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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
05 May 2022 (05.05.2022)

WIPO | PCT

(10) International Publication Number
WO 2022/090981 A1

(51) International Patent Classification:
A61M 3/00 (2006.01) *A61M 5/31* (2006.01)

(21) International Application Number:
PCT/IB2021/059960

(22) International Filing Date:
28 October 2021 (28.10.2021)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
202021047046 28 October 2020 (28.10.2020) IN

(72) Inventor; and

(71) Applicant: **PATEL, Karna Nikhil** [IN/IN]; 50, Alembic Nagar, Opp. Gorwa Police, Station, Gorwa, Vadodara, Gujarat 390016 (IN).

(74) Agent: **KHURANA & KHURANA, ADVOCATES & IP ATTORNEYS**; E-13, UPSIDC, Site-IV, Behind-Grand Venice, Kasna Road, Greater Noida, National Capital Region, Uttar Pradesh 201310 (IN).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,

(54) Title: DEVICE FOR INJECTING FLUID IN A BODY

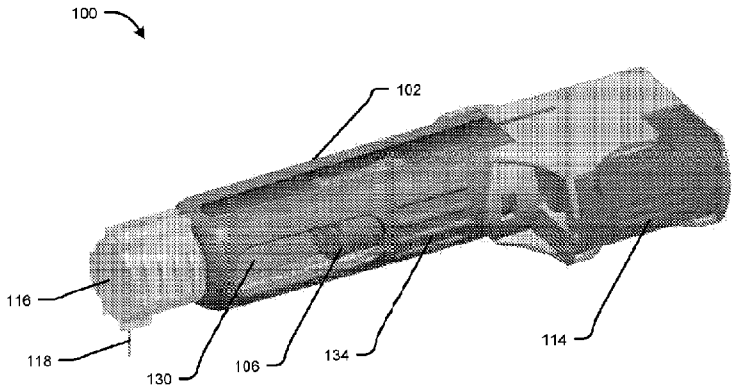

FIG. 1A

(57) Abstract: The present disclosure relates to a fluid injecting device that include a hollow member, having a first end and a second end, configured to accommodate a cartridge, having an outlet, containing the fluid. A needle assembly, having an injection needle, configured at the first end of the housing, and fluidically coupled with the outlet.An actuation assembly configured at the second end of the hollow member, and is operatively configured with the cartridge for facilitating outflow of the fluid, to the injection needle, from the cartridge.The actuation assembly includes a plunger screw operatively configured with the cartridge, and configured to move along a longitudinal axis of the hollow member. A dose nut rotatably configured with the plunger screw such that rotating the dose nut in a first direction facilitates advancement of the plunger screw towards the cartridge, which enables outflowing of the fluid from the cartridge to the needle.

WO 2022/090981 A1

[Continued on next page]

MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

DEVICE FOR INJECTING FLUID IN A BODY

TECHNICAL FIELD

[0001] The present disclosure relates to a field of syringes. More particularly, the present disclosure relates to a device for injecting fluid in a body, the fluid including medicinal fluids, but not limited to the likes.

BACKGROUND

[0002] Background description includes information that may be useful in understanding the present invention. It is not an admission that any of the information provided herein is prior art or relevant to the presently claimed invention, or that any publication specifically or implicitly referenced is prior art.

[0003] Syringes or fluid injecting devices are being widely in the medical field for centuries for injecting medicine or therapeutic fluids inside a living organism. Typical syringes are reciprocating pumps consisting of a plunger that fits tightly in a cylindrical tube and includes a needle at the front end of the barrel. The plunger is adapted to be manually pulled to extract materials or fluids inside the barrel through the needle, and the plunger is further adapted to be pushed inside the barrel to push the fluid present inside the barrel, out of the syringe through the needle. In other types of automated syringes, the plunger is automatically pushed or pulled.

[0004] One of the major drawbacks associated with existing syringes is that the needle of the syringe remains exposed to the outside environment while extracting fluid inside the barrel. The needle is required to be inserted in a container storing the fluid, and then the plunger is pulled to extract the fluid inside the barrel. Further, the needle is inserted inside the body of a patient, and the plunger is pushed to inject the fluid into the body. As a result, the needle remains exposed to the outside environment, which increases the chances of contamination of the needle, and the same contaminated needle, when inserted in the body, may cause infections and in the severe case may cause life-threatening problems to the patient.

[0005] In addition, the needle of existing syringes extends longitudinally in the direction of the barrel and plunger, and such syringes require experts or medical practitioners to firstly insert the needle at the desired position on the body, followed by pushing the plunger to inject the fluid in the body. Such a method is very risky, as shaky hands or any accidental movement of the syringe when it is inside the body, may seriously damage the

body at the insertion point. As a result, existing syringes are difficult to position and insert the needle at the desired location in the body safely and stably.

[0006] Further, it is also difficult to administer and inject a fixed desired amount of fluid in the body of the patient at a fixed flow rate, which may lead to either underdose or overdose of the fluid to the patient.

[0007] There is, therefore, a need to provide a stable and safe device for injecting a predefined amount of fluid into a body at a safe flow rate, which facilitates easier and stable positioning and insertion of the needle at desired positions on the body, and restricts interaction of the needle and fluid with the outside environment, thereby preventing the needle and fluid from contamination.

OBJECTS OF THE PRESENT DISCLOSURE

[0008] Some of the objects of the present disclosure, which at least one embodiment herein satisfies are as listed herein below.

[0009] It is an object of the present disclosure to provide a fluid injection device.

[0010] It is an object of the present disclosure to provide a fluid injection device, which is efficient.

[0011] It is an object of the present disclosure to provide a fluid injection device having an injection needle that remains isolated from ambient.

[0012] It is an object of the present disclosure to provide a fluid injection device, which is cost effective.

[0013] It is an object of the present disclosure to provide a fluid injection device, which requires less maintenance cost.

[0014] It is an object of the present disclosure to provide a fluid injection device, which is easy to use.

SUMMARY

[0015] The present disclosure relates to a field of syringes. More particularly, the present disclosure relates to a device for injecting fluid in a body, the fluid including medicinal fluids, but not limited to the likes.

[0016] An aspect of the present disclosure pertains to a fluid injecting device that include a hollow member, having a first end and a second end, configured to accommodate a cartridge, having an outlet, containing the fluid. A needle assembly, having an injection needle, configured at the first end of the housing, and the injection needle is fluidically

coupled with the outlet. An actuation assembly configured at the second end of the hollow member, and the actuation assembly is operatively configured with the cartridge for facilitating outflow of the fluid, to the injection needle, from the cartridge. The actuation assembly includes a plunger screw operatively configured with the cartridge, and the plunder screw is moved along a longitudinal axis of the hollow member, and a dose nut rotatably configured with the plunger screw such that rotating the dose nut in a first direction facilitates advancement of the plunger screw towards the cartridge, which enables outflowing of the fluid from the cartridge to the injection needle.

[0017] In an aspect, a first threads of the dose nut may be engaged with a corresponding second threads of the plunger screw for facilitating conversion of a rotational motion of the dose nut to a linear movement of the plunger screw.

[0018] In an aspect, the actuation assembly may comprise a switch having one or more prongs.

[0019] In an aspect, the switch may be disposed at the second end of the fluid injecting device.

[0020] In an aspect, dose nut may comprise any of a third threads, and extensions on an outer surface of the dose nut, operatively coupled with one or more prongs such that pressing of the switch facilitates a controlled rotation of the dose nut in the first direction.

[0021] In an aspect, the one or more prongs may get locked with any of the third threads and the extensions, after the switch is retracted back to its initial position, for restricting the rotation of the dose nut in a second direction opposite to the first direction.

[0022] In an aspect, the switch may be retracted back to the initial position through one or more springs operatively configured with the one or more prongs.

[0023] In an aspect, a single pressing of the switch may facilitate outflowing of a pre-defined amount of fluid from the cartridge.

[0024] In an aspect, the fluid injecting device may comprise an injecting spring for facilitating a push force to the plunger screw to reduce a force required for pressing the switch.

[0025] In an aspect, the needle assembly may comprise a platform on which the injection needle may be mounted, a cap covering the injection assembly, and a cover may be elastically configured with the platform to move between a first position and a second position. The cover at least may partially cover the injection needle, when at the first position, to prevent the injection needle from coming in contact with ambient, and the cover maybe retracted, when at the second position, towards the platform.

[0026] In an aspect, the cover may be actuated, by a skin of the user who is supposed to receive the outflown fluid from the cartridge, from the first position to the second position when the injection needle is pressed against the skin, and the outflown fluid is injected to the user through the injection needle.

[0027] In an aspect, the platform may comprise a plurality of channels through which the needle is fluidically coupled with the cartridge.

[0028] In an aspect, any of the plurality of channels may be configured to be fluidically coupled with the cartridge inside the hollow member, by positioning the needle assembly in one or more orientations with respect to the first end of the hollow cylindrical member.

[0029] In an aspect, the actuation assembly may comprise a cylindrical member, having two half threads, covering the plunger screw for facilitating a controlled advancement, by a pre-defined distance, of the plunger screw towards the cartridge.

[0030] In an aspect, the fluid injection device may comprise a dose recorder to keep a record of an amount of the fluid outflown from the cartridge.

[0031] In an aspect, the plunger screw may be operatively configured with the cartridge through a plunger.

[0032] In an aspect, the plunger screw may be prevented from rotating on its axis using any of by disposing a central rod in the plunger screw, and by making projections, to be engaged against corresponding profile, to the projections, in the plunger, at a front end of the plunger screw.

[0033] In an aspect, the fluid injection device may be a wearable device.

[0034] Various objects, features, aspects and advantages of the inventive subject matter will become more apparent from the following detailed description of preferred embodiments, along with the accompanying drawing figures in which like numerals represent like components.

BRIEF DESCRIPTION OF DRAWINGS

[0035] The accompanying drawings are included to provide a further understanding of the present disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the present disclosure and, together with the description, serve to explain the principles of the present disclosure. The diagrams are for illustration only, which thus is not a limitation of the present disclosure.

[0036] In the figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label with a second label that distinguishes among the similar components. If only the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

[0037] FIG. 1A to 1D illustrate exemplary views of the proposed device for injecting fluid in a body in accordance with an embodiment of the present invention.

[0038] FIG. 2A-2C illustrate exemplary views of a side button injection mechanism of the proposed device in accordance with an embodiment of the present invention.

[0039] FIG. 2D to 2E illustrate exemplary views of a rear button injection mechanism of the proposed device in accordance with an embodiment of the present invention.

[0040] FIGs 3A-B and FIG. 3E-F illustrates the device with a central rod in accordance with an embodiment of the present invention.

[0041] FIGs 3C-D and FIG. 3G-H illustrates the device without a central rod in accordance with an embodiment of the present invention.

[0042] FIG. 4A to 4F illustrates a first embodiment of the needle assembly of the proposed device having bent needle connection with the cartridge in accordance with an embodiment of the present invention.

[0043] FIG. 5A to 5D illustrates a second embodiment of the needle assembly of the proposed device having a straight needle connection with the cartridge in accordance with an embodiment of the present invention

[0044] FIG. 6A illustrates a needle connector with a port for side and top connection (also referred as one or more configurations) of the proposed device in accordance with an embodiment of the present invention.

[0045] FIG. 6B to 6G illustrates the top connection of the proposed device with the needle connector in accordance with an embodiment of the present invention.

[0046] FIG. 6H to 6L illustrates the top connection of the proposed device with the needle connector in accordance with an embodiment of the present invention.

[0047] FIG. 7A to 7O illustrate exemplary views of various components and their positions in the proposed device in accordance with an embodiment of the present invention.

[0048] FIG. 8A illustrates an exemplary representation of the injection device with a reference plate, FIG. 8B to 8C illustrates an exemplary representation of the injection device with half nut configuration, in accordance with an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0049] The following is a detailed description of embodiments of the disclosure depicted in the accompanying drawings. The embodiments are in such detail as to clearly communicate the disclosure. However, the amount of detail offered is not intended to limit the anticipated variations of embodiments; on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the scope of the present disclosure as defined by the appended claims.

[0050] In the following description, numerous specific details are set forth in order to provide a thorough understanding of embodiments of the present invention. It will be apparent to one skilled in the art that embodiments of the present invention may be practiced without some of these specific details.

[0051] The present disclosure relates to a field of syringes. More particularly, the present disclosure relates to a device for injecting fluid in a body, the fluid including medicinal fluids, but not limited to the likes.

[0052] The present disclosure elaborates upona fluid injecting device that include a hollow member, having a first end and a second end, configured to accommodate a cartridge, having an outlet, containing the fluid. A needle assembly, having an injection needle, configured at the first end of the housing, and the injection needle is fluidically coupled with the outlet. An actuation assembly configured at the second end of the hollow member, and the actuation assembly is operatively configured with the cartridge for facilitating outflow of the fluid, to the injection needle, from the cartridge. The actuation assembly includes a plunger screw operatively configured with the cartridge, and the plunder screw is moved along a longitudinal axis of the hollow member, and a dose nut rotatably configured with the plunger screw such that rotating the dose nut in a first direction facilitates advancement of the plunger screw towards the cartridge, which enables outflowing of the fluid from the cartridge to the injection needle.

[0053] In an embodiment, a first threads of the dose nut can be engaged with a corresponding second threads of the plunger screw for facilitating conversion of a rotational motion of the dose nut to a linear movement of the plunger screw.

[0054] In an embodiment, the actuation assembly can comprise a switch having one or more prongs.

[0055] In an embodiment, the switch can be disposed at the second end of the fluid injecting device.

[0056] In an embodiment, dose nut can comprise any of a third threads, and extensions on an outer surface of the dose nut, operatively coupled with one or more prongs such that pressing of the switch facilitates a controlled rotation of the dose nut in the first direction.

[0057] In an embodiment, the one or more prongs can get locked with any of the third threads and the extensions, after the switch is retracted back to its initial position, for restricting the rotation of the dose nut in a second direction opposite to the first direction.

[0058] In an embodiment, the switch can be retracted back to the initial position through one or more springs operatively configured with the one or more prongs.

[0059] In an embodiment, a single pressing of the switch can facilitate outflowing of a pre-defined amount of fluid from the cartridge.

[0060] In an embodiment, the fluid injecting device can comprise an injecting spring for facilitating a push force to the plunger screw to reduce a force required for pressing the switch.

[0061] In an embodiment, the needle assembly can comprise a platform on which the injection needle can be mounted, a cap covering the injection assembly, and a cover can be elastically configured with the platform to move between a first position and a second position. The cover at least can partially cover the injection needle, when at the first position, to prevent the injection needle from coming in contact with ambient, and the cover can be retracted, when at the second position, towards the platform.

[0062] In an embodiment, the cover can be actuated, by a skin of the user who is supposed to receive the outflown fluid from the cartridge, from the first position to the second position when the injection needle is pressed against the skin, and the outflown fluid is injected to the user through the injection needle.

[0063] In an embodiment, the platform can comprise a plurality of channels through which the needle is fluidically coupled with the cartridge.

[0064] In an embodiment, any of the plurality of channels can be configured to be fluidically coupled with the cartridge inside the hollow member, by positioning the needle assembly in one or more orientations with respect to the first end of the hollow cylindrical member.

[0065] In an embodiment, the actuation assembly can comprise a cylindrical member, having two half threads, covering the plunger screw for facilitating a controlled advancement, by a pre-defined distance, of the plunger screw towards the cartridge.

[0066] In an embodiment, the fluid injection device can comprise a dose recorder to keep a record of an amount of the fluid outflown from the cartridge.

[0067] In an embodiment, the plunger screw can be operatively configured with the cartridge through a plunger.

[0068] In an embodiment, the plunger screw can be prevented from rotating on its axis using any of by disposing a central rod in the plunger screw, and by making projections, to be engaged against corresponding profile, to the projections, in the plunger, at a front end of the plunger screw.

[0069] In an embodiment, the fluid injection device can be a wearable device.

[0070] FIG. 1A to 1D illustrate exemplary views of the proposed device for injecting fluid in a body in accordance with an embodiment of the present invention.

[0071] As illustrated, a fluid injecting device 100 can include a hollow member 102 that can be configured to accommodate a cartridge having a fluid stored therein. The hollow member 102 can include a first end and a second end and the cartridge can include an outlet for dispensing the fluid. A needle assembly 116 can be configured at the first end of the hollow member 102 (can also be referred as housing 102). The needle assembly can include an injection needle 118 that can be fluidically coupled with the outlet of the cartridge. An actuation assembly, having a housing 108,can be configured at the second end of the hollow member 102. The actuation assembly can be operatively configured with the cartridge for facilitating outflow of the fluid, to the injection needle 118, from the cartridge. The disclosed fluid injection device 100 can be a wearable device that can be worn by the user who requires frequency doses or can be standalone device that be carried along.

[0072] In an embodiment, the actuation assembly can include a plunger screw 112 that can be operatively configured with the cartridge, and the plunder screw 112 can be moved along a longitudinal axis of the hollow member 102. The plunger screw 112 can be operatively configured with the cartridge through a plunger 106 that can be made of but without limiting to rubber. The actuation assembly can include and a dose nut 110 that can be rotatably configured with the plunger screw 110 such that rotating the dose nut 110 in a first direction can facilitate an advancement of the plunger screw 112 towards the cartridge. This can enable outflowing of the fluid from the cartridge to the injection needle 118.A first threads of the dose nut 110 can be engaged with a corresponding second threads of the plunger screw 112 for facilitating conversion of a rotational motion of the dose nut 110 to a linear movement of the plunger screw 112. The dose nut 110 includes any of a third threads, and extensions protruding circumferentially from the outer surface of the dose nut 110.

