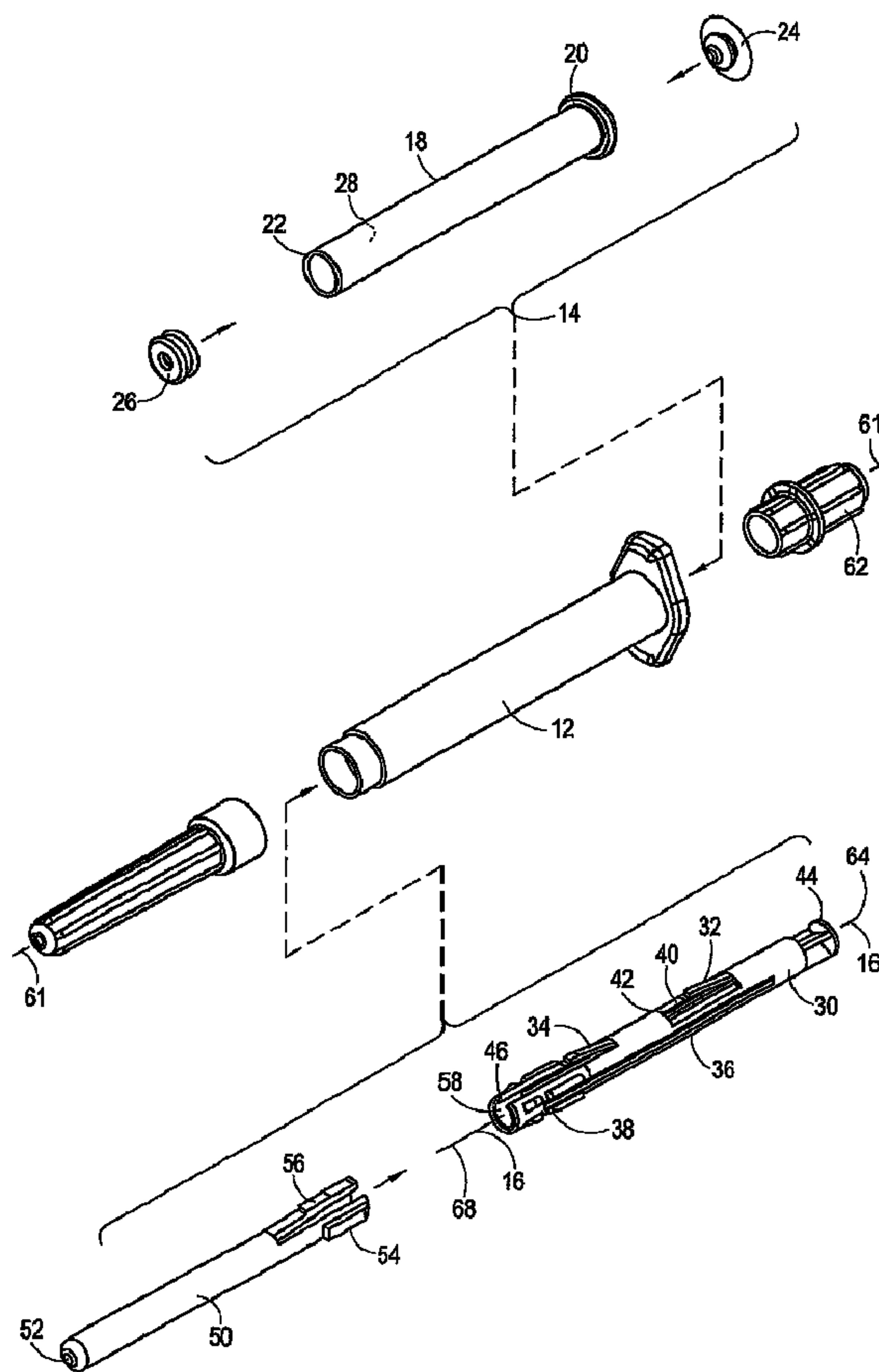




(86) Date de dépôt PCT/PCT Filing Date: 2006/03/31  
 (87) Date publication PCT/PCT Publication Date: 2007/03/01  
 (45) Date de délivrance/Issue Date: 2011/03/22  
 (85) Entrée phase nationale/National Entry: 2008/02/22  
 (86) N° demande PCT/PCT Application No.: US 2006/011714  
 (87) N° publication PCT/PCT Publication No.: 2007/024274  
 (30) Priorité/Priority: 2005/08/25 (US11/211,336)

(51) Cl.Int./Int.Cl. *A61M 5/32* (2006.01)  
 (72) Inventeur/Inventor:  
MILLERD, DON, US  
 (73) Propriétaire/Owner:  
MEDPRO SAFETY PRODUCTS, INC, US  
 (74) Agent: MACPHERSON LESLIE & TYERMAN LLP

(54) Titre : GARDE DE SERINGUE POUR FIOLE PREREMPLIE DE MEDICAMENT  
 (54) Title: SYRINGE GUARD FOR PRE-FILLED MEDICAMENT VIAL



(57) Abrégé/Abstract:

A device for expelling fluid from a pre-filled vial includes a hollow needle that is axially mounted on a syringe body. A guard, also mounted on the syringe body, is moveable between a first position wherein it is held to expose a distal portion of the needle and a

(57) **Abrégé(suite)/Abstract(continued):**

second position wherein, after being released, it covers the distal portion. In operation, the vial is engaged in fluid communication with the needle, and it is then advanced on the syringe body. During this advancement, fluid is expelled from the vial through the needle, and the vial releases the guard for its movement from the first to the second position.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

REVISED VERSION

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
1 March 2007 (01.03.2007)

PCT

(10) International Publication Number  
**WO 2007/024274 A3**(51) International Patent Classification:  
A61M 5/32 (2006.01)

(21) International Application Number:

PCT/US2006/011714

(22) International Filing Date: 31 March 2006 (31.03.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

