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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 March 2017 (16.03.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/042540 A1

(51) International Patent Classification:
A61B 5/15 (2006.01) *A61B 5/151* (2006.01)

(21) International Application Number:
PCT/GB2016/052703

(22) International Filing Date:
1 September 2016 (01.09.2016)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1515916.3 8 September 2015 (08.09.2015) GB

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(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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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, 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).

Declarations under Rule 4.17:

— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

— *of inventorship (Rule 4.17(iv))*

Published:

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

(54) Title: LANCET DEVICE

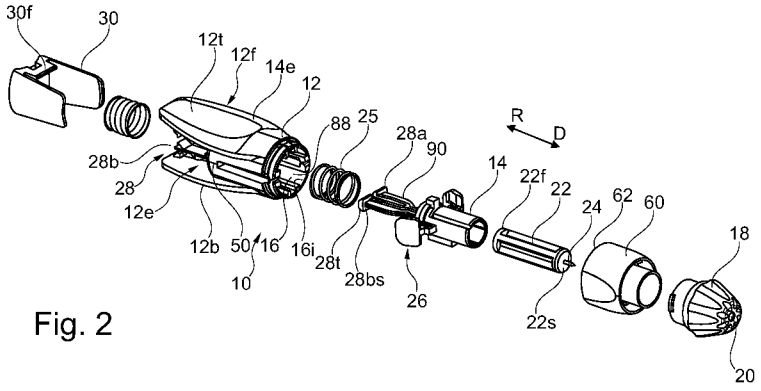


Fig. 2

(57) Abstract: The present invention provides a blood sampling device (10) having body (12) having an opening (20) therein for receiving a retractable needle holder (14). A mechanism is provided for biasing the holder (14) and any needle contained therein to a position in which it projects from the body (12) such as to cause the taking of a sample of blood from a user. The mechanism includes a re- latchable spring biasing system.

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LANCET DEVICE

The present invention relates to a lancing device and relates particularly to a mini lancing device such as may be carried by a patient having a need to obtain small blood samples for testing purposes. Such devices are commonly used to pierce a user's skin such as to allow for the taking of a sample of blood without the need of expert medical assistance.

Lancing devices are well known and generally comprise some form of a realisably retractable lancet holder housed within a housing or body portion and a sprung loaded firing mechanism which, upon external activation, causes the lancet holder and any lancet needle contained therein to be shot a pre-determined distance out of the body portion and into the user's skin, such as to secure a sample of blood for subsequent analysis. One example of such a device is shown in US 5,908,434 which includes a body having an interior for receiving a retractable needle holder having a first retracted position and a second deployed position. The holder receives a needle containing lancet and is sprung loaded against the action of a releasable latch such as to allow for the needle to be driven into the skin of a user as and when the latch is released. The device itself is a "one-shot" device as there is no facility to re-latch the retractable holder.

US 8,828,038 discloses a multi-use realisably retractable lancing device having a body portion which incorporates a cocking mechanism at one end of the device and a releasing mechanism at another end of said device. Both the cocking and releasing mechanisms may be actuated multiple times such as to allow the user to use the device to secure multiple samples. The body comprises two halves which are secured together and act to contain the lancet holder, a latching mechanism and a firing mechanism. The lancet holder and the latching mechanism are assembled on one half of the body before the two halves thereof are secured together and the releasing mechanism comprises a sprung loaded button which extends into the body itself and engages with a latch on the holder such that depression of the button releases the latch and allows for the deployment of the lancet and the taking of a blood sample. The cocking mechanism extends axially from the body such that, in a cocked position, the cocking mechanism extends the length of the device itself. Whilst this device does provide an adequate sampling mechanism, the complexity of design is such as to require multiple body parts in order to facilitate the capturing of the holder and latch and the length of the device is greatly increased when the device is cocked which makes the device somewhat larger than may be desired.

It is an object of the present invention to provide a blood sampling or lancing device which reduces and possibly eliminates the disadvantages of the above-mentioned arrangements.

According to a first aspect of the present invention, there is provided a blood sampling device comprising a body having a longitudinal axis X and having an exterior having an exterior surface, an interior having an interior surface and a first end having an opening therein; a retractable needle holder within the interior of the body for receiving a lancet, said holder having a first retracted position R and a second deployed position D and said lancet having a first end and a second end and having a needle projecting from said first end a biasing member for biasing the needle holder to said deployed position D in which the needle projects through said opening in said first end a retractor mechanism for retracting said holder from said deployed position D to said retracted position R and having a portion extending external to said body a latching

mechanism for realisably latching said needle holder from said retracted position R; and a releasing mechanism for releasing said holder from said latched retracted position R; wherein said body includes one or more slots extending between said interior surface and said exterior surface and extending axially between a closed end and an openable end, said slot receiving the portion of said retraction mechanism and having one or more end-stops towards said open end for restricting movement of said portion to within said slot (during normal operation); and wherein said open end is movable between a first, closed, position C in which the end-stops are in close proximity to each other and prevent portion being inserted into or removed from said slot and a second, opened, position O in which said portion may pass between said end-stop and be inserted into or removed from said one or more slots.

Those skilled in the art will appreciate that the above described device is arranged such as to allow for the simple insertion of the holder mechanism into the body without the need for the body to comprise multiple portions.

Preferably, the body includes a top portion and a bottom portion, two sides and two slots positioned one on each side and opposite to each other, said top portion and bottom portion being linked at the closed ends of the slots by joining portion and said top and bottom portions being of resiliently flexible material such as to allow for the reversible opening of said openable end.

Advantageously, said top and bottom portions include spaced apart axially extending portions extending away from said joining portion in a direction opposite to the direction of extension of said slots and form levers for allowing the top and bottom portions to pivot about the joining portion upon the application of radially inward pressure to said axially extending portions.

The arrangement may include a locking feature on the exterior surface of each of the top and bottom portions and the device further includes a locking ring including a locking feature surrounding said locking features and being coupled to said locking features such as to prevent outward radial movement of said top and bottom portions. Advantageously, said locking feature may comprise detents and said locking feature on said locking ring may comprise indents.

In a preferred arrangement, said openable end comprises mutually confronting surfaces which, when said slots are in a closed position act to obturate the openable end but which in an opened position of said slots are spaced from each other. Advantageously, said mutually confronting surfaces include tapered leading edges opposite each other on an outer side of said slots which, in operation, allow for the opening of the slots upon the insertion of the needle holder into the interior of the body.

Advantageously, said retractor mechanism includes one or more axial projections between the needle holder and the external portion or portions of the retractor mechanism and wherein said axially extending projection or projections include tapered leading edges for causing opening of said slots upon insertion of the needle holder into the opening of the body.

Advantageously, the slots include inner surfaces and said one or more axial projections include elongate outer surfaces for sliding engagement with said inner surfaces of said slots.

Preferably, said one or more axial projections include an end surface for engagement with the closable end of the slots when said needle holder is in its second deployed position.

Advantageously, said body includes one or more recesses on outer surfaces and wherein said external portions of said retraction mechanism are movable between a first (deployed) position in which they are substantially external to said recesses and a second (retracted) position in which they are substantially within said recesses such as to allow finger access for moving said needle holder from said second deployed position to said first retracted position. Preferably, said recess comprises tapered recesses.

Preferably, the device includes a pair of external portions, each being on an opposite side of the body and each having a finger engagement portion.

Advantageously, said body includes an axially extending aperture extending therethrough and said latching mechanism comprises a latchable member on said retractable needle holder and a releasable latch on said body portion.

Preferably, said latchable member comprises an undercut tapered male member having an undercut bottom surface and a tapered top surface located on a projection portion on said needle holder and said latching mechanism comprises a corresponding undercut sprung loaded ramp portion having a sloping surface and a returning surface and being positioned on said body.

Preferably, the device includes a flexible member having a proximal end attached to the body and a free distal end and in which said latchable member is mounted on said flexible member towards said free end and movable therewith.

Advantageously, said body includes a joining portion and said proximal end is attached to said joining portion.

Preferably, said latchable member comprises a double sided undercut male member having a tapered upper portion on each of two sides and an undercut on each of said two sides and wherein said releasable latch comprises a pair of undercut sprung loaded ramp portions having sloping ramp surfaces and returning surfaces one such ramp portion being on each side of said latchable member.

The device may also include a movement limiting stop to restrict axial movement of the retractable needle holder towards a deployed position. Preferably, said movement stop comprises a projection on a proximal end of said flexible member.

Also described herein is a blood sampling device comprising a body, a retractable lancet holder and a latching mechanism, said body includes an axially extending aperture extending therethrough and said latching mechanism comprises a latchable member on said retractable lancet holder and a releasable latch on said body portion wherein said latchable member comprises an undercut tapered male member having an undercut bottom surface and a tapered top surface located on a projection portion on said lancet holder and said latching mechanism comprises a corresponding undercut sprung loaded ramp portion having a sloping surface and a returning surface and being positioned on said body.

Also described herein is a blood sampling device comprising a body having an interior surface and an exterior surface and having one or more slots extending between said interior surface and said exterior surface and extending axially between a closed end and an openable end, said slot receiving the portion of said retraction mechanism and having one or more end-stops towards said open end for restricting movement of said portion to within said slot and wherein said open end is movable between a first, closed, position C in which the end-stops are in close proximity to each other and prevent portion being inserted into or removed from said slot and a second, opened, position O in which said portion may pass between said end-stops and be inserted into or removed from said one or more slots, a retractable lancet holder and a retractor mechanism wherein said retractor mechanism includes one or more axial projections between the lancet holder and the external portion or portions of the retractor mechanism and wherein said axially extending projection or projections include tapered leading edges for causing opening of said slots upon insertion of the lancet holder into the opening of the body.

