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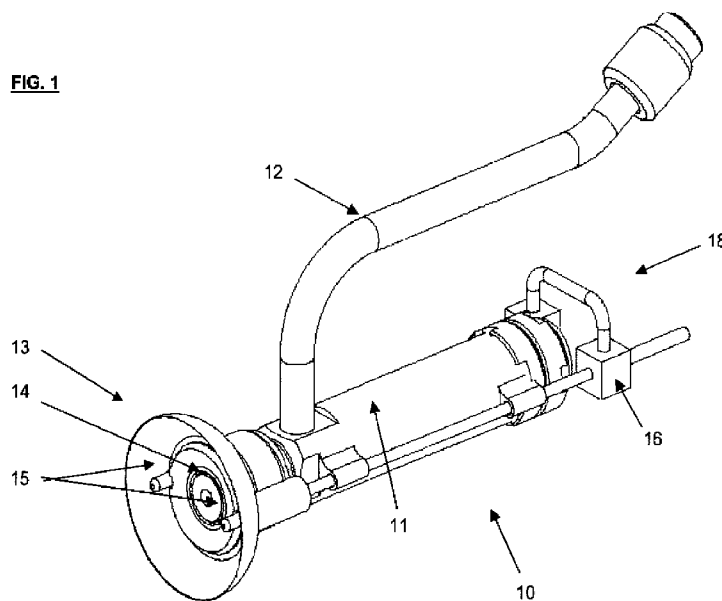
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(54) Title: INJECTION SAFETY MECHANISM



(57) Abstract: An injection device with a safety mechanism that, when prompted, initiates the injection process or transitions the injection device to a state where the injection device's injection process may be initiated by other means.

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INJECTION SAFETY MECHANISM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 61047099, filed on April 22, 2008, the entire contents is hereby incorporated by reference herein.

FIELD

[0002] This disclosure relates to a needle-free injector with safety mechanisms to prevent accidental discharge of medications that the needle-free injector will administer to a subject.

BACKGROUND

[0003] For many years, vaccination and administration of medicine has been accomplished by using syringes and needles. However, use of traditional syringes and needles increases the risk of accidental needle-sticks and disease transmission among injection recipients. In addition, if not administered with caution, syringes and needles may cause tissue damage at the site of injection, thereby creating lesions and scar tissue. Particularly with the use of needle injection of animals, the risk of accidental needlesticks and inadvertent self-injection increases. Also, injection site lesions may result in losses of tens of millions of dollars each year to meat producers from reduced grade and carcass trim. Further, during injection, needle tips may break causing residual needle fragments to remain in the subject. With animal use, this may further result in needle fragments entering into the food system. Disposable needles and syringes also create hazardous medical waste and waste disposal problems. A further drawback to traditional syringes and needles are the high costs when the units are provided for worldwide use. Many subjects, whether human or animal, have a strong aversion to needle injection. Other drawbacks are associated the traditional methods of delivering medications using needles and syringes.

[0004] Alternative methods of delivering medication have been developed. Syringes and needles have been equipped with certain safety features to reduce the risk of needlesticks or accidental injection. Another method is to deliver medication using a needle-free injector. A needle-free injector delivers medication by providing a strong, high pressure blast of the medication through a small orifice, which causes a minute stream of the medication to exit the orifice at a high rate of speed, thereby allowing the medication to penetrate into the skin and subcutaneous tissues. However, one drawback of existing needle-free injectors is that they do not assist the user in making sure that proper contact with the subject to be injected is maintained during the injection process. There is therefore presently a need for an easy-to-use, needle-free injector having a contact safety mechanism for ensuring that proper contact is made with the subject to ensure safe and proper injections are given to the subject.

SUMMARY

[0005] Utilizing the methods and systems described herein, a needle-free injector is provided having a contact mechanism that will come into contact with the subject, which restricts the needle-free injector from giving the injection to the subject until all of the conditions required by the contact mechanism are met.

