The syringe is sequentially operable in a drawing mode, an injection mode, a transition mode and a retraction mode. In the drawing mode, liquid is drawn through the needle into the container in response to rearward withdrawal of the plunger. In the injection mode, the holder is sealingly and releasably engaged with the front end of the container with the needle in the projecting configuration and in fluid communication with the chamber such that depression of the plunger progressively injects the liquid from the container. In the transition mode, the actuating end of the plunger at a predetermined position of forward displacement sealingly engages the proximal end of the holder and disengages the locking means to release the holder. In the retraction mode, the resilient bias means effect withdrawal of the needle assembly into the retracted configuration within the container to prevent reuse.

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TITLE:

A RETRACTABLE NON-REUSABLE SYRINGE

FIELD OF THE INVENTION

The present invention relates generally to syringes, and more particularly to a disposable, retractable, non-reusable syringe.

BACKGROUND OF THE INVENTION

The following discussion of the prior art is provided to enable the invention to be placed in an appropriate technical context and allow the advantages of it to be more fully appreciated. However, statements about the prior art should not be construed as express or implied admissions that such art was widely known or formed part of common general knowledge in the relevant field at the priority date.

Disposable syringes have been known for some time. These are typically manufactured from relatively inexpensive plastics materials, and are adapted to be discarded after a single use to prevent cross-contamination. One problem with syringes of this type is that they are present a significant health risk because of the potential for accidental needle sticks, which may be suffered by medical personnel, sanitation employees, and others involved in the administration and disposal of such syringes. They also pose a risk to the general public when discarded carelessly or inappropriately, as often occurs in the context of illicit drug use. These issues have increased in significance with the proliferation of AIDS, hepatitis and other serious infectious diseases.

In an attempt to minimise these problems, retractable syringes have been developed. These typically incorporate some form of retraction mechanism whereby the needle is withdrawn into the body of the syringe after use, to minimise the risk of accidental needle sticks. These too, however, have suffered from disadvantages. In particular, the retraction mechanisms hitherto known have tended to be relatively complex and expensive. Cost in particular has been found to be a significant impediment to widespread adoption, in both mainstream medical practice and among drug users.

Known retraction mechanisms have also tended to be unreliable. In some cases, they inadvertently allow the needle to remain protruding after use with the

consequential risk of contamination through needle sticks, or allow the syringe to be reused with the possibility of cross contamination. Some retraction designs also rely heavily on the user to initiate operation of the retraction mechanism. Illicit drug users can intentionally fail to activate the retraction mechanism, if a replacement syringe is not readily available, which is often the case. Another problem with some syringe designs of this nature is that a small and residual amount of liquid remains within the syringe after use, which again tends to act as a disincentive to use by drug addicts. A further problem with most known retraction mechanisms is that they do not adequately seal the needle during the retraction stage, which may be initiated, intentionally or otherwise, with the needle still in contact with the patient. This gives rise to the possibility of injection of air bubbles, with potential for medical complications for the recipient.

It is an object of the present invention to provide a retractable non-reusable syringe, which overcomes or substantially ameliorates one or more of the disadvantages of the prior art, or at least provides a useful alternative.

DISCLOSURE OF THE INVENTION

According to the invention there is provided retractable non-reusable syringe including an elongate tubular container, a needle assembly, releasable locking means for the needle assembly, resilient bias means operable on the needle assembly, and a plunger slidably disposed within the container,

the container having an open front end, an open back end and an inner surface defining a chamber to contain a liquid to be injected,

the needle assembly including a needle having a support end and a penetrating end, and a needle holder having a distal end adapted to support the needle and a proximal end, the needle assembly being movable between a projecting configuration wherein the penetrating end of the needle projects forwardly from the front end of the container and a retracted configuration wherein the penetrating end of the needle is enclosed within the chamber,

the releasable locking means being adapted to retain the needle assembly in releasable locking engagement with the front end of the container in the projecting configuration and maintain sealed fluid communication between the needle and the chamber,

the resilient bias means being disposed to urge the needle assembly toward the retracted configuration,

the plunger having a forward actuating end sealingly engageable with the inner surface of the container, and a rear end, the actuating end being adapted for sealing engagement with the proximal end of the needle holder and being adapted to disengage the releasable locking means,

the syringe being sequentially operable in a drawing mode, an injection mode, a transition mode and a retraction mode, whereby

in the drawing mode, liquid is drawn through the needle into the container in response to rearward withdrawal of the plunger,

in the injection mode the holder is sealingly and releasably engaged with the front end of the container with the needle in the projecting configuration and in fluid communication with the chamber such that depression of the plunger progressively injects the liquid from the container,

in the transition mode the actuating end of the plunger at a predetermined position of forward displacement sealingly engages the proximal end of the holder and disengages the locking means to release the holder, and

in the retraction mode the resilient bias means effect withdrawal of the needle assembly into the retracted configuration within the container to prevent reuse.

Preferably, in the transition mode the actuating end of the plunger engages the proximal end of the holder sealingly and lockingly such that in the retraction mode the supporting end of the needle is closed off and positively sealed.

Preferably also, during disengagement of the releasable locking means, the actuating end of the plunger breaks the needle holder.

Also preferably, during disengagement of the releasable locking means the actuating end of the plunger breaks the needle holder.

Preferably, the plunger includes an internal cavity adapted to accommodate and captively retain the needle assembly in the retracted configuration. Even more preferably, the plunger includes a front wall including a first line of weakness disposed such that upon release of the needle holder, the bias means force the needle holder to break an opening in the front wall of the plunger defined by the first line of

weakness, so as to move the needle irreversibly into the retracted configuration within the cavity.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a cross-sectional side elevation showing a syringe, according to the invention;

figure 2 is a partially cutaway view showing the tubular body of the syringe from figure 1;

figure 3 is an end view of the tubular body shown in figure 2;

figure 4 is a cross-sectional view of the tubular body taken along line A of figure 2;

figure 5 is an enlarged cross-sectional view showing the front end of the tubular body of the syringe, from within line A of figure 2;

figure 6 is an enlarged cross-sectional side view showing the syringe of figure 1 in the injection mode;

figure 7 is an enlarged cross-sectional side view similar to figure 6, showing the syringe in the transition mode;

figure 8 is an enlarged cross-sectional side view similar to figures 6 and 7, showing the syringe in the retraction mode;

figure 9 is an enlarged perspective view showing the tip of the needle of the syringe;

figure 10 is another enlarged view showing the tip of the needle, from an alternative perspective;

figure 11 is a partially sectioned side elevation showing the plunger from the syringe of figure 1;

figure 12 is an end view of the plunger shown in figure 11;

figure 13 is an enlarged cross-sectional side view showing the actuating end of the plunger from within line "A" of figure 11;

figure 14 is an enlarged end view of the annular sealing member from the actuating end of the plunger;

figure 15 is a cross-sectional view of the sealing member taken along line 15-15 of figure 14;

figure 16 is an enlarged end view of the needle holder from the syringe shown in figure 1;

figure 17 is a cross-sectional side view of the needle holder, taken along line 17-17 of figure 16; and

figure 18 shows a further enlarged cross-sectional view of the remote end of the needle holder from within line "A" of figure 17.