11/211,336 25 August 2005 (25.08.2005) US

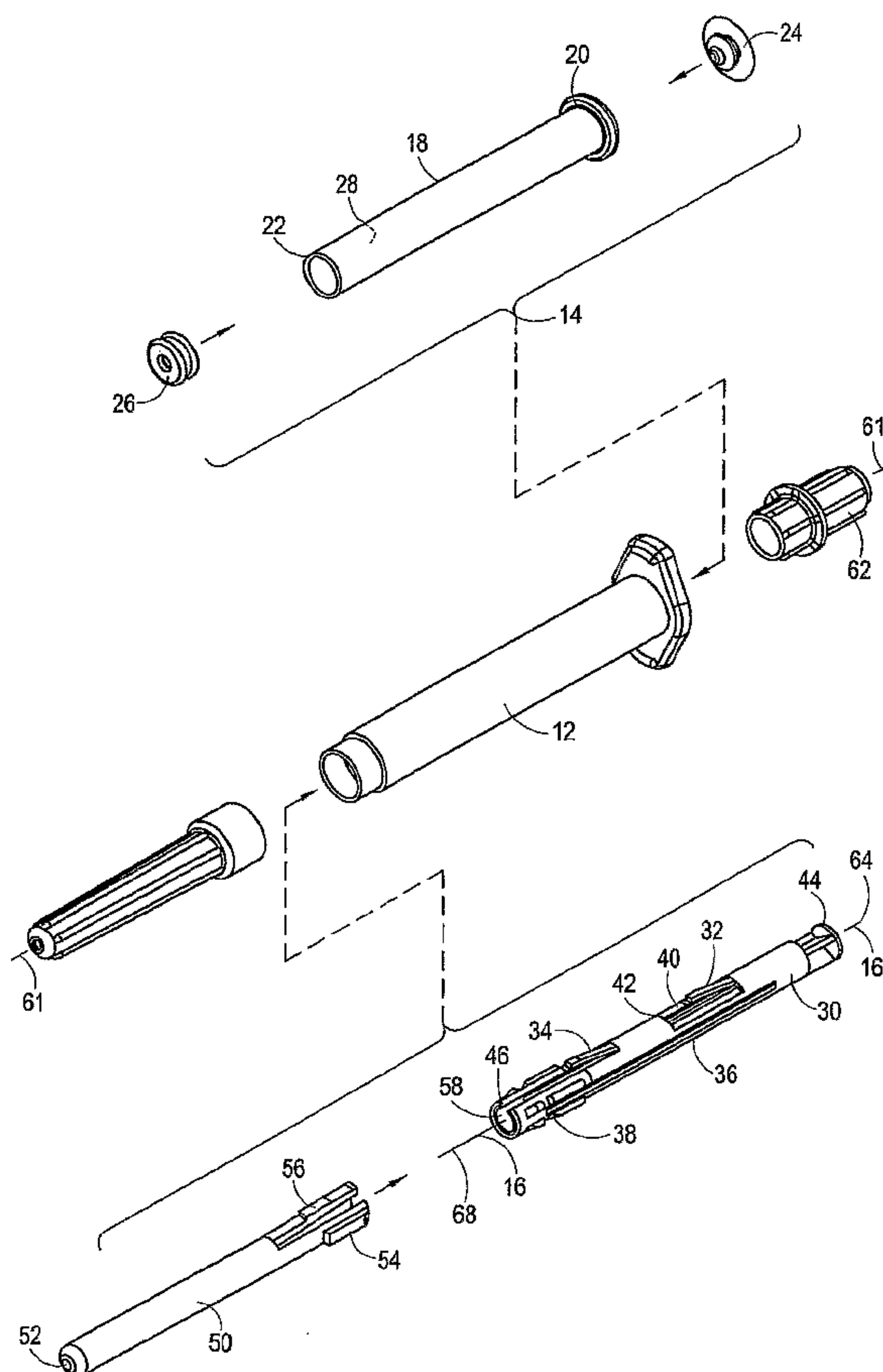
(71) Applicant (for all designated States except US): **VISUAL CONNECTIONS, INC.** [US/US]; 3414 Jackdaw Street, San Diego, California 92103 (US).(72) Inventor: **MILLERD, Don**; 7960 Convoy Court, San Diego, California 92111 (US).(74) Agents: **NYDEGGER, Neil et al.**; NYDEGGER & ASSOCIATES, 348 Olive Street, San Diego, California 92103 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: SYRINGE GUARD FOR PRE-FILLED MEDICAMENT VIAL



(57) Abstract: A device for expelling fluid from a pre-filled vial includes a hollow needle that is axially mounted on a syringe body. A guard, also mounted on the syringe body, is moveable between a first position wherein it is held to expose a distal portion of the needle and a second position wherein, after being released, it covers the distal portion. In operation, the vial is engaged in fluid communication with the needle, and it is then advanced on the syringe body. During this advancement, fluid is expelled from the vial through the needle, and the vial releases the guard for its movement from the first to the second position.

WO 2007/024274 A3

**WO 2007/024274 A3**



**Published:**

— *with international search report*

**(15) Information about Correction:**

see PCT Gazette No. 48/2007 of 29 November 2007

**(88) Date of publication of the international search report:**

11 October 2007

**Date of publication of the revised international search  
report:**

29 November 2007

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

### FIELD OF THE INVENTION

The present invention pertains generally to fluid infusion devices. More particularly, the present invention pertains to fluid infusion devices that include an automatically activated guard for covering and protecting the needle of the device  
5 after its use. The present invention is particularly, but not exclusively, useful as a syringe, with a needle guard, where the syringe is engageable with a pre-filled fluid vial to establish a fluid infusion device.

### BACKGROUND OF THE INVENTION

Fluid medicaments, as well as other commercially available fluids, can be  
10 purchased in a variety of different type containers. The container of particular interest here, however, is the pre-filled vial. Typically, such a container/vial is made of glass, and is formed as a hollow cylindrical tube that has two open ends. One end can then be closed with a plug, and a stopper can be inserted through the opposite end to create a fluid chamber in the vial between the plug and the  
15 stopper. Thus, the chamber of the container/vial can then be filled with a predetermined amount of a desired fluid (e.g. a fluid medicament).

For the context wherein a container, such as the pre-filled fluid vial described above, is to be used for an infusion of fluid, the fluid must somehow be brought into fluid communication with a needle. Heretofore, a typical procedure  
20 for accomplishing this purpose has been to penetrate the stopper of the container/vial with a hypodermic needle. Fluid in the vial is then evacuated from the fluid chamber of the vial. In this example, the fluid is caused to flow through the needle and into the fluid chamber of a syringe. The now-filled syringe can then be disengaged from the vial and used for an infusion. The procedure just  
25 described, however, is somewhat cumbersome. In particular, this is so because

the filling of the syringe, and the infusion of the fluid are performed as two separate and distinct operations. And, as such, each has its own attendant hazards. Further, with the increased awareness of communicable diseases (e.g. AIDS), the protection of the user from unwanted needle sticks has become of paramount importance. The consequence here is that the commercial potential for using pre-filled fluid vials may be enhanced by reducing the number of required manipulations in a procedure, and by directly incorporating pre-filled fluid vials into systems/devices that automatically protect the user from unwanted or inadvertent needle sticks.