[0073] In an embodiment, the actuation assembly can include a switch 114 that can further have one or more prongs. The one or more prongs can include a first prong or an actuation prong, and a second prong or a body prong. The switch 114 can be configured with the actuation assembly. Any of the third thread or extensions can be operatively coupled with one or more prongs such that pressing of the switch 114 can facilitate a controlled rotation of the dose nut 110 in the first direction. The one or more prongs can get locked with any of the third threads and the extensions, after the switch is retracted back to its initial position, for restricting the rotation of the dose nut in a second direction opposite to the first direction.

[0074] In an embodiment, the fluid injection device 100 can be stored in a box. The box can include a bottom enclosure 120 for accommodating the device 100, and a lid 122 adapted to open and close and provide access of the device 100 to the user. In an exemplary embodiment, an upper surface of the enclosure 120 can be provided with a sticker cover 124 to protect the device 100 from the outside environment. The lid 122 and the enclosure 120 can be provided with cushioning elements 124, including but not limited to a sponge, to protect the device from mechanical shocks. The device can be packed in a cover 124.The device 100 can include a dose recorder 126 configured with the hollow member 102 to record the dosage of the fluid. In another embodiment, the hollow member 102 and/or the dose recorder 126 can be enclosed inside a holder 134.

[0075] In an exemplary embodiment, at least a portion of the hollow member 102 and the holder 134 can be transparent to allow the user to view the fluid stored inside the cartridge 102. In another exemplary embodiment, the plunger 106 can be made of rubber, but not limited to the likes. In yet another exemplary embodiment, the body can be the body of a living organism, where the upper surface is the skin of the living organism. The fluid can be a therapeutic or medicinal fluid, but not limited to the likes.

[0076] FIG. 2A-2C illustrate exemplary views of a side button injection mechanism of the proposed device in accordance with an embodiment of the present invention.

[0077] FIG. 2A illustrates the side button being in a non-actuated position, and FIG. 2B illustrates the side button being in an actuated position in accordance with an embodiment of the present invention.

[0078] As illustrated, in an embodiment, the device 100 can include the injection button 114 (also referred as switch 114) being configured on the side surface of the actuation assembly's housing108. The dose nut 110 can include any of the third thread and extensions 204-1, 204-2 (also referred to as serrations 204 or step 204, herein) protruding circumferentially from the outer surface of the dose nut 110. The one or more prongs can

include a first prong 202 and a second prong 204. The first prong 202 (can also referred to as actuation prong 202, herein) can be configured to engage with at least one of the extensions 204, such that actuation or pressing of the switch 114 towards the dose nut 110 (or inside the housing 108) can enable the first prong 202 to rotate the dose nut 110 by a predefined angle in the first direction. The inner surface of a rear end of the housing 108 can include the second prong 206 (also referred to as body prong 206, herein). The second prong 206 can be flexible and remains engaged with at least one step 204-2 among the extensions 204 of the dose nut 110, but bends and disengages with the step 204 when the dose nut 110 rotates in the predefined direction. Upon further rotation of the dose nut 110 in the first direction, the second prong 206 can again retract and engage with the next step of dose nut 110 to restrict further rotation of the dose nut 110, in a second direction opposite to the first direction, until the injection button 114 is again actuated.

[0079] In an embodiment, the first prong 202 can be flexible and adapted to bend and slide over the next step, when the at least one button spring (132-1, 132-2) of the injection button 114 retracts the injection button 114 to its original position.The device 100can generate two click sounds in one press cycle of the injection button. First click happens when the switch 114 is completely pressed by release and hitting of the bent second prong 206 on the steps of the dose nut 110 as illustrated, and the second click happens when the injection button 114 completely retracts by release and hit of bent first prong on the next step of the dose nut 110.

[0080] In an illustrative embodiment, each pressing or actuation of the switch 114 can rotate the dose nut 110 by the predefined angle in a clockwise direction (First direction). As the plunger screw 112 is configured inside the dose nut 110, the plunger screw 112 can move by the predefined distance towards the cartridge as per the pitch of the second threads of the plunger screw 112. This motion of the plunger screw 112 can push the plunger 106 towards the cartridge 102, thereby injecting the fluid through the needle 118. Thus, the injection buttonor switch 114 can push the dose nut110 leading to the displacement of the plunger screw112 leading to the displacement of the plunger 106 towards the hollow member 102, leading to the injection of the fluid. But there is a certain resistance force in the device which raises the force required to push the injection button 114. Thus, the injection spring 136 or 208 can be used to store potential energy and provide push force to the plunger screw 112. This pushing force provided by the dose nut110 can reduce the force required to push the injection button or switch 114. Further, one end of the dose nut 110 can be supported on the housing108 and the other end on the plunger screw 112. The injection spring 136 or 208 can

be pre-compressed during the assembling of the injecting device 100. The front end of the compressed dose nut 110 can push the plunger screw 112 forward towards the plunger 106. This can reduce the resistance or back force in the device100 thereby reducing the required injection button 114 press force.

[0081] FIGs 3A-B and FIG. 3E-F illustrates the device with a central rod in accordance with an embodiment of the present invention.

[0082] FIGs 3C-D and FIG. 3G-H illustrates the device without a central rod in accordance with an embodiment of the present invention.

[0083] As illustrated in FIGs 3A to 3B, and 3E to 3F, the device 100 having a central rod 302 is disclosed. In this configuration with the central rod 302 present in the housing 108, the central rod 302 can be disposed within the plunger screw 112 and provides a linear guide to the plunger screw 112 so that plunger screw 112 does not rotate axially upon actuation of the switch 114, and just move linearly towards the plunger 106.

[0084] As illustrated in FIGs 3C to 3D, and 3G to 3H, the device 100 without the central rod is disclosed. In the configuration without a central rod present in the second housing, ribs 304 (also referred as projections 304) can be present in the front end of plunger screw 112 which can engage with corresponding depression (also referred as corresponding profile) of the plunger 106. This can provide rotational resistance to the plunger screw 112 so that plunger screw 112 does not rotate axially upon actuation of the switch 114, and it just moves linearly towards the plunger 106.

[0085] FIG. 4A to 4F illustrates a first embodiment of the needle assembly of the proposed device having bent needle connection with the cartridge, in accordance with an embodiment of the present invention.

[0086] According to an embodiment, the injection needle 118 can be a bent needle having a rear tip making an angle with the front tip, where the angle is not equal to 180 degrees, as shown in FIG. 4D. In an exemplary embodiment, the rear tip of the needle 118 can be perpendicular to the front tip of the needle. Upon coupling the needle assembly with the hollow member 102, the bent needle 118 can extend between the outlet 104 of the hollow member 102, and outside a first end of the needle cap 402 (also referred as cap), such that a rear tip of the needle 118 can be fluidically coupled to the opening 104 and a predefined length of the needle 118 or front tip of the needle 118 is outside the opening present at the first end of the needle cap 402.

[0087] In an embodiment, the needle mechanism can include a needle spring 406 configured with the needle cover 404 (also referred as cover), and configured to

automatically move the needle cover 404 between a first position and a second position when a force applied on the needle assembly or device 100 by the user is less than the spring force of the needle spring 406. The cover 404 can be actuated, by a skin of the user who is supposed to receive the outflown fluid from the cartridge, from the first position to the second position when the injection needle 118 is pressed against the skin, and the outflown fluid is injected to the user through the injection needle

[0088] In an embodiment, once the needle tip is inside the body, the actuation of the switch 114 by the user can enable rotation of the dose nut which correspondingly facilitates the plunger screw to move linearly in a direction towards the plunger, thereby enabling the plunger to push the fluid out of the opening 104 and then into the body through the needle 118. Further, when the device 100 is removed from the body, the needle cover 404 can automatically slide outside of the needle cap402 because of the force of compressed needle spring 406 as shown in FIG. 4D and 4E, thereby again covering the front tip of the needle 118.

[0089] FIG. 5A to 5D illustrates a second embodiment of the needle assembly of the proposed device having a straight needle connection with the cartridge in accordance with an embodiment of the present invention.

[0090] According to another embodiment, the needle 118 can be a straight needle being configured in the needle cap 402 of the needle mechanism/assembly. Upon coupling of the needle mechanism with the cartridge 102, the needle 118 can extend between the first opening 104, and outside the first end of the needle cap 402, such that the rear tip of the straight needle 118 is fluidically coupled to the opening 104 of the hollow member 102, and a predefined length of the needle 118 or front tip of the straight needle 118 is outside the opening present at the first end of the needle cap 402.

[0091] In an implementation, upon pressing the device 100 on a surface of the body, including but not limited to the skin of a body, the front tip of the needle 118 can penetrate into the skin. Once, the needle tip is inside the body, the actuation of the switch 114 by the user can enable rotation of the dose nut 110 which correspondingly facilitates the plunger screw to move linearly in a direction towards the plunger 106, which then moves the plunger 106 from the first position towards the second position within the hollow cylindrical member 102, thereby enabling the plunger 106 to push the fluid out of the first opening 104 and then into the body through the needle tip of needle 118.

[0092] FIG. 6A illustrates a needle connector with a port for side and top connection (also referred as one or more orientations) of the proposed device in accordance with an embodiment of the present invention.

[0093] As illustrated in FIG. 6A, a needle connector 600 can include a flange 602 provided with a needle port 604 on one end. The needle port 604 can include a catheter 608 extending from the needle port 604, and at least two holes 606-1and 606-2 positioned at the rear and top side of the port 604. The at least two holes 606-1 and 606-2 of the needle port 604 can include a top hole 606-2 and a side hole 606-1, being fluidically coupled through one or more channels, to the catheter 608. The needle connector 600 can be adapted to be attached to the upper surface of the body such that catheter 608 is perpendicular and inside the body. Further, the flange 602 can be adapted to attach the device 100 to the needle connector 600 as required, and the needle connector can be attached to the upper surface of the body such that the catheter is at the position where the fluid is to be injected. In an implementation, the front needle tip 118 of the device 100 can be configured inside the top hole 606-2 of the needle port 604, upon which the injection button 114 can be actuated to inject the fluid in the body. In another embodiment, the front needle tip 118 of the device 100 can be configured directly into the side hole 606-1 of the needle port 604. After that, the injection button114 can be pressed to inject the fluid in the body.

[0094] FIG. 6B to 6G illustrates the top connection of the proposed device with the needle connector in accordance with an embodiment of the present invention.

[0095] As illustrated, in an embodiment, the device 100 having the straight needle 118 can be coupled to the needle port 604 such that the front tip of the straight needle 118 moves into the top hole 606-2 of the needle port 600, and the cartridge of the device 100 gets fluidically coupled to the catheter 608. Once, the catheter 608 of the needle port 604 having the front tip of the needle 118 within the top hole 606-2 is inside the body, the actuation of the switch 114 by the user can enable rotation of the dose nut which correspondingly facilitates the plunger screw 112 to move linearly in a direction towards the plunger 106, which then moves the plunger from the first position towards the second position within the cartridge of the device 100, thereby enabling the plunger to push the fluid out of the first opening and then into the body through the catheter 608.

[0096] FIG. 6H to 6L illustrates the top connection of the proposed device with the needle connector in accordance with an embodiment of the present invention.

[0097] As illustrated, the device 100 having the straight needle 118 can be coupled to the needle port 604 such that the front tip of the straight needle 118 moves into the side hole

606-1 of the needle port 604, and the cartridge of the device 100 gets fluidically coupled to the catheter 608. Further, the outer flange 602 can facilitates attachment of the device 100 to it. Once, the catheter 608 of the needle port 604 having the front tip of the needle 118 within the side hole 606-1 is inside the body, the actuation of the injection button by the user can enable rotation of the dose nut 110 which correspondingly facilitates the plunger screw 112 to move linearly in a direction towards the plunger, which then moves the plunger from the first position towards the second position within the cartridge of the device 100, thereby enabling the plunger to push the fluid out of the opening 104 and then into the body through the catheter 608.

[0098] FIG. 7A to 7O illustrates an exemplary view of various components and their positions in the proposed device in accordance with an embodiment of the present invention

[0099] As illustrated in FIG. 7A, the initial position of the needle cap 402 is shown. The needle cap 402 can be separately provided to the user, and the user can take the needle mechanism or needle assembly, and attach it to the opening 104 as shown in FIG. 7B. The holder 134 can engage or attach to the housing 108 as shown in FIG. 7C.

[00100] As illustrated in FIG. 7D, the hollow member102 can be slide fitted into the holder 134, and the holder 134 can then be attached to the housing 108 on its rear end and to the needle mechanism at its front end. Further, as shown in FIG. 7E and 7F, the switch 114 can snap-fitted in the housing 108, such that the first prong 202 of the switch 114 can slide in an actuation slot of the housing 108, and the second prong 206 of the housing 108 can engage with steps 204 of the dose nut 110. The housing 108 can be provided with holes and the hollow member 102 can be provided with ribs such that the holes of the housing 108 engage with ribs at 702. As shown in FIG. 7G, the switch 114 can slide in the housing 108 and can get a lock with the housing at slot 706. As shown in FIG. 7H and 7I, the first prong 202 of the switch 114 can engage and fit with the steps 204-1 of the dose nut, and the second prong 206 of housing 108 engage with step 204-2 of the dose nut 110.

[00101] As illustrated in FIG. 7J-7M, the housing 108 can concentrically fit outside the dose nut 110, and the plunger screw 112 can be fit inside the dose nut 110 like a screw, such that the internal threads of the dose nut engage with the external threads of the plunger screw 112 as shown at 710. Further, as shown in FIG. 7K, the housing 108 hook fits in an engagement slot or extensions 708 of the dose nut 110. The plunger screw 112 fits outside the housing 108 as shown in FIG. 7M, so that the plunger screw 112 does not rotate. Further, central rod 302 can also be provided within the plunger screw 112 to restrict rotation of the plunger screw 112.

[00102] FIG. 7N illustrates the initial position of the injection spring 136 being positioned concentrically outside the dose nut 110. Finally, the assembled device 100 can be fitted tightly and a transparent flexible cover 124 of the exact same size of the assembled device can be tightly fitted outside the assembled device as shown in FIG. 7O.

[00103] As used herein, and unless the context dictates otherwise, the term "coupled to" is intended to include both direct coupling (in which two elements that are coupled to each other or in contact each other) and indirect coupling (in which at least one additional element is located between the two elements). Therefore, the terms "coupled to" and "coupled with" are used synonymously. Within the context of this document terms "coupled to" and "coupled with" are also used euphemistically to mean "communicatively coupled with" over a network, where two or more devices are able to exchange data with each other over the network, possibly via one or more intermediary device.

[00104] FIG. 8A illustrates an exemplary representation of the injection device with a reference plate, FIG. 8Bto 8C illustrates an exemplary representation of the injection device with half nut configuration, in accordance with an embodiment of the present disclosure.

[00105] As illustrated, the plunger screw 110 can include a reference plate configured at its end. The reference stopper 140 can be engaged with any of the one or more prongs and can limit the further actuation of the plunger screw. In another embodiment, the actuation assembly can comprise a cylindrical member, having two half threads 138, covering the plunger screw for facilitating a controlled advancement, by a pre-defined distance, of the plunger screw towards the cartridge. The plunger screw 112 will be allowed to move towards the hollow member 102 only by a distance equal to a pitch of the two half nuts. This can facilitate a controlled advance of the plunger screw 112 towards the hollow member 102 to control the amount of fluid to be ejected or outflown from the cartridge.

[00106] As used herein, and unless the context dictates otherwise, the term "coupled to" is intended to include both direct coupling (in which two elements that are coupled to each other or in contact each other) and indirect coupling (in which at least one additional element is located between the two elements). Therefore, the terms "coupled to" and "coupled with" are used synonymously. Within the context of this document terms "coupled to" and "coupled with" are also used euphemistically to mean "communicatively coupled with" over a network, where two or more devices are able to exchange data with each other over the network, possibly via one or more intermediary device.

[00107] Moreover, in interpreting the specification, all terms should be interpreted in the broadest possible manner consistent with the context. In particular, the terms

"comprises" and "comprising" should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced. Where the specification claims refer to at least one of something selected from the group consisting of A, B, C ....and N, the text should be interpreted as requiring only one element from the group, not A plus N, or B plus N, etc.

[00108] While the foregoing describes various embodiments of the invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof. The scope of the invention is determined by the claims that follow. The invention is not limited to the described embodiments, versions or examples, which are included to enable a person having ordinary skill in the art to make and use the invention when combined with information and knowledge available to the person having ordinary skill in the art.

ADVANTAGES OF THE INVENTION

[00109] The proposed invention provides a fluid injection device.

[00110] The proposed invention provides a fluid injection device, which is efficient.

[00111] The proposed invention provides a fluid injection device having an injection needle that remains isolated from ambient.

[00112] The proposed invention provides a fluid injection device, which is cost effective.

[00113] The proposed invention provides a fluid injection device, which requires less maintenance cost.

[00114] The proposed invention provides a fluid injection device, which is easy to use.

I Claim:

1. A fluid injecting device (100) comprising:

a hollow member (102), having a first end and a second end, configured to accommodate a cartridge, having an outlet, containing the fluid;

a needle assembly (116), having an injection needle (118), configured at the first end of the housing, and the injection needle is fluidically coupled with the outlet; and

an actuation assembly configured at the second end of the hollow member (102), and the actuation assembly is operatively configured with the cartridge for facilitating outflow of the fluid, to the injection needle (118), from the cartridge, the actuation assembly comprises:

a plunger screw (112) operatively configured with the cartridge, and the plunder screw (112) is moved along a longitudinal axis of the hollow member (102), and

a dose nut (110) rotatably configured with the plunger screw (112) such that rotating the dose nut (110) in a first direction facilitates advancement of the plunger screw (112) towards the cartridge, which enables outflowing of the fluid from the cartridge to the injection needle (118).

