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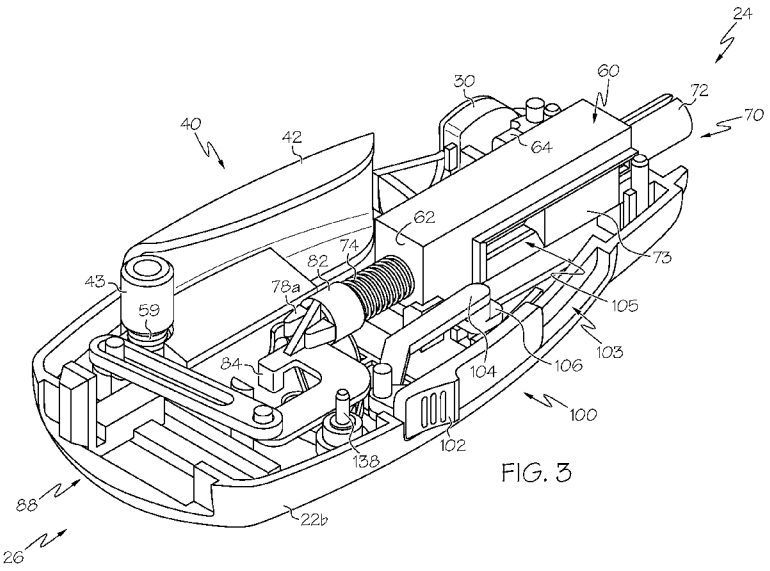

FIG. 3

(57) Abstract: A lancing device (10) having a housing (20) with a proximal end (26), a distal end (24) and a longitudinal axis. The lancing device also has a lancet carrier (70) translationally supported with respect to the housing. The lancet carrier has a proximal end and a distal end. The lancing device additionally has a charging mechanism (40) and/or an ejection mechanism (100; 200) adapted to pivot into the lancing device for engaging portions of the lancet carrier to perform the same.

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LANCING DEVICE WITH SIDE ACTIVATED CHARGE AND EJECT MECHANISMS

Cross-Reference to Related Application

[0001] This application claims the priority benefit of U.S. Provisional Patent Application Serial No. 61/623,276 filed April 12, 2012, the entirety of which is hereby incorporated herein by reference for all purposes.

Technical Field

[0002] The present invention relates generally to the field of medical devices, and more particularly to a lancing device for blood sampling and testing, and incorporated mechanisms for charging and/or ejecting the lancet by pivoting or transversely articulating a portion of the mechanism into the lancing device.

Background

[0003] Lancing devices are utilized for penetrating the skin of a human or animal subject at a lancing site to obtain a sample of blood or other body fluid for medical testing, as in blood-typing or blood-glucose testing. Known lancing devices commonly include a housing containing a drive mechanism, a charging mechanism for energizing the spring or other drive means of the drive mechanism, and a release mechanism for releasing the drive mechanism upon actuation.

[0004] A lancet is typically propelled by the drive mechanism from a retracted position within the housing to an extended position wherein a sharp tip portion of the lancet projects from the housing to prick the subject's skin at a desired lancing site. Optionally, an ejection mechanism may be incorporated into the lancing device for removal of the lancet after use. Many known lancing devices commonly use charging and/or lancet ejection mechanisms that function by pulling and/or pushing the mechanism generally away from

the body of the lancing device, resulting in the user having to perform the charging and/or lancet ejection procedure by actuating or pulling a portion of the respective mechanism away from the body of the lancing device. Actuating the charging and/or ejection mechanism by pulling a portion of the mechanism away from the body of the lancing device can present challenges to users with reduced manual dexterity, and may require the subject or user to use two hands to hold the device body and pull the handle until the device is charged or the lancet is ejected.

[0005] Continuing improvement to charging and/or ejecting of lancing devices is sought. It is to the provision of improved lancing devices and methods of operation and use thereof that the present invention is primarily directed.

Summary

[0006] In example embodiments, the present invention provides a lancing device having an improved charging and/or ejection mechanism. Additional example embodiments of the present invention provide improved methods of use of lancing devices.

[0007] In one aspect, the present invention relates to a lancing device with a housing with a longitudinal axis extending between a proximal end and a distal end. The lancing device includes a lancet carrier translationally mounted for axial movement within the housing. The lancing device also includes a drive mechanism secured to the lancet carrier to drive the lancet carrier through a lancing stroke. The lancing device further includes a charging mechanism with an actuator pivotally mounted to the housing. The charging mechanism is engaged with respect to the drive mechanism to charge the drive mechanism during pivotal movement.

[0008] In another aspect, the invention relates to a charging mechanism for a lancing device with a housing and a drive mechanism for driving a lancet carrier through a lancing stroke. The charging mechanism includes a pivotally mounted actuator with an input portion extending into the housing and an elongate portion rotatably mounted with

respect to the input portion. The elongate portion is removably engaged with respect to the drive mechanism to apply a releasable charging force to the drive mechanism.

[0009] In still another aspect, the invention relates to a lancing device for carrying a lancet through a lancing stroke. The lancing device includes a housing with a longitudinal axis extending between a proximal end and a distal end and a lancet carrier translationally mounted for axial movement within the housing. The lancing device also includes an ejection mechanism with an actuator mounted to the housing, an elongate portion extending within the housing, and a linkage driven by the elongate portion toward the housing distal end. The linkage is engaged with respect to the lancet carried in the lancet carrier.

[0010] In yet another aspect, the invention relates to an ejection mechanism for a lancing device with a housing and a drive mechanism for driving a lancet carrier through a lancing stroke. The ejection mechanism includes an actuator mounted with respect to the housing and includes an elongate portion with a free en extending into the housing and an ejector finger engaged with respect to the lancing device.