10 In light of the above, it is an object of the present invention to provide a device which can be engaged with a pre-filled fluid vial for infusing fluid directly from the vial. Another object of the present invention is to provide a device for infusing a fluid medicament that automatically protects the user from unwanted or inadvertent needle sticks after the fluid from a pre-filled fluid vial has been  
15 infused. Yet another object of the present invention is to provide a device for infusing fluid from a pre-filled vial that is easy to use, is relatively simple to manufacture, and is comparatively cost effective.

### SUMMARY OF THE INVENTION

20 In accordance with the present invention, a device is provided for expelling fluid from a pre-filled vial, through a needle. As envisioned for the present invention, the pre-filled fluid vial will have a hollow, cylindrical-shaped, glass wall, with a plug covering one of its open ends. A stopper will be inserted into the other open end of the cylindrical wall to thereby create a fluid chamber in the vial for holding fluid therein between the plug and the stopper.

25 Structurally, the device of the present invention includes a hollow, cylindrical-shaped syringe body that is formed with a lumen and has an open proximal end, and an open distal end. Thus, the syringe body defines a longitudinal axis that extends between the two ends. Further, an elongated

adapter is axially aligned within the syringe body, and it is fixedly mounted in the lumen of the syringe body. As so mounted, a space is created between the adapter and the syringe body.

For the device of the present invention, the adapter is substantially  
5 cylindrical in shape, and it is formed with a lumen. Additionally, a hollow needle is mounted in the lumen of the adapter such that the needle extends along the longitudinal axis of the syringe body. Importantly, the adapter is formed with both a proximal hinge, and a distal hinge. Both of these hinges are so-called "living"  
10 hinges, and they are longitudinally aligned with each other. The adapter is also formed with at least one slot that extends along its length.

In addition to the needle, a guard is also mounted in the lumen of the adapter. Specifically, the guard is cylindrical shaped and it is positioned within the lumen of the adapter for axial movement over the needle between a first  
15 position and a second position. In its first position, the guard is held within the syringe body to expose a distal portion of the needle as it extends beyond the distal end of the syringe body. Structurally, the guard is held in the first position by a flexible hinge lock on the guard that engages with the adapter. Upon  
20 release of the hinge lock, however, the guard moves distally into its second position. In its second position, the guard extends beyond the distal end of the syringe body, to cover the distal portion of the needle. For the device of the present invention, this distal movement of the guard in the axial direction is caused by a spring that is located between the adapter and the guard to push  
25 distally against the guard. This movement, however, is limited by a tab on the guard that extends into the slot of the adapter.

In operation, the fluid vial is first engaged with the proximal end of the  
30 syringe body. With this engagement, the proximal end of the needle pierces the stopper in the vial. This then establishes fluid communication between the fluid chamber of the vial and the needle. Also, during this engagement, the wall of the vial is introduced into the space between the syringe body and the adapter. Subsequently, as the wall of the vial is advanced distally into the space between

the syringe body and the adapter, it activates the proximal hinge of the adapter. When activated, the proximal hinge of the adapter releases the hinge lock of the guard for movement of the guard in the distal direction. As indicated above, this causes the guard to extend beyond the distal end of the syringe body to cover and protect the distal end of the needle. It is to be noted here, however, that if the needle is being used for an infusion, the body into which the infusion is being made may prevent the guard from making its full distal movement. Next, as further distal movement of the wall of the vial is made during the infusion, the wall repositions the distal hinge of the adapter to prevent a subsequent proximal movement of the guard. Thus, subsequent to an infusion, and after the needle has been withdrawn from the body being infused, the guard remains extended beyond the distal end of the syringe body. This causes the guard to cover the needle and to thereby protect against accidental or inadvertent sticks by the needle.

15

#### BRIEF DESCRIPTION OF THE DRAWINGS

The novel features of this invention, as well as the invention itself, both as to its structure and its operation, will be best understood from the accompanying drawings, taken in conjunction with the accompanying description, in which similar reference characters refer to similar parts, and in which:

20 Fig. 1 is a view of an assembled device for infusing fluids from a pre-filled vial, in accordance with the present invention;

Fig. 2 is an exploded perspective view of the component elements of the device;

25 Fig. 3 is a cross section view of a pre-filled vial for use with the device of the present invention as seen along the line 3-3 in Fig. 1;

Fig. 4 is an elevation view of the device of the present invention ready for use with a pre-filled vial, and with portions broken away for clarity;



Fig. 5A is an elevation view of a device in accordance with the present invention when it is engaged with a pre-filled vial and ready for use in an infusion procedure, again, with portions of the device broken away for clarity;

Fig. 5B is a view of the device shown in Fig. 5A during an infusion procedure, when configured with the vial engaging the adapter of the device to release the guard of the device for its distal movement; and

Fig. 5C is a view of the device shown in Figs. 5A and 5B, after an infusion procedure.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring initially to Fig. 1, a device for expelling fluid from a pre-filled vial is shown and is generally designated 10. As shown, the device 10 includes a syringe body 12 that is engaged with a pre-filled vial/container 14. In accordance with the discussion below, it will be appreciated that the device 10 is useful for expelling fluid from the vial 14, and through a hollow needle 16, during an infusion procedure. Further, it will also be appreciated that the device 10 provides structure for covering the needle 16 after the infusion procedure has been completed. The purpose here is to prevent accidental or inadvertent sticks with the needle 16 that might otherwise occur after using the device 10. Preferably, the needle 16 is made of a stainless steel type material.

The various structural components of the device 10 will, perhaps, be best appreciated with reference to Fig. 2. There it can be seen that the pre-filled vial 14 includes a hollow cylindrical wall 18 that has both an open proximal end 20 and an open distal end 22. Further, the vial 14 includes a plug 24 and a stopper 26. When the vial 14 is assembled, as shown in Fig. 3, the plug 24 is positioned to cover the proximal end 20, and the stopper 26 is inserted through the distal end 22. Thus, a fluid chamber 28 is created for the vial 14. A fluid (e.g. a fluid medicament) can then be held inside the fluid chamber 28 that is surrounded by the wall 18 and enclosed by the plug 24 and the stopper 26. As intended for the

device 10, the stopper 26 is moveable within the vial 14, and the wall 18 is preferably made of a rigid transparent material, such as glass.