[0006] Other embodiments, objects, features and advantages will be set forth in the detailed description of the embodiments that follows, and in part will be apparent from the description, or may be learned by practice, of the claimed invention. These objects and advantages will be realized and attained by the process and compositions particularly pointed out in the written description and claims hereof. The Summary is made with the understanding that it is to be considered as a brief and general synopsis of some of the embodiments disclosed herein,

is provided solely for the benefit and convenience of the reader, and is not intended to limit in any manner the scope, or range of equivalents, to which the claims are lawfully entitled.

[0007] The present invention is described in detail below with reference to the attached drawing figures, wherein:

[0008] FIG. 1 is a perspective view of an injection system in accordance with an embodiment of the present invention;

[0009] FIG. 2A is a cross-sectional view of the injection device of an embodiment of the present invention;

[0010] FIG. 2B is a cross-sectional view of the actuated injection device of an embodiment of the present invention; and

[0011] FIG. 2C is a cross-sectional view of the non-actuated injection device of an embodiment of the present invention.

[0012] FIG. 3 is a cross-sectional view of an electronically operated injection device of an embodiment of the present invention; and

[0013] FIG. 4 is a cross-sectional view of a pneumatically operated injection device of an embodiment of the present invention.

DETAILED DESCRIPTION

[0014] While the present invention is capable of being embodied in various forms, the description below of several embodiments is made with the understanding that the present disclosure is to be considered as an exemplification of the claimed subject matter, and is not intended to limit the claims to the specific embodiments described herein. The headings used throughout this disclosure are provided for convenience only and are not to be construed to limit the claims in any way. The various embodiments disclosed herein may be combined with other embodiments for the creation and description of yet additional embodiments.

[0015] FIG. 1 depicts an injection system 10 for injecting a substance into a subject. The injection system 10 includes a body 11, medicine supply tube 12, distal end 13, and proximal end 18. The distal end 13 of the injection device has a tissue interface 14 through which the substance is expelled into a subject, and safety interfaces 15. The safety interfaces 15 have to be collectively depressed into a distal end 13 of the injection device 10 to initiate the injection process or to transition the injection device 10 to a state where the injection device's injection process may be enabled and/or initiated. The distal end 13 and/ or the proximal end 18 of the injection device 10 has pneumatic, mechanical or electrical actuators 16, which are connected with safety interfaces 15 by mechanical, electrical, pneumatic or other means.

[0016] Fig. 2A-B depicts a cross-sectional view of the injection system 10 for injecting a substance into a subject. The injection system 10 includes a body 11, medicine supply tube (NOT SHOWN), distal end 17, and proximal end 15. The body 11 of the injection system 10 has an internal cavity 16 through which the substance is delivered into a subject. The proximal end 15 of the injection device 10 has a lever 12 that can be rotated on an axis 13. The lever 12 has contact with safety interfaces 18 and transfer the axial movement of the safety interfaces 18 to

injection actuator 14. With reference to Fig. 2A, an injection device 10 is ready for injection. With reference to Fig. 2B, the injection device 10 is pressed against the subject 20 into which the substance is delivered. Tissue interface 19 comes in flush contact with the subject 20 and safety interfaces 18 are simultaneously depressed into a distal end 17 of the injection device 10. When the safety interfaces 18 becomes flush with the tissue interface 19 the lever 12 moves backwards and presses onto the injection actuator 14. The injection process is then enabled and/or initiated. With the reference to Fig. 2C, the distal end 17 of the injection device 10 is pressed against the subject 20 with the slight angle. The tissue interface 19 does not have a flush contact with the subject 20. In this situation just one of the safety interfaces 18 gets depressed into a distal end 17 of the injection device 10. The lever 12 rotates on axis 13 and fails to move back to enable and/or initiate the injection process. The injection process is not enabled and/or initiated.

[0017] The safety interface mechanism can incorporate an electronic dispatching mechanism that dispatches an electronic signal (as it is presented on Fig. 3) to the injection device or can utilize a pneumatic actuation (as it is presented on Fig. 4) to initiate the injection process or to transition the injection device to a state where the injection device's injection process may be enabled and/or initiated. With reference to Fig. 3, the injection device 10 has safety interfaces 18 that, when depressed, actuate independent sequentially placed electronic switches 21. Both switches have to be engaged simultaneously for the injection to occur.