[0011] In still another aspect, the invention relates to a method of charging a lancing device. The method includes pivotally mounting a charging mechanism within a portion of the lancing device. The method also includes pivotally mounting a linkage within a portion of the lancet carrier. The method also includes movably mounting a portion of the linkage to the charging mechanism. The method further includes pressing the charging mechanism into the lancing device to drive the arm and engage a lancet carrier. The method also includes retracting the lancet carrier to charged the lancing device.

[0012] In yet another aspect, the invention relates to a method of ejecting a lancet from a lancing device. The method includes pivotally mounting an ejection mechanism within a portion of the lancing device and pivotally mounting a linkage to a portion of the ejection mechanism. The method includes movably mounting a linkage within a lancet

carrier and pressing the ejection mechanism into the lancing device. The method includes traversing the linkage within the lancet carrier to engage a lancet and removing the lancet from the lancing device.

[0013] These and other aspects, features and advantages of the invention will be understood with reference to the drawing figures and detailed description herein, and will be realized by means of the various elements and combinations particularly pointed out in the appended claims. It is to be understood that both the foregoing general description and the following brief description of the drawings and detailed description of the invention are exemplary and explanatory of preferred embodiments of the invention, and are not restrictive of the invention, as claimed.

Brief Description of the Drawings

[0014] **FIGURE 1** is a front perspective view of a lancing device according to an example embodiment of the present invention.

[0015] **FIGURE 2** is a rear perspective view of the lancing device of FIGURE 1.

[0016] **FIGURE 3** shows the lancing device of FIGURE 1 with portions of its external housing removed to show internal components thereof.

[0017] **FIGURE 4** is a top perspective view of the charging mechanism of the lancing device of FIGURE 1.

[0018] **FIGURE 5** is a bottom perspective view of the charging mechanism of the lancing device of FIGURE 1.

[0019] **FIGURE 6** is a partial assembly view of the lancing device of FIGURE 1 with portions removed to show internal components thereof.

[0020] **FIGURES 7A-7D** are top views of the lancing device of FIGURE 1 with portions of its external housing removed, showing the sequential operation moving between a neutral state, a charging state, a charged state, and a fully extended state.

[0021] **FIGURE 8** is a perspective view of a lancing device with portions of its external housing removed to show internal components thereof, according to another example embodiment of the present invention.

[0022] **FIGURE 9** is a top perspective view of the ejection mechanism of the lancing device of FIGURE 8.

[0023] **FIGURE 10** is a bottom perspective view of the ejection mechanism of the lancing device of FIGURE 8.

[0024] **FIGURE 11** is a partial assembly view of the lancing device of FIGURE 8 with portions removed to show internal components thereof.

[0025] **FIGURES 12A-B** are top views of the lancing device of FIGURE 8, showing the sequential operation of the lancet ejection mechanism moving from a neutral state to an ejection state.

[0026] **FIGURES 13A-B** are cross-sectional views of the lancing device of FIGURES 12A-B, showing the sequential operation of the lancet ejection mechanism moving from a neutral state to an ejection state.

Detailed Description of Example Embodiments

[0027] The present invention may be understood more readily by reference to the following detailed description of the invention taken in connection with the accompanying drawing figures, which form a part of this disclosure. It is to be understood that this invention is not limited to the specific devices, methods, conditions or parameters described and/or shown herein, and that the terminology used herein is for the purpose of

describing particular embodiments by way of example only and is not intended to be limiting of the claimed invention. Any and all patents and other publications identified in this specification are incorporated by reference as though fully set forth herein.

[0028] Also, as used in the specification including the appended claims, the singular forms "a," "an," and "the" include the plural, and reference to a particular numerical value includes at least that particular value, unless the context clearly dictates otherwise. Ranges may be expressed herein as from "about" or "approximately" one particular value and/or to "about" or "approximately" another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent "about," it will be understood that the particular value forms another embodiment.

[0029] With reference now to the drawing figures, wherein like reference numbers represent corresponding parts throughout the several views, **Figures 1-13** show various aspects and features of a lancing device 10 according to example forms of the invention. As best shown in **Figures 1-2**, the lancing device 10 includes a housing 20 generally comprising separable upper 22a and lower 22b housing shells, and a forward or distal end 24 defining a lancet opening through which at least a sharp tip portion of a lancet projects at the extended position of the lancing stroke to penetrate the skin of a subject during the lancing process. The housing 20 protects a lancet carrier 70 that is movably housed within the shells 22a, 22b. As depicted, the housing 20 has a generally elongate ergonomic shape, wider at the back and tapering to a narrower front; however, alternate housing shapes can be utilized. The housing 20 preferably has a lengthwise dimension, in an axial direction between the forward end 24 and rear or proximal end 26, that is greater than its side-to-side width in a transverse dimension, which in turn is greater than its thickness from top-to-bottom. The housing 20 can be constructed of a substantially rigid durable material, for example plastic or composites, in example embodiments.

[0030] A release button 30 projects through a side opening formed in the shells 22a, 22b to release a trigger mechanism when depressed, as shown in **Figure 7C**. The release button 30 actuates the device to propel the lancet carrier 70 along a lancing stroke from a charged or retracted position within the housing 20, as best shown in **Figures 7B**, to an extended or lancing position, as best shown in **Figure 7D**. In the extended position, at least the sharp tip portion of the lancet projects outwardly of the lancet opening at the distal end 24 of the housing 20.