PREFERRED EMBODIMENT OF THE INVENTION

Referring to the drawings, the invention in broad overview provides a retractable non-reusable syringe 1 including an elongate container 2, a needle assembly 3, releasable locking means 4 for the needle assembly, resilient bias means 5 operable on the needle assembly, and a plunger 6 slidably disposed within the container.

The container comprises a generally cylindrical body 7, a frustoconical front end 8, and a tubular nozzle 9 extending forwardly from the front-end, as best shown in figures 1 and 2. The back end 10 of the cylindrical body is open and adapted to receive the plunger 6. It also includes an abutment formation 11 to facilitate single-handed manipulation of the syringe. The inner surface 12 of the tubular body 7 defines a chamber 13 to contain a liquid (not shown), typically dawn from an ampule for injection, or drawn from a patient for testing.

The needle assembly 3 includes a needle 14 and a needle holder 15. As best shown in figures 6 to 8, the needle has a support end 16 and a penetrating end 17 adapted for penetrating the membrane of an ampoule or the body of the patient. The penetrating end terminates at a peripheral edge 18 defining a concave virtual surface at the outlet 19 of the needle, as best shown in figure 9. The peripheral edge is bevelled so as to define a chisel-like tip 20 at the extremity of the penetrating end of the needle. The needle holder 15 has a distal end 21 for supporting the needle and a proximal end 22 adapted for engagement by the plunger as described in more detail below. An outer surface 23 on the needle holder and a mating inner surface 24 on the front end 8 of the container are correspondingly tapered to facilitate the sealing engagement between these components. The proximal flared end 22 of the needle

holder 15 includes a flared section 25, an outwardly directed peripheral gripping rim 26, a pair of elongate slots 27 extending axially along opposite sides, and a line of weakness in the form of a circular groove 28 linking the bases of the slots. These features facilitate engagement with the actuating end of the plunger 6, as described more fully below.

The needle assembly is movable between a projecting configuration, as best illustrated in figures 1 and 6, and a retracted configuration, as best illustrated in figure 8. In the projecting configuration, the needle holder 15 is disposed generally within the frustoconical end 8 of the container, and the penetrating end 17 of the needle projects forwardly from the tip 29 of the nozzle. In this configuration, the respective, correspondingly tapered engagement surfaces 23 and 24 on the needle holder and the container prevent leakage, while the support end of the needle is positionally stabilised and sealed by the nozzle. In the retracted configuration, the needle assembly including the penetrating end of the needle is safely enclosed within the chamber 13.

The releasable locking mechanism 4 includes a forwardly and inwardly directed circumferential stopper flange 30 formed on the inner surface 12 of the container, and a complementary rearwardly and outwardly directed abutment shoulder 31 formed on an outer surface of the needle holder 15. The stopper flange and the abutment shoulder are releasably engageable to retain the needle assembly 3 in the projecting configuration.

The resilient bias means 5 take the form of a coil spring 32, which at least in the projecting configuration, is disposed concentrically around the needle 14 and coaxially between the tip of the nozzle and the remote end of the needle holder 15. The biasing force of the spring urges the needle assembly 3 toward the retracted configuration. The spring 32 is designed not to force the needle holder over the stopper flange 30 during normal injection.

The plunger 6 is best illustrated in figures 11 to 13. It includes a generally cylindrical body 33, a forward actuating end 34, and a rear end 35 incorporating a sealed closure element in the form of cap 36. The actuating end includes a frustoconical tongue 37 adapted for sealing engagement with the proximal end 22 of the needle holder, which is correspondingly flared for optimum sealing characteristics.

The actuating end 34 also includes an inwardly directed circumferential gripping jaw 38 disposed around the tongue and complementary to the peripheral gripping rim 26 on the proximal end of the needle holder 15. By this means, the gripping jaw and the gripping rim are interengageable to apply an inwardly directed circumferential pressure to the proximal end of the needle holder sufficient to break it. The body of the plunger includes an internal cavity 39 adapted to accommodate and captively retain the needle assembly 3 in the retracted configuration.

The front wall 40 of the forward actuating end 34 of the plunger includes a peripheral groove 41 disposed to define a line of weakness along the periphery of the base of the sealing tongue 37. It should be appreciated that the line of weakness, defined here by a grooves, may alternatively be defined by series of indentations, a frangible membrane, or other suitable means.

The actuating end of the plunger further includes a peripheral locating groove 42 and a sealing member 43 mounted in the groove for slidable sealing engagement with the inner surface of the container. The sealing member includes two peripheral sealing lips 44, each with a concave outer bearing surface 45, as best shown in figures 14 and 15. The bearing surfaces on the respective sealing lips are oriented toward one another to facilitate smooth, leakage-free operation during axial displacement of the plunger in either direction. The base of the rear end 35 of the plunger includes a forwardly projecting breakable tab 46 to prevent inadvertent engagement of the actuating end of the plunger with the needle holder.

Turning now to describe the operation of the syringe, in an initial storage configuration, the plunger is forwardly depressed into a position where the protecting tab abuts the projection on the back end of the tubular body of the syringe. This maintains a predetermined minimum distance between the actuating end of the plunger 6 and the needle holder 15. In this configuration, the needle holder is sealingly and releasably engaged with the front end of the container, with the needle in the projecting configuration being in fluid communication with the chamber. The syringe is intended for use either to draw liquid from an ampoule for injection as medication into a patient, or to draw liquid such as blood from a patient for testing. The functionality in both cases is substantially identical but will be described here

with reference to the former scenario, which involves use of the syringe sequentially in a drawing mode, an injection mode, a transition mode and a retraction mode.

In the drawing mode, the tip of the needle in the projecting configuration is used to penetrate the membrane of the ampoule (not shown), following which withdrawal of the plunger draws liquid from the ampoule through the needle into the chamber of the container 2, in conventional manner. The needle is then withdrawn from the ampoule, the air bubbles are removed, and the tip of the needle is inserted so as to penetrate the body tissue of the patient where required for the injection. During this process, the particular structure of the tip of the needle can substantially reduce the damage to the skin caused by insertion of the needle. This is because the chisel-like tip of the needle, as best illustrated in figures 9 and 10, cuts only a small section of skin (not shown) which is then lifted to allow the penetration of the needle. Upon withdrawal of the needle this skin "flap" covers the damaged area to allow expeditious healing.

In the subsequent injection mode, depression of the plunger progressively injects the liquid from the container into the patient. It is important to note here that the line of weakness defined by the peripheral groove 41 on the forward end of the plunger has a break point sufficiently high to withstand pressures well above those usually generated during the drawing or injection modes. At or near the end of the injection phase, the transition mode is approached at a predetermined position of forward displacement of the plunger. At this point, the protecting tab 46 on the plunger engages the abutment formation at the base of the tubular body of the syringe, to prevents inadvertent initiation of the transition mode. The tab must therefore be removed manually if this mode is required.