Also described herein is a blood sampling device comprising a body having an interior surface and an exterior surface and having one or more slots extending between said interior surface and said exterior surface and extending axially between a first end and a second end, a retractable lancet holder and a retractor mechanism having one or more external portions external to said body, wherein said retractor mechanism includes one or more radial projections between the lancet holder and the external portion or portions of the retractor mechanism, in which said one or more radial projections pass through said slot or slots and wherein said body includes one or more recesses on outer surfaces and wherein said external portions of said retraction mechanism are movable between a first (deployed) position in which they are substantially external to said recesses and a second (retracted) position in which they are substantially within said recesses such as to allow finger access for moving said needle holder from said second deployed position D to said first retracted position R.

It will be appreciated that features of the present invention may be used in combination with each other so as to form a single product but also that elements claimed in the independent claims may be used on their own without relying on the features protected by other claims or without relying on features described in the specific description but not claimed. It will also be appreciated that elements shown in drawings may reasonably be used and claimed individually without relying on other elements shown in the same drawing.

The present invention will now be more particularly described by way of example only with reference to the accompanying drawings, in which:

Figure 1 is a general isometric view of a blood sampling device incorporating features of the present invention;

Figure 2 is an exploded view of the sampling device of figure 1;

Figure 3 is a partial exploded view of the sampling device of figure 1;

Figure 4 is an isometric view of the main body portion of the sampling device of figure 1;

Figure 5 is a side elevation of the main body portion shown in figure 4;

Figure 6 is an end view of the main body portion shown in figures 4 and 5;

Figure 7 is a top view of the main body portion shown in figures 4 to 6;

Figures 8a and 8b are side and top views of the sampling device in a default position;

Figures 8c and 8d are cross-sectional views in the direction of arrows A-A and B-B respectively in figures 8a and 8b;

Figures 9a and 9b are side and top views of the sampling device in a primed position;

Figures 9c and 9d are cross-sectional views in the direction of arrows A-A and B-B respectively in figures 9a and 9b;

Figures 10a and 10b are side and top views of the sampling device when the firing button has been pressed;

Figures 10c and 10d are cross-sectional views in the direction of arrows A-A and B-B respectively in figures 10a and 10b;

Figures 11a and 11b are side and top views of the sampling device in a fired position;

Figures 11c and 11d are cross-sectional views in the direction of arrows A-A and B-B respectively in figures 11a and 11b; and

Figure 12 is a cross-sectional view of portion 76 in figure 3 and shows the tapered leading edges 761 and 762

Referring now to the drawings in general but particularly to figures 1 to 3, a blood sampling device shown schematically at 10 includes a main body portion 12 having an exterior surface 14e and an interior 16, best seen in figures 2 and 3, and an interior surface 16i. A first end 18 is provided with an opening 20 through which, in operation, a needle described later herein may be deployed. A retractable lancet holder 14 is provided within the interior 16 of the body 12 for receiving a lancet 22 having a needle 24 provided theirin and extending therefrom. The lancet 22 has a first end 22f for engagement within the holder 14 and a second end 22s for receiving said needle 24. A biasing member 25 in the form of, for example, a compression spring 25 is provided to bias the holder 14 towards a deployed position D in which the needle 24 projects from the opening 20 in the first end 18, such as to allow for the pricking of the skin of a user and the collection of a blood sample in a process described in more detail later herein. A retractor mechanism shown generally at 26 is provided for retracting said holder 14 from said deployed position D to said retracted position R and includes a portion 26e extending external to said body 12 which may be accessed by the thumb or finger of a user. A latching mechanism shown by way of example under reference 28 may be provided for releasably latching said needle holder 14 from said retracted position R. A releasing mechanism shown by way of example under reference number 30 may be provided for releasing said holder 14 from said latched retracted position R as and when required in a manner described in detail later herein. The body 12 includes one or more slots 40a, 40b extending between said interior surface 16i and said exterior surface 14e and extending axially between a closed end 42 and an openable end 44. The said one or more slots 40a, 40b receive the external

portion 26e of said retraction mechanism 26 and each slot has one or more end-stops 46 towards said openable end 44 for restricting movement of said portion 26e to within said slot during normal operation. The said openable end 44is movable between a first, closed, position C in which the end-stops 46 are in close proximity to each other and prevent portion 26e being inserted into or removed from said slot 40 and a second, opened, position O in which said portion 26e may pass between said end-stops 46 and may be inserted into or removed from said one or more slots 40. This facility of movement may be implemented by providing the body in a material which has a degree of flexibility sufficient to allow the material of the holder 12 on each side of the slot or slots 40 to flex about the closed end 42 and allow the opening of the openable end 44. One example of a suitable material is Acetel plastic but other plastics such as high density PTFE may also be used.

In a preferred arrangement, the body 12 of the above arrangement may include a top portion 12t and a bottom portion 12b, two sides 12e and 12f and two slots 40a, 40b positioned one on each side 12e, 12f and opposite to each other, said top portion 12t and bottom portion 12b being linked at the closed ends 42 of the slots 40a, 40b by joining portion 50 and said top and bottom portions 12t, 12b being of resiliently flexible material, as mentioned above, such as to allow for the opening of said openable end 44 when inserting the holder 14. This arrangement provides a slot on each side of the body 12 and is, therefore, able to offer dual external retractor mechanism portions 26, as best seen in figures 2 and 3. In a preferred arrangement, the said top and bottom portions 12t, 12b include spaced apart axially extending portions 52, 54 extending along axis X away from said joining portion 50 in a direction opposite to the direction of extension of said slots 40a, 40b and form levers for allowing the top and bottom portions 12t, 12b to pivot about the joining portion 50 upon the application of radially inward pressure P to said axially extending portions 52, 54.

One optional arrangement may be provided in the form of a locking mechanism shown generally at 58 for ensuring the openable end 44 is prevented from being opened once the lancet holder 14 has been inserted into said body 12. Such an arrangement may include first locking features 58a, 58b on the exterior surface 14e and towards the openable end 44 of each of the top and bottom portions 12t, 12b and a locking ring 60 having a second locking feature 62 surrounding said first locking features 58 and being connectable to said locking features 58a, 58b in an inter-engaging manner such as to prevent outward radial movement of said top and bottom portions 12t, 12b. In the particular arrangement shown, said locking feature 58a, 58b comprises one or more detents 58b and said locking ring 60 comprises an indent.

The openable end 44 preferably comprises mutually confronting surfaces 70a, 70b on projections 70 which, when said slots 40 are in a closed position, act to obturate the openable 44 end but which in an opened position of said slots 40 are spaced from each other. The mutually confronting surfaces 70a, 70b include tapered leading edges 72a, 72b opposite each other on an outer side OS of said slots 40 which, in operation, allow for the opening of the slots 40 upon the insertion of the needle holder 14 into the interior 16 of the body 12. The trailing edges 72c, 72d of the surfaces 70 are bluff surfaces which, in operation, act to prevent removal of the holder 14 from the body 12.

The retractor mechanism 26, best seen in figure 3, includes one or more axial projections 76 between the needle holder14 and the external portion or portions 26e of the retractor mechanism 26. Preferably, the said axially extending projection or projections 76 include tapered leading edges 76L for causing opening of said slots 40 upon insertion of the needle holder 14 into the opening 20 of the body. The projections 76 extend between the main holder 14 and the one or more external portions 26e such as to allow the holder 14 to move as one with said external portions 26e. The axial projections 76 may comprise elongate outer surfaces 76s which have a length L along the longitudinal axis X which is greater than their width W measured perpendicular to said axis X. this arrangement facilitates a greater degree of stability of the holder within the body 12 as the projections 76 will have a relatively long contact surface in contact with the slot 40 of the main body portion 12 for sliding engagement with the inner surface 40i of the one or more slots 40. An end surface 80 is provided on the one or more axial projections 76 for engagement with the openable end 44 of the slot 40 when said needle holder 14 is in a second, deployed, position. This effectively, defines the maximum extent of travel of the holder 14 within the body 12 and the position thereof helps define a datum position provided by the back surface 28bs from which one may define the total axial projection of the needle from the device, as discussed in more detail later herein. Whilst it will be appreciated that one may provide just one projection 76 and one external portion 26e, it has been found that the provision of two such arrangements with one being provided on each of two sides of the device 10 has the advantage of easy access to the retraction mechanism. If two such arrangements are provided it is preferable to provide them on opposite sides of the body 12 such as to provide a balanced feel to the user and to allow for easy operation by a thumb and a finger of the same hand.

Referring now more particularly to figures 1, 3 and 4, said body 12 may include one or more recesses 82, 84 on outer surfaces 12e, 12f in the vicinity of the track of the external portions 26e of said retraction mechanism 26 as and when they are moved between a first (deployed) position (shown dotted in figure 1) in which they are substantially external to said recesss 82, 84 and a second (retracted) position (shown in full in figure 1) in which they are substantially within said recesses 82, 84. This arrangement is provided through the edges 82e, 84e of the recesses being tapered in height relative to the bottom 82b, and 84b of the recesses such as to provide a tapered recess. This arrangement allows easy finger access to the external portions 66e as and when required for moving said needle holder 14 from said second deployed position D to said first retracted position R but shields the retraction mechanism 26 within the recess when in the retracted position R, otherwise known as the “cocked position”. The edges 82e, 84e of the recesses also help define the edges of top and bottom portions 12t, 12b, which are used to hold the device whilst handling it and before releasing the needle from the latch as described later herein.