[0031] **Figures 1-7** show a charging mechanism 40 that has a charging actuator or user-actuated arm 42 positioned within a portion of one side contour of the housing shells 22a, 22b. When actuated, the charging mechanism 40 retracts the lancet carrier 70 and energizes a biasing spring 74 to provide motive force to propel the lancet carrier along the lancing stroke when the device is actuated by depressing the release button30. In example embodiments, the charging actuator 42 pivotally mounts to the housing 20 at one end, and aligns with and fills a void or cut-out portion on one side of the housing shells 22a, 22b to generally form a generally continuous and smoothly radiused side portion of the outer contour of the lancing device 10. When the charging actuator 42 is pressed or squeezed transversely inwardly toward the central longitudinal axis of the housing 20, the charging actuator pivots or translates into the housing, operating through a linkage providing mechanical advantage to retract the lancet carrier 70 and charge the drive mechanism of the lancing device. As depicted, the charging actuator 42 can be a separate body from the housing 20 or alternatively an integral flexing or otherwise articulated part of the housing (not shown). The transversely-operated charging mechanism 40, with the charging actuator 42, is operated by squeezing inwardly into the housing 20 to allow a user to charge the lancing device's drive mechanism with one hand in an intuitive and ergonomic manner, and provide a degree of mechanical advantage for ease of operation.

[0032] Optionally, the lancing device 10 can include a depth-adjust mechanism 88, an endcap or nose-cone portion 90, and/or an ejection mechanism 100. As depicted, a

proximal end 26 of the lancing device 10 includes a portion of the depth-adjust mechanism 88 including an elongated opening or slot through which a distal positioning tab or slider extends, movable within the limits of the opening, to increase or decrease the depth or extension of the lancet tip projecting external of the housing. As best shown in **Figures 12A-13B**, removal of the endcap 90 allows access for removal and replacement of the lancet after use, for example by actuation of the ejector handle 102. The ejector handle 102 movably mounts within an elongated opening 103 along a side of the housing 20 generally opposite the charging actuator 42 and extends within the housing to selectively engage and eject the lancet.

[0033] **Figure 3** shows the lancing device with its upper housing shell 22a removed. An inner drive core 60 is engaged in a fixed position within the housing 20 by one or more interengaging pin and receiver connections or other interengaging surface features, as is shown in greater detail in **Figure 6**. In example embodiments, a portion of an inner drive mechanism is translationally mounted to slide within an axial bore or channel 66 through the inner drive core 60. As depicted, the drive mechanism includes the lancet carrier 70 that has a collar or sleeve 72 at a distal end thereof for releasably engaging a lancet. The biasing spring or combination drive-and-return spring 74 is engaged between a proximal wall 62 of the drive core 60 and a coupling or spring retainer 80. The spring 74 propels the lancet carrier 70 along the forward portion of the lancing stroke, and subsequently returning the lancet carrier to a retracted position within after the lancing has been completed. Optionally, separate drive and return springs can be used as desired. For example, an additional biasing spring can be included between arms 73 on the carrier 70 and the interior portion of the proximal wall 62 to function as a drive spring in order to propel the lancet carrier along the forward portion of the lancing stroke. The biasing spring 74, can function as a return spring to return the lancet carrier 70 to a retracted position within the housing 20.

[0034] A cantilevered release finger 76 projects from the axial shaft of the lancet carrier 70 for releasable engagement with a catch surface 64 of the drive core 60, as best

shown in **Figure 7C**, to retain the lancet carrier in its retracted position when the device is charged. The release finger 76 is contacted, and depressed/deflected, by the release button 30 being pressed to release the lancet carrier 70 to travel along its lancing stroke and thereby initiate the lancing procedure. As depicted, the proximal end of the lancet carrier 70 includes a split yoke having a pair of resilient forks or barbs 78a, 78b to permit installation and retention of the biasing spring 74. As depicted, an axially oriented bore or collar 82 of the spring retainer 80 is secured at the proximal end of the lancet carrier 70 with the resilient forks 78a, 78b, for example with interengaging surface features.

[0035] The depth-adjust mechanism 88 generally includes a pivotal link having one end pivotally mounted to a portion of the spring retainer 80 and having another end pivotally mounted to the distal positioning tab. One or more releasable index detents are optionally provided between the positioning tab and the housing to secure the positioning tab in a user-selected position in the elongated opening on the housing, to permit indexed movement; or alternatively a continuously variable positional adjustment is provided. When the lancet carrier 70 is released to travel along its lancing stroke, the pivotal link abuts an engagement post within the lower housing shell 22b, functioning as a fulcrum about which the link pivots, to restrict the penetration or lancing depth of the lancing stroke. As depicted, the depth adjust mechanism 88 is positioned for minimum penetration by maximizing the length between the distal positioning tab and the engagement post. Alternatively, the positioning tab can be positioned at one or more intermediate points between the minimum and maximum penetration settings. Further description of the example depth-adjustment mechanism 88 is presented in the Applicant's U.S. Provisional Patent Application Number 61/622,570 filed April 11, 2012, which is hereby incorporated by reference for all purposes.

[0036] The ejection mechanism 100 generally includes an actuator or user-actuated portion 102 that is movably mounted within an elongated slot 103 on the side of the lancing device. As depicted, a portion of a handle 102 extends internally within the housing 20 and

pivotally mounts to a link 104. As shown, the link 104 can have an angled elbow shape with a distal end and a proximal end, which pivotally mounts to the handle 102. The distal end of the link 104 extends within the housing 20 and pivotally mounts to a finger 106 that is slidably or translationally mounted within a portion of the lancet carrier 70. Generally, the lancet carrier 70 includes an elongated slot or channel 66 for accommodating the finger 106 during the lancing procedure. When a used lancet is to be ejected, the endcap 90 is removed and the actuator handle 102 is pushed or pressed in an distal or forward direction, which forces the finger 106 in a distal or advancing direction within the channel 66 to selectively engage and eject the used lancet outwardly from the sleeve 72.