Once the tab is removed, further forward displacement of the plunger triggers the transition mode. In this mode, as best shown in figure 7, the sealing tongue 37 at the actuating end of the plunger sealingly engages the correspondingly flared proximal end 22 of the needle holder. At the same time, the gripping jaw 38 engages the gripping rim 26 and applies an inwardly directed circumferential pressure to the proximal end of the needle holder. The line of weakness defined by the groove 41 has a breaking point such that the inwardly directed circumferential pressure applied at this stage is sufficient to break the holder. The abutment shoulder 31 of the holder is

thereby moved out of supporting engagement with the stopper flunge 30, as a result of which the locking mechanism is effectively released and the needle assembly disengaged from the front end of the tubular body of the syringe. The release of the needle assembly at the conclusion of the transition mode irreversibly and automatically actuates the retraction mode.

The sealing tongue and the actuating end generally are configured relative to the front end of the container such that at the point of maximum forward displacement of the plunger, substantially all liquid remaining in the syringe is expelled. Ideally, however, the configuration is such that the entire contents of the syringe cannot be expelled without initiation of the transition mode. For this reason, drug addicts and illicit drug users are unlikely to attempt to reuse the syringe by intentionally failing to activate the transition mode, because this would entail leaving some residual quantity of liquid, containing the active drug, within the syringe.

Upon commencement of the retraction mode, the proximal end 22 of the needle holder is engaged by the sealing tongue 37 on the actuating end of the plunger. Consequently, the support end 16 of the needle is sealed off from the surrounding volume in the container. However, the needle holder 15 has been released from locking engagement with the front end of the container and the entire force of the retraction spring is consequently applied to the sealing tongue 37. The line of weakness defined by the groove 41 in the actuating end of the plunger has a break point that is sufficiently low to insure that the bias force of the spring easily breaks an opening, defined by the line of weakness, in the front wall 40 of the plunger and then pushes the needle assembly into the cavity. The needle thereby adopts the retracted configuration with the tip safely concealed within the plunger, as best shown in figure 8. Importantly, during the transition and retraction modes, the support end of the needle remains positively sealed, so as to prevent air from penetrating the patient's body during the retraction. It will also be appreciated that because of the rupturing of both the needle holder 15 and the actuating end 34 during the transition mode, the retraction mode is irreversible, thereby ensuring that the syringe cannot be reused.

The invention thus provides a simple, reliable and cost-effective form of retractable, non-reusable syringe that avoids the possibility of inadvertent needle sticks after use, and also avoids the possibility of reuse. These factors combine to

substantially reduce or eliminate the risk of cross-contamination. In these respects, the invention represents a practical and commercially significant improvement over the prior art.

Although the invention has been described with reference to specific examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

CLAIMS:

1. A retractable non-reusable syringe including an elongate tubular container, a needle assembly, releasable locking means for the needle assembly, resilient bias means operable on the needle assembly, and a plunger slidably disposed within the container,

the container having an open front end, an open back end and an inner surface defining a chamber to contain a liquid to be injected,

the needle assembly including a needle having a support end and a penetrating end, and a needle holder having a distal end adapted to support the needle and a proximal end, the needle assembly being movable between a projecting configuration wherein the penetrating end of the needle projects forwardly from the front end of the container and a retracted configuration wherein the penetrating end of the needle is enclosed within the chamber,

the releasable locking means being adapted to retain the needle assembly in releasable locking engagement with the front end of the container in the projecting configuration and maintain sealed fluid communication between the needle and the chamber,

the resilient bias means being disposed to urge the needle assembly toward the retracted configuration,

the plunger having a forward actuating end sealingly engageable with the inner surface of the container, and a rear end, the actuating end being adapted for sealing engagement with the proximal end of the needle holder and being adapted to disengage the releasable locking means,

the syringe being sequentially operable in a drawing mode, an injection mode, a transition mode and a retraction mode, whereby

in the drawing mode, liquid is drawn through the needle into the container in response to rearward withdrawal of the plunger,

in the injection mode the holder is sealingly and releasably engaged with the front end of the container with the needle in the projecting configuration and in fluid communication with the chamber such that depression of the plunger progressively injects the liquid from the container,

in the transition mode the actuating end of the plunger at a predetermined

position of forward displacement sealingly engages the proximal end of the holder and disengages the locking means to release the holder, and

in the retraction mode the resilient bias means effect withdrawal of the needle assembly into the retracted configuration within the container to prevent reuse.

2. A retractable syringe according to claim 1, wherein in the transition mode the actuating end of the plunger engages the proximal end of the holder sealingly and lockingly such that in the retraction mode the supporting end of the needle is closed off and positively sealed.

3. A retractable syringe according to claim 1 or claim 2, wherein during disengagement of the releasable locking means the actuating end of the plunger breaks the needle holder.

4. A retractable syringe according to any one of the preceding claims, wherein the plunger includes an internal cavity adapted to accommodate and captively retain the needle assembly in the retracted configuration.

5. A retractable syringe according to any one of the preceding claims, wherein the plunger includes a front wall including a first line of weakness disposed such that upon release of the needle holder, the bias means force the needle holder to break an opening in the front wall of the plunger defined by the first line of weakness, so as to move the needle irreversibly into the retracted configuration within the cavity.

6. A retractable syringe according to claim 5, wherein the first line of weakness is defined by a peripheral channel or groove, a series of indentations, or a frangible membrane.

7. A retractable syringe according to any one of the preceding claims, wherein the releasable locking means include a forwardly directed circumferential stopper flange formed on the inner surface of the container, and a complementary rearwardly directed abutment shoulder formed on an outer surface of the needle holder, the stopper flange and the abutment shoulder being engageable releasably to retain the needle assembly in the projecting configuration, in the injection mode.

8. A retractable syringe according to claim 7 wherein the stopper flange extends inwardly and the abutment shoulder extends outwardly.

9. A retractable syringe according to claim 7 or claim 8, wherein the needle holder is flexible and includes a second line of weakness such that engagement by the

actuating end of the plunger during the transition mode breaks the holder along the second line of weakness and displaces the stopper flange relative to the abutment shoulder, thereby to disengage the locking means and release the needle holder.

10. A retractable syringe according to any one of the preceding claims wherein the inner surface of the front end of the container and the respective outer surface of the needle holder are correspondingly tapered to facilitate sealing engagement in the projecting configuration.

11. A retractable syringe according to any one of the preceding claims, wherein the proximal end of the needle holder is flared and includes at least one slot to enhance flexibility and facilitate engagement with the actuating end of the plunger.

12. A retractable syringe according to claim 11, wherein the proximal end of the needle holder includes a pair of said slots extending generally axially along opposite sides of the holder.

13. A retractable syringe according to claim 11 or claim 12, wherein the actuating end of the plunger includes a generally frustoconical sealing tongue adapted, upon forward movement of the plunger, to expel substantially all liquid remaining in the syringe and sealingly engage with the flared proximal end of the needle holder.