2. The fluid injection device (100) as claimed in the claim 1, wherein a first threads of the dose nut (110) is engaged with a corresponding second threads of the plunger screw (112) for facilitating conversion of a rotational motion of the dose nut (110) to a linear movement of the plunger screw (112).
3. The fluid injection device (100) as claimed in the claim 1, wherein the actuation assembly comprises a switch (114) having one or more prongs.
4. The fluid injection device (100) as claimed in the claim 3, wherein the switch (114) is configured with the actuation assembly.
5. The fluid injection device (100) as claimed in the claim 3, wherein dose nut (110) comprises any of a third threads, and extensions (204-1. 204-2) on an outer surface of the dose nut (110), operatively coupled with one or more prongs (202, 206) such that pressing of the switch (114) facilitates a controlled rotation of the dose nut (110) in the first direction.
6. The fluid injection device (110) as claimed in the claim 5, wherein the one or more prongs (202, 206) get locked with any of the third threads and the extensions (204-1,

204-2), after the switch (114) is retracted back to its initial position, for restricting the rotation of the dose nut (110) in a second direction opposite to the first direction.

7. The fluid injection device (100) as claimed in the claim 3, wherein the switch (114) is retracted back to the initial position through one or more springs (132-1, 132-2) operatively configured with the one or more prongs (202, 206).
8. The fluid injection device (100) as claimed in the claim 3, wherein a single pressing of the switch (114) facilitates outflowing of a pre-defined amount of fluid from the cartridge.
9. The fluid injection device (100) as claimed in the claim 3, wherein the fluid injecting device comprises an injecting spring (136) for facilitating a push force to the plunger screw (112) to reduce a force required for pressing the switch (114).
10. The fluid injection device (100) as claimed in the claim 1, the needle assembly comprises:

    a platform on which the injection needle is mounted;

    a cap (402) covering the injection assembly; and

    a cover (404) elastically configured with the platform to move between a first position and a second position, and the cover (404) at least partially coverthe injection needle (118), when at the first position, to prevent the injection needle (118) from coming in contact with ambient, and the cover (404) is retracted, when at the second position, towards the platform.
11. The fluid injection device (100) as claimed in the claim 9, wherein the cover (404) is actuated, by a skin of the user who is supposed to receive the outflown fluid from the cartridge, from the first position to the second position when the injection needle is pressed against the skin, and the outflown fluid is injected to the user through the injection needle (118).
12. The fluid injection device (100) as claimed in the claim 9, wherein the platform comprises a plurality of channels through which the needle is fluidically coupled with the cartridge.
13. The fluid injection device (100) as claimed in the claim 12, wherein any of the plurality of channels is configured to be fluidically coupled with the cartridge inside the hollow member (102), by positioning the needle assembly in one or more orientations with respect to the first end of the hollow cylindrical member (102).
14. The fluid injection device (102) as claimed in the claim 1, wherein the actuation assemblycomprise a cylindrical member, having two half threads (138), covering the

plunger screw (112) for facilitating a controlled advancement, by a pre-defined distance, of the plunger screw (112) towards the cartridge.

15. The fluid injection device (100) as claimed in the claim 1, wherein the fluid injection device comprises a dose recorder (126) to keep a record of an amount of the fluid outflown from the cartridge.

16. The fluid injection device (100) as claimed in the claim 1, wherein the plunger screw (112) is operatively configured with the cartridge through a plunger (106).

17. The fluid injection device (106) as claimed in the claim 16, wherein the plunger screw (112) is prevented from rotating on its axis using any of by disposing a central rod (302) in the plunger screw (112), and by making projections, to be engaged against corresponding profile, to the projections, in the plunger (106), at a front end of the plunger screw.

18. The fluid injection device (112) as claimed in claim 1, wherein the fluid injection device is a wearable device.

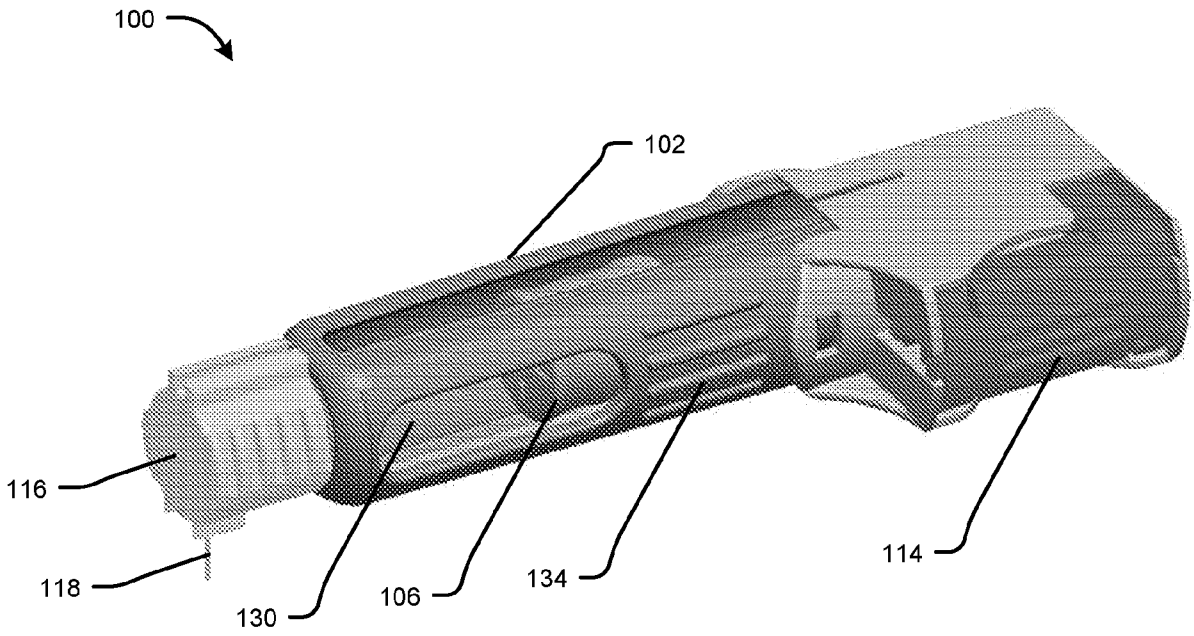
100
102
116
118
130
106
134
114

FIG. 1A

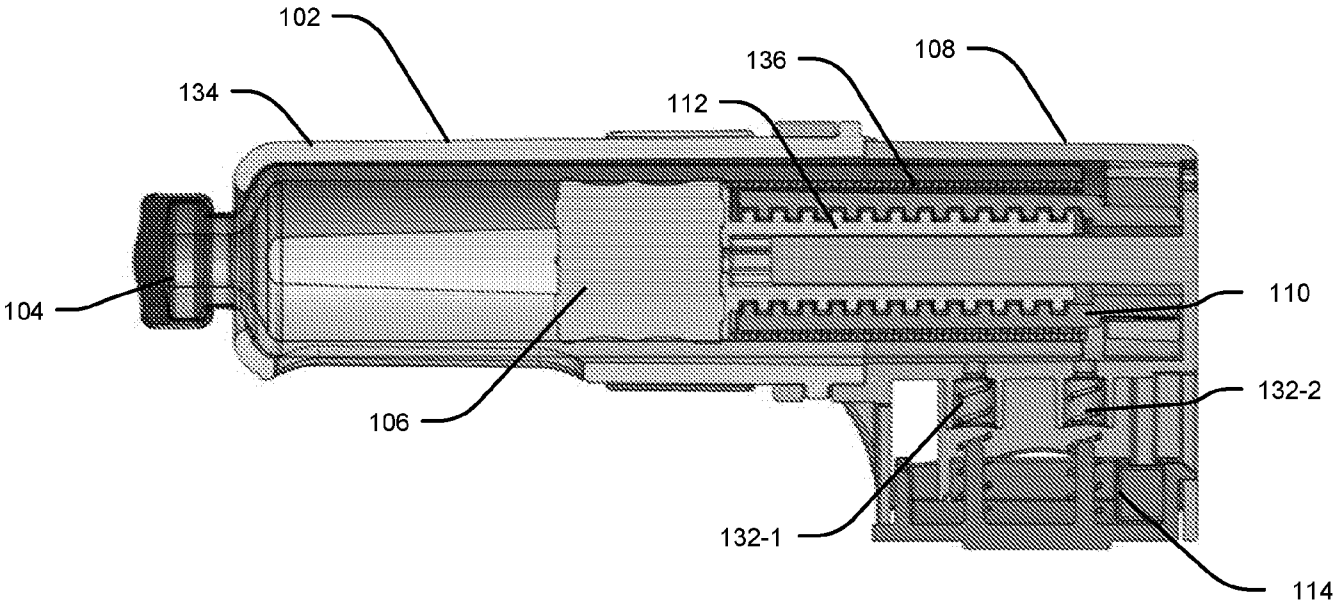
102
134
136
108
112
104
110
106
132-2
132-1
114