[0037] The pivoting cam linkage or charging mechanism 40 generally includes the charging actuator 42 and an arm 50, each pivotally mounted to portions of the lower housing shell 22b, as best shown in **Figures 6-7**. Pivoting the actuator 42 within the housing 20 proximally drives the arm 50 to engage a tab or surface feature 84 on the spring retainer 80. When engaged, the arm 50 drives the tab 84 toward the housing proximal end 26, which correspondingly retracts the lancet carrier 70 to the charged state. Preferably, the charging mechanism 40 provides a degree of mechanical advantage to operation of the arm 50 that contacts the tab or surface feature 84 when retracting the lancet carrier 70 to the charged state.

[0038] **Figures 4-5** show details of the charging mechanism 40. In the depicted embodiment, the charging handle or actuator 42 generally has an arcuate or radial U-shaped or C-shaped cross-sectional profile to fill the void of the housing 20 and align with the contour of the housing. The charging actuator 42 includes a pivot sleeve or collar 43 to pivotally mount to an axle or pin portion 134 of the housing for actuation or pivoting thereon. Preferably, the charging handle 42 is sized and shaped to accommodate actuation by one hand or by one or more fingers of the user. A flange or internal portion 44 of the charging handle 42 includes one or more features for guiding and/or driving portions of the charging mechanism 40. For example, a slot 46 for guidance, alignment and support slidably receives a guide post 136 extending upwardly from the lower housing shell

22b. The flange 44 also has a slot 48 for receiving a guiding portion 58 of the pivotal arm 50 therein to be driven upon actuation of the charging handle 42.

[0039] The arm 50 generally includes an elongated member having a pivot end 52 and a free end 54 generally opposite thereto. The pivot end 52 includes a pivot sleeve 56 to pivotally mount to a pin or post 138 extending from the lower housing shell 22b. The free end 54, or a portion proximal thereto, is provided for selectively engaging the surface feature tab 84 of the spring retainer 80. The guiding portion 58, for example a pin or probe, generally extends between the midpoint of the arm 50 and the pivot end 52, and is provided for movably mounting within the slot 48.

[0040] **Figure 6** shows a partial assembly view of the lancing device 10, including the charging mechanism 40 and the lower housing shell 22b. As depicted, interengaging surface features 130, 132 near the distal end 24 are provided to engage the proximal and distal ends of the inner drive core 60 in a fixed position within the lower housing shell 22b. A proximal portion of the lower shell 22b includes the pivot post 134 for engaging the pivot sleeve 43 of the charging handle 42, the post 138 for engaging the pivot sleeve 56 of the arm 50, and the guiding pin or feature 136 movably inserting within the slot 46 in order to guide and support the flange 44. Optionally, a biasing spring 59 can be provided between the pivot sleeve 43 and the pivot post 134 for biasing the charging handle 42 towards a closed or unactuated position wherein the handle 42 aligns with the contour of the housing 20.

[0041] **Figures 7A-D** show the sequence of operation of the lancing device 10 throughout the charging and actuation portions of the lancing procedure. As depicted, the charging actuator 42 pivots (clockwise in the depicted view) from an unactuated neutral position (**Figure 7A**) wherein the pivotally mounted elongate arm 50 is generally angularly offset from the elongated axis of the lancet carrier 70, to an actuated position (**Figure 7B**), driving the arm 50 to pivot (counter-clockwise in the depicted view) and position transverse to the elongated axis of the lancet carrier 70. As the arm 50 is driven to pivot (counter-

clockwise in the depicted view) by the pivotal actuation (clockwise) of the charging actuator 42, the arm 50 engages the surface feature tab 84 of the spring retainer 80, further retracting the lancet carrier 70 to energize the biasing spring 74 and engage the release finger 76 with the catch surface 64 of the drive core 60 (**Figure 7C**). After engaging the release finger 76 with the catch surface 64, the natural bias of the biasing spring 59 returns the charging handle 42 to an unactuated position and the arm 50 returns to being angularly offset relative to the elongated axis of the lancet carrier 70.

[0042] Upon actuating or depressing the release button 30 to disengage the release finger 76 from the catch surface 64, the charged biasing spring 74 propels the lancet carrier 70 along an advancing portion of the lancing stroke from the charged position within the housing 20 to an advanced position wherein at least the sharp lancet tip 94 projects externally of the housing 20 to penetrate the subject's skin at a lancing site (**Figure 7D**). The biasing spring 74 subsequently returns the lancet carrier and the lancet to the neutral position (**Figure 7A**). As described above, when the used lancet 92 is to be ejected, the endcap 90 is removed from the housing 20 and the ejector handle 102 is actuated forward, forcing finger 106 movably mounted within the lancet carrier 70 to engage and eject the lancet (shown in **Figures 12A-13B**).

[0043] In further example embodiments, as depicted in **Figures 8-13**, an alternative ejection mechanism 200 is pivotally mounted to the housing similarly to the charging mechanism described above. This ejection mechanism 200 ejects the lancet by actuating or pivoting an ejection actuator 202 into the housing 20 of the lancing device 10. The ejection mechanism 200 generally includes an ejection handle 202 having an elongate arm or interior portion 204, a link 211, and a finger 214. The ejection handle or user actuated portion 202 generally has a similar profile and contour as the charging actuator 42 described above, and is similarly sized and shaped to accommodate actuation or pivoting transversely inward into the housing 20, upon operation as by a user squeezing or pressing inwardly with one hand or with one or more fingers of the user.

