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(54) **Title:** AN IMPROVED NEEDLELESS HYPODERMIC INJECTION DEVICE

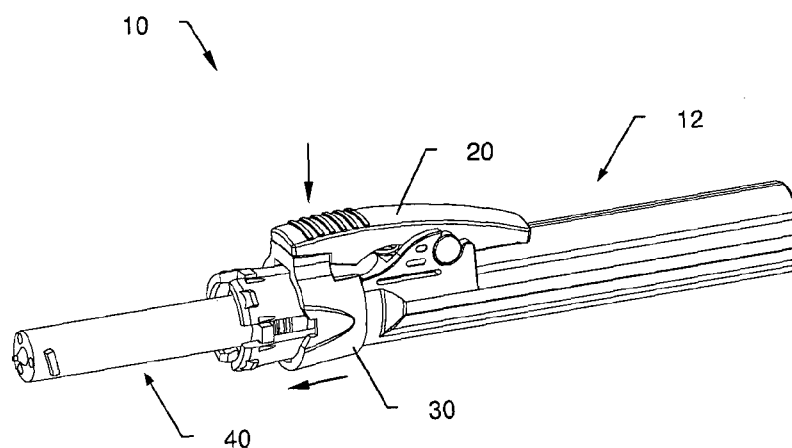


FIG. 3b

(57) **Abstract:** The present invention relates to an improved needleless hypodermic injection device (10). Accordingly, the needleless hypodermic injection device (10) includes: (a) an injector (12) having a housing (13) formed by first and second housing sections; (b) a spring injector mechanism (14) in associated with a piston (16) disposed within the injector (12); (c) a trigger (20) having a stopper (22) and in associated with a return spring (23) pivotally mounted to the injector (12); (d) a safety lock (30) slidably attached to the injector (12) to prevent undesired release movement of the trigger (20); wherein the piston (16) is in associated with a compression spring (15) and is capable to provide two different setting of spring loaded force for both low and height doses injection.



AN IMPROVED NEEDLELESS HYPODERMIC INJECTION DEVICE

FIELD OF INVENTION

- 5 The present invention relates to an injection device and more particularly to an improved needleless hypodermic injection device.

BACKGROUND OF INVENTION

- 10 Fear of needle injections has been widespread ever since the syringe was invented. The problems related to needle injections are numerous such as crying children, long periods of treatment, no therapy, or wrong therapy. This often leads to serious sequel that burden the patient and the entire supporting infrastructure, such as health insurance companies and medication budgets.

- 15 Various needleless injection devices which administer subcutaneous medications have been used. Among many advantages of such needleless injection devices include reduction of pain apprehension commonly associated with hypodermic needles, elimination of needle stick injuries, and reduction of environmental pollution associated with contaminated needle disposal. Needleless injection device is useful in wide range of drug therapies. It is also useful in the administration of insulin to the diabetic population where individuals frequently require a number of daily injections. The needleless injection devices also become great interest for those people who have limited physical ability.

- 25 Although many needleless injection devices have achieved public acceptance and commercial success in the marketplace, however there are some factors which may

need to be considered such as their sophisticated design, and high cost of contemporary injection devices. For example, many needleless injection system devices used stainless steel type injectors which are produced by a very high cost metal injection molding technology. As such the device is comparatively expensive to
5 manufacturer and thus burden most of the potential individuals from adapting into high cost needleless injector. In addition, some of the needleless injection system devices used fixed dose ampule which has to be prefilled at the factory and to be attached to the injector when required for usage. This is particularly troublesome for those individuals who require self-administer a large number of daily injections such as diabetics.

10

In view of these and other shortcomings of the prior art there is a need in the art for an improved needleless injection device. Accordingly, it is an object of the present invention to provide an improved needleless hypodermic injection device which is simple, low cost, compact and reliable to use. The improved needleless hypodermic
15 injection device is capable of being resettled for multiple injection shots.

SUMMARY OF THE INVENTION

The present invention relates to an improved needleless hypodermic injection device.
20 Accordingly, the needleless hypodermic injection device includes: (a) an injector having a housing formed by first and second housing sections; (b) a spring injector mechanism in associated with a piston disposed within the injector; (c) a trigger having a stopper and in associated with a return spring pivotally mounted to the injector; (d) a safety lock slidably attached to the injector to prevent undesired release movement of the trigger;
25 wherein the piston is in associated with a compression spring and is capable to provide two different setting of spring loaded force for both low and height doses injection.