14. A retractable syringe according to claim 13, wherein the actuating end of the plunger includes a circumferential gripping jaw disposed generally around the tongue, and the proximal end of the needle holder includes a complementary peripheral gripping rim, the gripping jaw and the gripping rim being interengageable to apply inwardly directed circumferential pressure to the proximal end of the needle holder, thereby to release the locking means.

15. A retractable syringe according to claim 14, wherein the gripping rim is generally outwardly directed and the gripping jaw is generally inwardly directed.

16. A retractable syringe according to any one of claims 12 to 14, wherein the flared proximal end of the holder and the corresponding outer surface of the sealing tongue are correspondingly tapered to facilitate sealing engagement.

17. A retractable syringe according to any one of the preceding claims, wherein the actuating end of the plunger includes a peripheral locating groove and a sealing member mounted in the groove for slidable sealing engagement with the inner surface of the container.

18. A retractable syringe according to claim 17, wherein the sealing member includes two peripheral sealing lips.

19. A retractable syringe according to claim 18, wherein each of the sealing lips includes a generally concave outer bearing surface.

20. A retractable syringe according to claim 18 or claim 19, wherein the bearing surfaces on the respective sealing lips are oriented toward one another to facilitate sealing during reciprocation of the plunger.

21. A retractable syringe according to any one of the preceding claims, wherein the penetrating end of the needle terminates at a peripheral edge defining a concave virtual surface at the outlet of the needle.

22. A retractable syringe according to any one of the preceding claims, wherein the penetrating end of the needle terminates at a peripheral edge that is bevelled.

23. A retractable syringe according to any one of claims 1 to 21, wherein an outermost point of the peripheral edge is ground to define a chisel-like tip at the extremity of the penetrating end of the needle.

24. A retractable syringe according to any one of the preceding claims, wherein the resilient bias means include a coil spring that at least in the projecting configuration is disposed concentrically around the needle between the front end of the container and the needle holder.

25. A retractable syringe according to any one of the preceding claims wherein the rear end of the plunger includes a base having a breakable forwardly projecting protecting tab to prevent inadvertent engagement of the actuating end of the plunger with the needle holder to initiate the transition mode.

26. A retractable syringe according to any one of the preceding claims wherein the container includes a generally cylindrical body, a frustoconical front end, and a tubular nozzle.