[0044] The elongate arm or interior portion 204, generally extending within the housing 20, includes a pivot sleeve 206 for pivotally mounting to a pivot post 234 of the lower housing shell 22b, and a pivot post 210 for pivotally mounting to the link 211 (shown in **Figures 8-10**). As depicted in **Figures 9-10**, the link 211 includes an L-shaped arm portion 212 having a pivot end pivotally mounted to the pivot post 210 of the interior portion 204, and a leg portion 213, generally transverse and axially offset from the arm 212 and pivotally mounted to a pivot post 215 of the finger 214.

[0045] As shown in **Figure 11**, the inner drive core 60 includes an elongate guide or channel 66 including walls 67, 68 for supporting and guiding the finger 214. The walls 67, 68 of the channel 66 align with the elongated slots of the inner drive core and the lancet carrier 70 such that the pivotally mounted leg portion 213 and finger 214 can freely traverse therein upon actuation of the ejection handle 202, subsequently advancing and retracting the finger within slots in the drive core and the lancet carrier to abut and remove or eject the lancet 92 from the sleeve 72 of the lancet carrier 70 (as shown in **Figures 12A-B**). **Figures 13A-B** show cross-sectional views of the lancing device 10 of **Figures 12A-B** to show additional features of components thereof, as described above.

[0046] The systems and methods of the example forms of the invention enable the user to charge the drive mechanism and/or eject the lancet by redirecting the pivotal motion of pushing or pressing the user actuated portions or actuators 42, 202 transversely inward toward the central longitudinal axis of the housing, through a cam or linkage mechanism, to result in an axial charging or ejection motion. The charging mechanism and/or ejection mechanism may include other mechanical linkages having pivotal links, slots, pins, cams, gears, pulleys, cords, cables, and/or any other mechanically advantaged linkages that can redirect motion or change the ratio between the length of the charging handle stroke and the length necessary to retract and charge the lancet carrier.

[0047] While the invention has been described with reference to preferred and example embodiments, it will be understood by those skilled in the art that a variety of

modifications, additions and deletions are within the scope of the invention, as defined by the following claims.

What is Claimed is:

1. A lancing device comprising:

a housing comprising a longitudinal axis extending between a proximal end and a distal end;

a lancet carrier translationally mounted for axial movement within the housing;

a drive mechanism secured to the lancet carrier to drive the lancet carrier through a lancing stroke; and

a charging mechanism comprising an actuator pivotally mounted to the housing, the charging mechanism engaged with respect to the drive mechanism to charge the drive mechanism during pivotal movement.

2. The lancing device of Claim 1, wherein the charging mechanism further comprises an elongated arm comprising a free end, and a pivot end pivotally mounted to the housing.

3. The lancing device of Claim 2, wherein the elongated arm free end is engagable with respect to the drive mechanism to force the drive mechanism toward the housing proximal end.

4. The lancing device of Claim 2, wherein the charging mechanism actuator further comprises a flange extending into the housing, the elongated arm being movably secured to the flange.

5. The lancing device of Claim 4, wherein the flange comprises a slot aperture to pivotally secure the elongated arm.

6. The lancing device of Claim 5, wherein the elongated arm comprises a pin extending vertically from a location between the pivot end and the free end.

7. The lancing device of Claim 6, wherein the flange slot aperture pivotally receives the elongated arm pin.

8. A charging mechanism for a lancing device comprising a housing and a drive mechanism for driving a lancet carrier through a lancing stroke, the charging mechanism comprising:

a pivotally mounted actuator comprising an input portion extending into the housing and an elongate portion rotatably mounted with respect to the input portion, the elongate portion being removably engaged with respect to the drive mechanism to apply a releasable charging force to the drive mechanism.

9. The charging mechanism of Claim 8, wherein the actuator is pivotally mounted to the housing.

10. The charging mechanism of Claim 8, wherein the elongate portion comprises a pivot end and a free end, the pivot end being pivotally mounted to the housing.

11. The charging mechanism of Claim 8, wherein the input portion comprises a pivot slot and the elongate portion comprises a pin rotatably inserted through the input portion pivot slot.

12. The charging mechanism of Claim 11, wherein the elongate portion is configured to engage the drive mechanism when the actuator is pivotally actuated.

13. The charging mechanism of Claim 8, further comprising a bias spring engaged to the actuator, the bias spring applying resistive force against the actuator pivotal movement.

14. A lancing device for carrying a lancet through a lancing stroke, the lancing device comprising;

a housing comprising a longitudinal axis extending between a proximal end and a distal end;

a lancet carrier translationally mounted for axial movement within the housing; and

an ejection mechanism comprising:

an actuator mounted to the housing,

an elongate portion extending within the housing, and

a linkage driven by the elongate portion toward the housing distal end, the linkage being engaged with respect to the lancet carried in the lancet carrier.

15. The lancing device of Claim 14, wherein the ejection mechanism actuator is translationally mounted to the housing.

16. The lancing device of Claim 15, wherein the linkage comprises a finger that is translationally inserted into the lancet carrier to engage the lancet carried in the lancet carrier.

17. The lancing device of Claim 15, wherein the elongate portion comprises an angled arm with a distal end that is engaged with respect to the lancet carried in the lancet carrier.

18. The lancing device of Claim 14, wherein the ejection mechanism actuator is pivotally mounted to the housing.

19. The lancing device of Claim 18, wherein the linkage is pivotally mounted to the elongate portion.

20. The lancing device of Claim 19, wherein the elongate portion is fixedly mounted to the actuator and comprises a free end extending into the housing.