Referring now more particularly to figure 3, the body 12 includes an axially extending aperture 88 extending along longitudinal axis X into which is inserted the holder 14. In the particular arrangement of the drawings, the latching mechanism 28 comprises a latchable member 28a on said retractable needle holder 14 and a releasable latch 28b on said body portion 12, shown in more detail in figures 5 and 8. The aperture 88 allows for the holder 14 to be inserted into the body 12 such that the latch 28b and latchable member 28a can engage with each other as and when appropriately positioned next to each other. In a preferred arrangement, the latchable

member 28a comprises an undercut tapered male member 28a having an undercut bottom surface 28bs and a tapered top surface 28t located on a projection portion 90 on said needle holder 14 and said latching mechanism 28b comprises a corresponding undercut inwardly biased ramp portion 28b having a sloping surface 28ss and a returning surface 28rs and being positioned on said body 12. The arrangement also includes a flexible member 102 having a proximal end 102p attached to the body 12 and a free distal end 102d in which said latchable member 28a is mounted on said flexible member 102 towards said free end and is movable therewith. The body 12 includes a joining portion 50 and said proximal end 102p of the flexible member 102 is attached to said joining portion 50 such as to allow flexing about said portion. In a particularly preferred arrangement said latchable member 28a comprises a double sided undercut male member 28a having a tapered upper portion 28tu on each of two sides A, B and an undercut 28uc1, 28uc2 on each of said two sides A, B and said releasable latch 28b comprises a pair of undercut sprung loaded ramp portions 28ur having sloping ramp surfaces 28ss and returning surfaces 28rs, one such ramp portion being on each side A, B of said latchable member 28a. such an arrangement allows for the sandwiching of the latchable member between two latches and improves the latching as two latches are provided but the releasing of both latches can be achieved by the same mechanism, as discussed later herein. The operation of the latching mechanism will be described in detail with reference to figures 8 to 11 below.

The latch mechanism may also include a movement limiting stop 122 having a sloping surface 120a and a generally radially extending surface 120b to restrict axial movement of the retractable needle holder 14 towards a deployed position D by engaging on the one or more undercuts 28uc1, 28uc2, as best seen in figure 9D. Whilst it will be appreciated that any one of a number of stop arrangements may be employed, a convenient arrangement comprises a stop 122 on a proximal end of said flexible member 102 which extends inwardly such that radially extending surfaces 120b catch the undercut 28uc1, 28uc2 of the latchable portion once it has passed. In this regard, it will be appreciated that the flexibility of the flexible member 102 will allow for the limiting stop to move radially inwardly and outwardly and that if a sloping surface 120s is provided such as to interact with the tapered portions 28tu of the holder 14 as and when the holder 14 is inserted such as to move the limiting stop 122 out of the way. This stop, in effect, prevents the inadvertent removal of the holder 14 from the body 12. The position of the various stops described in this paragraph and above may be selected such as to ensure the holder 14 has the desired degree of axial movement sufficient to cause the required degree of penetration of any needle into the skin of the user. In practice, this may mean that limiting stop 122 is not engaged in normal use as the holder 14 may engage with the stopping surfaces of the closable end 44 first.

The releasing mechanism 30 may comprise any one of a number of devices for separating the one or portions of the latching mechanism 28 but it has been found most convenient to provide it in the form of a release button 30 which acts to separate the portions of the latch from each other upon depression along axis X. The button 30 is best seen in figure 2 but the operation thereof is best seen in figures 8D, 9D, 10D and 11D, each of which will be referred to later herein when discussing the latching and releasing process steps. The button 30 is provided with one or more surfaces 30f which, in operation, are arranged to engage with corresponding sloping surfaces 120f on inner sides 120i of the one or more flexible members 120 such that depression of the button 30 along axis X causes the surfaces to contact and the sloping surface 120f to be displaced

radially outwardly. This movement is set to be sufficient to cause the release of the latchable portion 28a from the latching portion 28b and allow the holder to be deployed under the influence of the biasing means 25 and cause any needle within the holder 14 to project beyond the body 12 itself. Outer surfaces 102x of the flexible member 102 are provided with a stop 102s having an engagement surface 102e which confronts the joining portion 50. A spring 140 is provided between the joining portion 50 and the stop 102s and engages on the bottom surfaces 28bs of the latchable portion 28 such as to bias it and the holder 14 in the direction of arrow R in figure 1. The strength of spring 140 is less than that of spring 25 such that spring 25 can cause the needle to project from the outlet 20 when released by mechanism 30 but, after the needle 24 has punctured the skin of a patient or user the combined forces of the springs acts to maintain the needle within the body 12 where it is clear of any possible interaction with the user until the device 10 has been re-activated by the user.

Assembly of the above device will now be discussed with reference to the drawings in general but with particular reference to figures 8 to 11. Firstly, the spring 25 is inserted into the body 12 or around the holder 14 before the holder 14 is placed up against the openable end of the body 12 such as to introduce tapered leading edges 761 and 762 to surfaces 72a, 72b. The holder 14 is then pushed in the direction of arrow R in figure 2. This action causes the surfaces 761, 762 to move surfaces 72a, 72b apart and allow the insertion of holder 14 into the main body 12 where axial projections 76 are retained within but slidable along slots 40a, 40b. As the holder is passed into the aperture within the body 12, the latchable member 28a passes towards the latch 28b and the tapered leading edges of the latch 28a engage with tapered surfaces 28ss of the latch such that the physical interaction of tapered surfaces causes the flexible member 102 to flex away from the latchable member and allow for the latchable member to pass over the tapered surface 28ss such as to allow the flexible member 102 to return back to its prior position and allow back surfaces 28bs of the head of the latchable portion 28a to engage with the returned surfaces 28rs of the latch 28b such as to latch the holder 14 is a “cocked” or “primed” position best seen in figure 9D. If not already attached before priming, the locking ring 60 may now be attached to the openable end 44 such as to prevent opening thereof before the first end 18 having aperture 20 provided therein is attached to the locking ring such as to define a chamber surrounding any needle 24 within the device 10. The spring 140 may be passed over flexible portions 102 and positioned to engage between joining portion 50 and stop 102s. The button 30 may then be placed over the assembled latching portion such as to rest against the latch and allow surfaces 30f to contact surfaces 120f.

Operation of the assembled device 10 will now be described with reference to figures 8 to 11.

Figure 8 illustrates the device in a default position in which the needle 24 is safely contained within the device 10 and the holder 14 is held in the default position by the action of spring 140 acting between joining portion 50 and the back surface 28bs of the latchable portion 28. Spring 25 acts between the joining portion 50 and the engagement surface 14e of the holder 14 and acts to counter balance spring 140 and retain the holder and needle in the safe “default” position. The device is primed by causing the holder 14 to be moved in the direction of arrow P in figure 9 such that the tapered leading edges 28tu of the latchable portion 28 engage with tapered surfaces 28ss of the flexible member 102 and cause it to be deflected out of the way such as to allow the

latchable portion 28a to pass over tapered surface 28ss and allow the back surfaces 28bs to engage with and be retained by rear surfaces 28rs of flexible portion 102 such as to latch the holder in a “primed” position. This movement can be achieved by the user sliding one or other or both of portions 26e in the direction of arrow R in figure 2. In this position, spring 25 is fully compressed and spring 140 is fully expanded. To release the holder 14 and needle 24a, one simply needs to depress button 30 such as to cause surfaces 30f to engage with surfaces 120f and cause the flexible member 120 to be displaced outwardly such as to cause the disengagement of the surfaces 28bs and 28rs from each other and allow the holder to move rapidly in the direction of arrow D in each of figures 2 and 11 under the influence of previously compressed spring 25. The rapid release of spring 25 causes the needle 24 to be temporarily deployed beyond outlet 20 such as to puncture the skin of a user if the outlet 20 is positioned against the skin of the user. After this initial firing the combined effect of the two springs 25 and 140 is such as to return the holder 14 to the default position shown in figure 8 where the needle 24 is safely within the device itself until it is next required.

CLAIMS

1. A blood sampling device (10) comprising:
   a) body (12) having a longitudinal axis X and having an exterior (14) having an exterior surface (14e), an interior (16) having an interior surface (16i) and a first end (18) having an opening (20) therein;
   b) a retractable needle holder (14) within the interior (16) of the body (12) for receiving a lancet (22), said holder (14) having a first retracted position R and a second deployed position D and said lancet (22) having a first end (22f) and a second end (22s) and having a needle (24) projecting from said first end;
   c) a biasing member (25) for biasing the needle holder (14) to said deployed position D in which the needle (24) projects through said opening (20) in said first end (18);
   d) a retractor mechanism (26) for retracting said holder (14) from said deployed position D to said retracted position R and having a portion (26e) extending external to said body (12);
   e) a latching mechanism (28) for releasably latching said needle holder (14) from said retracted position R; and
   f) a releasing mechanism (30) for releasing said holder (14) from said latched retracted position R;
   wherein said body (12) includes one or more slots (40a, 40b) extending between said interior surface (16i) and said exterior surface (14e) and extending axially between a closed end (42) and an openable end (44),

   said slot (40) receiving the portion (26e) of said retraction mechanism (26) and having one or more end-stops (46) towards said openable end (44) for restricting movement of said portion (26e) to within said slot; and

   wherein said openable end (44) is movable between a first, closed, position C in which the end-stops (46) prevent portion (26e) being inserted into or removed from said slot (40) and a second, opened, position O in which said portion (26e) may pass between said end-stops (46) and be inserted into or removed from said one or more slots (40).