FIG. 1B

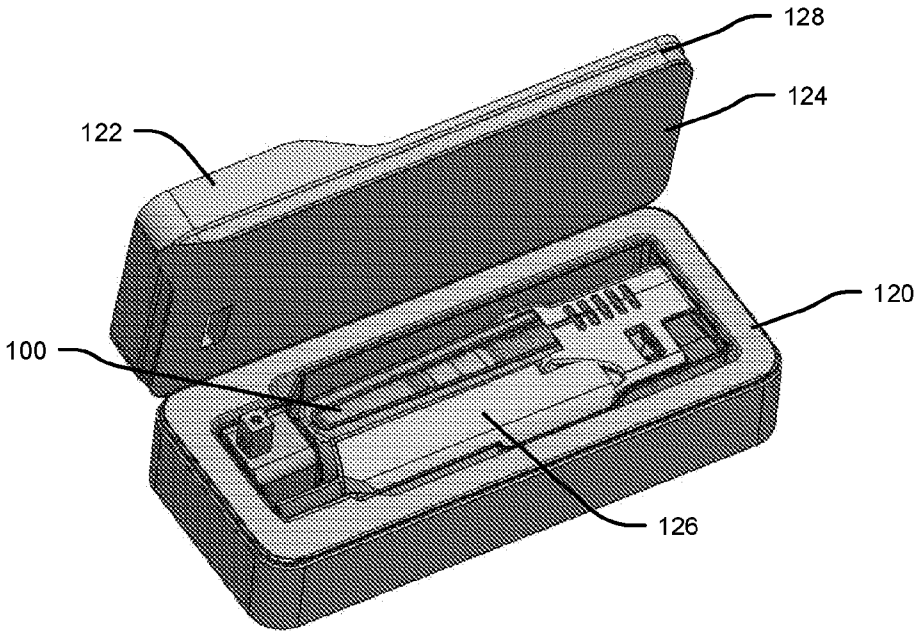

FIG. 1C

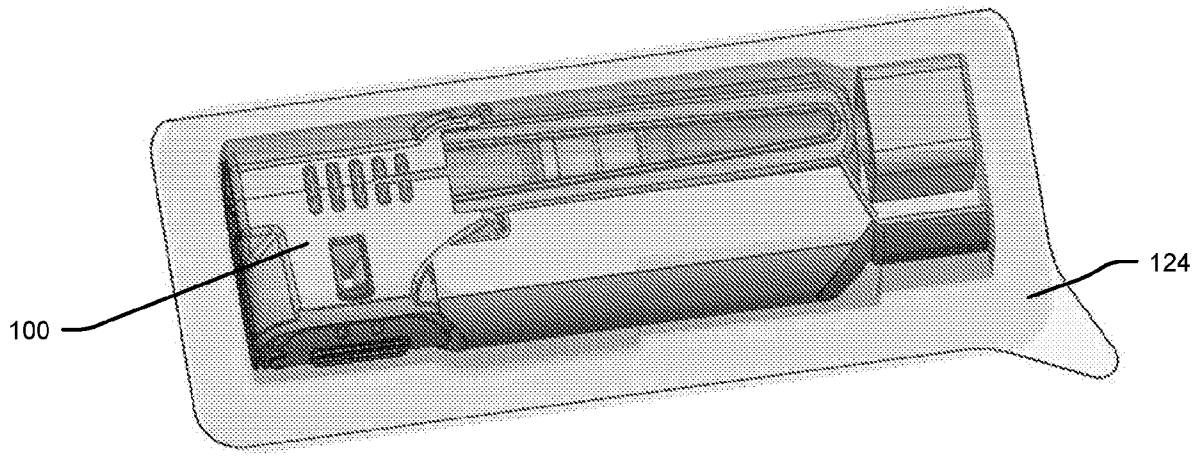

FIG. 1D

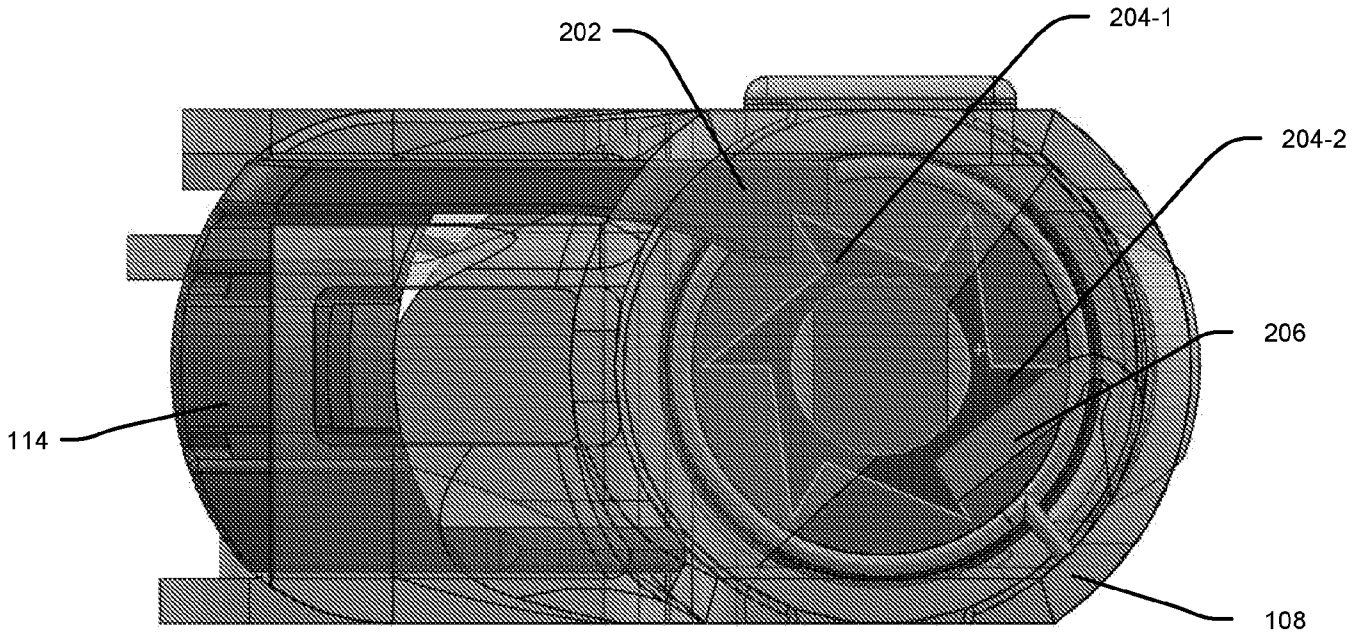

FIG. 2A

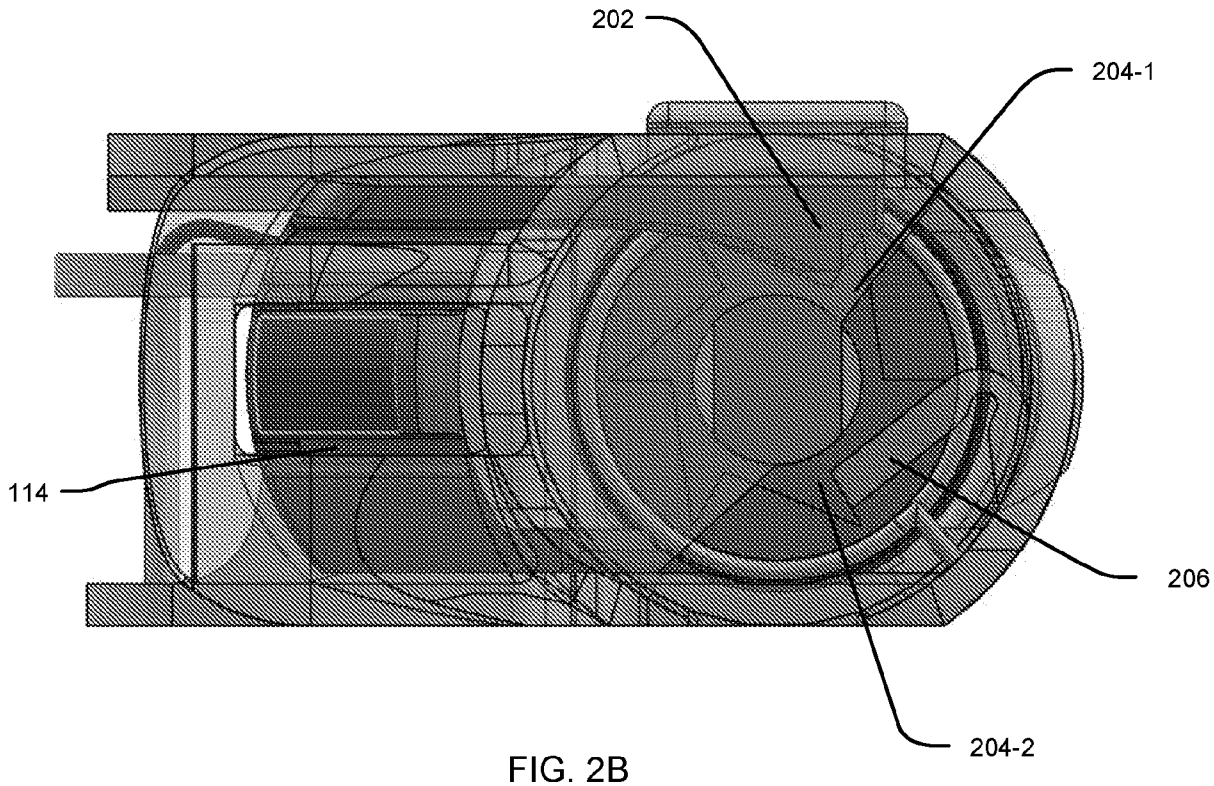

FIG. 2B

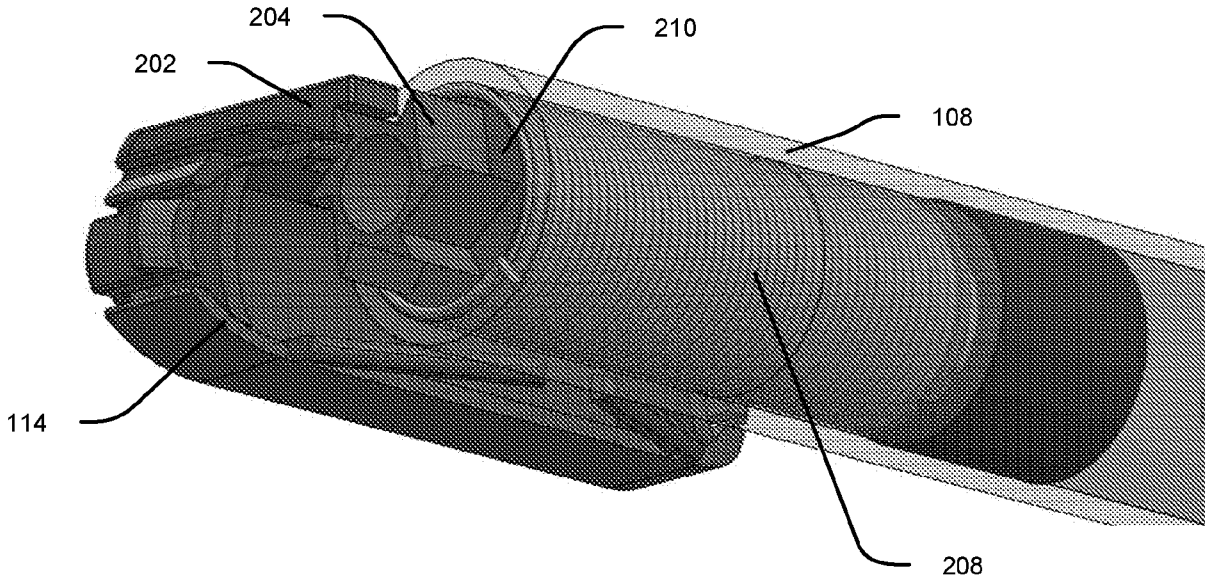

FIG. 2C

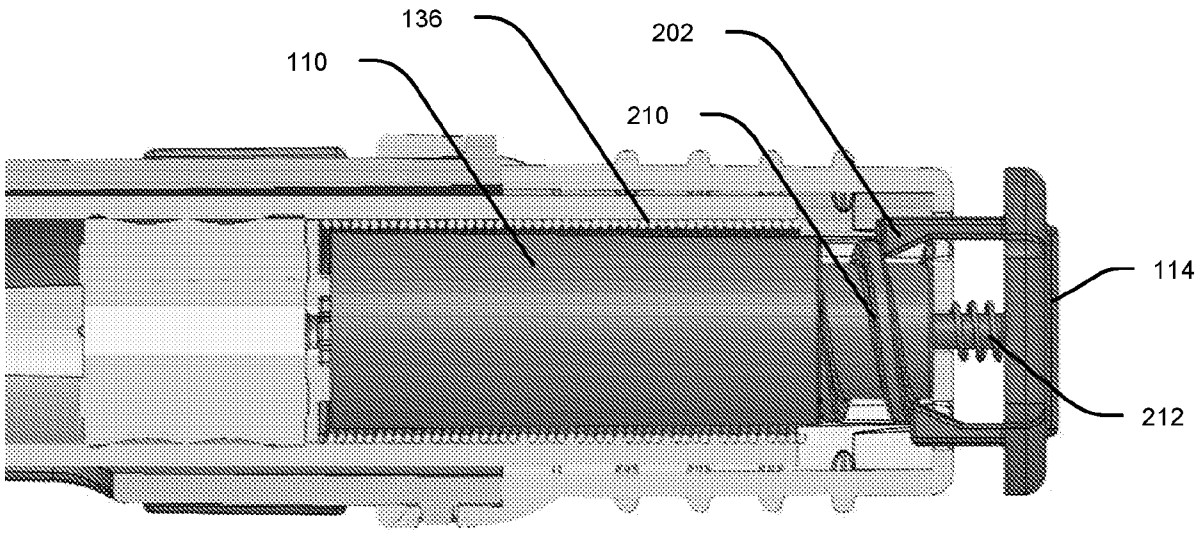

FIG. 2D

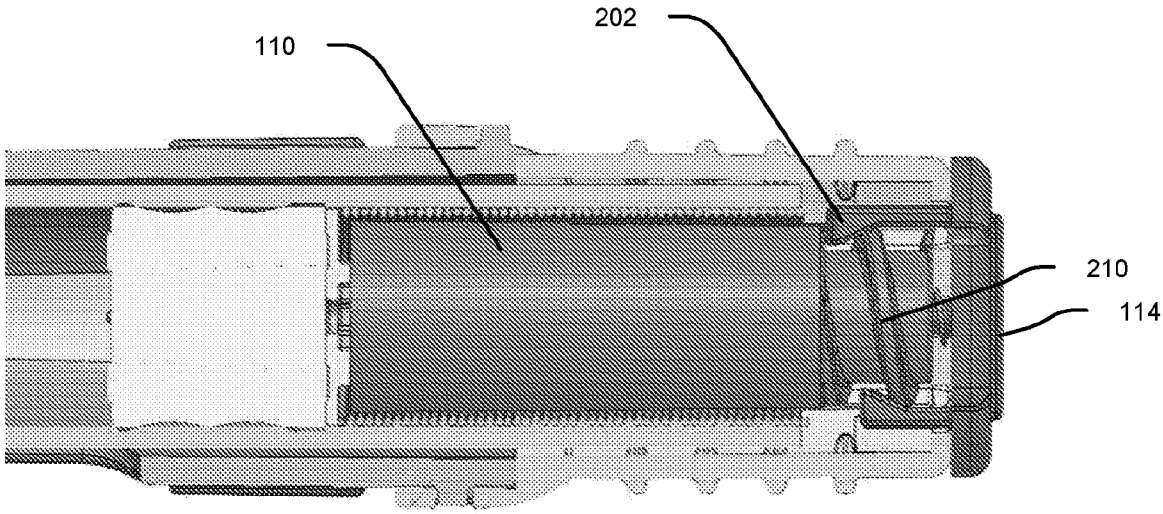

FIG. 2E

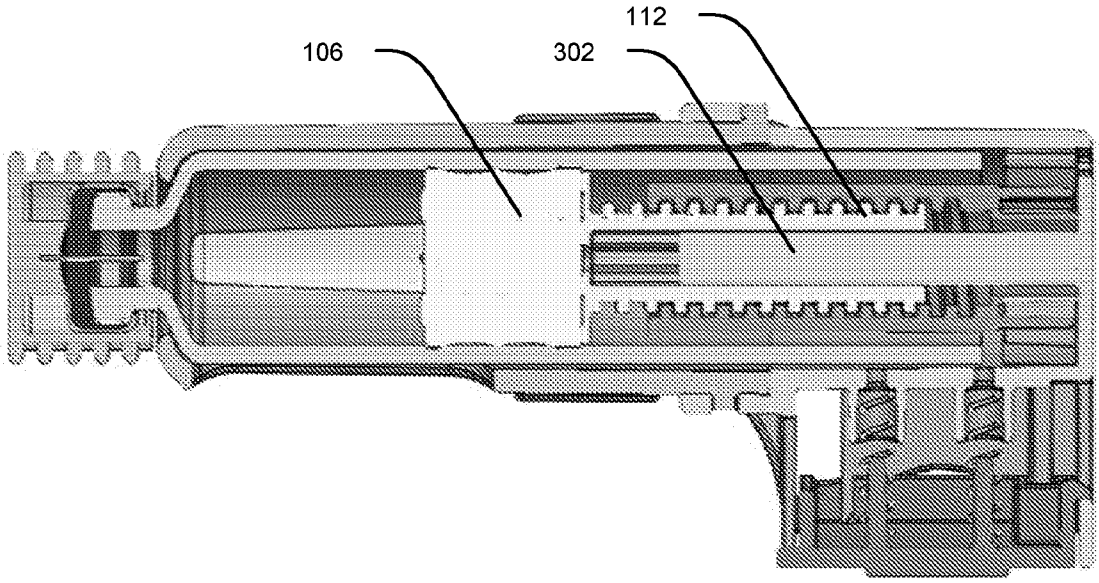

FIG. 3A

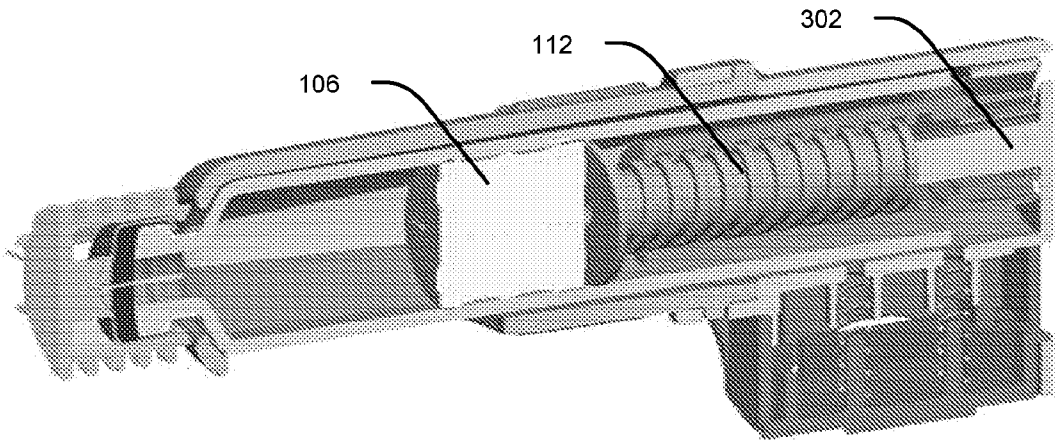

FIG. 3B

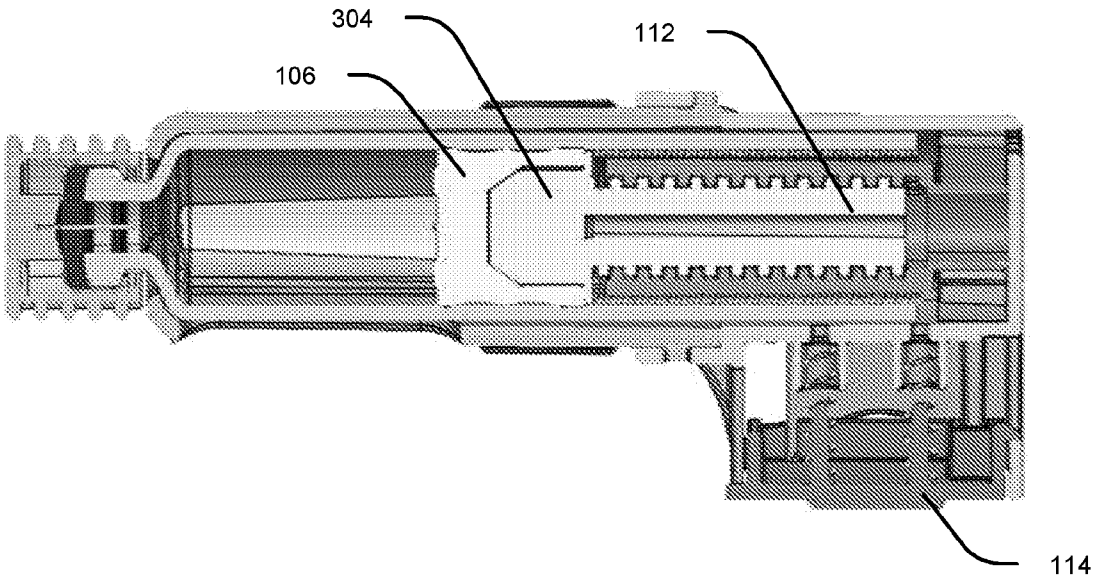

FIG. 3C

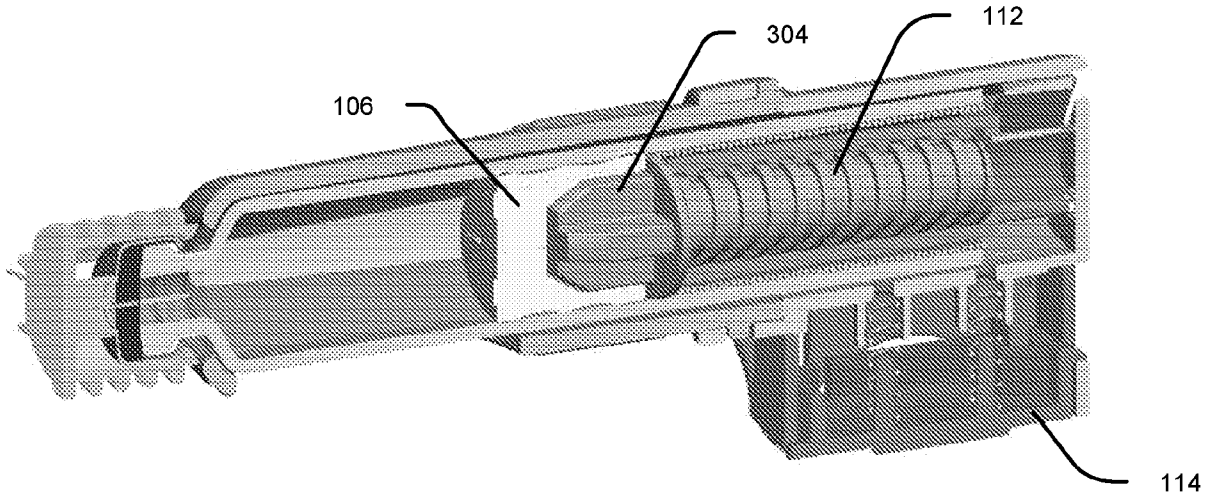

FIG. 3D

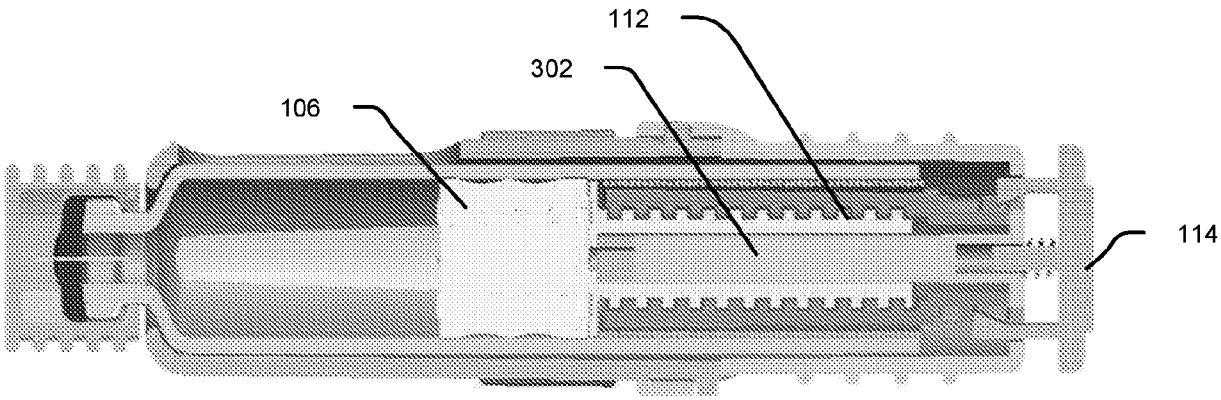

FIG. 3E

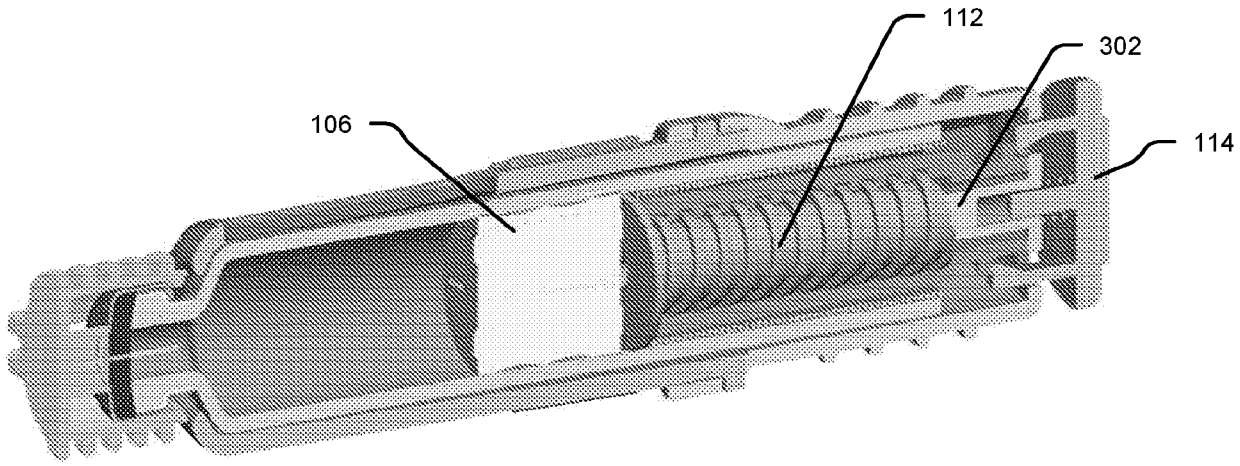

FIG. 3F

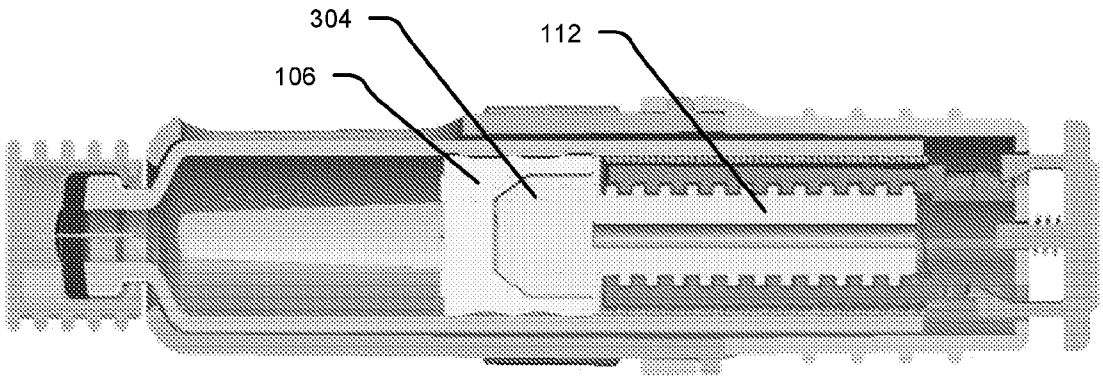

FIG. 3G

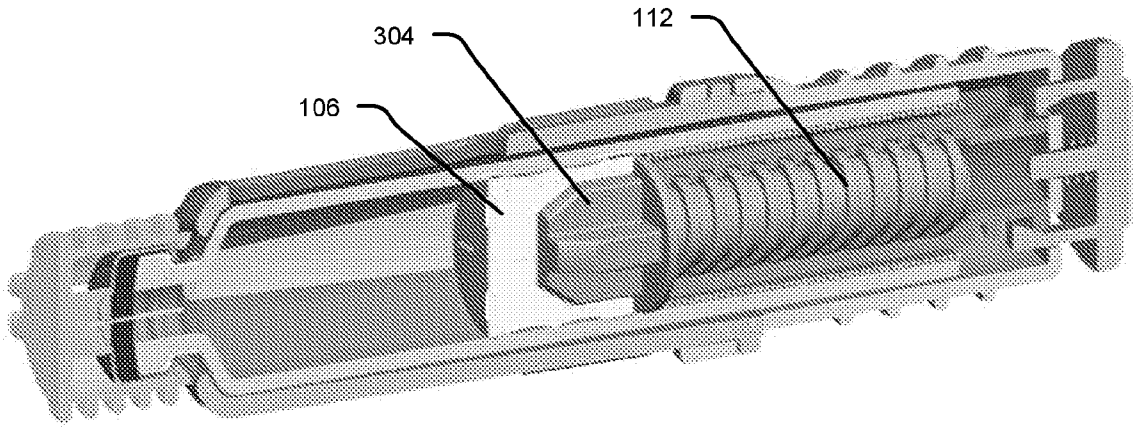

FIG. 3H

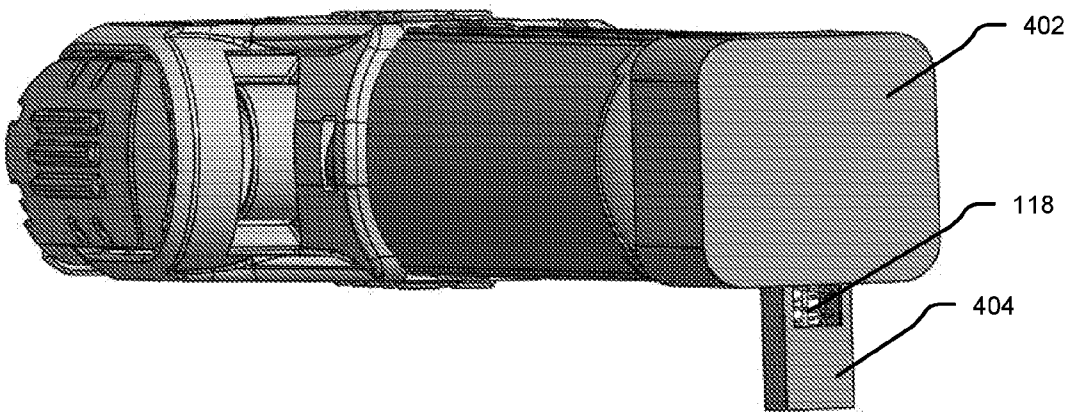

FIG. 4A

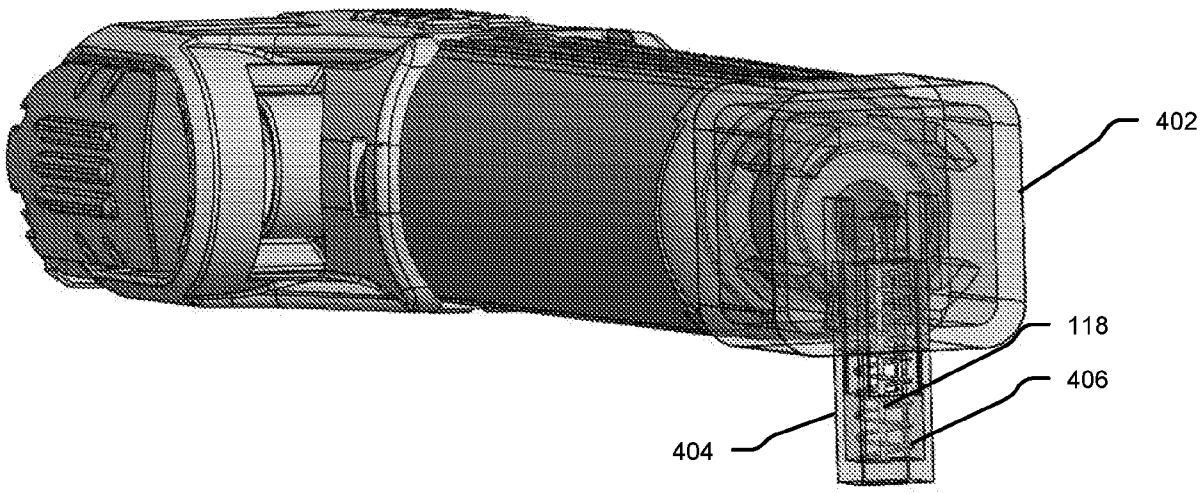