In the preferred embodiments, the first and second housing sections are of substantially mirror imaged and are formed by suitable injection molding material. Accordingly, the injection molding material is an inexpensive and sufficiently durable plastic or polymer material such as Polypropylene (PP), Acrylonitrile butadiene styrene (ABS) or
5 Polycarbonate.

The housing of the injector is further provided with a projected flange with a clevis to receive the trigger. Preferably, the first and second housing sections are bonded by using ultrasonic process such as ultrasonic welding.

10

It will be appreciated that the compression spring of the spring injector mechanism (14) is a helical coil spring. Accordingly, the compression spring is sized to slide freely within the housing and is enable to develop desire force in a compressed position to cock the spring injector mechanism.

15

Accordingly, the piston (16) of the preferred embodiments generally includes a head and a knob sized to be engaged with one distal end of the compression spring.

The trigger of the preferred embodiments is pivotally mounted to the injector which is
20 pivot about a pin journaled in the clevis of the projected flange. Accordingly, the stopper of the trigger is provided to engage with the piston of the compressed spring injector mechanism to prevent the spring loaded force from being fired or uncompressed prior to injection. In the event that when the trigger is depressed, the stopper disengages the piston to fire or uncompress the spring injector mechanism to perform injection. It will be
25 appreciated that the return spring serves to permit the pivotally mounted trigger to be returned to it original positional upon released of the trigger from depression.

In accordance with the preferred embodiments of the present invention, the safety lock has a ledge portion on which, in a safe or slide-in position, it prevents pivot movement of the trigger so as to inhibit actuation of the spring injector mechanism. Nevertheless, in a free or slide-out position, the safety lock allows pivot movement of the trigger so as to
5 permit actuation of the spring injector mechanism.

It will be appreciated that the injector of the present invention enables to be selectively mounted with 0.3ml or 0.5ml of standard type of ampule. The ampule generally has an elongated hollow cylindrical slidably fitted therein with a plunger. In accordance with the
10 preferred embodiments, the ampule is pluggably attached to the housing of the injector.

The present invention consists of several novel features and a combination of parts hereinafter fully described and illustrated in the accompanying description and drawings, it being understood that various changes in the details may be made without departing
15 from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

20 The present invention will be fully understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, wherein:

FIG. 1a is an exploded perspective view of an injector illustrating interrelationship of
25 internal mechanism in accordance with the preferred embodiments of the present invention;

FIG. 1b is an assembled perspective view of the injector of the preferred embodiments of the present invention;

FIGS. 2a and 2b are perspective view illustrating the assembly of trigger and safety lock
5 to the injector;

FIGS. 3a and 3b are perspective view illustrating the assembly of ampule to the injector.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

10

The present invention relates to an improved needleless hypodermic injection device. Hereinafter, this specification will describe the present invention according to the preferred embodiments of the present invention. However, it is to be understood that limiting the description to the preferred embodiments of the invention is merely to
15 facilitate discussion of the present invention and it is envisioned that those skilled in the art may devise various modifications and equivalents without departing from the scope of the appended claims.

According to the present invention, a simple, low cost, compact and reliable needleless
20 hypodermic injector device is provided so as to facilitate the administration of variety of subcutaneous medication such as vaccines, insulin, local anesthesia and heparin. The improved needleless hypodermic injection device of the present invention provides a plastic or polymer injector which is cost effective to replace the existing high cost stainless steel injector. The use of plastic or polymer injector enables to lower the cost
25 of purchase and thus making it affordable to individual user. It will be appreciated that the plastic injector of the present invention is resettlable for multiple injection shots. The present invention also provided with a piston which is capable to provide two different

setting of spring loaded force for both low and high doses injection. Accordingly, the plastic or polymer injector of the present invention enables to be selectively mounted with 0.3ml or 0.5ml of standard type of market available ampule. The improved needleless hypodermic injection device of the present invention also well suited for both
5 self-administrative of medication and for injection of others.

The improved needleless hypodermic injection device according to the preferred embodiments of the present invention will now be described in accordance to the accompanying drawings FIGS. 1a to 3b, both individually and in any combination
10 thereof.