20. The lancing device of Claim 19, wherein the elongate portion is fixedly mounted to the actuator and comprises a free end extending into the housing.

21. The lancing device of Claim 20, wherein the linkage is pivotally mounted to the elongate portion free end.

22. The lancing device of Claim 18, wherein the linkage comprises a finger that is translationally inserted into the lancet carrier to engage the lancet carried in the lancet carrier.

23. An ejection mechanism for a lancing device comprising a housing and a drive mechanism for driving a lancet carrier through a lancing stroke, the ejection mechanism comprising:

an actuator mounted with respect to the housing and comprising an elongate portion with a free en extending into the housing and an ejector finger engaged with respect to the lancing device.

24. The ejection mechanism of Claim 23, wherein the actuator is pivotally mounted to the housing.

25. The ejection mechanism of Claim 23, wherein the ejector finger is pivotally mounted with respect to the elongate portion free end.

26. The ejection mechanism of Claim 23, further comprising a link pivotally connected to the elongate portion free end and fixedly connected to the ejector finger.

27. The ejection mechanism of Claim 23, wherein the actuator is translationally mounted to the housing.

28. The ejection mechanism of Claim 23, wherein the ejector finger is fixedly mounted with respect to the elongate portion free end.

29. The ejection mechanism of Claim 23, further comprising a ling fixedly connected to the elongate portion free end and fixedly connected to the ejector finger.

30. A method of charging a lancing device, the method comprising:

pivotally mounting a charging mechanism within a portion of the lancing device,

pivotally mounting a linkage within a portion of the lancet carrier,

movably mounting a portion of the linkage to the charging mechanism,

pressing the charging mechanism into the lancing device to drive the arm and engage a lancet carrier, and

retracting the lancet carrier to charged the lancing device.

31. A method of ejecting a lancet from a lancing device, the method comprising:

pivotally mounting an ejection mechanism within a portion of the lancing device,

pivotally mounting a linkage to a portion of the ejection mechanism,

movably mounting a linkage within a lancet carrier,

pressing the ejection mechanism into the lancing device,

traversing the linkage within the lancet carrier to engage a lancet, and

removing the lancet from the lancing device.