2. A device as claimed in claim 1 in which the body (12) includes a top portion (12t) and a bottom portion (12b), two sides (12e) and (12f) and two slots (40a, 40b) positioned one on each side (12e, 12f) and opposite to each other, said top portion (12t) and bottom portion (12b) being linked at the closed ends (42) of the slots (40a, 40b) by joining portion (50) and said top and bottom portions (12t, 12b) being of resiliently flexible material to allow for the reversible opening of said openable end (44).

3. A device as claimed in claim 2, wherein said top and bottom portions (12t, 12b) include spaced apart axially extending portions (52, 54) extending away from said joining portion (50) in a direction opposite to the direction of extension of said slots (40a, 40b) and form levers for allowing the top and bottom portions (12t, 12b) to pivot about the joining portion

(50) upon the application of radially inward pressure P to said axially extending portions (52, 54).

4. A device as claimed in any one of claims 1 to 3, including a first locking feature (58a, 58b) on the exterior surface (14e) of each of the top and bottom portions (12t, 12b) and the device (10) further includes a locking ring (60) including a second locking feature (62) surrounding said first locking features (58) and being coupled to said first locking features (58a, 58b) to prevent outward radial movement of said top and bottom portions (12t, 12b).

5. A device as claimed in claim 4, wherein said first locking feature (58a, 58b) comprises a detent and said second locking feature (62) on said locking ring (60) comprises an indent.

6. A device as claimed in any one of claims 1 to 5, wherein said openable end (44) comprises mutually confronting surfaces (70a, 70b) which, when said slots (40) are in a closed position act to obturate the openable end but which in an opened position of said slots (40) are spaced from each other.

7. A device as claimed in claim 6, wherein said mutually confronting surfaces (70a, 70b) include tapered leading edges (72a, 72b) opposite each other on an outer side (OS) of said slots (40) which, in operation, allow for the opening of the slots (40) upon the insertion of the needle holder (14) into the interior (16) of the body (12).

8. A device as claimed in any one of claims 1 to 7, wherein said retractor mechanism (26) includes one or more axial projections (76) between the needle holder (14) and the external portion or portions (26e) of the retractor mechanism (26) and wherein said axially extending projection or projections (76) include tapered leading edges (761, 762) for causing opening of said slots (40) upon insertion of the needle holder (14) into the opening (20) of the body (12).

9. A device as claimed in claim 8, wherein said slots (40) include inner surfaces (40i) and said one or more axial projections include elongate outer surfaces (76s) for sliding engagement with said inner surfaces (40i) of said slots (40).

10. A device as claimed in claim 8 or claim 9, wherein said one or more axial projections (76) include an end surface (80) for engagement with the openable end (44) of the slots (40) when said needle holder (14) is in its second deployed position D.

11. A device as claimed in any one of claims 1 to 10, wherein said body (12) includes one or more recesses (82, 84) on outer surfaces (12e, 12f) and wherein said external portions (26e) of said retraction mechanism (26) are movable between a first (deployed) position in which they are substantially external to said recess (82, 84) and a second (retracted) position in which they are substantially within said recesses (82, 84) to allow finger access for moving said needle holder (14) from said second deployed position D to said first retracted position R.

12. A device as claimed in claim 11, wherein said recess (82, 84) comprise tapered recesses.

13. A device as claimed in any one of claims 1 to 12 and including a pair of external portions (26e), each being on an opposite side of the body (12) and each having a finger engagement portion (26FE).

14. A device as claimed in any one of claims 1 to 13, wherein said body (12) includes an axially extending aperture (88) extending therethrough and said latching mechanism (28) comprises a latchable member (28a) on said retractable needle holder (14) and a releasable latch (28b) on said body portion (12).

15. A device as claimed in claim 14, wherein said latchable member (28a) comprises an undercut tapered male member (28a) having an undercut bottom surface (28bs) and a tapered top surface (28t) located on a projection portion (90) on said needle holder (14) and said latching mechanism (28b) comprises a corresponding undercut sprung loaded ramp portion (28b) having a sloping surface (28ss) and a returning surface (28rs) and being positioned on said body (12).

16. A device as claimed in claim 14 and including a flexible member (102) having a proximal end (102p) attached to the body (12) and a free distal end (102d) and in which said latchable member (28a) is mounted on said flexible member (102) towards said free end and movable therewith.

17. A device as claimed in claim 16, wherein said body (12) includes a joining portion (50) and said proximal end (102p) is attached to said joining portion (50).

18. A device as claimed in any one of claims 14 to 17 and wherein said latchable member (28a) comprises a double sided undercut male member (28a) having a tapered upper portion (28tu) on each of two sides A, B and an undercut (28uc1, 28uc2) on each of said two sides A, B and wherein said releasable latch (28b) comprises a pair of undercut sprung loaded ramp portions (28ur) having sloping ramp surfaces (29a) and returning surfaces (29b), one such ramp portion being on each side A, B of said latchable member (28a).

19. A device as claimed in any one of claims 14 to 18 and including a movement limiting stop (120) to restrict axial movement of the retractable needle holder (14) towards a deployed position D.

20. A device as claimed in claim 19, wherein said movement stop (120) comprises a projection (122) on a proximal end of said flexible member (102).