The improved needleless hypodermic injection device (10) generally includes an injector (12), a spring injector mechanism (14) which is in associated with a piston (16) disposed within the injector (12). The injector (12) is provided with a trigger (20) in associated with
15 a return spring (23) pivotally mounted to the injector (12). For safety purposes, said injector (12) further provided with a safety lock (30) to prevent undesired release movement of the trigger (20) so as to prevent any re-coking of the spring injector mechanism. It will be appreciated that the improved needleless hypodermic injection device (10) of the present invention provides a user in a substantially ready-to-use
20 condition by mounting a 0.3ml or 0.5ml standard type of market available ampule (40) filled with a particular medicament prior to injection.

In the preferred embodiments, the injector (12) of the present invention includes a housing (13) having first and second housing sections of substantially mirror imaged.
25 The first and second housing sections are preferably formed by suitable injection molding material. Accordingly, an inexpensive and sufficiently durable plastic or polymer material such as Polypropylene (PP), Acrylonitrile butadiene styrene (ABS) or

Polycarbonate is used. The housing (13) of the injector (12) is further provided with a projected flange (13a) with a clevis (13b) to receive the trigger (20). It will be appreciated that the housing (13) of the injector (12) is shaped such that it is easily grasped by the user. Accordingly, the housing (13) and trigger (20) are configured such
5 that when the housing (13) is grasped by the user's hand, the trigger (20) can be easily and conveniently depressed either by the thumb or finger.

Preferably, the trigger (20) of the present invention has a sufficient surface area and leverage to enable the injector (12) to be easily actuated by the user. The location of the
10 trigger (20) is positioned to facilitate the use of the injector (12) for self-administrative medication, as well as to facilitate the administration of medicine to patients by healthcare personnel in any desired manner. In the preferred embodiments, the trigger (20) is in associated with return spring (23) and is disposed at substantial end portion of the injector (12). Accordingly, the trigger (20) is pivotally mounted to the injector (12)
15 which is pivot about a pin (21) journaled in the clevis (13b) of the projected flange (13a). The return spring (23) serves to return the pivotally mounted trigger (20) to it original positional upon released of the trigger (20) from depression. The trigger (20) further provided with a stopper (22) to engage with the piston (16) of the compressed spring injector mechanism (14) to prevent the spring loaded force from being fired or
20 uncompressed prior to injection.

It is to be noted that one advantageous feature by forming the housing (13) as two separate housing sections is appreciated during assembly process wherein the spring injector mechanism (14) can be assembled by simply placed onto one of the two
25 housing sections and then positioning other housing section thereover. The two housing sections are preferably bonded by using ultrasonic process such as ultrasonic welding.

It will be appreciated that any other desired method such as adhesive may be used to seal the two housing sections.

The spring injector mechanism (14) of the preferred embodiments generally comprises a
5 compression spring (15) and piston (16). Accordingly, the compression spring (15) is associated with the piston (16) disposed within the housing (13) of the injector (12). Preferably, the compression spring (15) is type of helical coil spring wherein the compression spring (15) can be cocked or compressed within the housing. It will be appreciated that the compression spring (15) is sized to slide freely within the housing
10 (13) and is enable to develop desire force in a compressed position to cock the spring injector mechanism (14).

The piston (16) associated therewith is configured to be forced by the compression spring (15). Accordingly, the piston (16) of the preferred embodiments includes a head
15 (17) and a knob sized to be engaged with one distal end of the compression spring (15). It will be appreciated that the piston (16) is also sized to slide freely within the housing (13). The exact configuration, size and dimensions of the piston (16) can be determined, at least in part, by the mass thereof which is required to communicate with a plunger (41) of the ampule (40) to eject fluid from the ampule (40) with the necessary force to
20 reliably perform an injection. It will also be appreciated that the configuration of the piston (16) in associated with the compression spring (15) is capable to provide two different setting of spring loaded force for both low and height doses injection. Thus, the present invention enables to be selectively mounted with 0.3ml or 0.5ml of standard type of market available ampule.