Still referring to Fig. 2, it will be seen that the device 10 includes an adapter 30. As shown, the adapter 30 is elongated and is substantially cylindrical in shape. It is also shown in Fig. 2 that the adapter 30 is formed with a proximal hinge 32 and a distal hinge 34. For purposes of the present invention, both of the hinges 32 and 34 are so-called "living" hinges, in that they are integral with the adapter 30. It is also seen in Fig. 2 that the adapter 30 is formed with a slot 36 that extends longitudinally along the adapter 30. Actually, the adapter 30 can have two such slots that are diametrically opposite each other (one such slot, however, is not shown in Fig. 2). Further, the adapter 30 is formed with a series of circumferentially oriented structural detents 38. Also, in conjunction with the proximal hinge 32, the adapter 30 is formed with a slit 40 into which the hinge 32 can be deflected. As shown, the slit 40 creates an abutment 42 at its distal end.

To best appreciate how the needle 16 and the adapter 30 are mounted on the syringe body 12, it is necessary to cross reference Fig. 2 with Fig. 4. With this cross-reference, it can be seen that the needle 16 is fixedly held at the proximal end 44 of the adapter 30 (see Fig. 4). Also, it can be seen that the detents 38 at the distal end 46 of the adapter 30 are fixedly engaged with the syringe body 12 (see Fig. 2). A consequence of this arrangement is that a space 48 is created between the adapter 30 and the syringe body 12.

Fig. 2 also shows that the device 10 includes a guard 50. Specifically, the guard 50 is a hollow, substantially cylindrical-shaped structure that defines a lumen 52, and that has diametrically opposed tabs 54 (one such tab 54 is not shown). Additionally, and importantly, the guard 50 is formed with a hinge lock 56. In its cooperation with the adapter 30, the guard 50 is inserted into the lumen 58 of the adapter 30, over the needle 16. More specifically, the guard 50 is inserted into the lumen 58 until the hinge lock 56 of guard 50 extends through the slit 40 of adapter 30, for engagement of the hinge lock 56 with the abutment 42. In this combination, a spring 60 (see Fig. 4) is positioned between the guard 50

and the proximal end 44 of the adapter 30 to urge the guard 50 in a distal direction. This, of course, also urges the hinge lock 56 against the abutment 42 to hold the guard 50 in the position shown in Fig. 4.

5 With the guard 50 engaged to the adapter 30 as described above, and with the adapter 30 mounted on the syringe body 12 as also described above, the needle 16 will be longitudinally aligned along the axis 61 that is defined by the syringe body 12 (see Fig. 2). A proximal shield 62 can then be engaged with the syringe body 12 to cover and protect the proximal end 64 of the needle 16. Similarly, a distal shield 66 can be engaged with the syringe body 12 to cover  
10 and protect the distal end 68 of the needle 16. The result is a combination of components as shown in Fig. 4.

In the operation of the device 10 of the present invention, the proximal shield 62 is removed from the syringe body 12 to expose the proximal end 64 of the needle 16. The pre-filled vial 14 is then engaged with the syringe body 12.  
15 Specifically, with this engagement, the proximal end 64 of the needle 16 penetrates through the stopper 26 to establish fluid communication between the needle 16 and fluid in the chamber 28 of vial 14. Also, with this engagement, the end 22 of wall 18 of the vial 14 is positioned in the space 48 between the syringe body 12 and the adapter 30. The distal shield 66 can then be removed from the  
20 syringe body 12 to expose a distal portion of the needle 16, as shown in Fig. 5A. The device 10 is now ready for an infusion procedure.

To perform an infusion procedure, with the device 10 in the configuration shown in Fig. 5A, the distal end 68 of the needle 16 is penetrated into the body that is to be infused (not shown). The pre-filled fluid vial 14 is then advanced  
25 distally along the axis 61, and into the syringe body 12. With this advancement, the end 22 of wall 18 comes into contact with the proximal hinge 32 of adapter 30 (see Fig. 5B). This contact then causes the proximal hinge 32 to deflect into the slit 40 of the adapter 30, and against the hinge lock 56 of the guard 50. In turn, this deflection moves the hinge lock 56 from its position against the abutment 42  
30 of adapter 30. This frees the guard 50 for distal movement along the axis 61

under the influence of spring 60. As stated above, a full distal movement of the guard 50 may not occur at this time due to contact between the guard 50 and the body (not shown) into which the needle 16 may be penetrated.

As the pre-filled vial 14 is further advanced from its position in Fig. 5B to the position shown in Fig. 5C, the end 22 of wall 18 comes into contact with the distal hinge 34 of the adapter 30. This contact then causes the distal hinge 34 to be deflected and held in a position wherein it, the hinge 34, will block any return movement of the guard 50 in a proximal direction. Consequently, when the device 10 is configured as shown in Fig. 5C, and the guard 50 is no longer constrained to move distally, the hinge 34 and syringe body 12 cooperate to block a proximal movement of the guard 50. This causes the guard 50 to remain in place over the distal end 68 of the needle 16, to thereby prevent accidental or inadvertent "sticks".

While the particular Syringe Guard for Pre-Filled Medicament Vial as herein shown and disclosed in detail is fully capable of obtaining the objects and providing the advantages herein before stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as described in the appended claims.

What is claimed is:

1. A device which comprises:

5 a hollow, cylindrical shaped syringe body formed with a lumen and defining an axis, with the axis extending between an open proximal end of the syringe body and an open distal end thereof;

10 an elongated adapter fixedly mounted and axially aligned within the lumen of the syringe body, and distanced therefrom to create a space therebetween, the adapter having a flexible hinge;

15 a hollow cylindrical shaped guard having a tab extending radially therefrom, with the tab positioned in a slot of the adapter for axial movement of the guard relative thereto, the guard having a flexible hinge lock engageable with the adapter to impede a distal movement of the guard relative to the adapter;

20 a spring positioned between the adapter and the guard to urge the guard in a distal direction;

a hollow needle mounted axially on the adapter, the needle having a proximal end and a distal end; and

25 a fluid vial having a cylindrical wall surrounding a fluid chamber, the vial being engageable with the proximal end of the syringe body to establish fluid communication between the needle and the fluid chamber, wherein, as the wall of the vial is distally advanced into the space between the syringe body and the adapter, fluid is expelled from the chamber through the needle and, in sequence, the wall activates the flexible hinge of the adapter to release the hinge lock for movement of the guard in a distal direction,  
30 within the syringe body, beyond the distal end of the syringe body, to cover and protect the distal end of the needle.