FIG. 4B

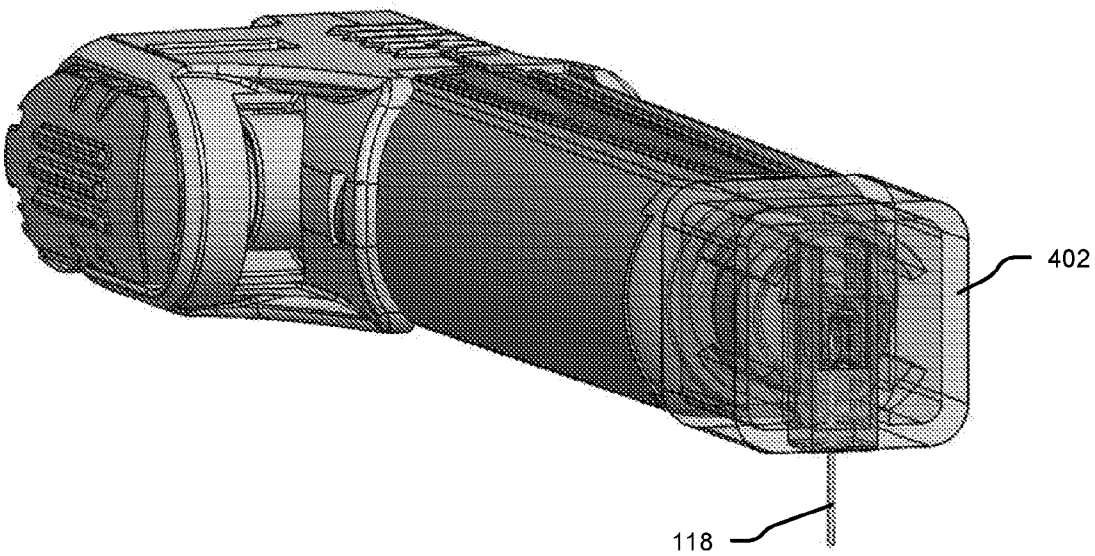

FIG. 4C

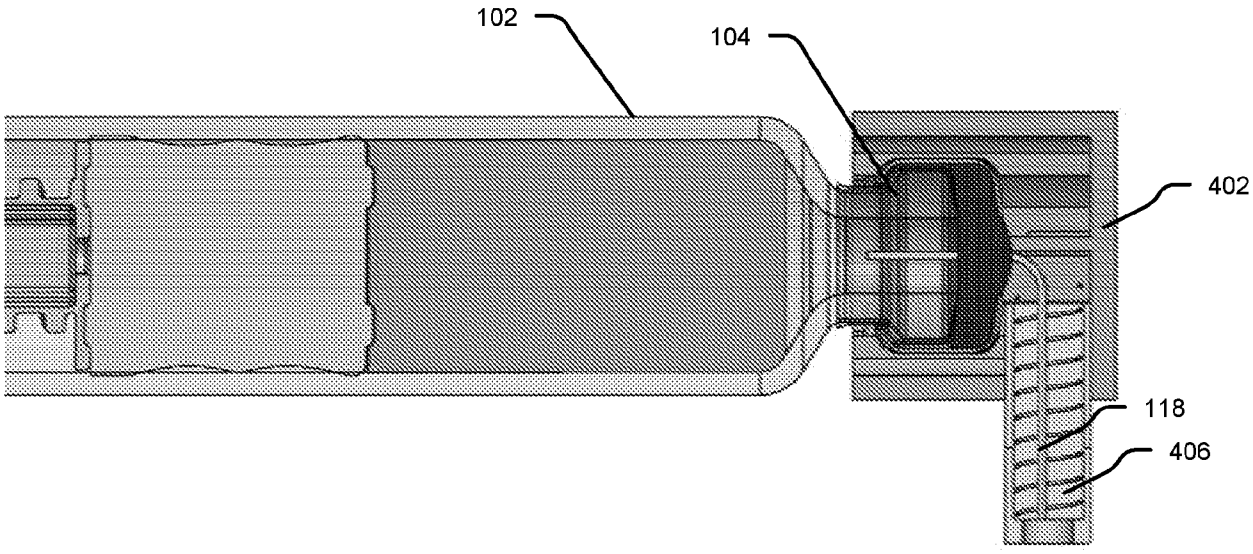

FIG. 4D

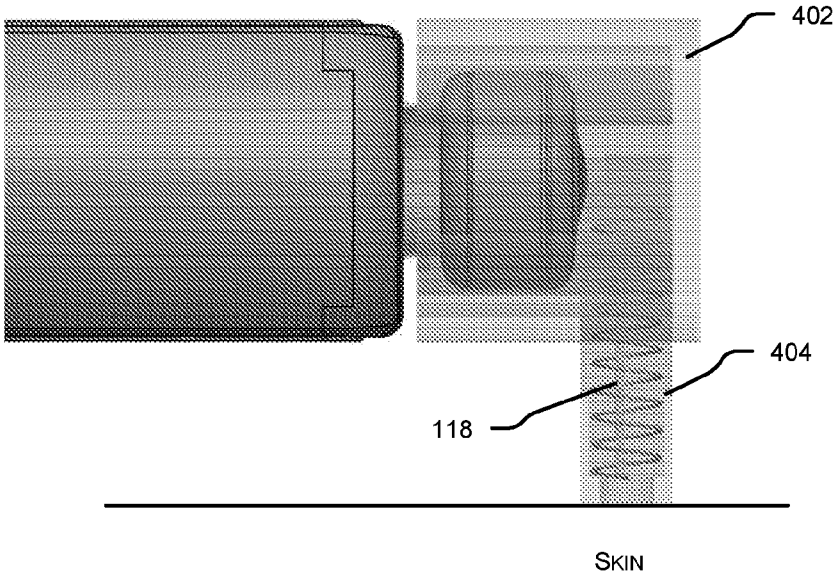

FIG. 4E

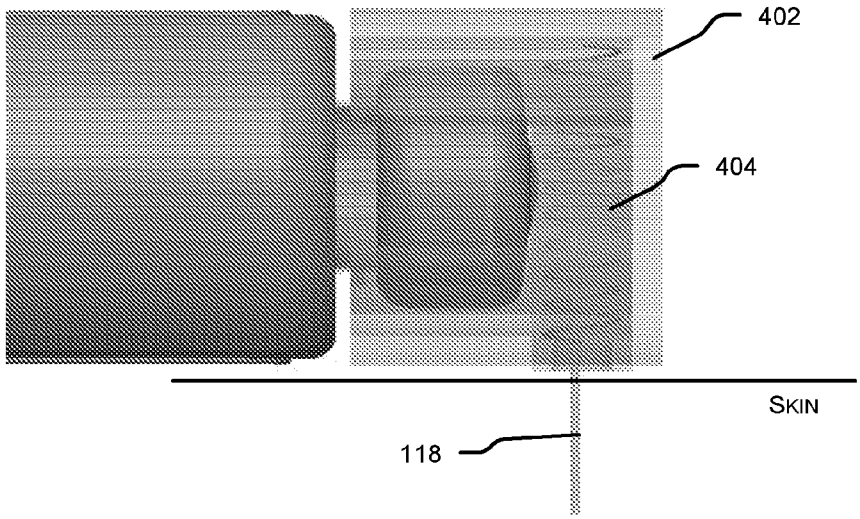

FIG. 4F

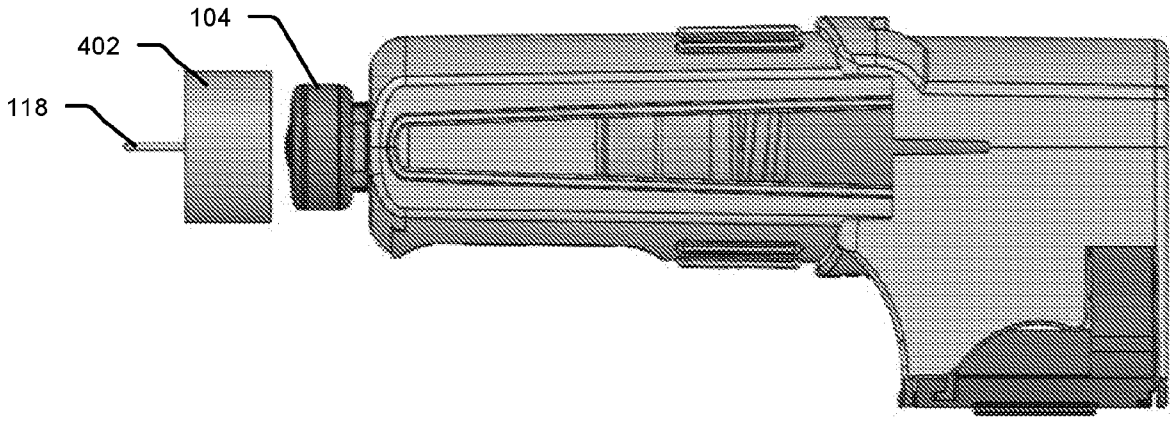

FIG. 5A

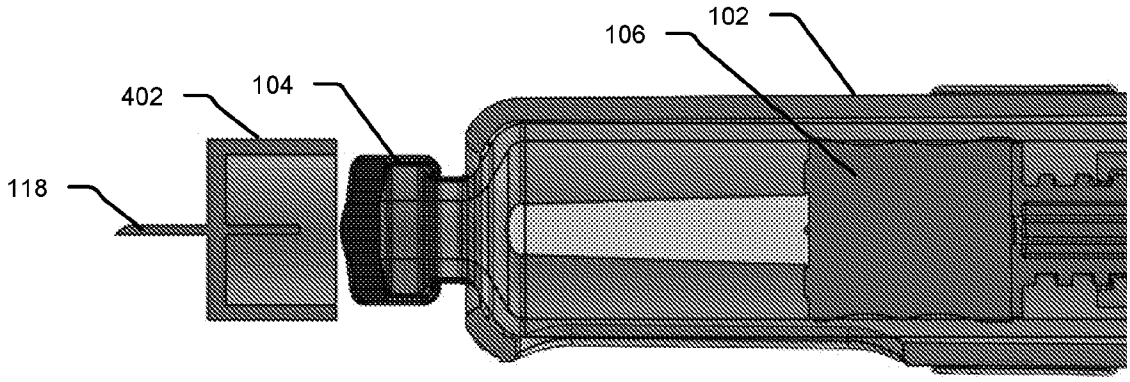

FIG. 5B

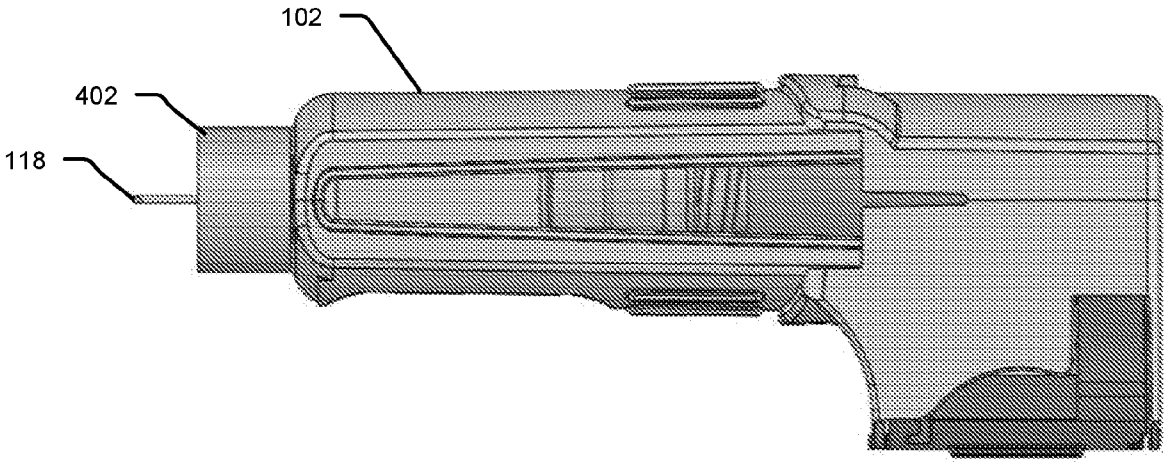

FIG. 5C

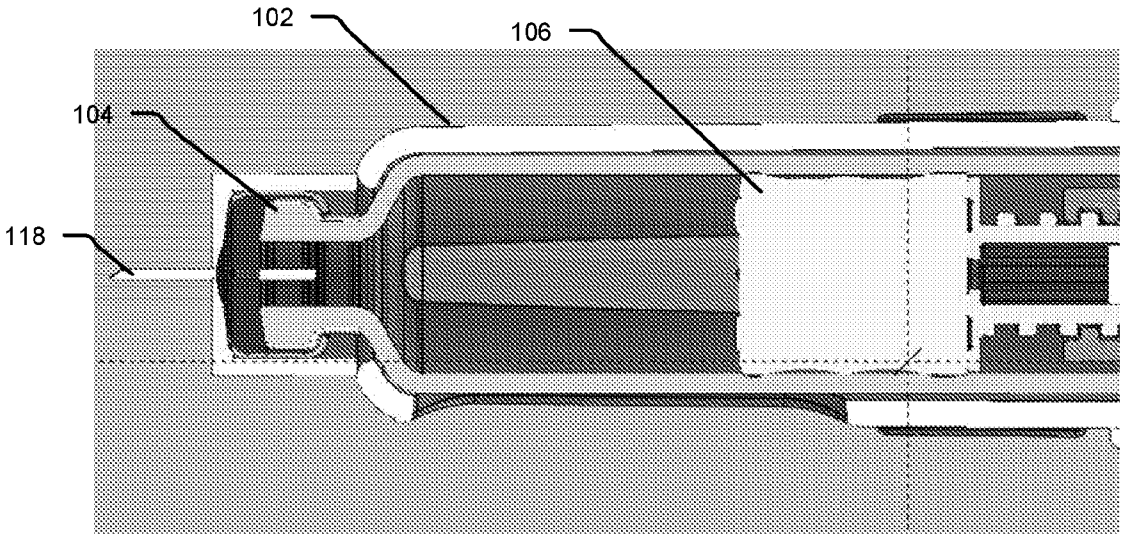

FIG. 5D

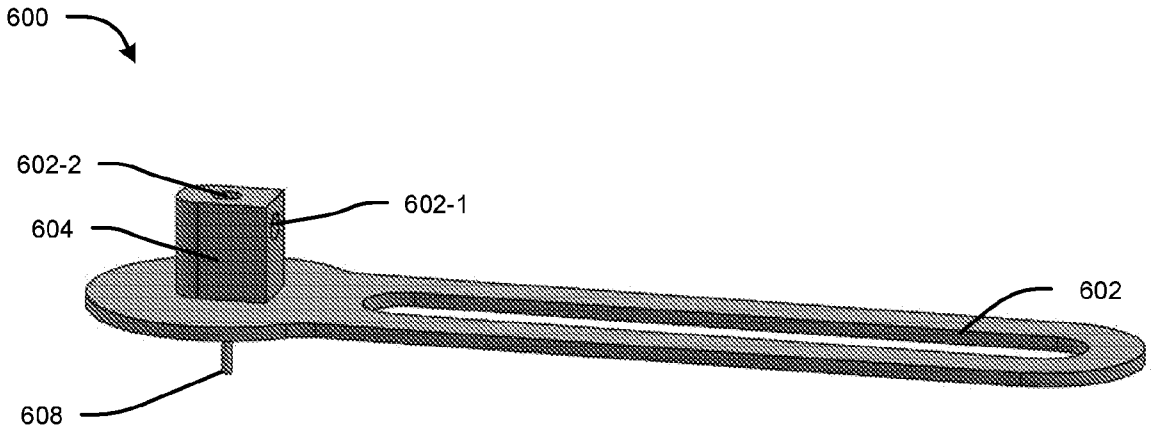

FIG. 6A

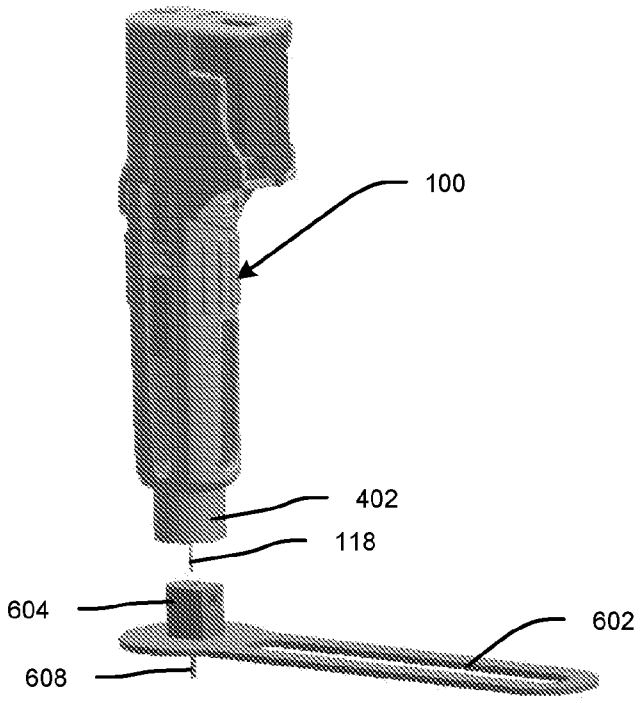

FIG. 6B

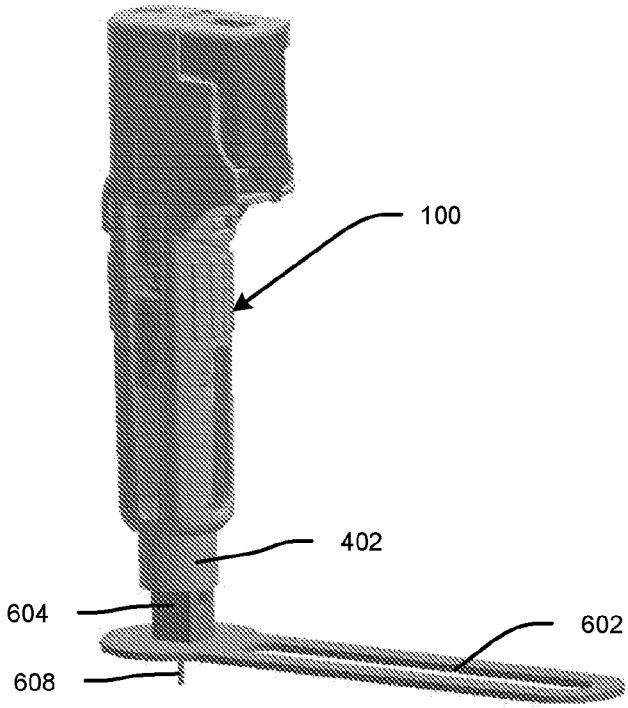

FIG. 6C

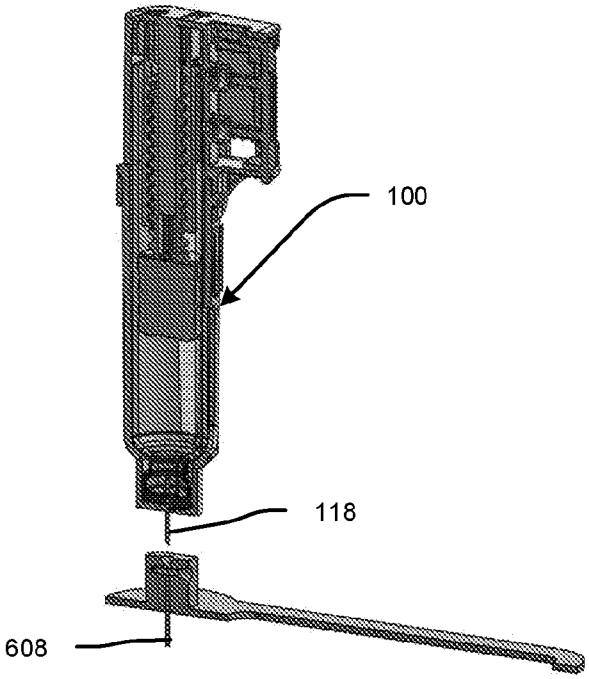

FIG. 6D

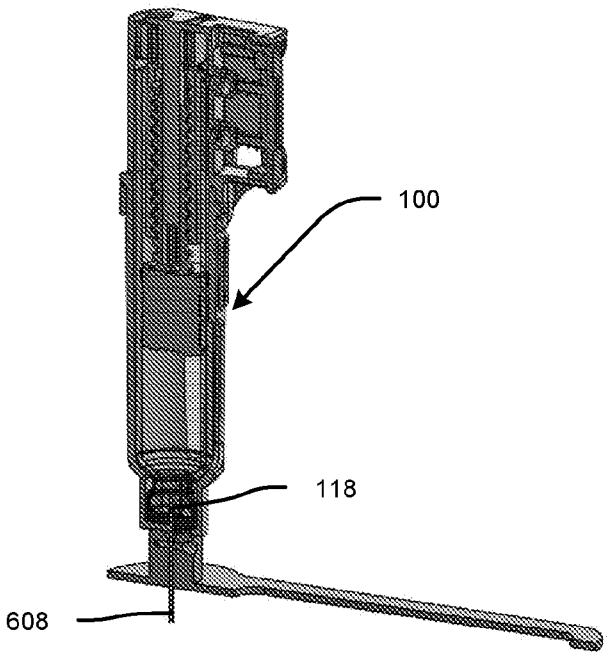

FIG. 6E

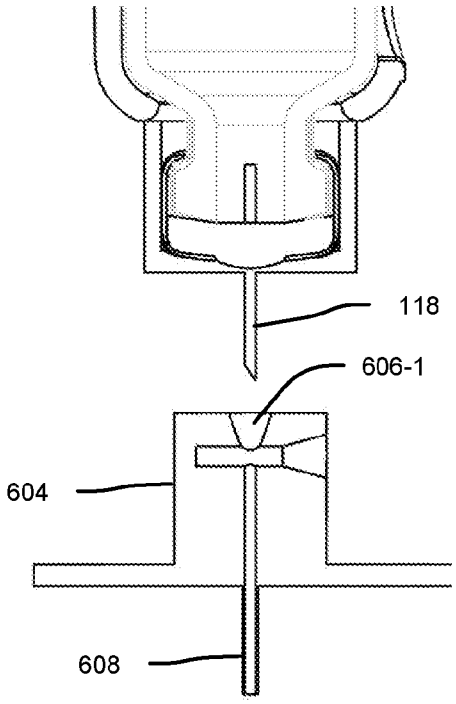

FIG. 6F

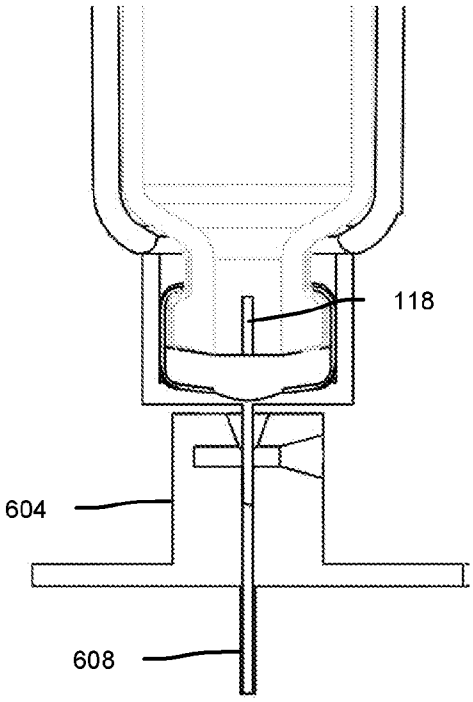

FIG. 6G

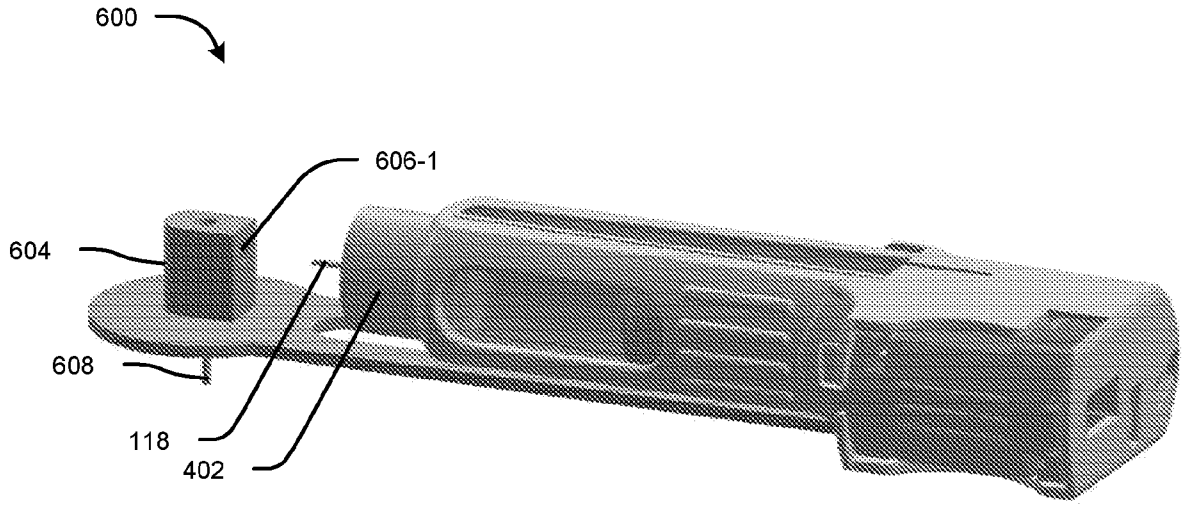

FIG. 6H