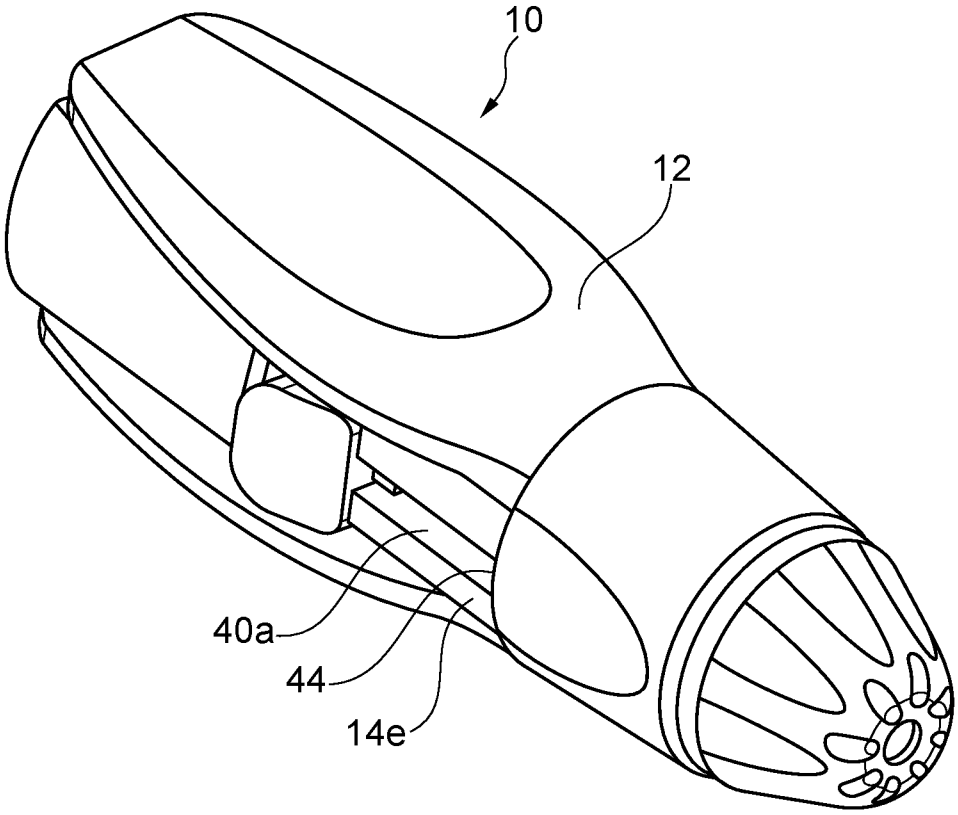


Fig. 1

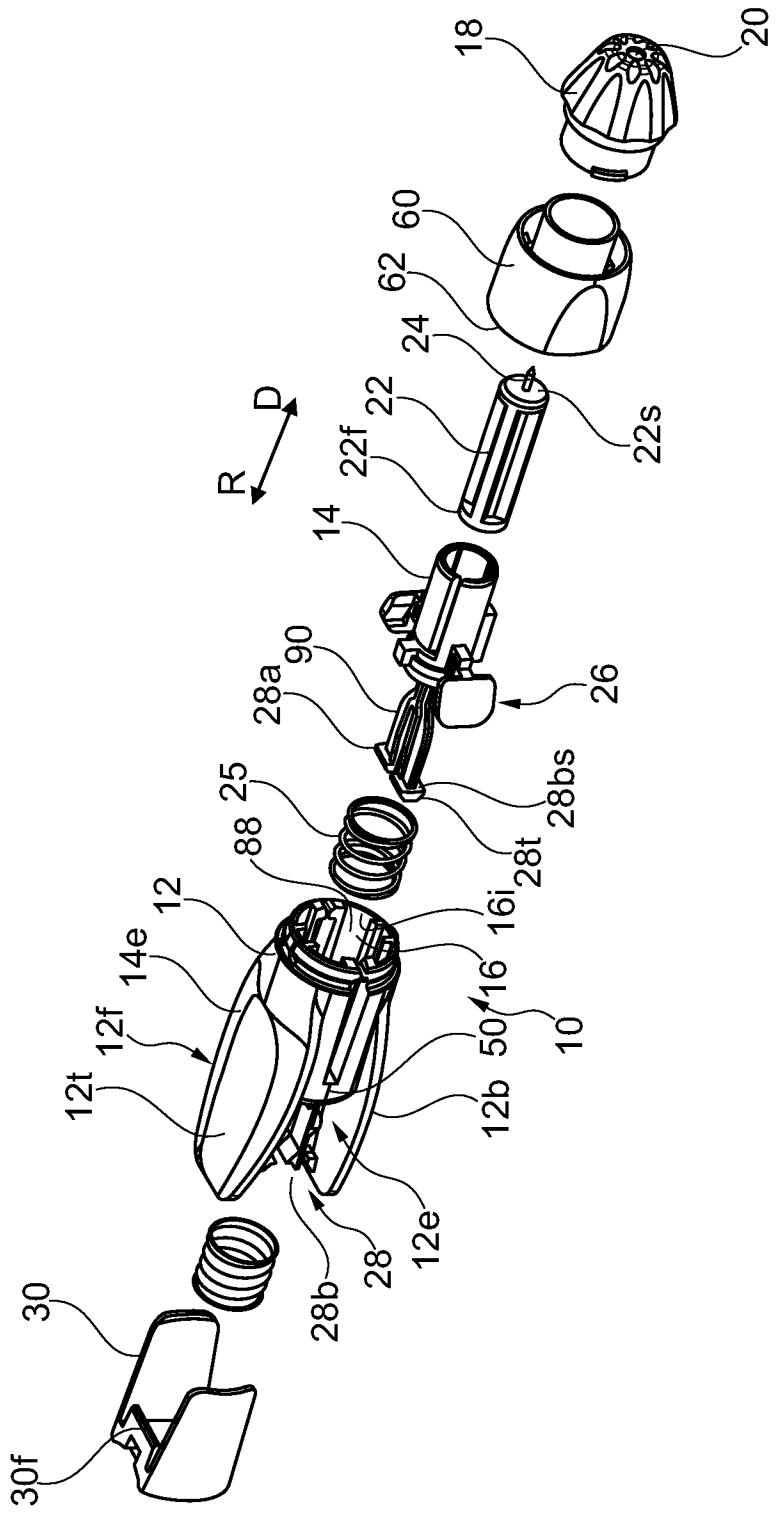

18
20
60
62
24
22
22f
22s
D
R
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28a
26
25
88
28bs
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30f

Fig. 2

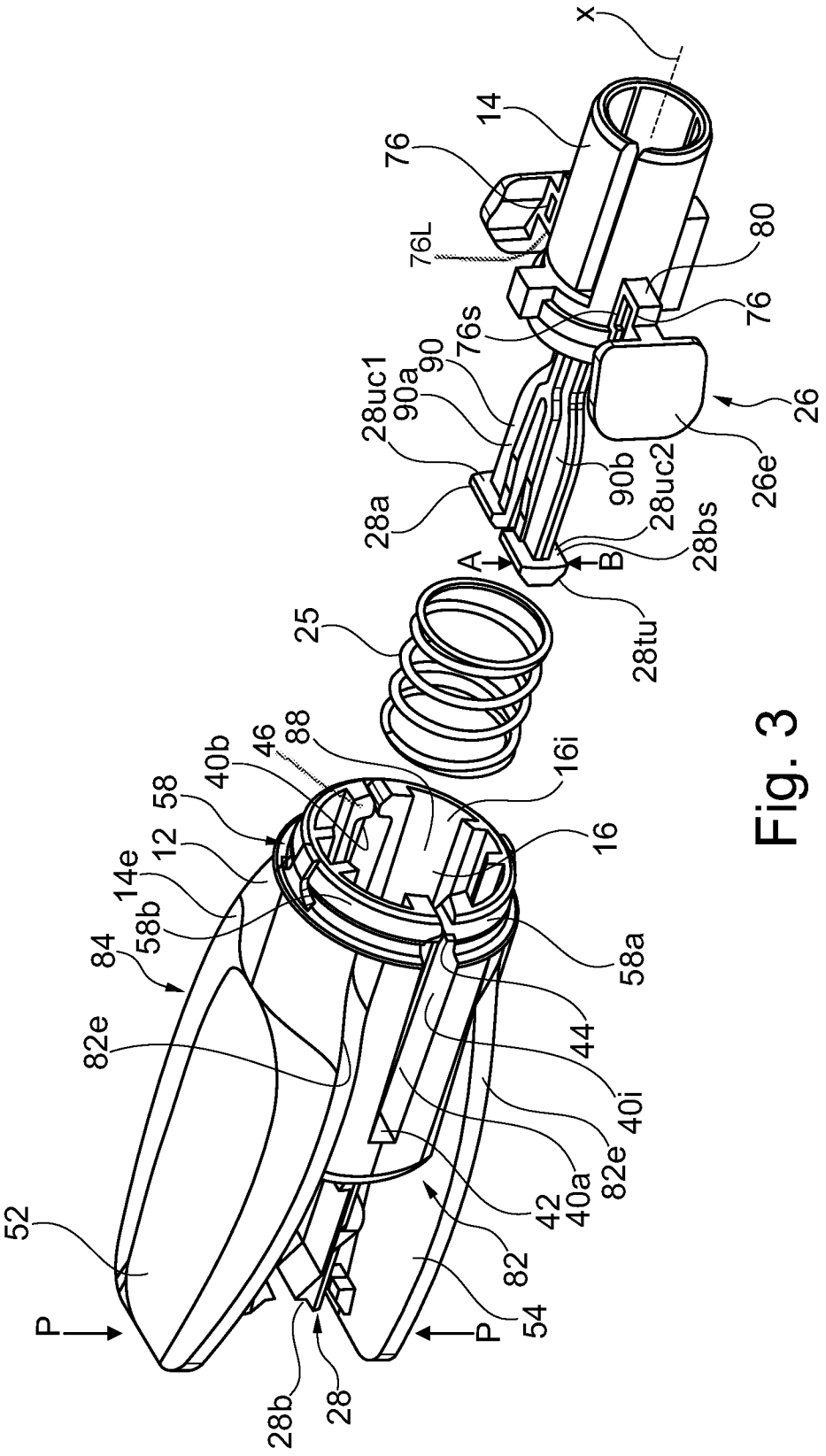

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76L
80
76
76s
90
90a
28uc1
26
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90b
28uc2
26e
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B
28tu
25
16i
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46
40b
58
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16
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Fig. 3