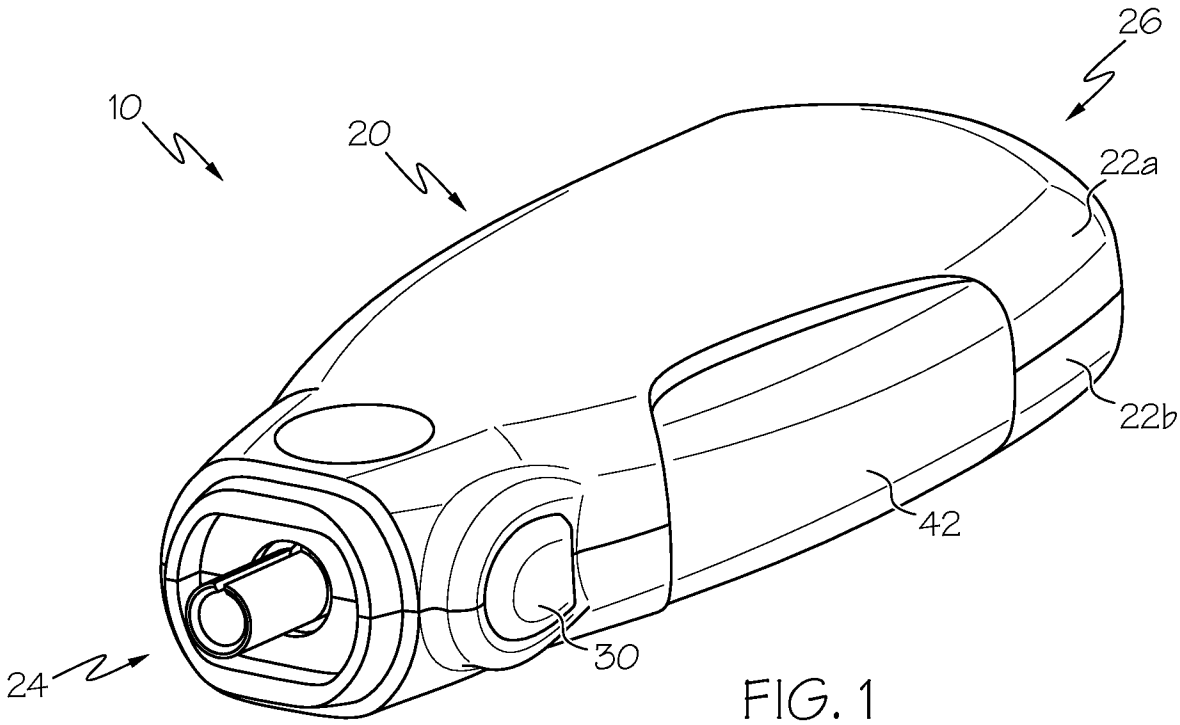

FIG. 1

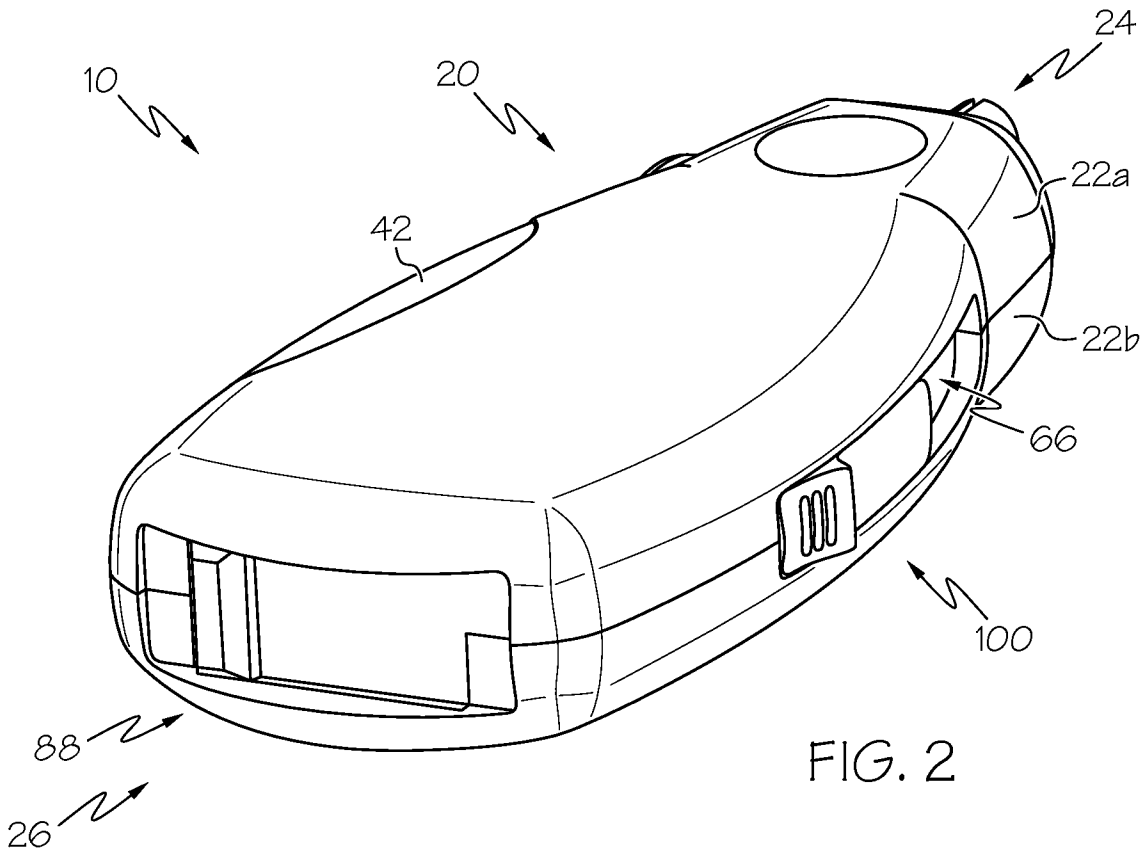

FIG. 2

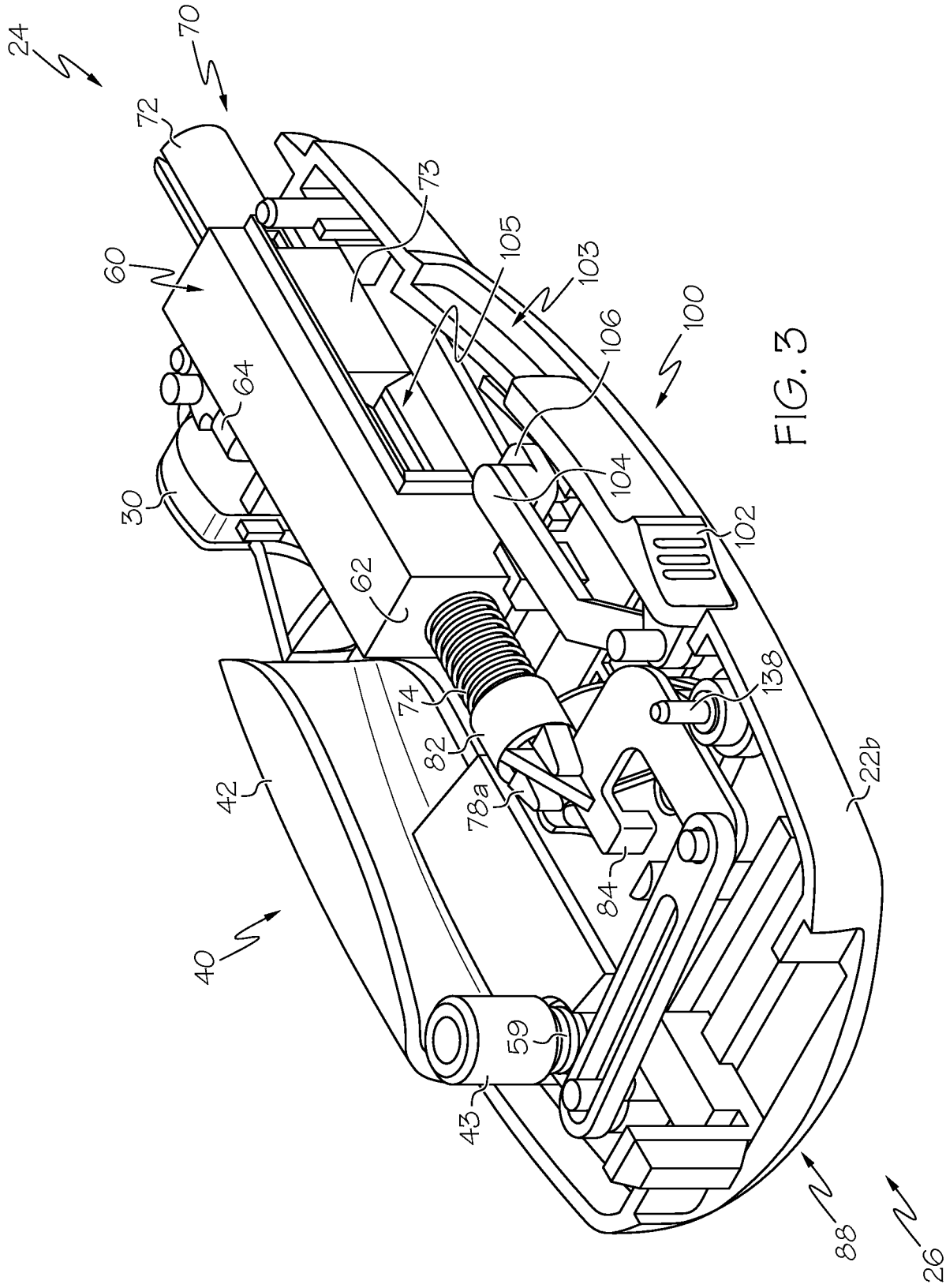
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FIG. 3