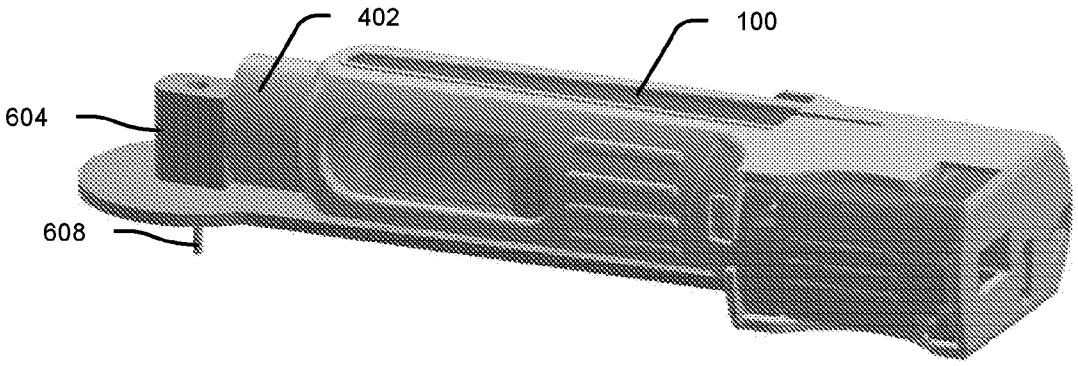

FIG. 6I

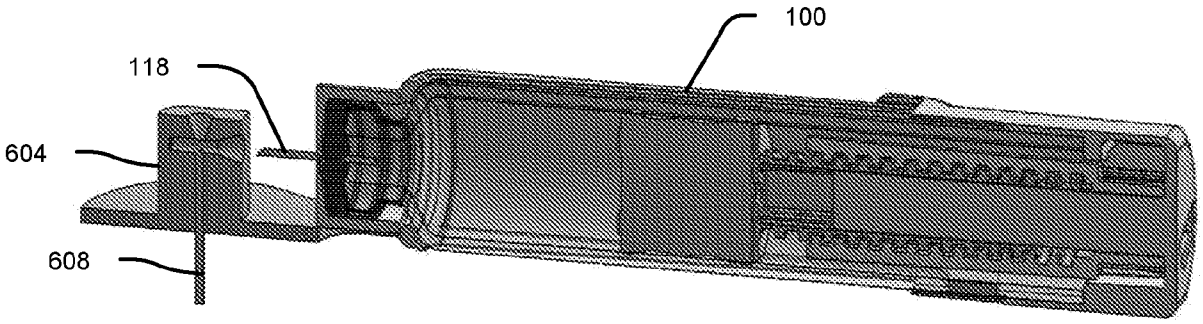

FIG. 6J

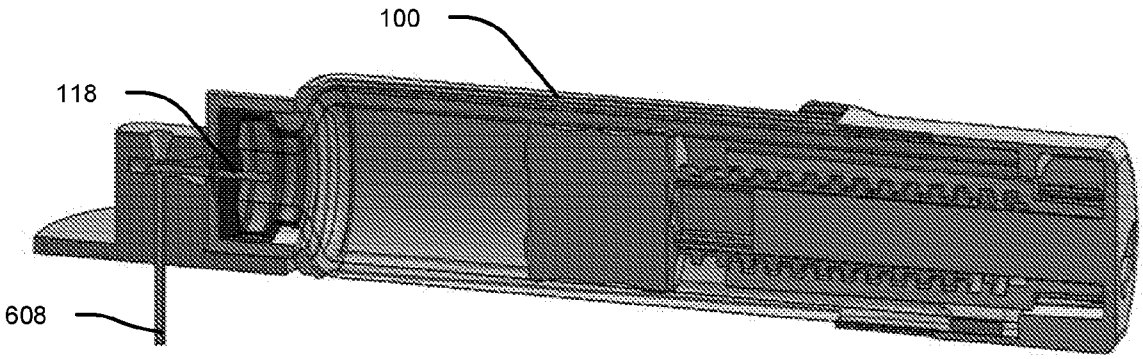

FIG. 6K

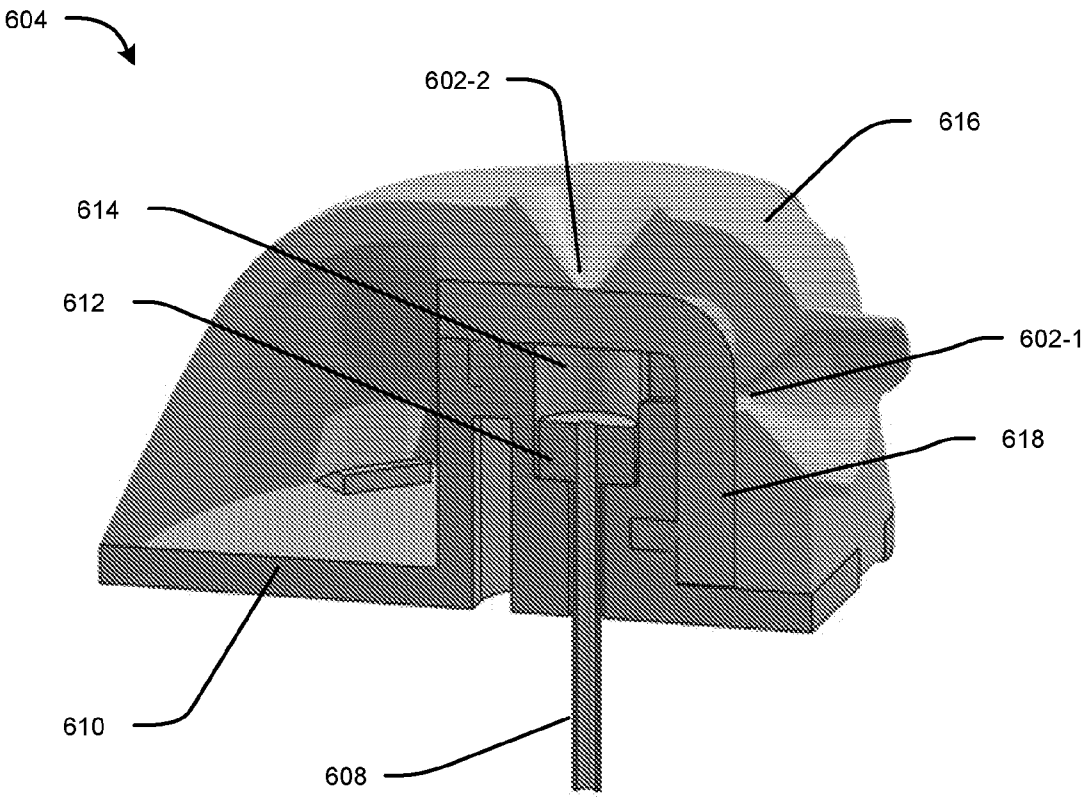

FIG. 6L

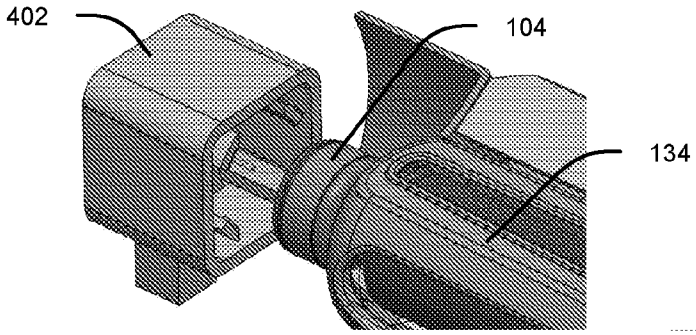

FIG. 7A

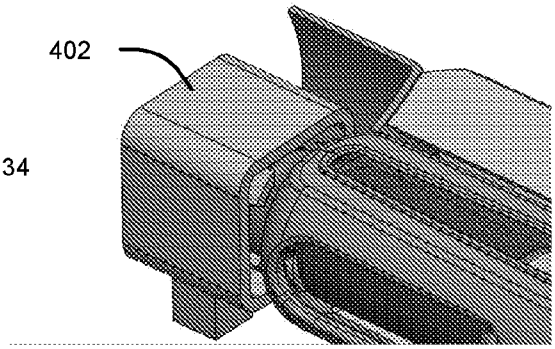

FIG. 7B

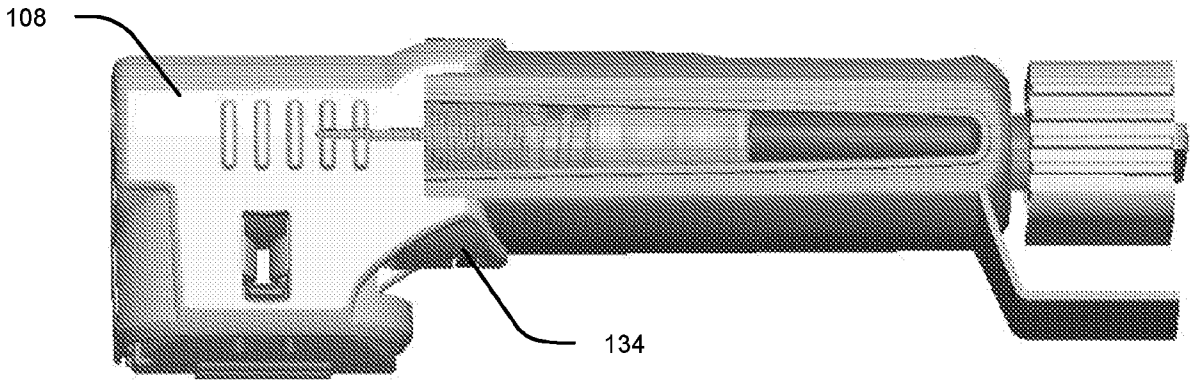

FIG. 7C

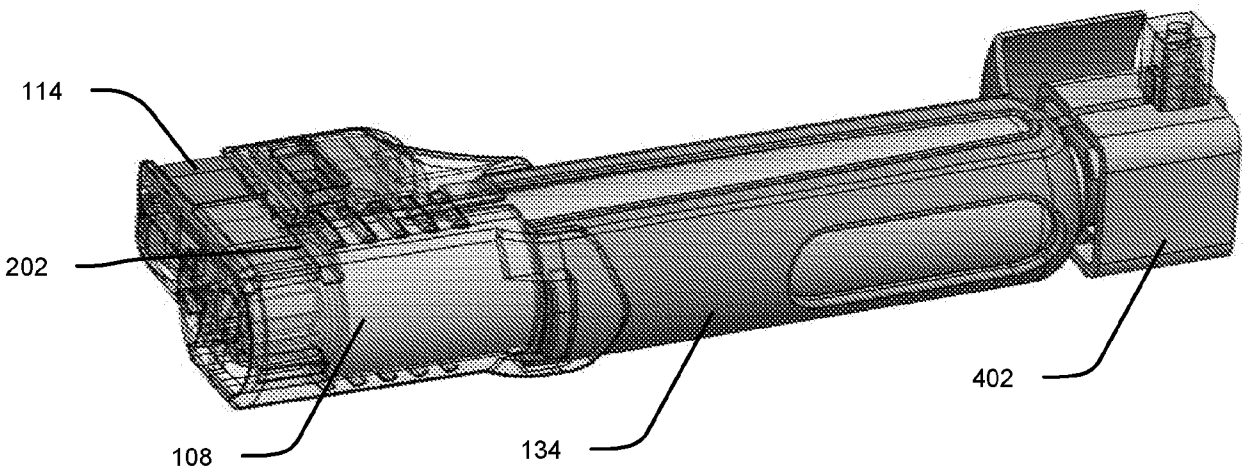

FIG. 7D

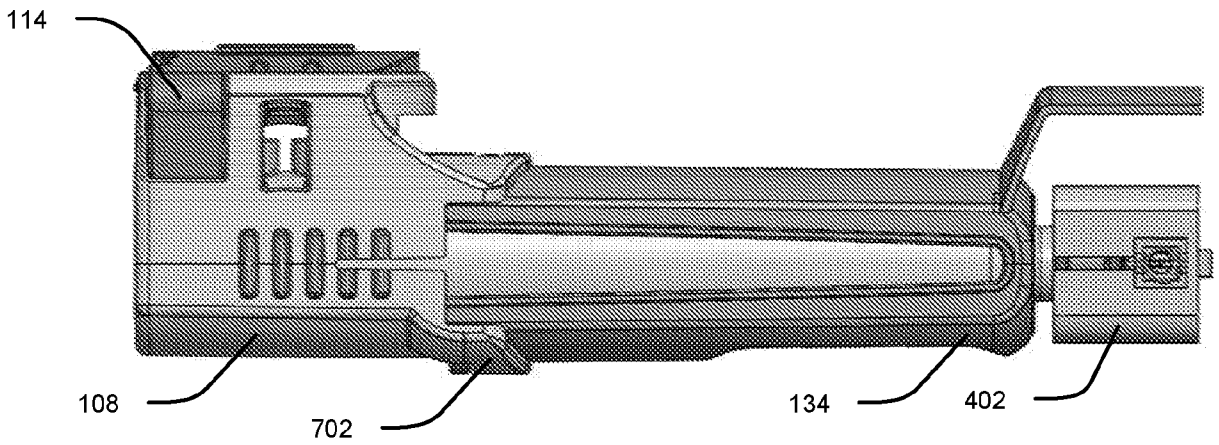

FIG. 7E

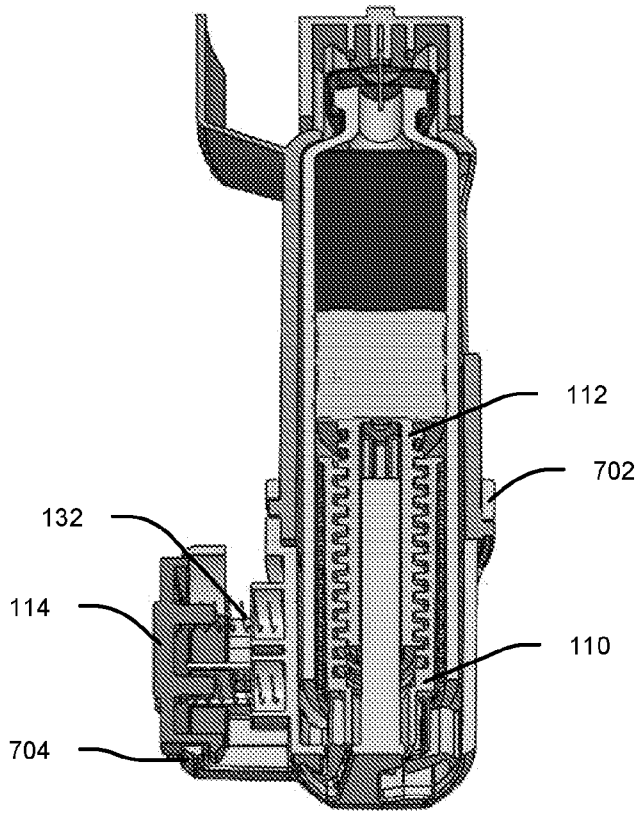

FIG. 7F

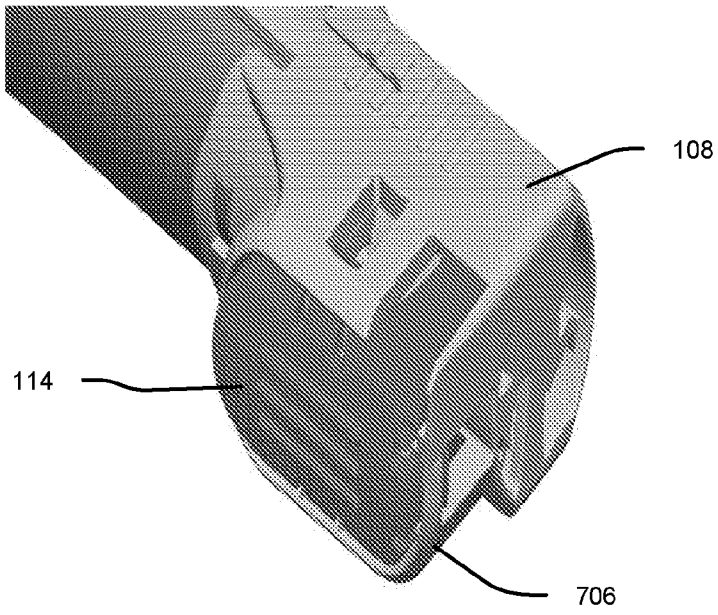

FIG. 7G

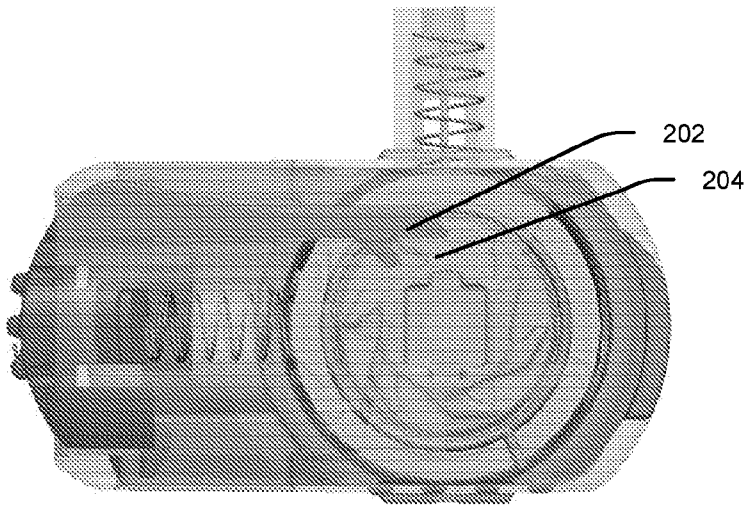

FIG. 7H

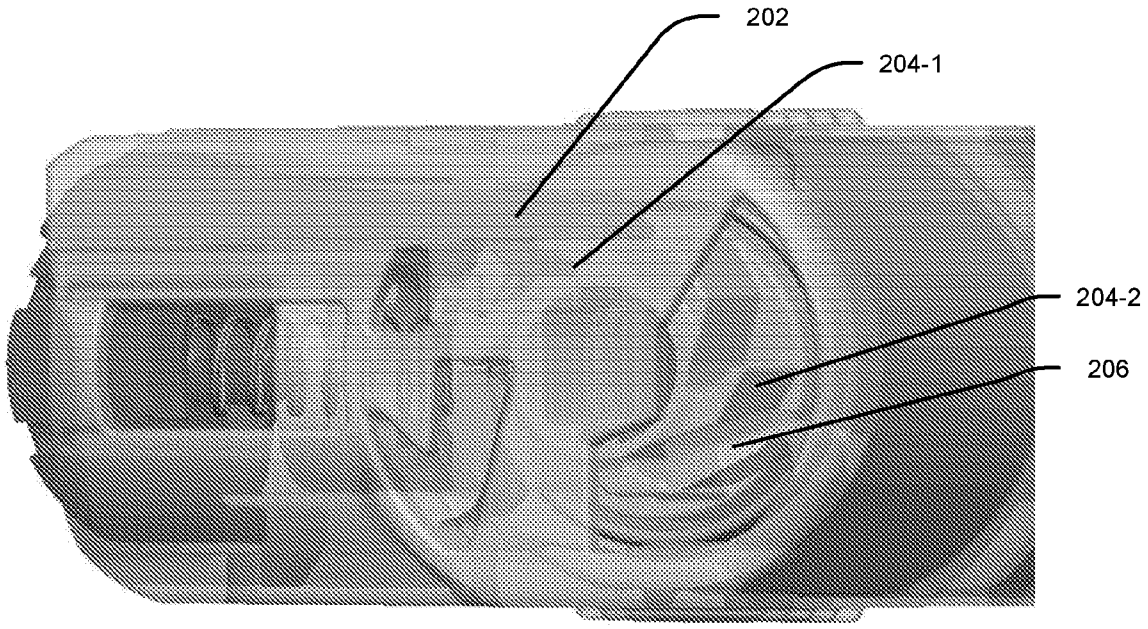

FIG. 7I

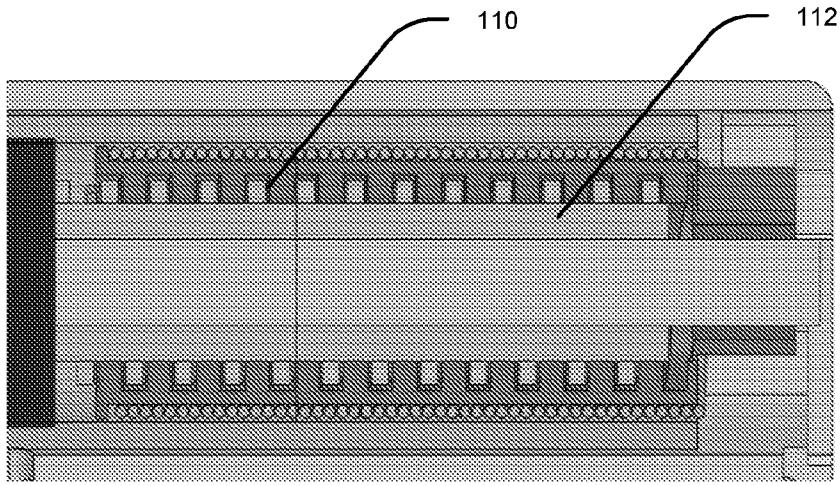

FIG. 7J

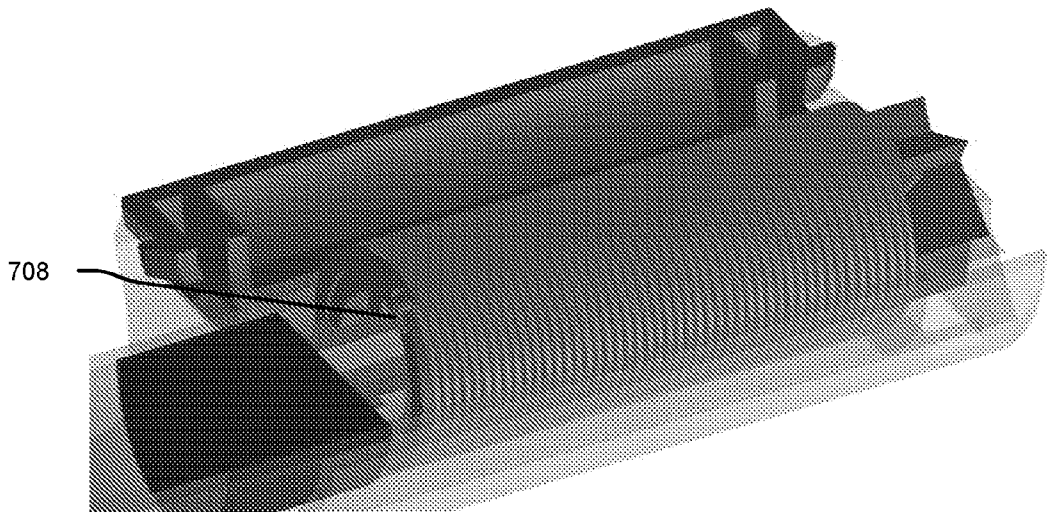

FIG. 7K

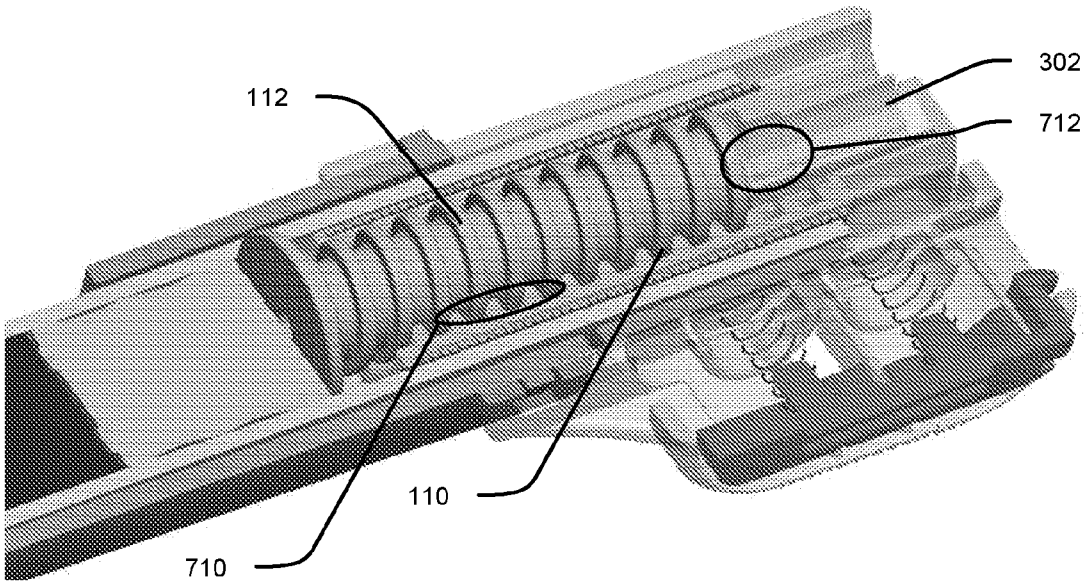

FIG. 7L

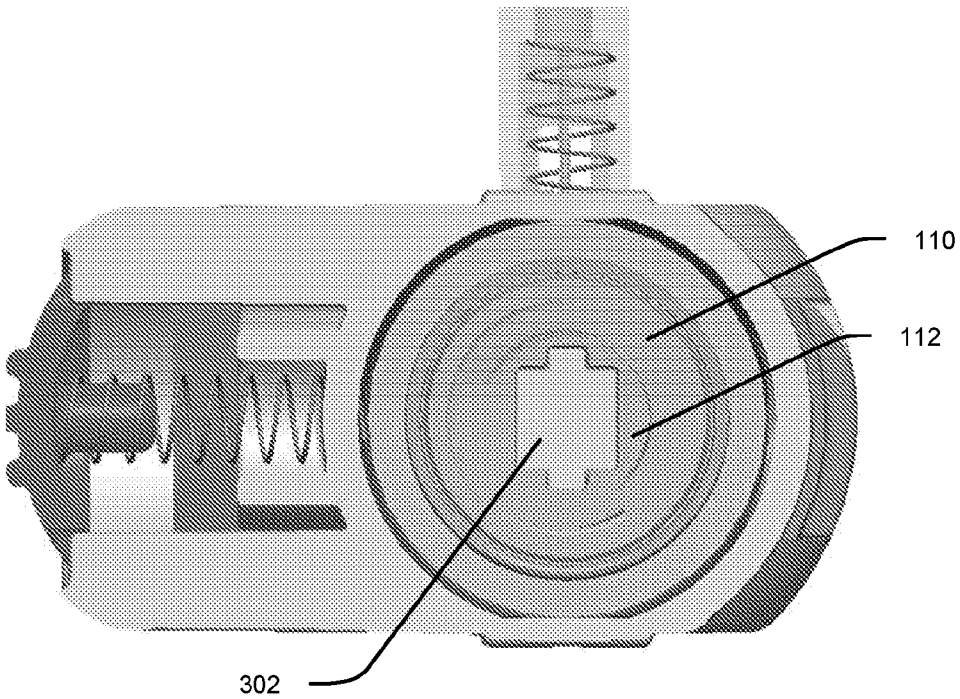