25

The safety lock (30) of the preferred embodiments is slidably attached to the housing (13) of the injector (12) such that the safety lock (30) has a ledge portion (32) on which,

in a safe or slide-in position, pivot movement of the trigger (20) about the pin (21) is inhibited so as to likewise inhibit actuation of the spring injector mechanism (14). Nevertheless, in a free or slide-out position, the trigger (20) is free to pivot about the pin (21) so as when the trigger (20) is depressed, the stopper (22) disengages the piston
5 (16), hence fired or uncompressed the spring injector mechanism (14) to perform the injection. The safety lock (30) tends to prevent accidental actuation of the spring injector mechanism (14) which might result in accidental injection of the medicine.

In the preferred embodiments, the ampule (40) is preferably pluggably attached to the
10 housing (13) of the injector (12). The ampule (40) generally comprises an elongated hollow cylindrical slidably fitted therein with a plunger (42). The ampule (40) can be of standard type of market available ampule (40) of 0.3ml or 0.5ml filled with particular medicament prior to injection. It will be appreciated that the ampule (40) can also be of unfilled type of market available 0.3ml or 0.5ml empty ampule which will required the
15 user to load a desired particular medicament before use. Accordingly, the empty ampule can be loaded with medicine by attaching a vial or the like with particular medicine to the distal end of the ampule, and moving its plunger (42) proximately so as to draw the medicine from the vial into the ampule according to well known principle.

20 The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the principle and scope of the invention, and all such modifications as would obvious to one skilled in the art intended to be included within the scope of following claims.

CLAIMS

1. A needleless hypodermic injection device (10) includes:
- (a) an injector (12) having a housing (13) formed by first and second housing sections;
 - (b) a spring injector mechanism (14) in associated with a piston (16) disposed within the injector (12);
 - (c) a trigger (20) having a stopper (22) and in associated with a return spring (23) pivotally mounted to the injector (12);
 - (d) a safety lock (30) slidably attached to the injector (12) to prevent undesired release movement of the trigger (20);
- wherein the piston (16) is in associated with a compression spring (15) and is capable to provide two different setting of spring loaded force for both low and height doses injection.
2. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the first and second housing sections are of substantially mirror imaged and are formed by suitable injection molding material.
3. A needleless hypodermic injection device (10) as claimed in Claim 2, wherein the injection molding material is an inexpensive and sufficiently durable plastic or polymer material such as Polypropylene (PP), Acrylonitrile butadiene styrene (ABS) or Polycarbonate.
4. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the housing (13) of the injector (12) is further provided with a projected flange (13a) with a clevis (13b) to receive the trigger (20).

5. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the first and second housing sections are bonded by using ultrasonic process such as ultrasonic welding.
- 5 6. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the compression spring (15) is a helical coil spring.
7. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the compression spring (15) is sized to slide freely within the housing (13) and is
10 enable to develop desire force in a compressed position to cock the spring injector mechanism (14).
8. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the piston (16) includes a head (17) and a knob sized to be engaged with one distal
15 end of the compression spring (15).
9. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the trigger (20) is pivotally mounted to the injector (12) which is pivot about a pin (21) journaled in the clevis (13b) of the projected flange (13a).
- 20 10. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the stopper (22) is to engage with the piston (16) of the compressed spring injector mechanism (14) to prevent the spring loaded force from being fired or uncompressed prior to injection.

11. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the
when the trigger (20) is depressed, the stopper (22) disengages the piston (16) to
fire or uncompress the spring injector mechanism (14) to perform injection.
- 5 12. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the
return spring (23) permits pivotally mounted trigger (20) to return to its original
positional upon released of the trigger (20) from depression.
- 10 13. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the
safety lock (30) has a ledge portion (32) on which, in a safe or slide-in position, it
prevents pivot movement of the trigger (20) so as to inhibit actuation of the spring
injector mechanism (14).
- 15 14. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the
safety lock (30) has a ledge portion (32) on which, in a free or slide-out position, it
allows pivot movement of the trigger (20) so as to permit actuation of the spring
injector mechanism (14).
- 20 15. A needleless hypodermic injection device (10) as claimed in Claim 1, wherein the
injector (12) enables to be selectively mounted with 0.3ml or 0.5ml of standard
type of ampule (40).
- 25 16. A needleless hypodermic injection device (10) as claimed in Claim 15, wherein the
ampule (40) has an elongated hollow cylindrical slidably fitted therein with a
plunger (42).

17. A needleless hypodermic injection device (10) as claimed in Claim 15, wherein the ampule (40) is pluggably attached to the housing (13) of the injector (12).