2. A device as recited in claim 1 wherein the vial has a proximal end and a distal end, and the vial further comprises:
- 5 a plug for providing a fluid tight cover for the proximal end of the vial; and
- a stopper, insertable into the distal end of the vial, for holding fluid in the chamber between the plug and the stopper.
3. A device as recited in claim 2 wherein fluid communication between the needle and the fluid chamber of the vial is established during engagement of the vial with the syringe body, as the proximal end of the needle penetrates the stopper.
- 10
4. A device as recited in claim 1 wherein the adapter is substantially cylindrical in shape, and is formed with a lumen extending longitudinally therethrough.
5. A device as recited in claim 1 wherein the needle is mounted on the adapter to extend through the guard and to axially position the distal end of the needle beyond the distal end of the syringe body.
- 15
6. A device as recited in claim 1 further comprising:
- a proximal shield engageable with the proximal end of the syringe body to cover the proximal end of the needle; and
- 20 a distal shield engageable with the distal end of the syringe body to cover the distal end of the needle.
7. A device as recited in claim 1 wherein the adapter is formed with a lumen and the guard is positioned in the lumen of the adapter.
- 25
8. A device which comprises:

a syringe body defining an axis and having a proximal end and a distal end;

5 a hollow needle mounted on the syringe body, the needle having a proximal end and a distal end, with a distal portion of the needle extending beyond the distal end of the syringe body;

10 a guard mounted within the syringe body for axial movement therein over the needle, the guard being moveable from a first retracted position wherein the guard exposes the distal portion of the needle and a second extended position wherein the guard covers and protects the distal portion of the needle; and

15 a hollow cylindrical vial formed with a fluid chamber for holding a fluid therein, the vial being engageable with the syringe body to establish fluid communication between the needle and the fluid chamber to expel fluid from the vial through the needle as the vial is axially advanced on the syringe body to release the guard for movement from its first retracted position into its second extended position.

9. A device as recited in claim 8 wherein the syringe body is formed with a lumen and the device further comprises:

20 an elongated adapter fixedly mounted and axially aligned in the lumen of the syringe body, and distanced therefrom to create a space therebetween, the adapter having a flexible hinge; and

25 a spring positioned between the adapter and the guard to urge the guard in a distal direction, wherein the guard has a flexible hinge lock engageable with the adapter to impede a distal movement of the guard relative to the adapter.

10. A device as recited in claim 9 wherein the guard has a tab extending radially therefrom, with the tab positioned in a longitudinal slot of the adapter for axial movement of the guard relative thereto.

11. A device as recited in claim 9 wherein the vial is formed with a wall surrounding the fluid chamber and further wherein, as the wall of the vial is distally advanced into the space between the syringe body and the adapter, fluid is expelled from the chamber through the needle and, in sequence, the wall activates the flexible hinge of the adapter to release the hinge lock for movement of the guard in a distal direction from its first retracted position to its second extended position.
12. A device as recited in claim 9 wherein the vial has a proximal end and a distal end, and the vial further comprises:
- a plug for providing a fluid tight cover for the proximal end of the vial; and
- a stopper, insertable into the distal end of the vial, for holding fluid in the chamber between the plug and the stopper.
13. A device as recited in claim 9 wherein fluid communication between the needle and the fluid chamber of the vial is established during engagement of the vial with the syringe body, as the proximal end of the needle penetrates the stopper.
14. A device as recited in claim 8 further comprising:
- a proximal shield engageable with the proximal end of the syringe body to cover the proximal end of the needle; and
- a distal shield engageable with the distal end of the syringe body to cover the distal end of the needle.
15. A device as recited in claim 8 wherein the fluid is a medicament.
16. A device as recited in claim 8 wherein the hollow needle is made of a stainless steel.
17. A method for expelling fluid from a vial, wherein the vial is formed with a fluid chamber for holding fluid, the method comprising the steps of:



- 5 providing a syringe body defining an axis and having a proximal end and a distal end, with a hollow needle mounted within the syringe body, the needle having a proximal end and a distal end, with a distal portion of the needle extending beyond the distal end of the syringe body, wherein a guard is mounted within the syringe body for axial movement thereon over the needle from a first retracted position wherein the guard exposes the distal portion of the needle and into a second extended position wherein the guard covers and protects the distal portion of the needle;
- 10 engaging the vial with the syringe body to establish fluid communication between the needle and the fluid chamber; and
- 15 advancing the vial distally within the syringe body to expel fluid from the vial through the needle and to release the guard for movement from its first retracted position and into its second extended position.
18. A method as recited in claim 17 wherein the syringe body is formed with a lumen and the device further comprises:
- 20 an elongated adapter fixedly mounted and axially aligned within the lumen of the syringe body, and distanced therefrom to create a space therebetween, the adapter having a flexible hinge and being formed with a longitudinal slot, and wherein the guard has a tab extending radially therefrom, with the tab positioned in the slot of the adapter for axial movement of the guard relative thereto; and
- 25 a spring positioned between the adapter and the guard to urge the guard in a distal direction, wherein the guard has a flexible hinge lock engageable with the adapter.
19. A method as recited in claim 17 wherein the vial is formed with a wall surrounding the fluid chamber and further wherein, as the wall of the vial is distally advanced into the space between the syringe body and the adapter, fluid is expelled from the chamber through the needle and, in sequence, the wall activates the flexible hinge of the adapter to release the hinge lock for movement of the guard in a distal direction from its first retracted position to its second extended position.
- 30

20. A method as recited in claim 17 wherein the vial has a proximal end and a distal end, and the vial further comprises: a plug for providing a fluid tight cover for the proximal end of the vial; and a stopper, insertable into the distal end of the vial, for holding fluid in the chamber between the plug and the stopper.