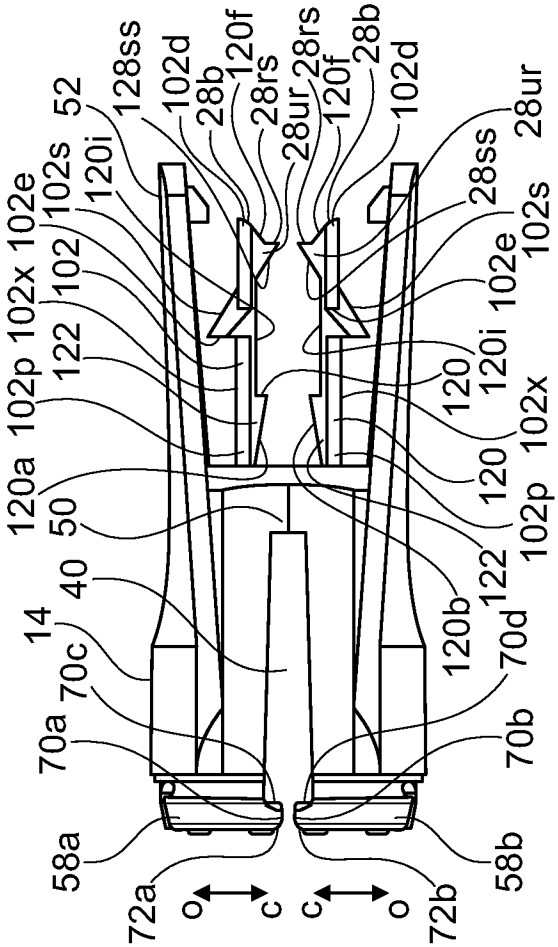


Fig. 5

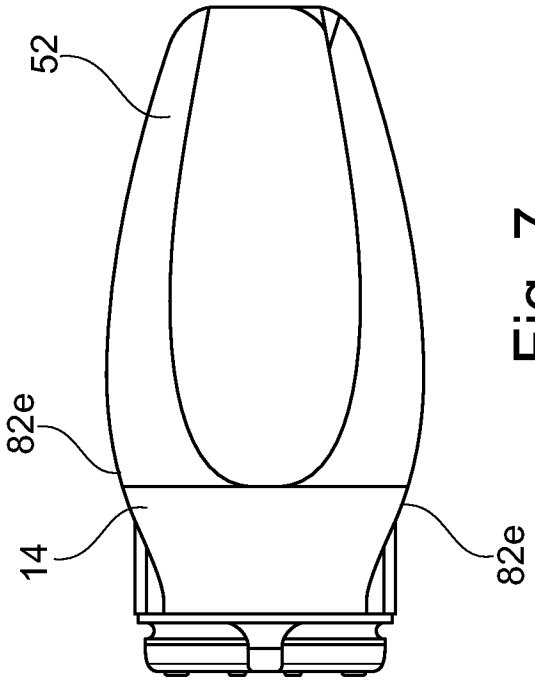


Fig. 7

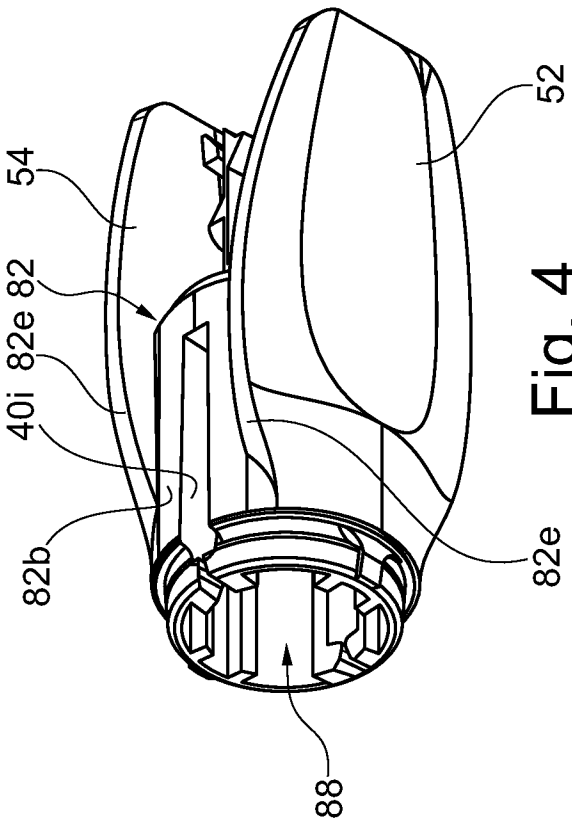


Fig. 4

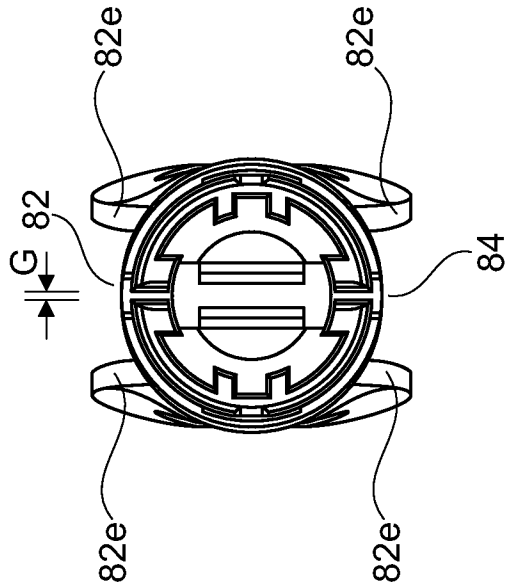


Fig. 6

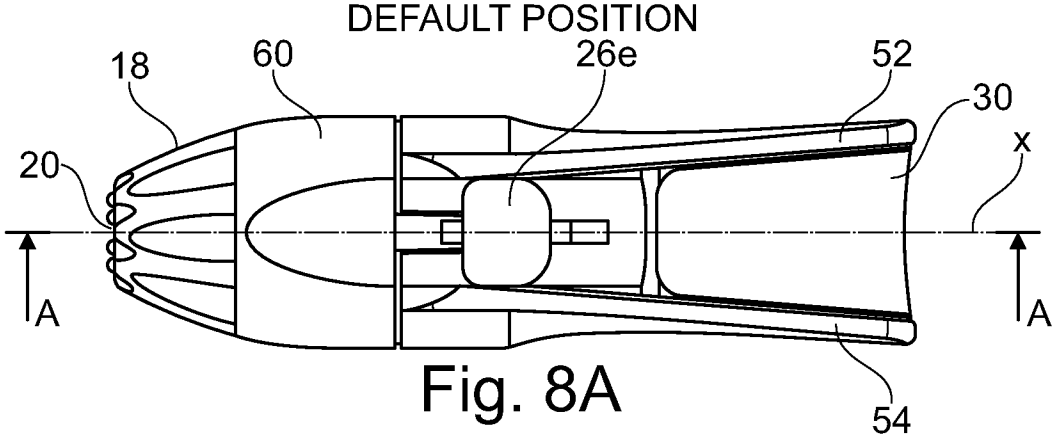


Fig. 8A

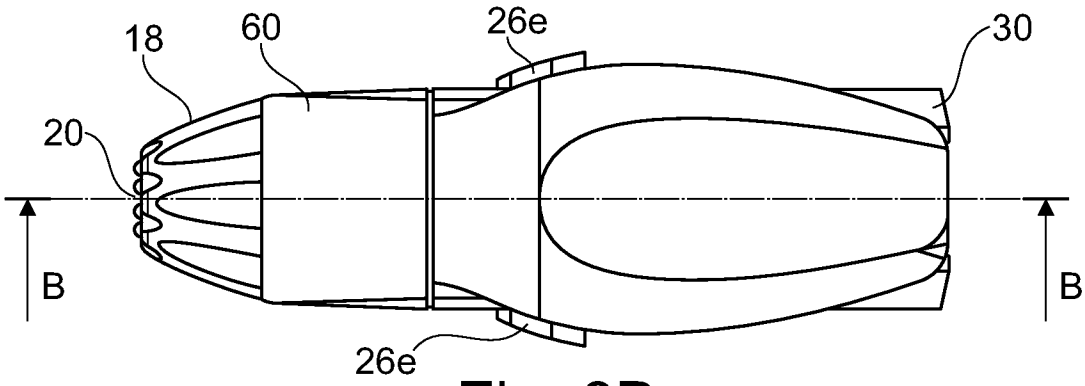


Fig. 8B

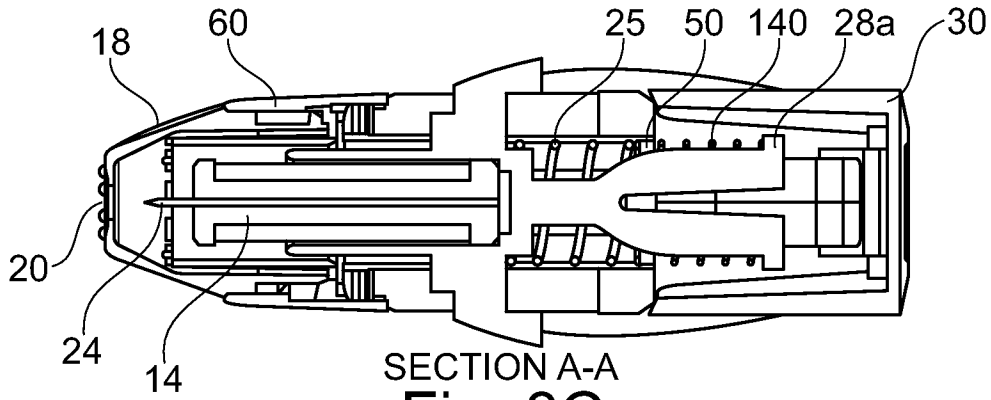


Fig. 8C

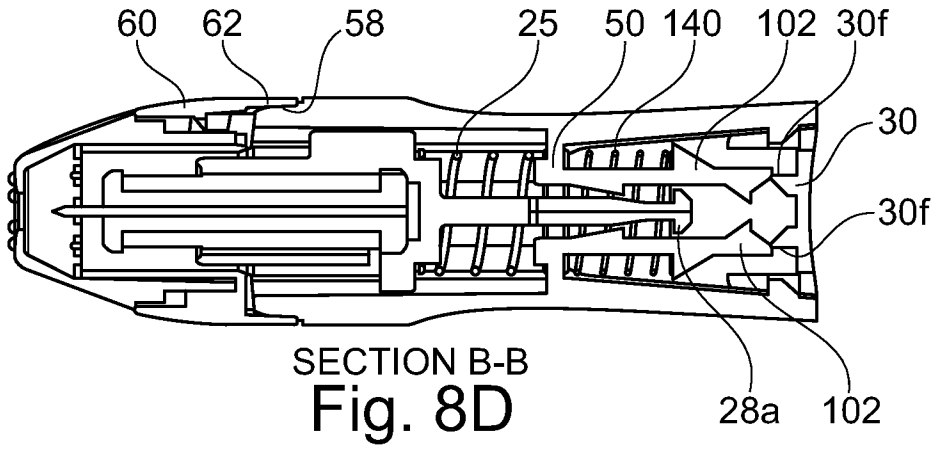


Fig. 8D

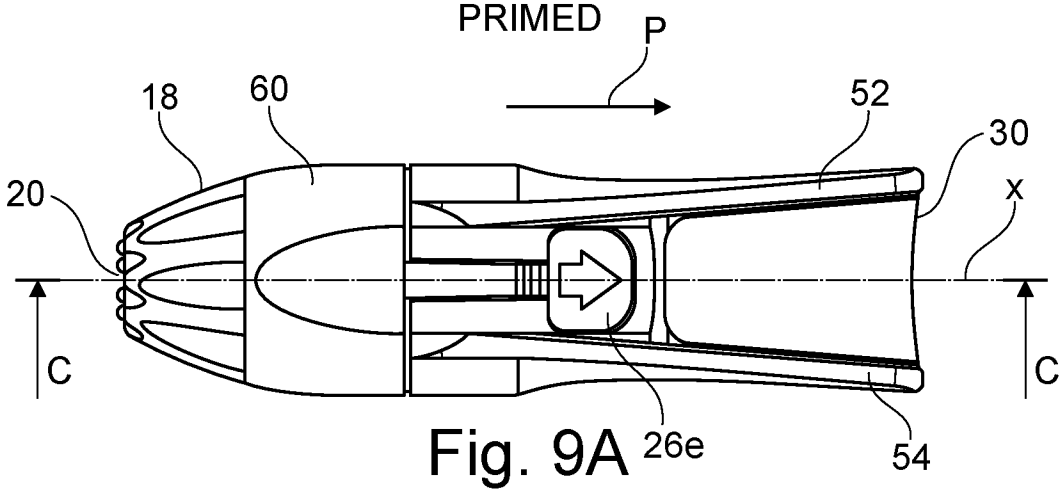


Fig. 9A

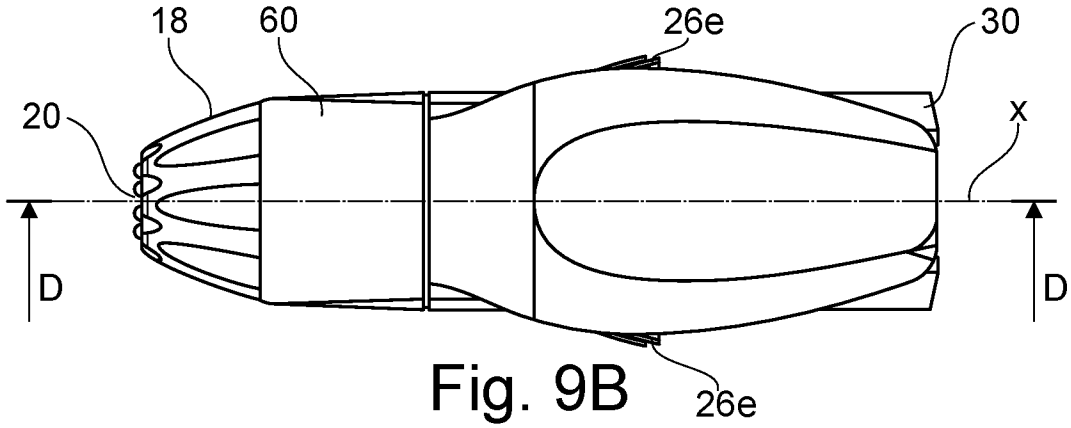


Fig. 9B

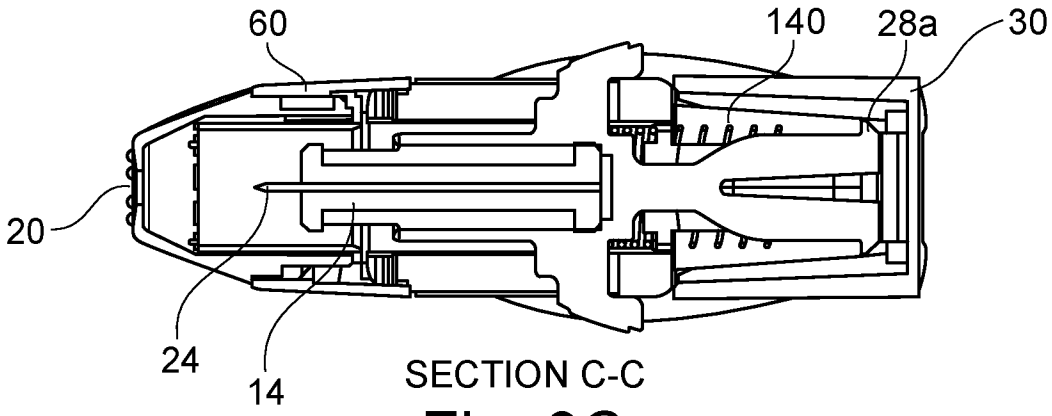


Fig. 9C

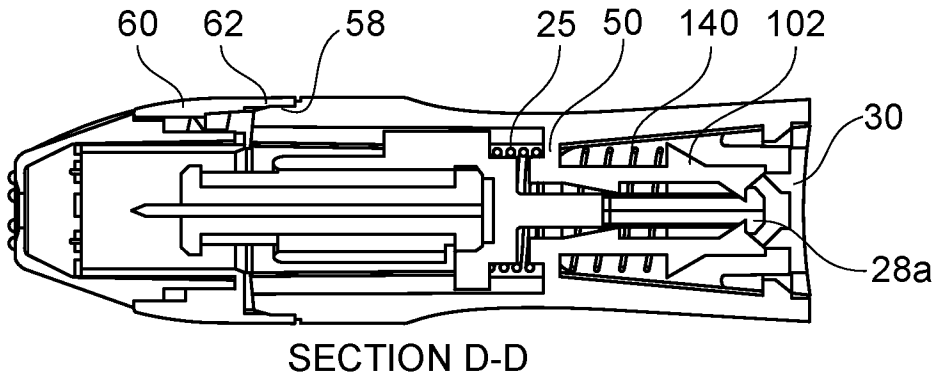


Fig. 9D

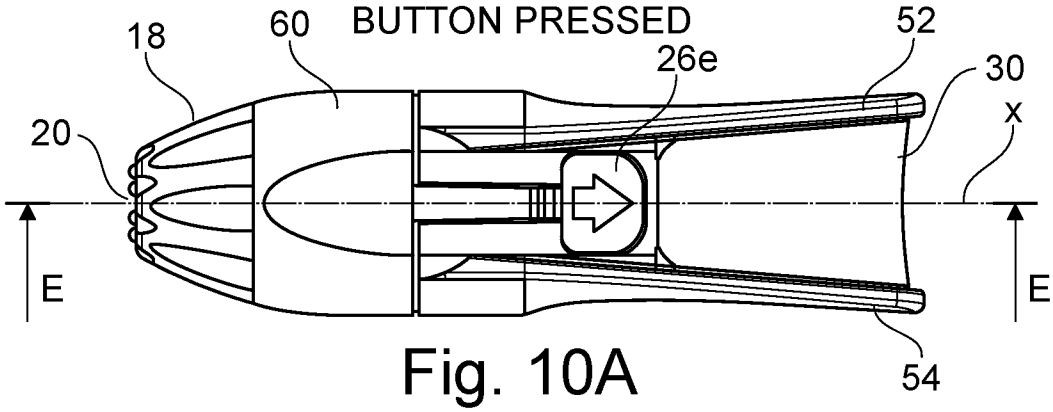


Fig. 10A

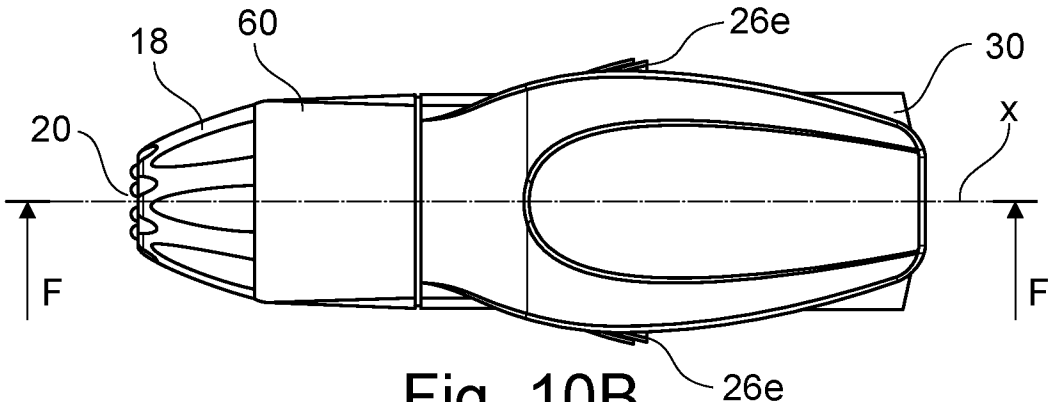


Fig. 10B

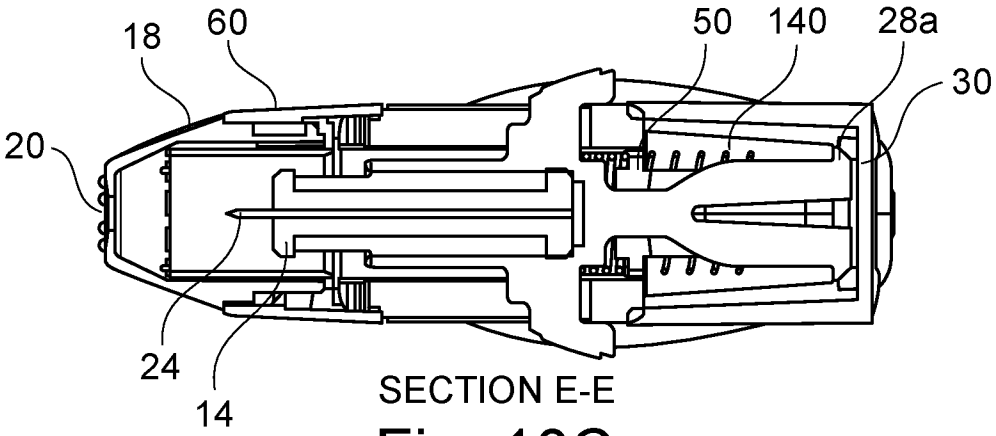


Fig. 10C

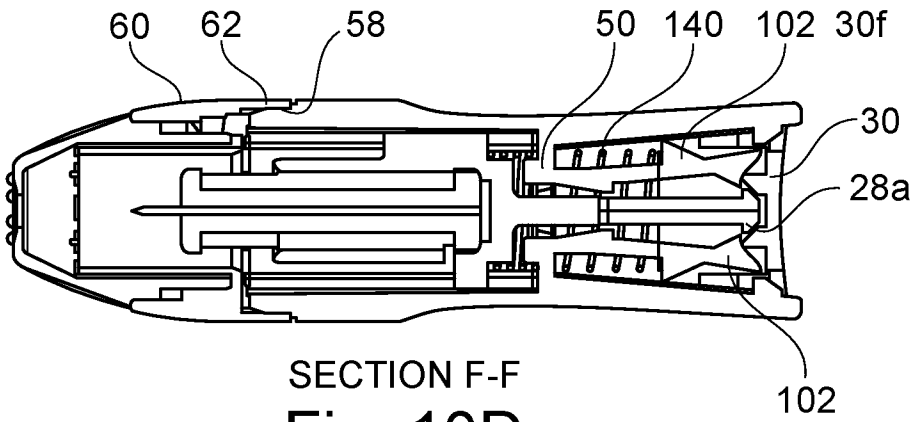


Fig. 10D

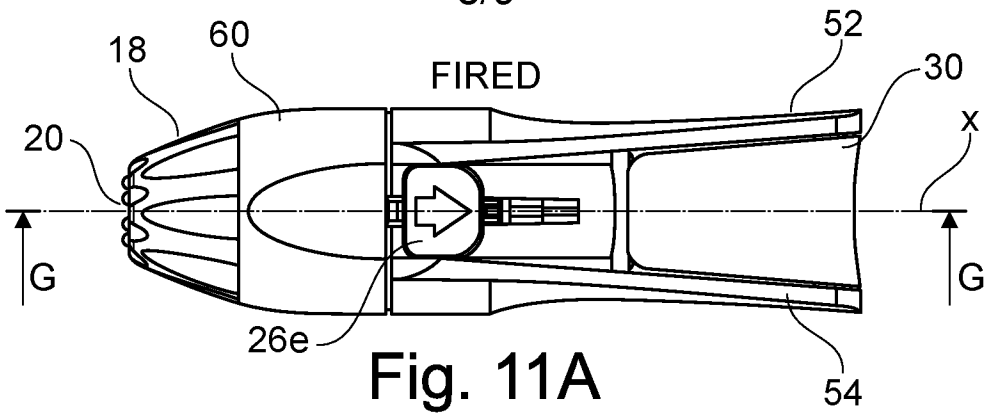