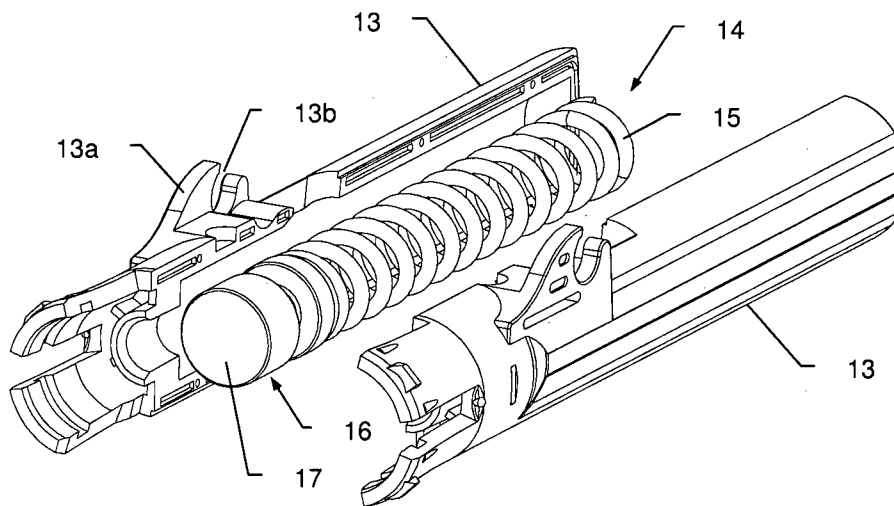


FIG. 1a

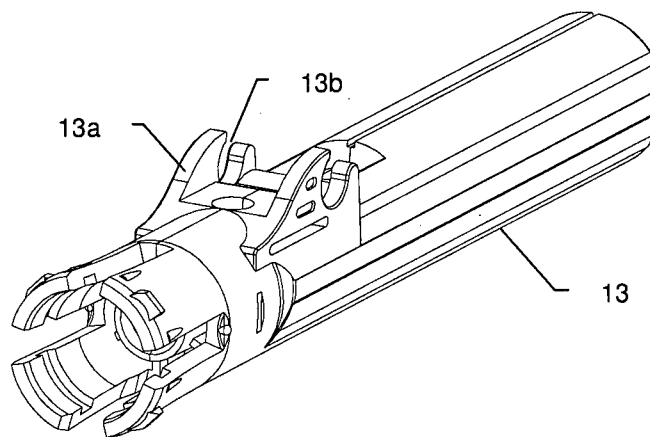


FIG. 1b

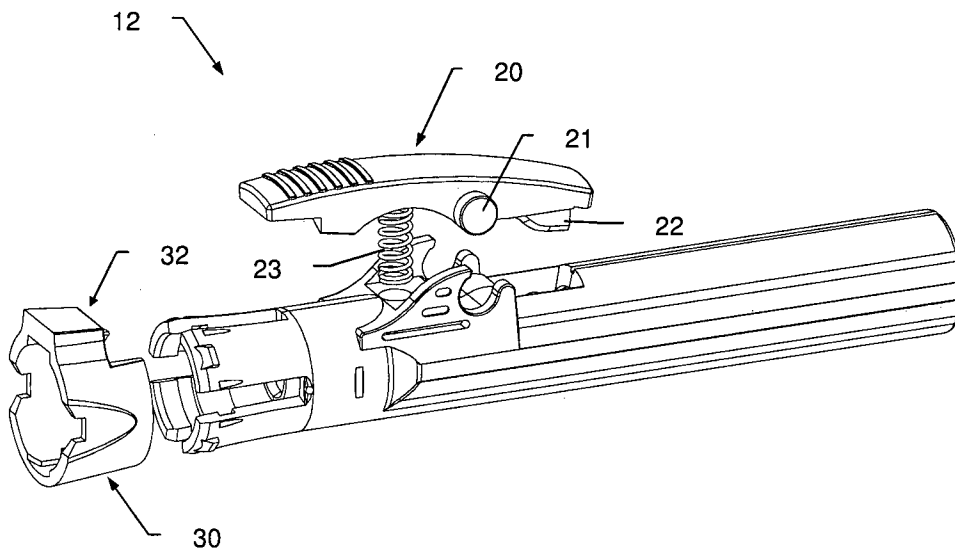


FIG. 2a