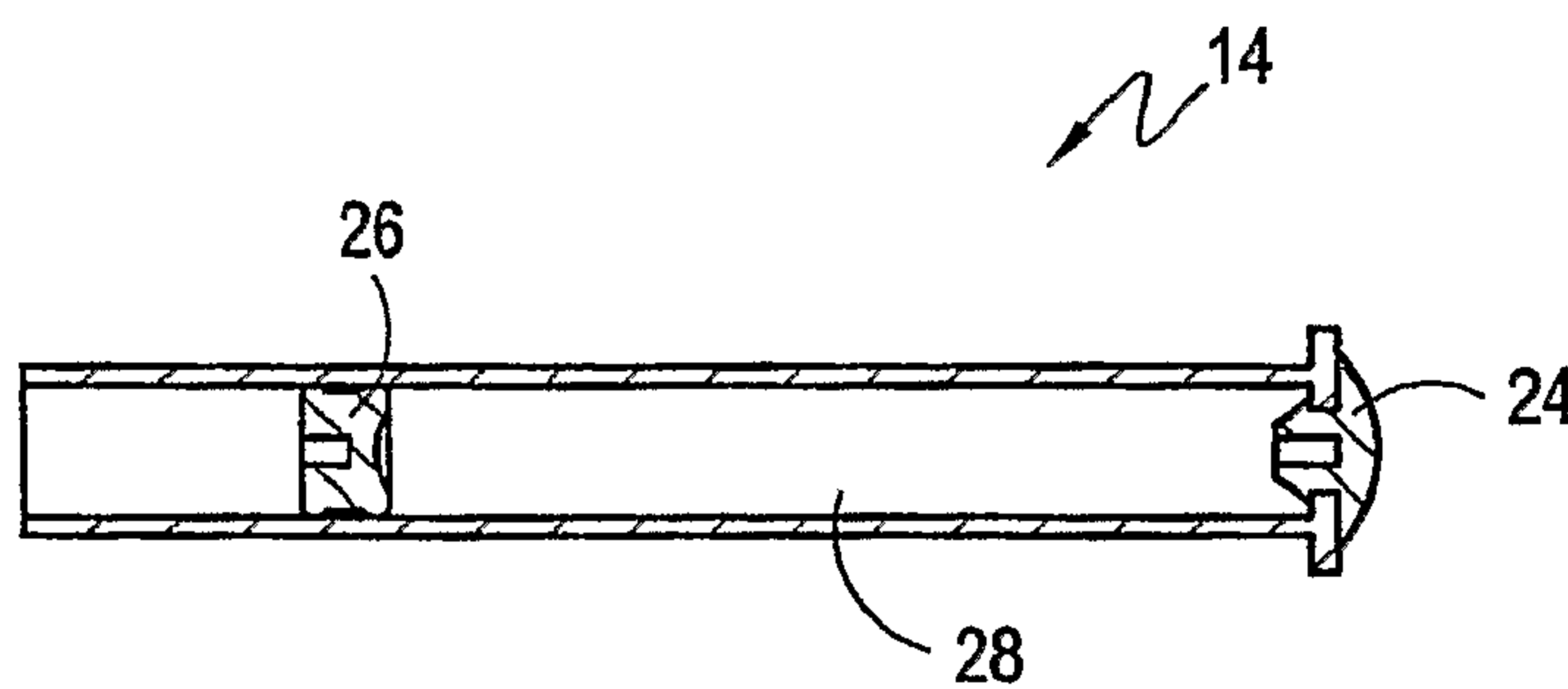
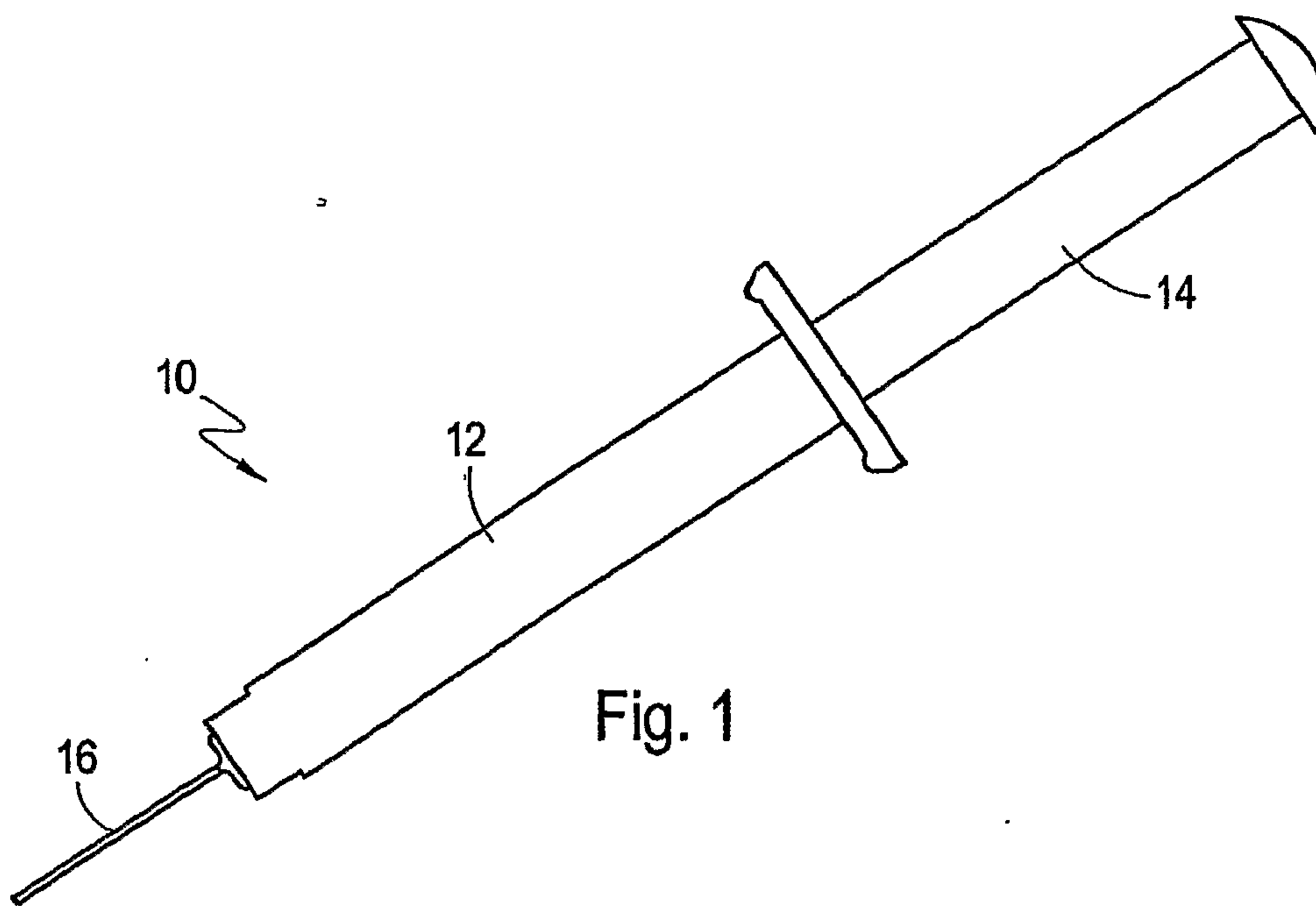