27. A retractable syringe substantially as herein described with reference to the accompanying drawings.

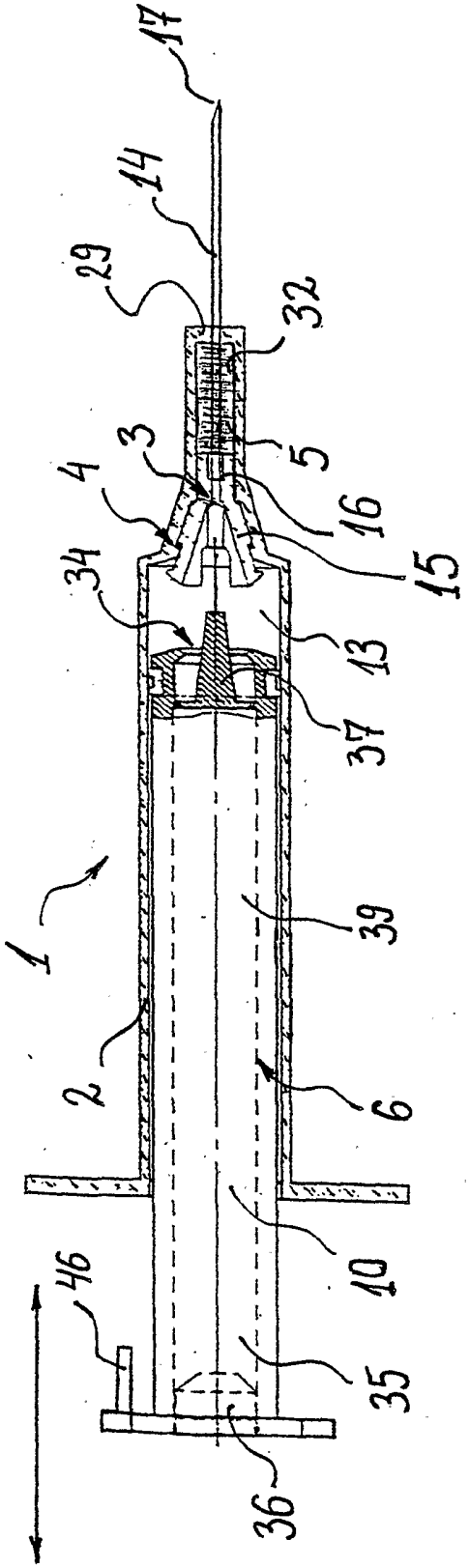

FIG. 1

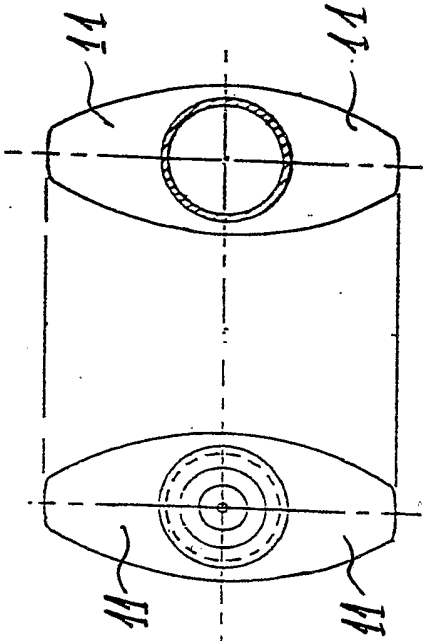

FIG. 4

FIG. 3

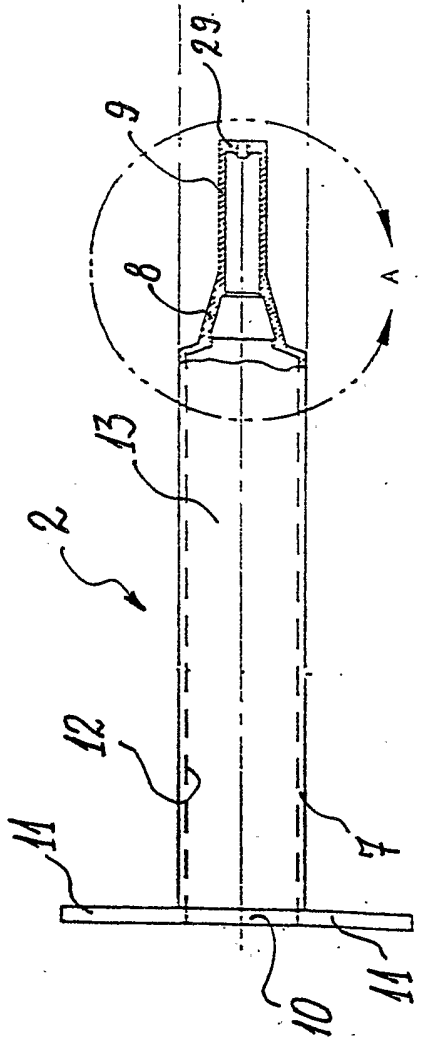

FIG. 2

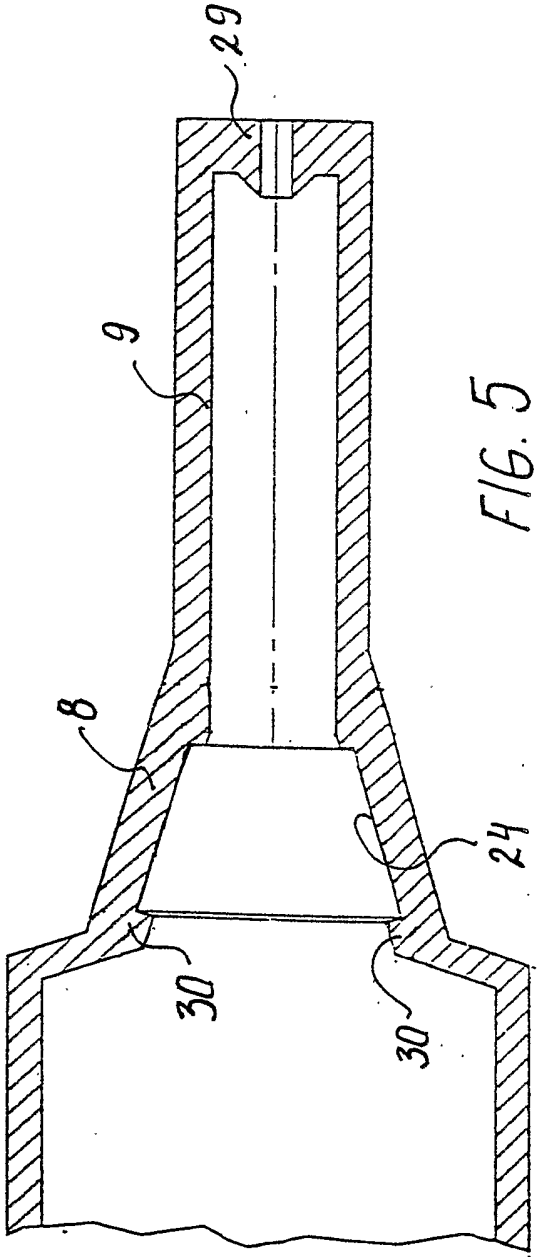

FIG. 5

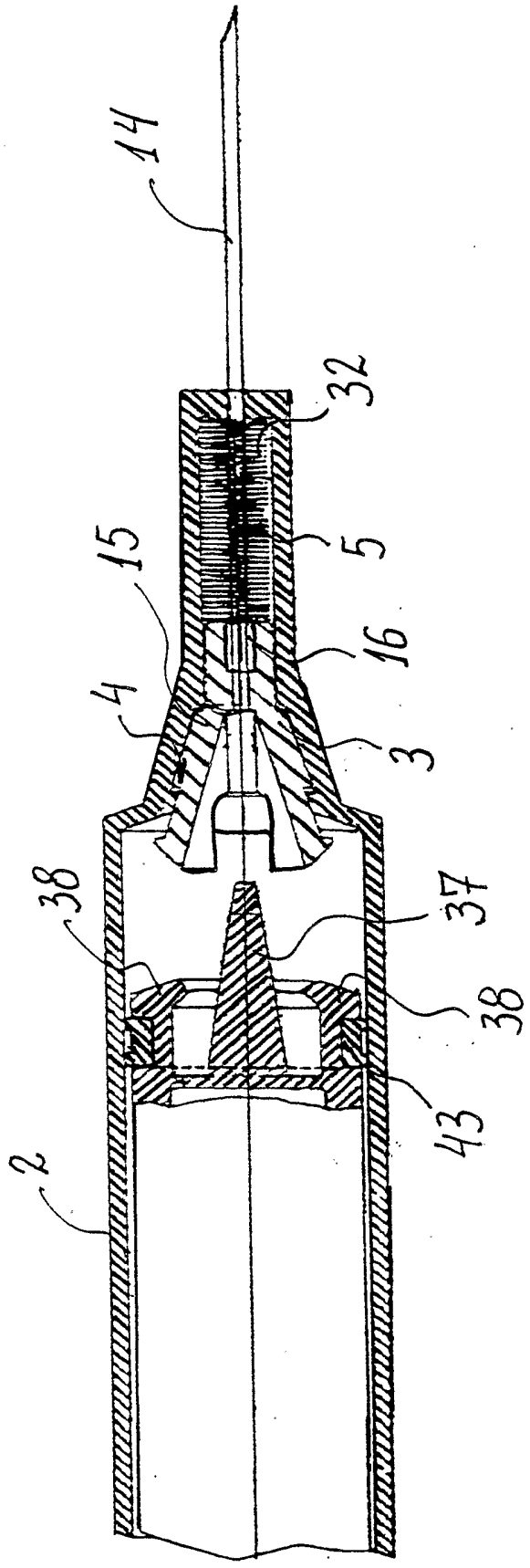

FIG. 6

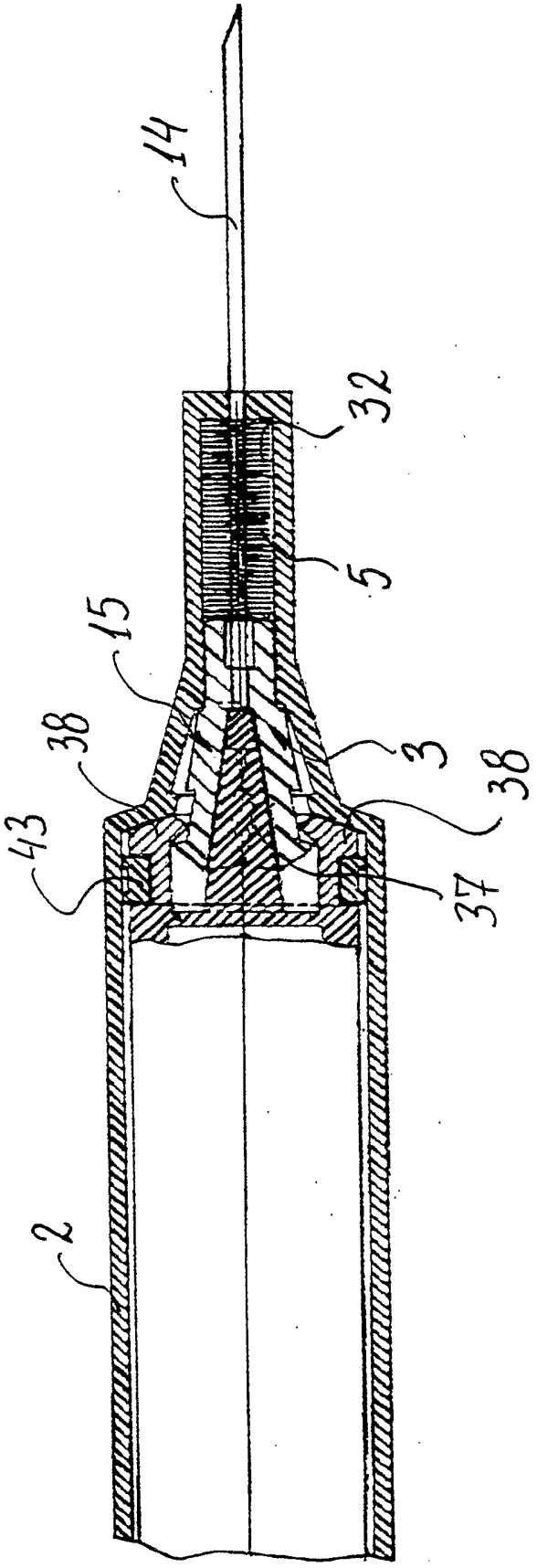

FIG. 7

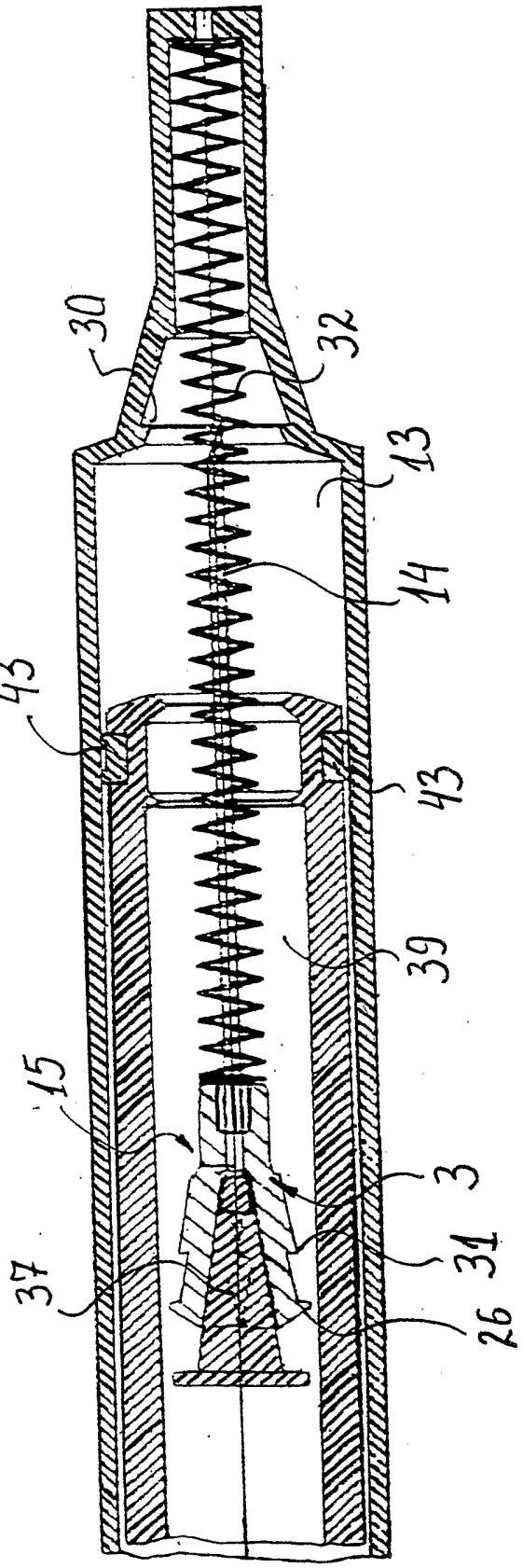

FIG. 8

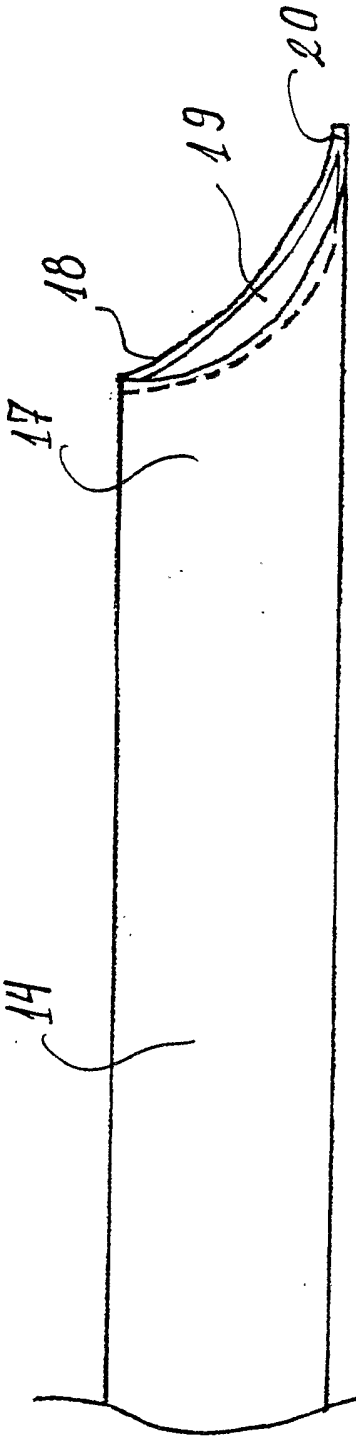

FIG. 9

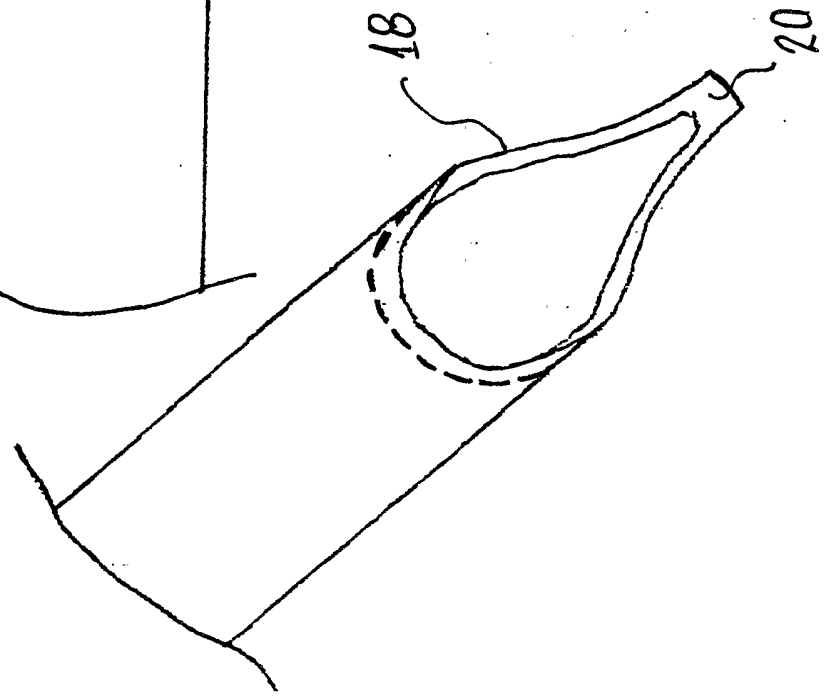

FIG. 10

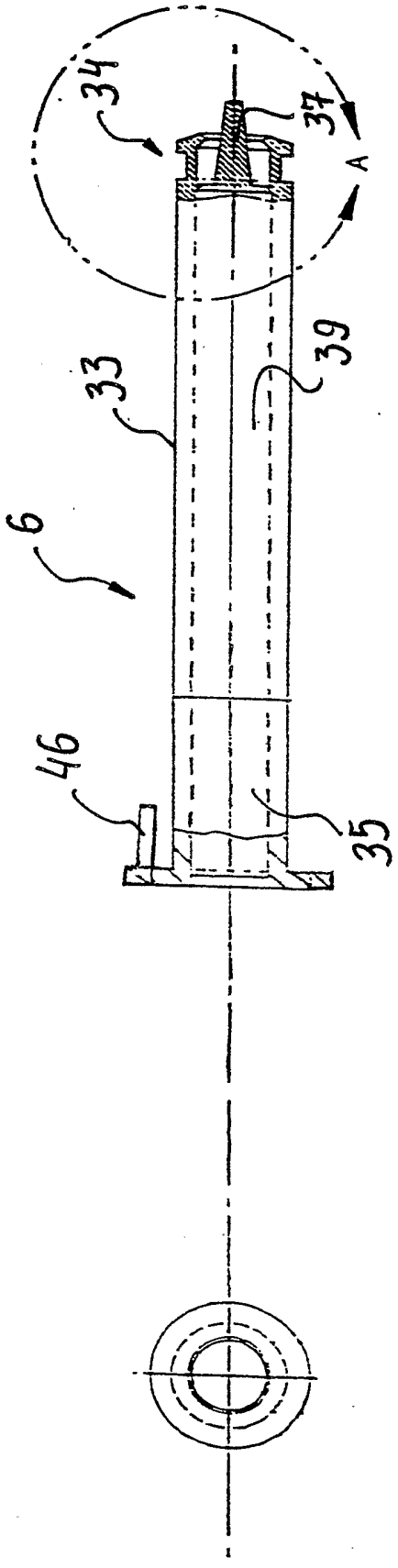

FIG. 11

FIG. 12

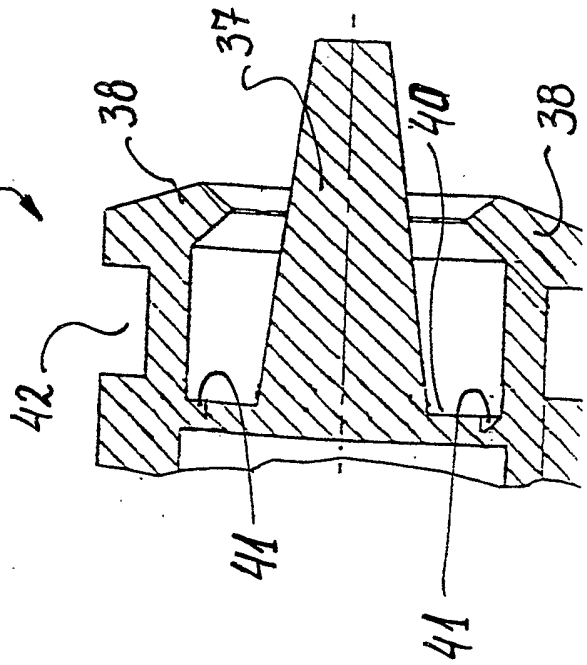

FIG. 13

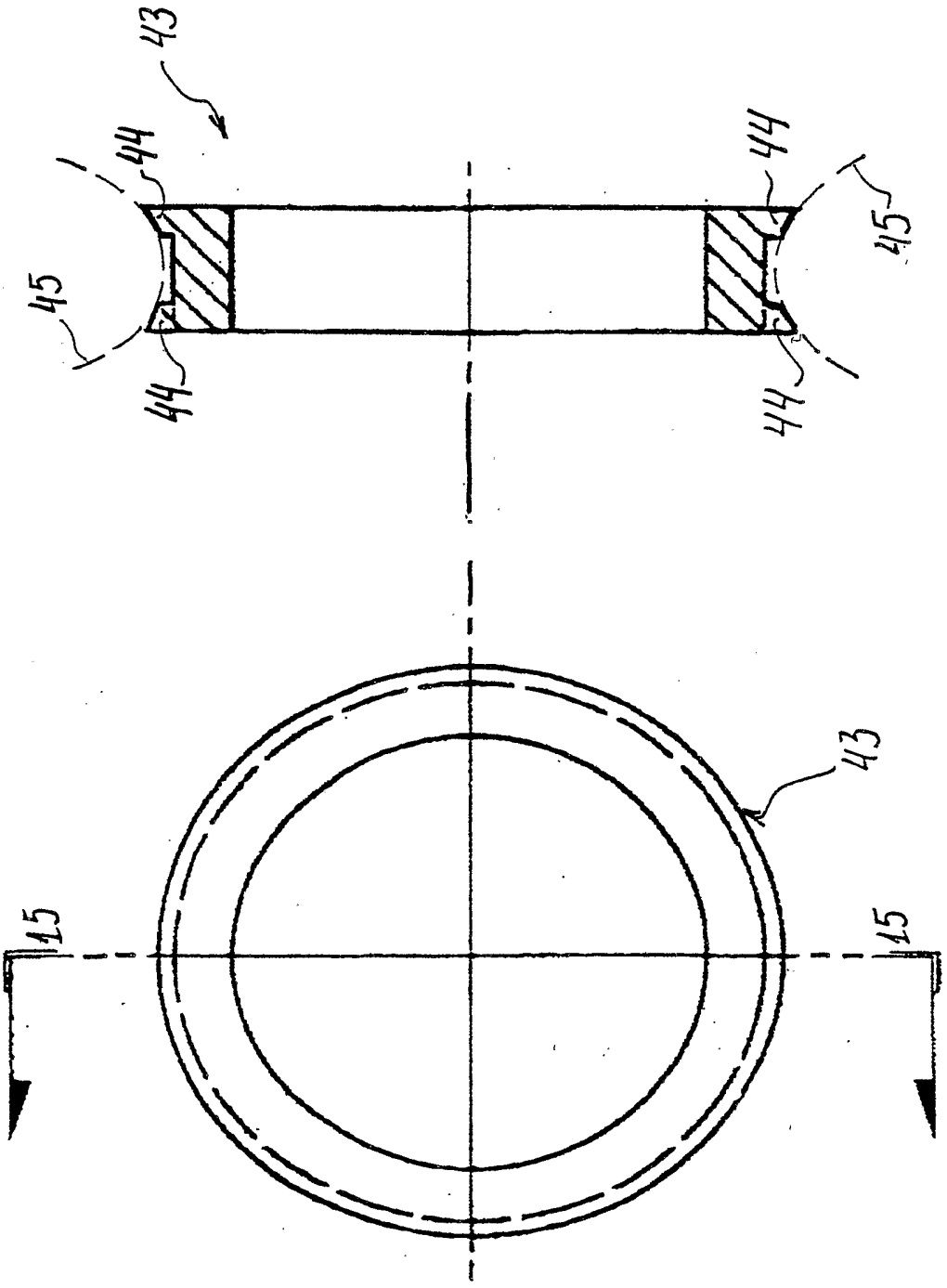

FIG. 15

FIG. 14

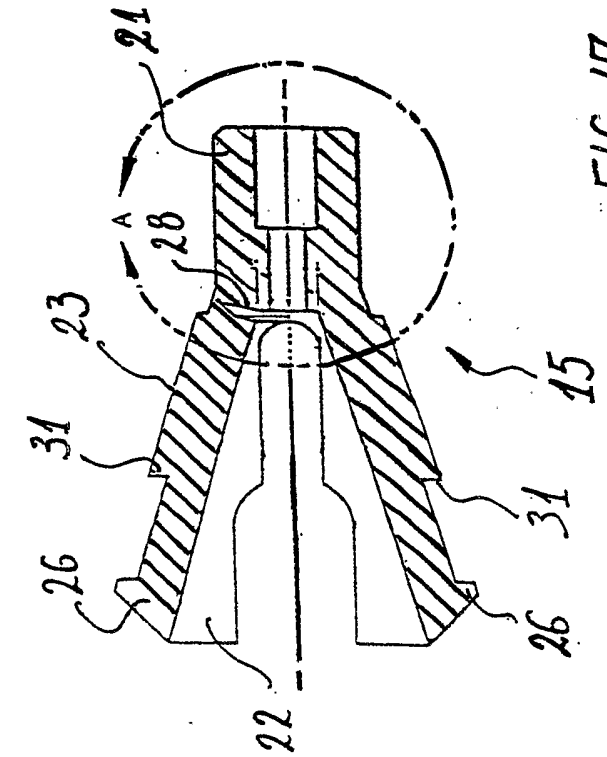

FIG. 17

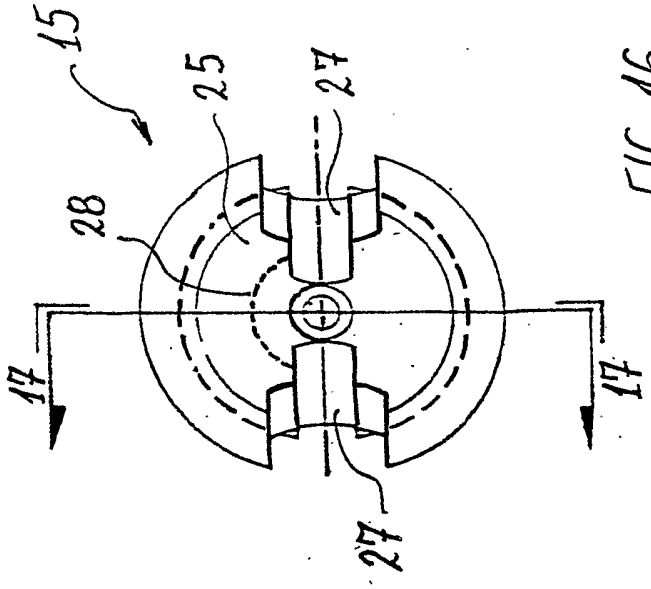

FIG. 16

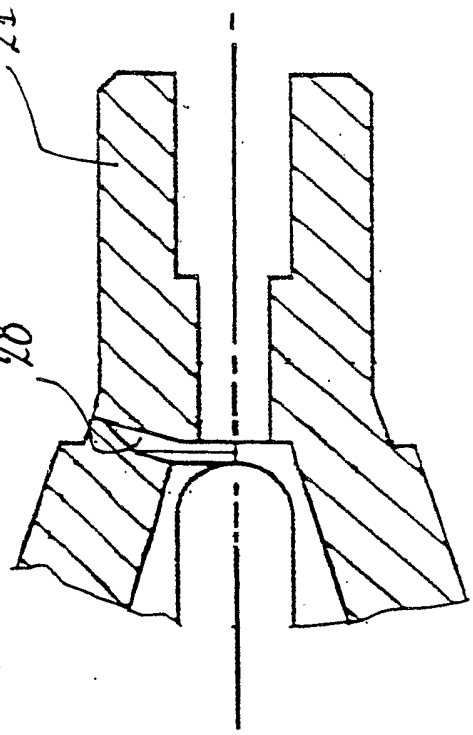