FIG. 7M

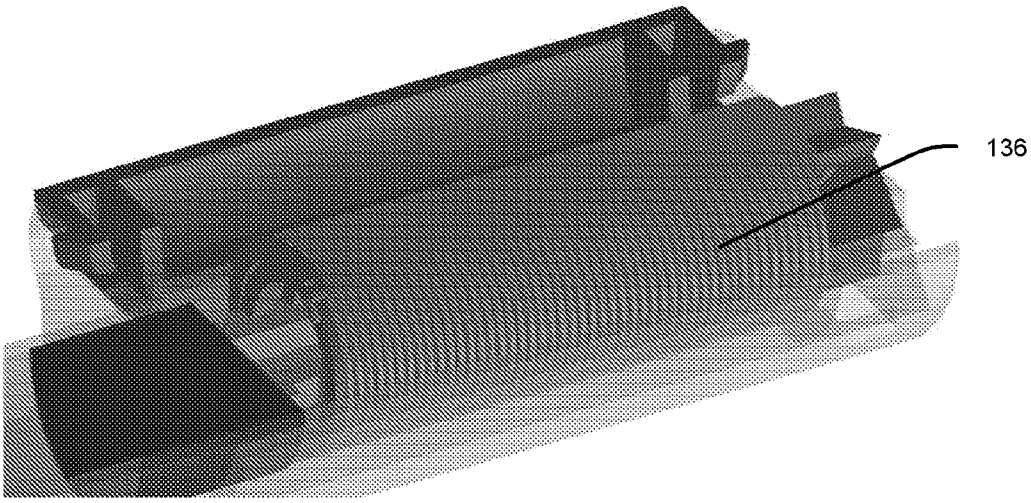

FIG. 7N

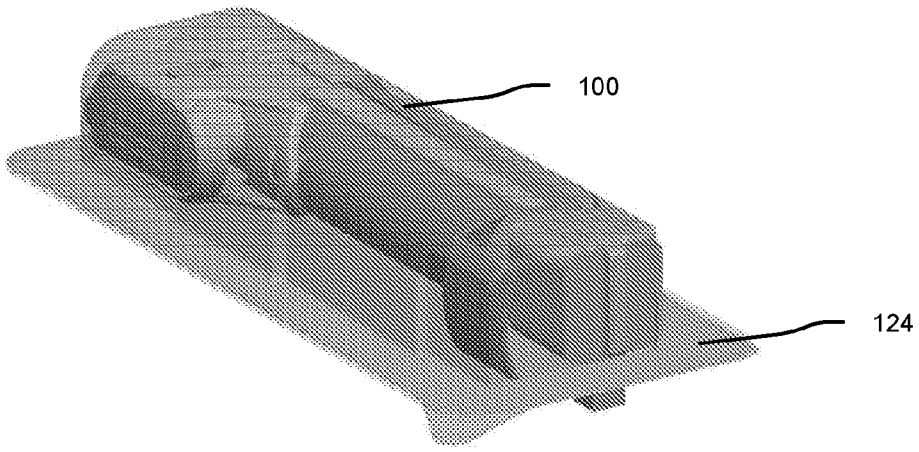

FIG. 7O

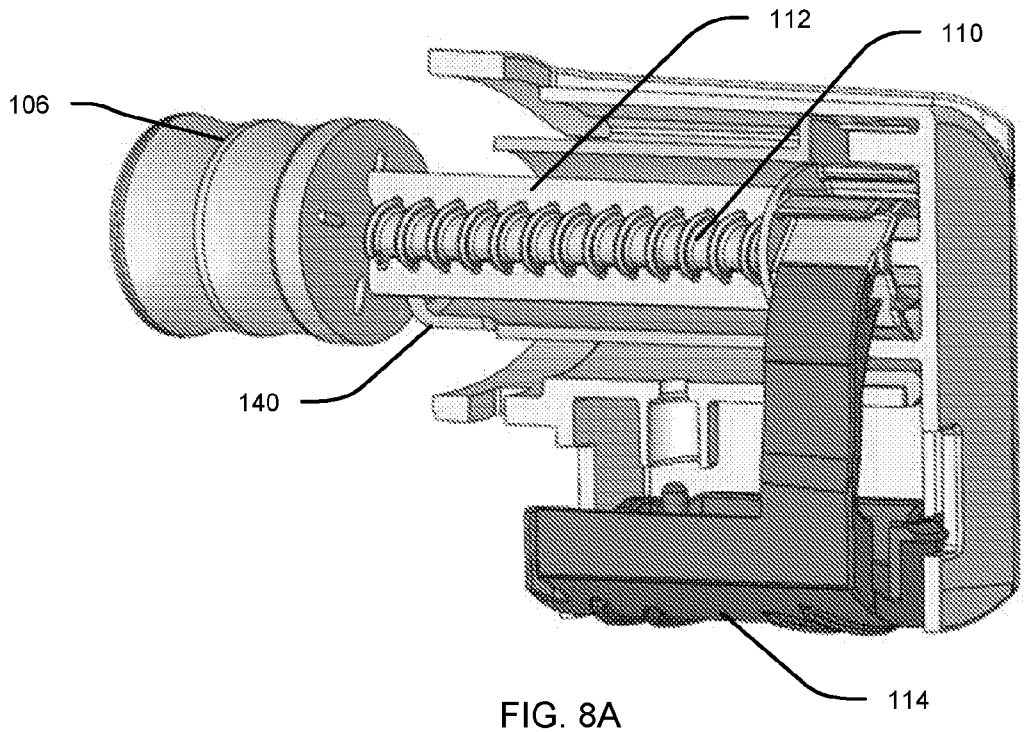

FIG. 8A

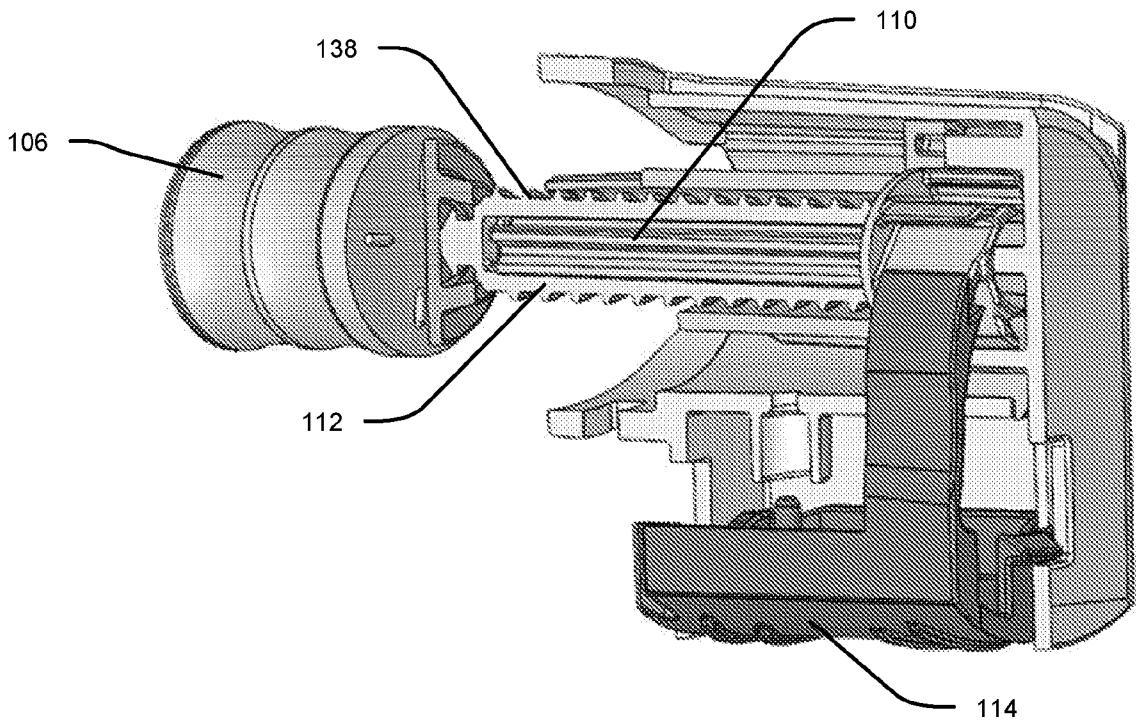

FIG. 8B

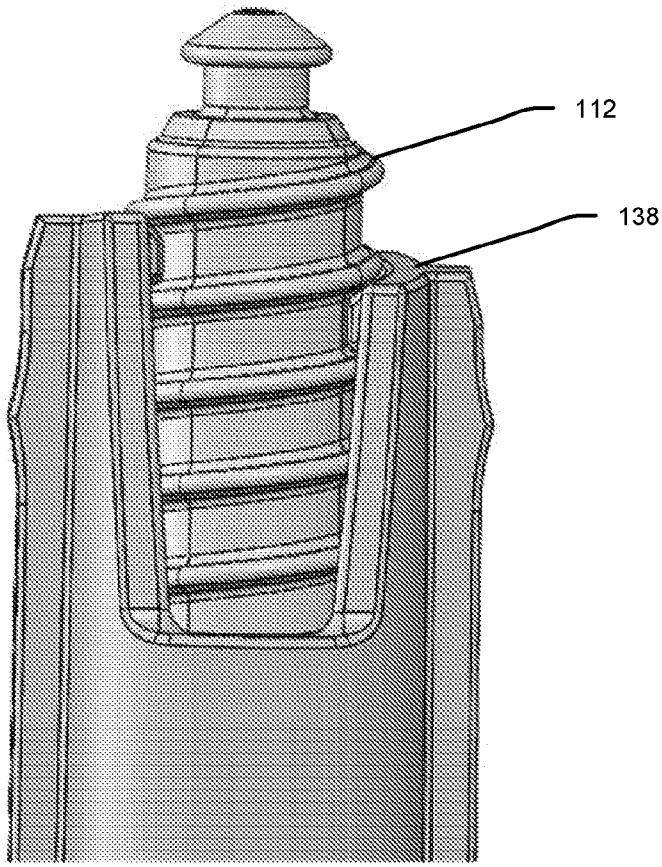

FIG. 8C

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2021/059960

A. CLASSIFICATION OF SUBJECT MATTER
A61M3/00,A61M5/31 Version=2022.01

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)

A61M

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)

Search Databases: PatSeer, IPO Internal Database
Keywords: Injecting device, cartridge, plunger, wearable, actuation

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 20130243612 A1 (ASANTE SOLUTIONS, INC., US)), 19 September 2013 (19.09.2013) Abstract, Description	1-2 and 8-18
Y	Abstract, Description	3-7
Y	US 20150297827 A1 (UNITRACT SYRINGE PTY LTD, US)), 22 October 2015 (22.10.2015) Abstract, Description	3-7

☐ Further documents are listed in the continuation of Box C. ☒ 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
"D" document cited by the applicant in the international application
"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
15-02-2022	15-02-2022
Name and mailing address of the ISA/ Indian Patent Office Plot No.32, Sector 14,Dwarka,New Delhi-110075 Facsimile No.	Authorized officer Pritish Ranjan Pal Telephone No. +91-1125300200

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2021/059960

Citation	Pub.Date	Family	Pub.Date
US 20130243612 A1	19-09-2013	WO 2008144695 A1	27-11-2008
		EP 2162167 A1	17-03-2010
US 20150297827 A1	22-10-2015	WO 2014036239 A2	06-03-2014
		JP 6645829 B2	14-02-2020
		EP 3028727 A1	08-06-2016