Fig. 11A

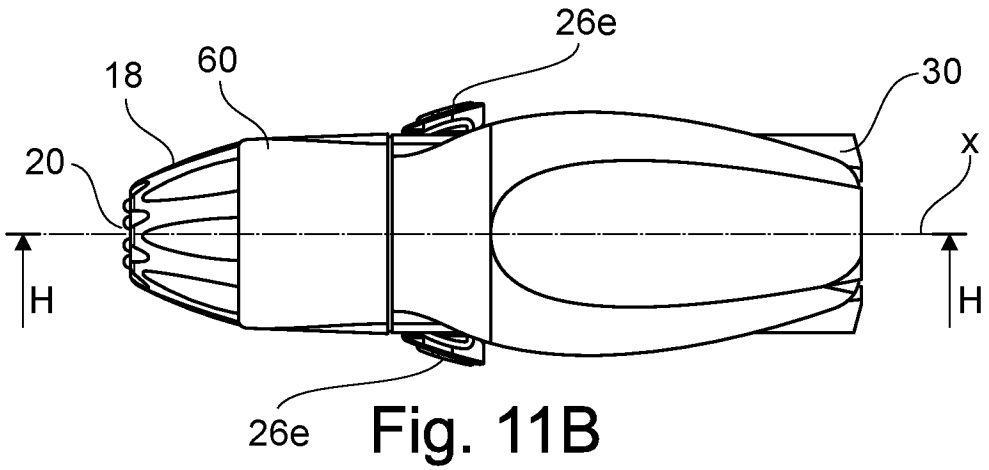
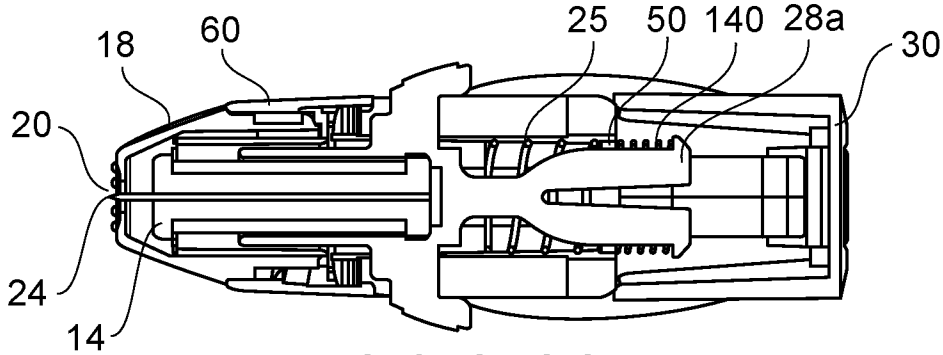
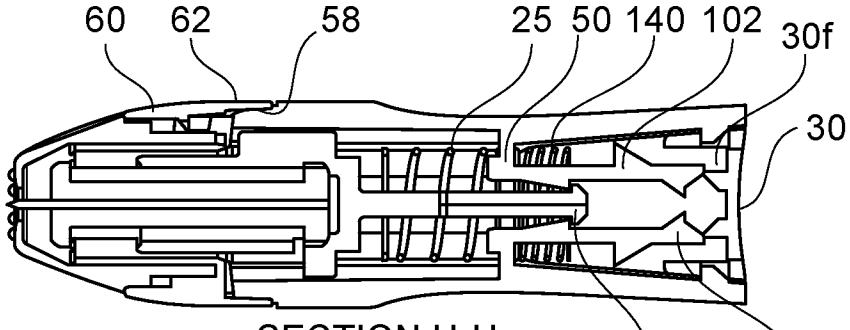


Fig. 11B



SECTION G-G

Fig. 11C



SECTION H-H

Fig. 11D

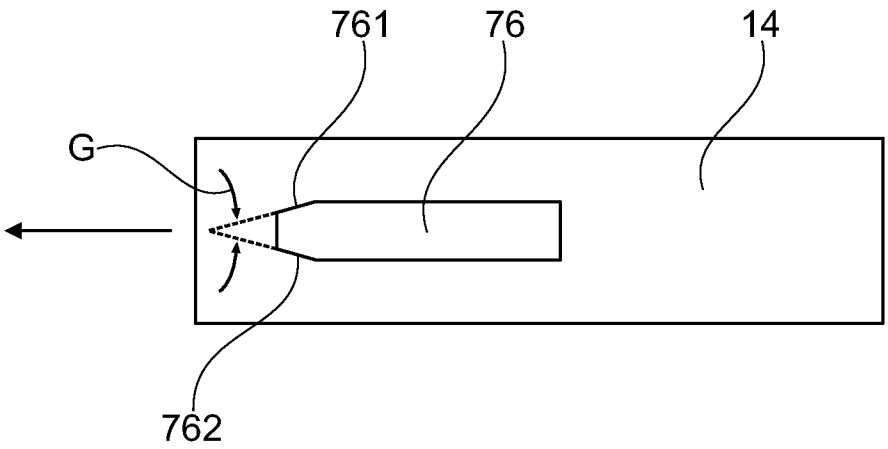


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2016/052703

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B5/15 A61B5/151
ADD.

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)
A61B

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98/48696 A1 (OWEN MUMFORD LTD [GB]; CROSSMAN DAVID DANVERS [GB]; MARSHALL JEREMY [G) 5 November 1998 (1998-11-05) page 4, line 16 - page 7, line 5 figures	1,2,4-20
A	EP 0 212 906 A2 (DOMBROWSKI MITCHELL P) 4 March 1987 (1987-03-04) page 5, line 2 - page 11, line 34 figures 1,2	1-20
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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 December 2016	12/12/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Schultz, Ottmar

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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2016/052703

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2011/098735 A1 (LAMPS GREG [US] ET AL) 28 April 2011 (2011-04-28) paragraphs [0024] - [0033] figures	1-20
A	US 2009/105613 A1 (NISHIUCHI DAISUKE [JP]) 23 April 2009 (2009-04-23) paragraph [0049] figures	1-20

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Information on patent family members

International application No
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2016/052703

Patent document cited in search report	Publication date	Patent family member(s)	Publication date

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