FIG. 18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU03/00140

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: A61M 5/50

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)
Refer electronic database consulted below

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)
DWPI +keywords:syringe, retract, frangible and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,010,486 (CARTER et al) 4 January 2000 column 2 lines 20 to 34	1-27
X	US 6,036,674 (CAIZZA et al) 14 March 2000 column 2 line 53 to column 4 line 17	1-27
X	US 4,994,034 (BOTICH et al) 19 February 1991 column 4 line 6 to column 6 line 2	1-27

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"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)
"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
"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
"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
"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
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 February 2003	06 MAR 2003
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **SUE THOMAS** Telephone No : (02) 6283 2454

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU03/00140

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,019,044 (TSAO) 28 May 1991 column 1 line 63 to column 2 line 25	1-27
X	US 5,632,733 (SHAW) 27 May 1997 column 2 line 41 to column 5 line 2	1-27
X	US 6,179,812 (BOTICH et al) 30 January 2001 column 1 line 65 to column 2 line 37	1-27
X	US 6,183,440 (BELL) 6 February 2001 column 2 line 43 to column 3 line 44	1-27
X	US 5,049,133 (VILLEN PASCUAL) 17 September 1991 column 1 lines 4 to 21	1-27
X	US 5,782,804 (McMAHON) 21 July 1998 column 2 line 53 to column 4 line 61	1-27

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU03/00140

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