Fig. 3

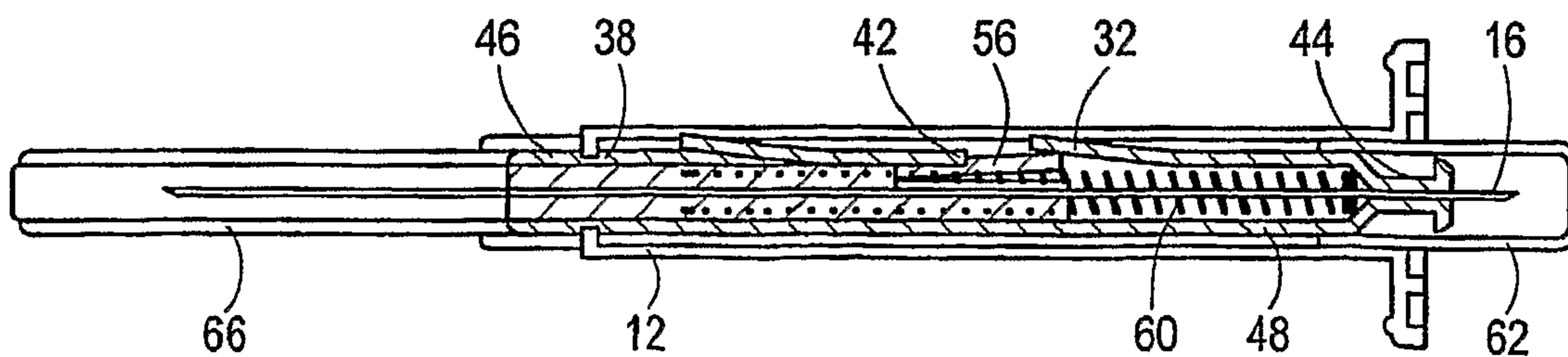


Fig. 4

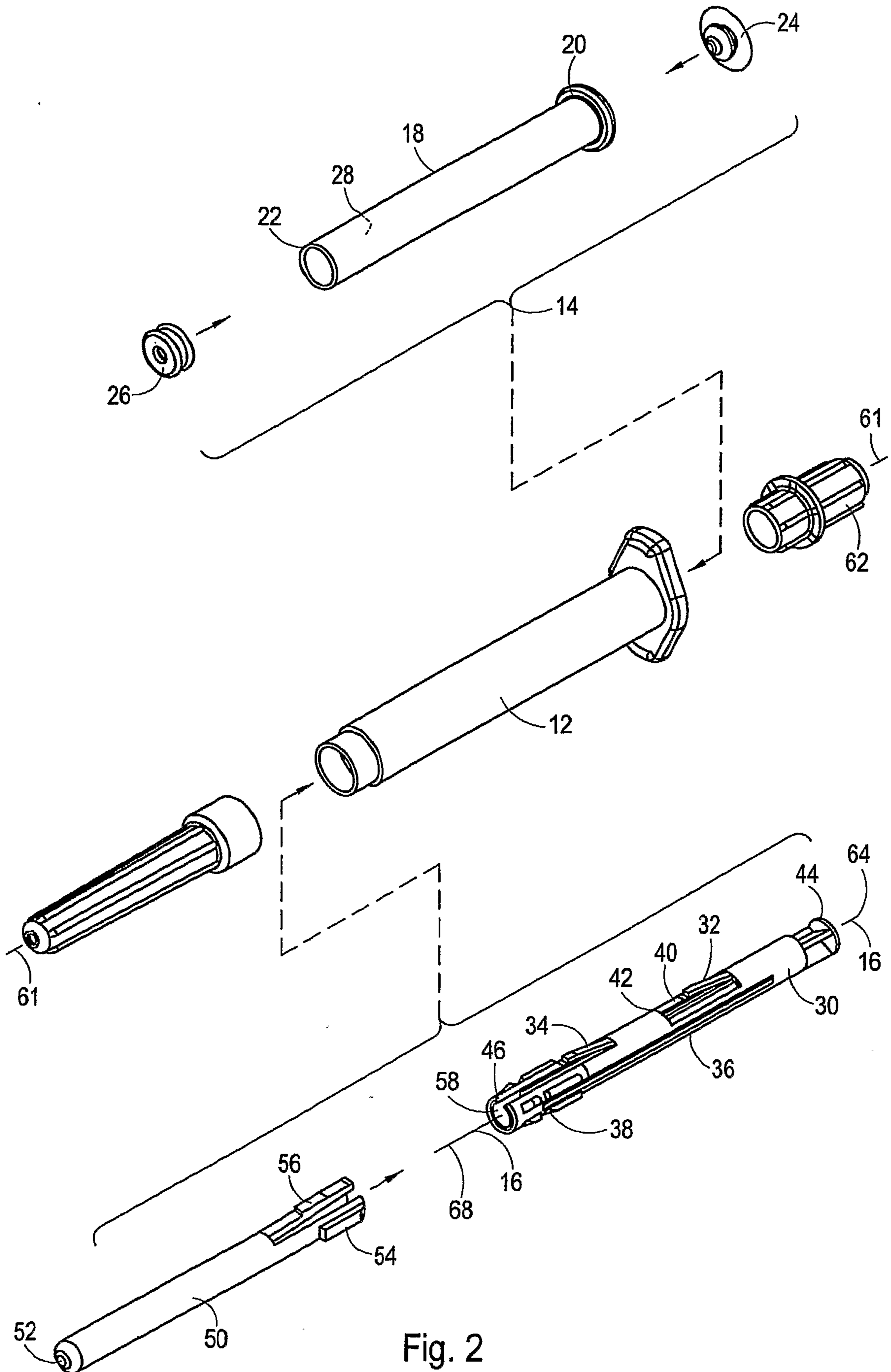


Fig. 2

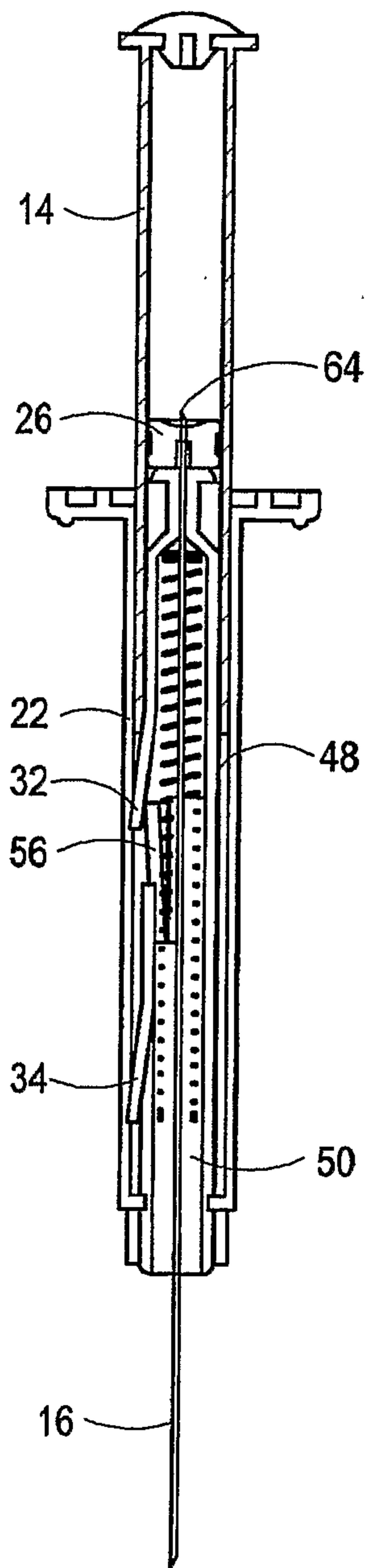