[0018] With reference to Fig. 4, the injection device 10 has safety interfaces 18 that, when depressed, actuate independent sequentially placed pneumatic valves 22. Both valves have to be actuated simultaneously for the injection process to be enabled and/or initiated.

[0019] The present invention has been described in relation to particular embodiments, which are intended in all respects to be illustrative rather than restrictive. Alternative

embodiments will become apparent to those of ordinary skill in the art to which the present invention pertains without departing from its scope.

[0020] The use of the terms “a” and “an” and “the” and similar reference in the context of this disclosure (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. The use of any and all examples, or exemplar language (e.g., such as, preferred, preferably) provided herein, is intended merely to further illustrate the content of the disclosure and does not pose a limitation on the scope of the claims. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of any aspect of the present disclosure.

[0021] Alternative embodiments of the claimed disclosure are described herein, including the best mode known to the inventors for practicing the claimed invention. Of these, variations of the disclosed embodiments will become apparent to those of ordinary skill in the art upon reading the foregoing disclosure. The inventors expect skilled artisans to employ such variations as appropriate (e.g., altering or combining features or embodiments), and the inventors intend for the invention to be practiced otherwise than as specifically described herein.

[0022] Accordingly, this invention includes all modifications and equivalents of the subject matter recited in the claims as permitted by applicable law. Moreover, any combination of the above described elements in all possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context.

CLAIMS

What is claimed is:

1. An injection device for delivering a substance to a subject, comprising:
 - a fluid path with a chamber;
 - a piston moveable within the chamber to force the substance from the chamber;
 - a tissue interface through which the substance is expelled from the chamber and into a subject; and
 - a safety mechanism with a tissue interface mechanism that, when prompted, transitions the injection device to a state where the injection device's injection process may be initiated through other means.
2. The injection device of claim 1, wherein a safety mechanism with multiple tissue interface mechanisms must be prompted to transition the injection device to a state where the injection device's injection process may be initiated through other means.
3. The injection device of claim 1, wherein a tissue interface mechanism incorporates a protruding extension that moves towards the injection device to transition the injection device to a state where the injection device's injection process may be initiated through other means.
4. The injection device of claim 1, wherein the tissue interface mechanism is comprised of a proximity sensor.
5. The injection device of claim 1, wherein the safety mechanism incorporates an electronic dispatching mechanism that dispatches an electronic signal to the injection device to transition the injection device to a state where the injection device's injection process may be initiated through other means.

6. The injection device of claim 1, wherein a shield enclosure surrounds the tissue interface to form an enclosed area between the tissue and the injection device.
7. The injection device of claim 1, wherein the safety mechanism is located on the distal portion of a shield enclosure that surrounds the tissue interface to form an enclosed area between the tissue and the injection device
8. An injection device for delivering a substance to a subject, comprising:
 - a fluid path with a chamber;
 - a piston moveable within the chamber to force the substance from the chamber;
 - a tissue interface through which the substance is expelled from the chamber and into a subject; and
 - a safety mechanism with a tissue interface mechanism that, when prompted, initiates the injection device's injection process.
9. The injection device of claim 8, wherein a safety mechanism with multiple tissue interface mechanisms must be prompted to initiate the injection device's injection process.
10. The injection device of claim 8, wherein a tissue interface mechanism incorporates a protruding extension that moves towards the injection device to initiate the injection device's injection process.
11. The injection device of claim 8, wherein the tissue interface mechanism is comprised of a proximity sensor.
12. The injection device of claim 8, wherein the safety mechanism incorporates an electronic dispatching mechanism that dispatches an electronic signal to the injection device to initiate the injection device's injection process.

13. The injection device of claim 8, wherein a shield enclosure surrounds the tissue interface to form an enclosed area between the tissue and the injection device.

14. The injection device of claim 8, wherein the safety mechanism is located on the distal portion of a shield enclosure that surrounds the tissue interface to form an enclosed area between the tissue and the injection device.