Patent Document Cited in Search Report		Patent Family Member					
US	6010486	AU	200021615	BR	9908070	CA	2321441
		EP	1056495	WO	200037131		
US	6036674	US	6221052				
US	4994034	NO	931662	US	5188599	US	5407431
		US	6096005	US	6179812	AU	67419/90
		BR	9008048	FI	932069	WO	9208505
		BG	97852	EP	568525	CA	2096026
US	5019044	AU	57097/90	CA	2018200	CN	1049457
		EP	413414	US	5084018		
US	5632733	AU	57143/96	AU	59724/98	BR	9608832
		CA	2218478	CN	1183729	CZ	9703548
		EP	900096	US	5578011	WO	9635463
		US	6090077				
US	6179812	NO	931662	US	4994034	US	5188599
		US	5407431	US	6096005	US	2003023205
US	6183440	AU	200146170	BR	200101564	CN	1325737
		EP	1157713	JP	2002058740	NZ	510883
US	5049133	ES	2009709				
US	5782804	AU	32268/95	BR	9508606	CA	2197573
		CN	1155846	CZ	9700349	EP	776225
		FI	970632	HK	1011623	HU	76903
		IL	114935	NO	970700	NZ	291205
		PL	318691	SK	161/97	WO	9605879
		ZA	9506861				

END OF ANNEX