Fig. 5A

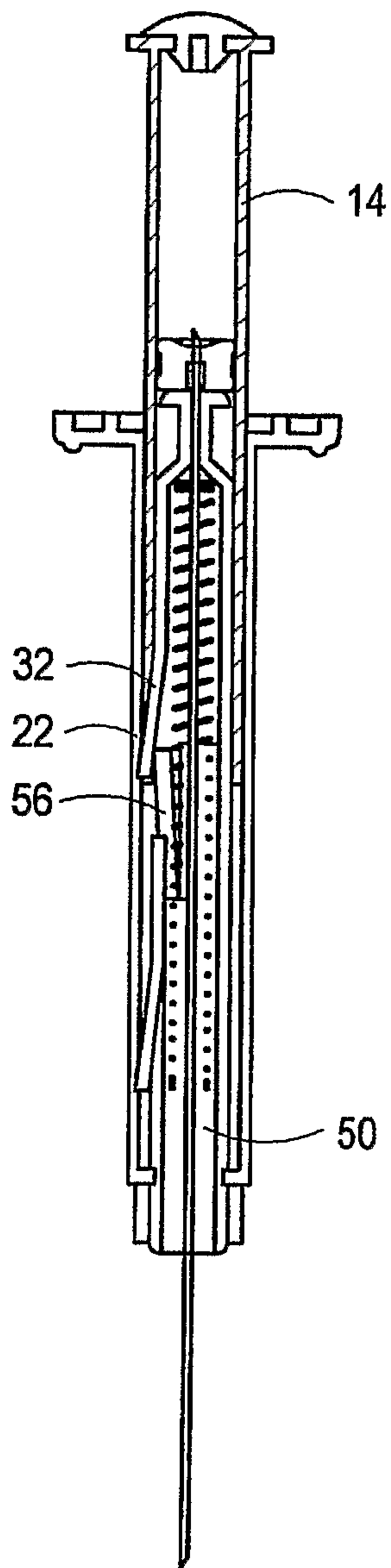


Fig. 5B

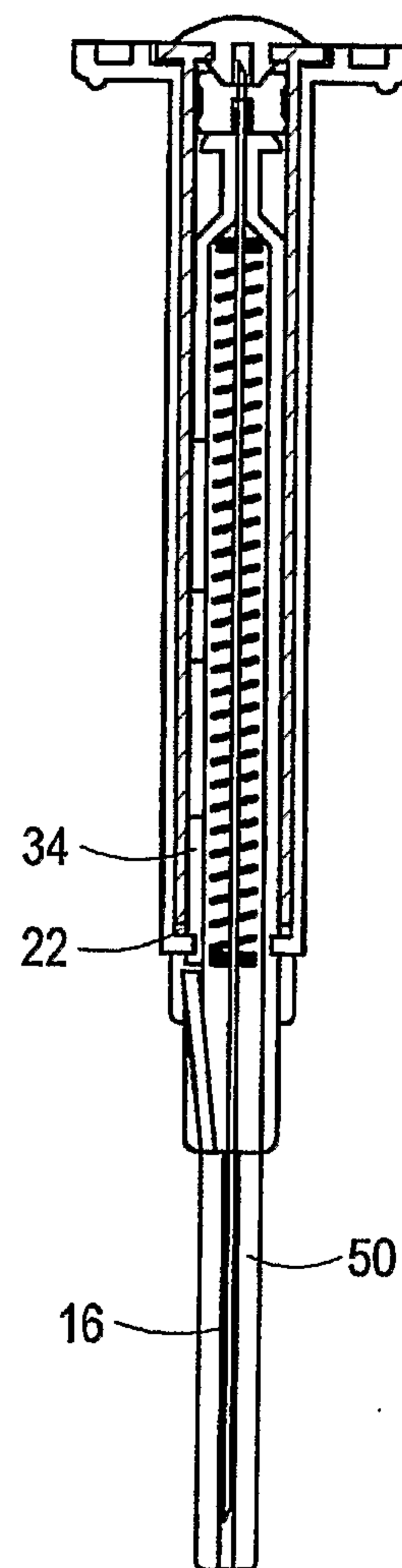


Fig. 5C