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FIG. 1

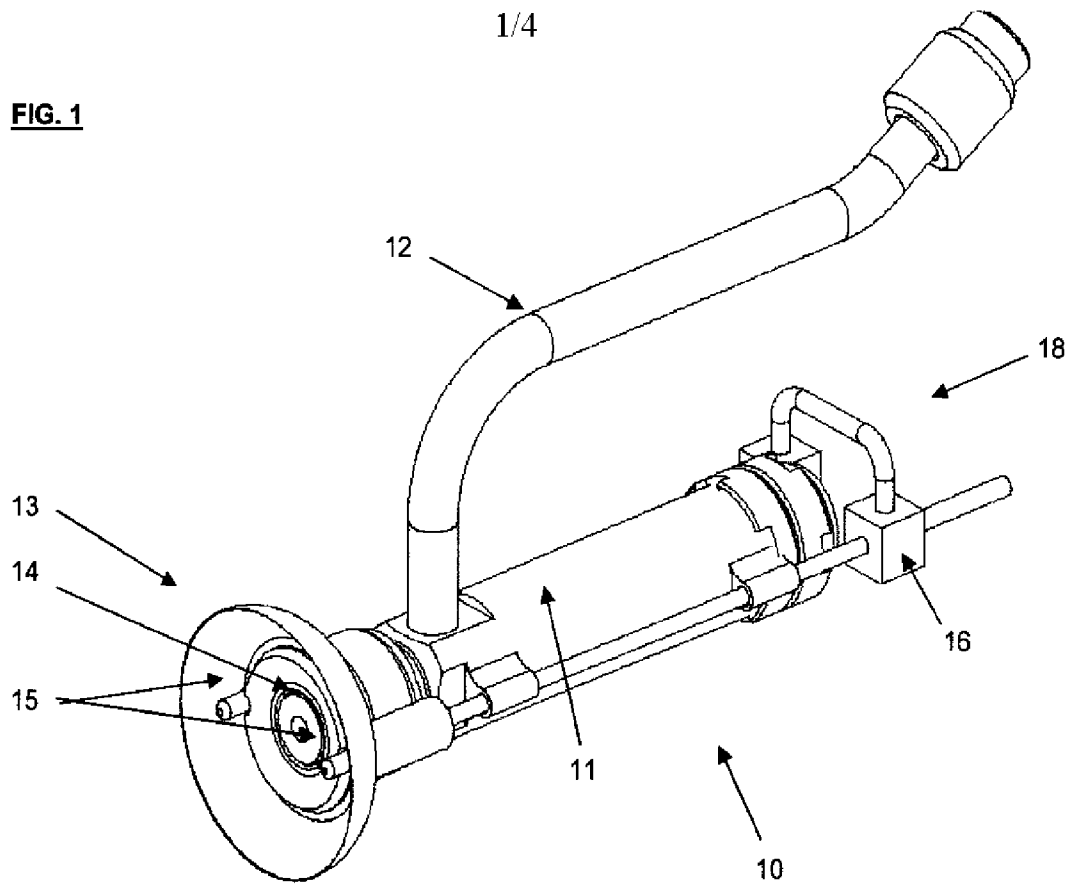


FIG. 2A

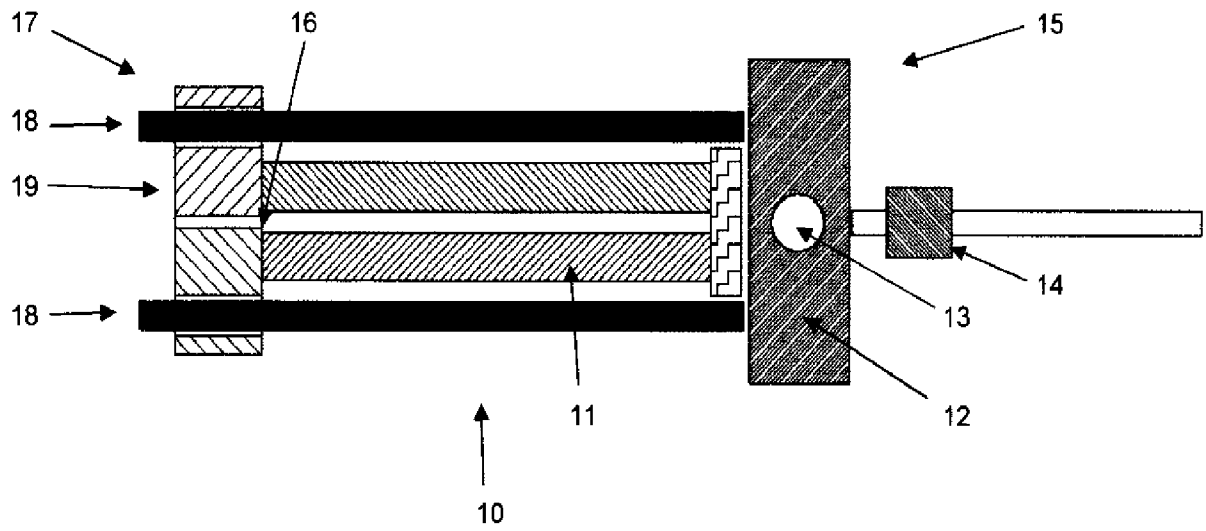


FIG. 2B

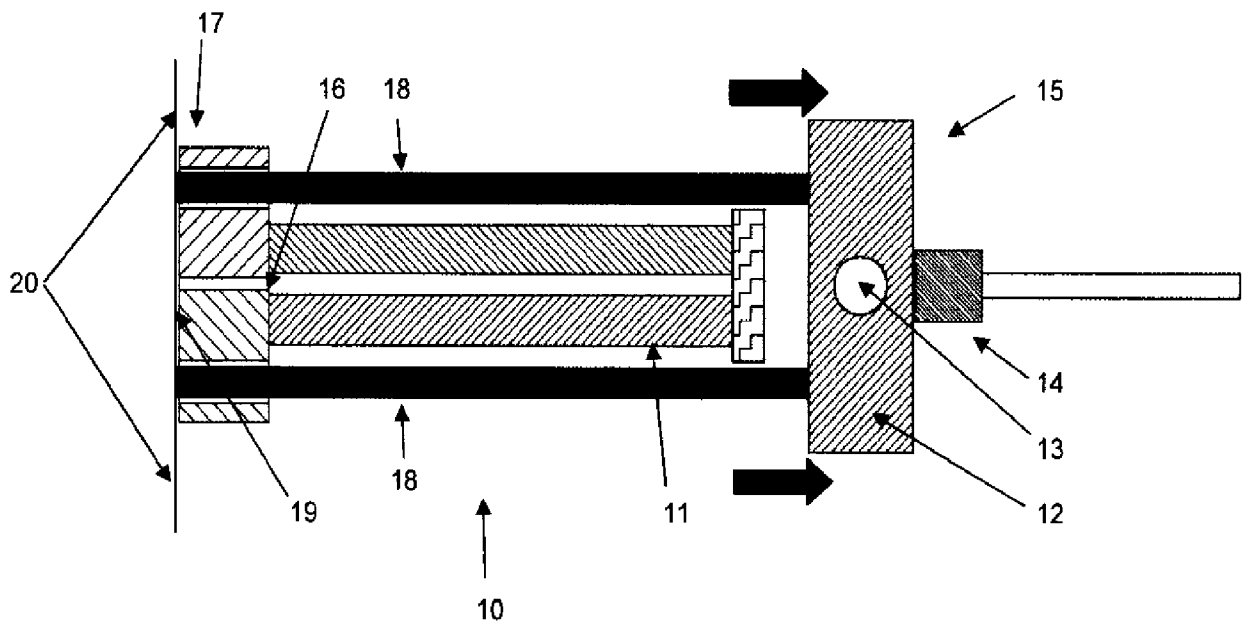


FIG. 2C

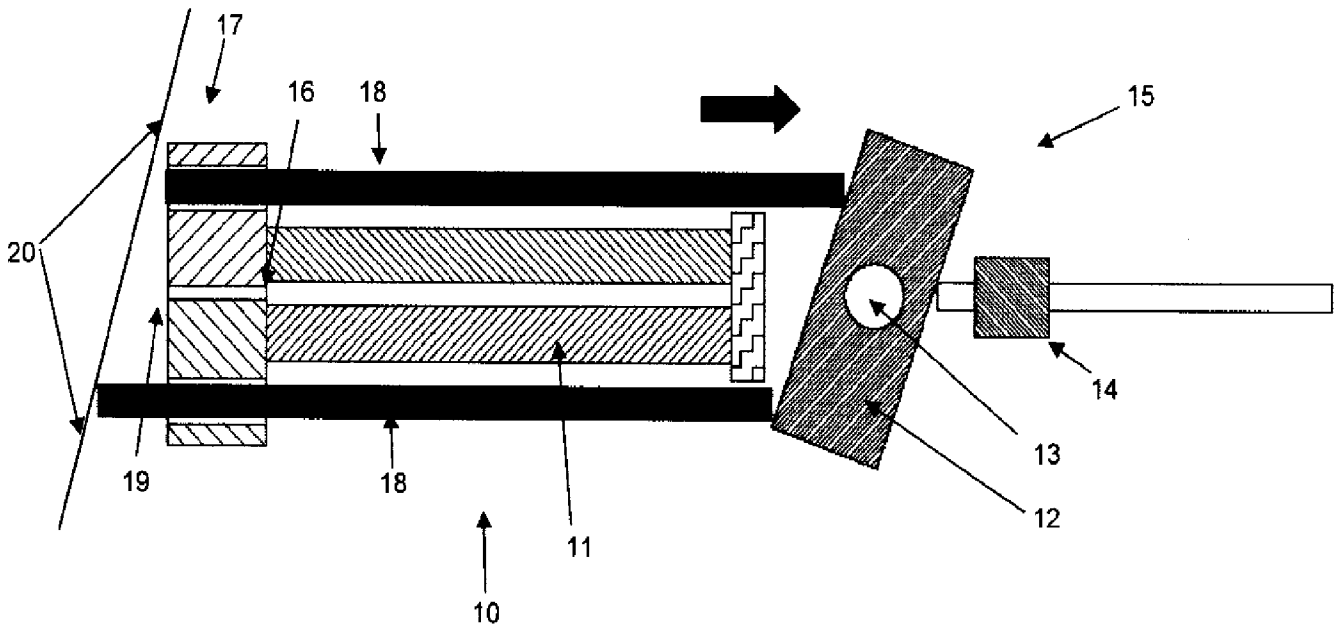


FIG. 3

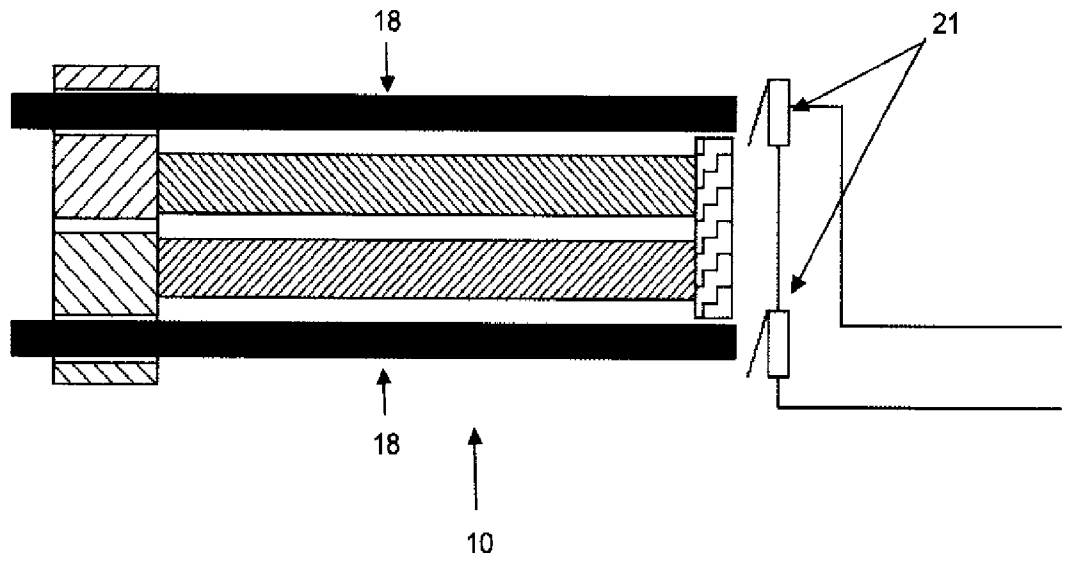
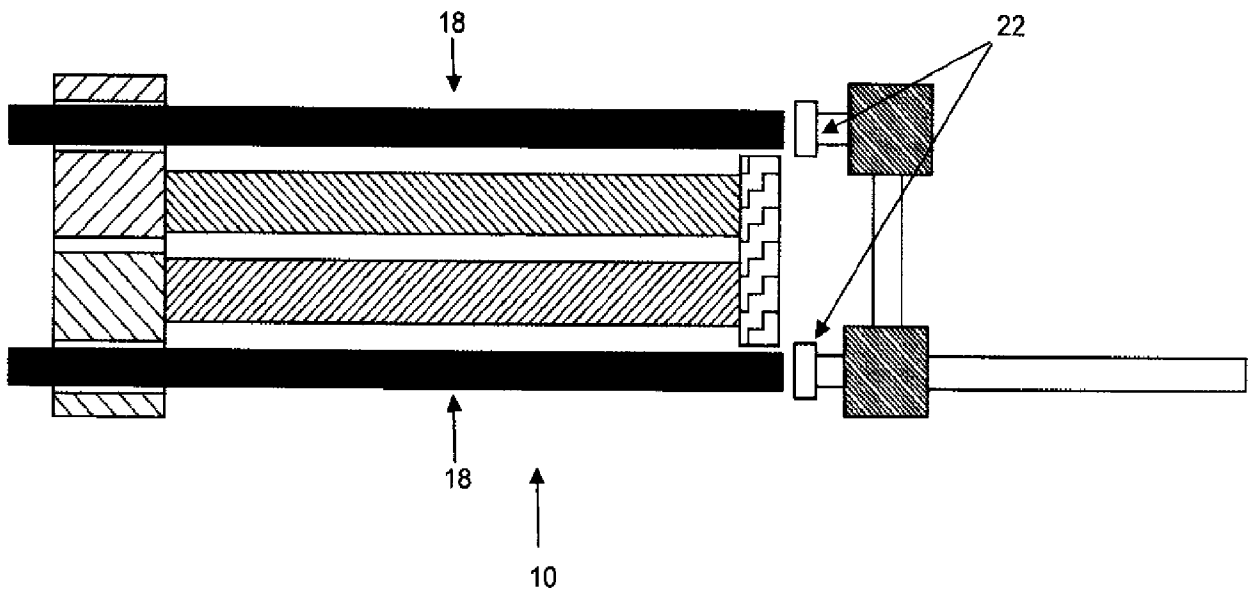


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 09/41224

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61M 5/30 (2009.01)

USPC - 604/68

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)
USPC: 604/68

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 604/48, 69, 70, 71, 72

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Pubwest (USPAT, PGPUB, JPO, EPO), Google: inject, needle-less, safety, chamber, piston, fluid, sensor, material, electrical, injection, release, eject.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/0151839 A1 (Landau) 17 October 2002 (17.10.2002) the entire document especially, para [0034], [0035], [0040] and Figure 2.	1-3, 8-10
----- Y		4-7, 11-14
Y	US 2004/0106894 A1 (Hunter et al.) 03 June 2004 (03.06.2004) the entire document especially, para [0052], [0068], [0072], [0073] and Figure 13.	4-7, 11-14
A	US 2003/0187386 A1 (Parsons) 02 October 2003 (02.10.2003) the entire document.	1-14
A	US 6210359 B1 (Patel et al.) 03 April 2001 (03.04.2001) the entire document.	1-14

Further documents are listed in the continuation of Box C.

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

Date of the actual completion of the international search 09 July 2009 (09.07.2009)	Date of mailing of the international search report 17 JUL 2009
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
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