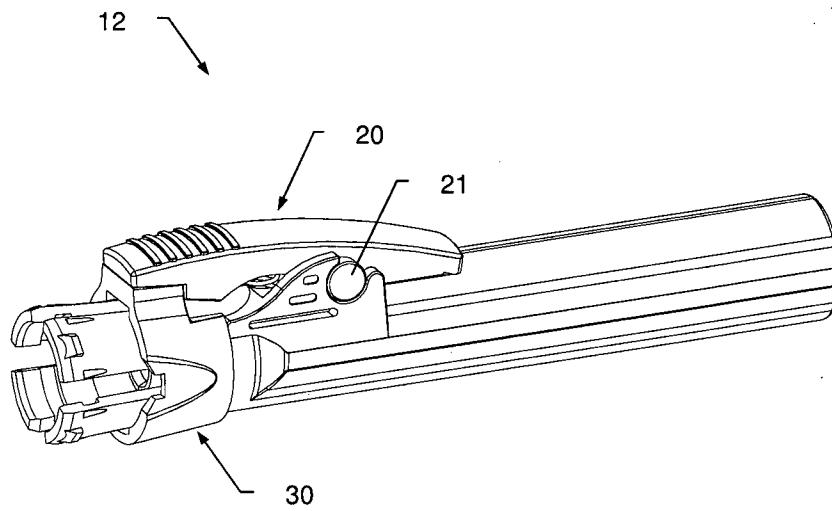


FIG. 2b

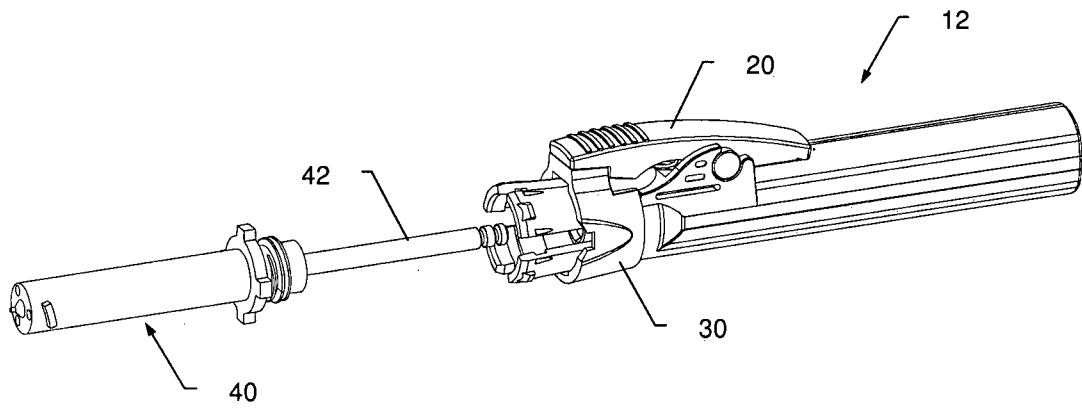


FIG. 3a

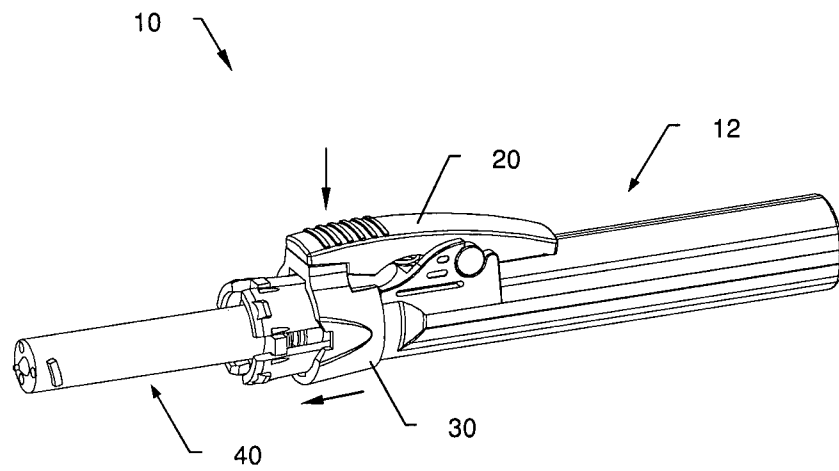


FIG. 3b