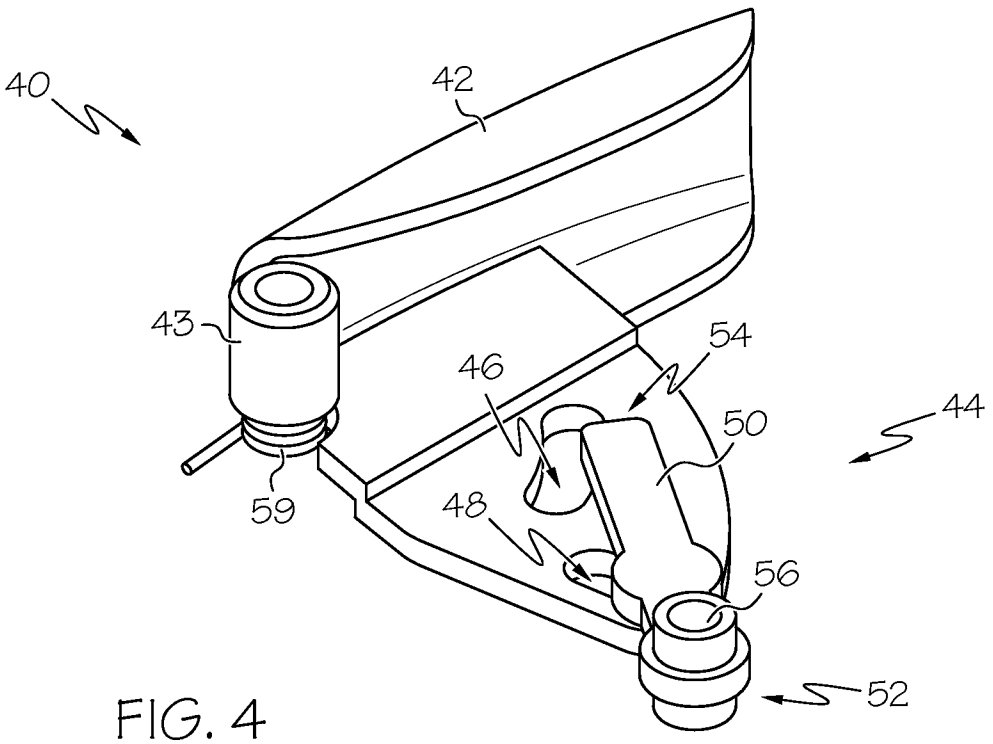

FIG. 4

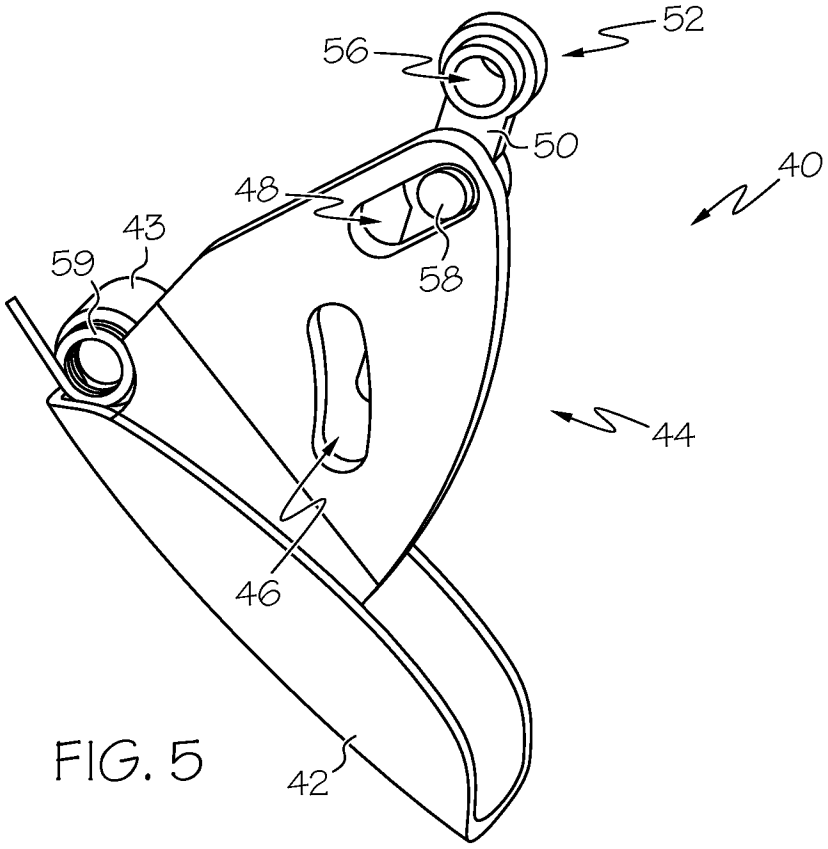

FIG. 5

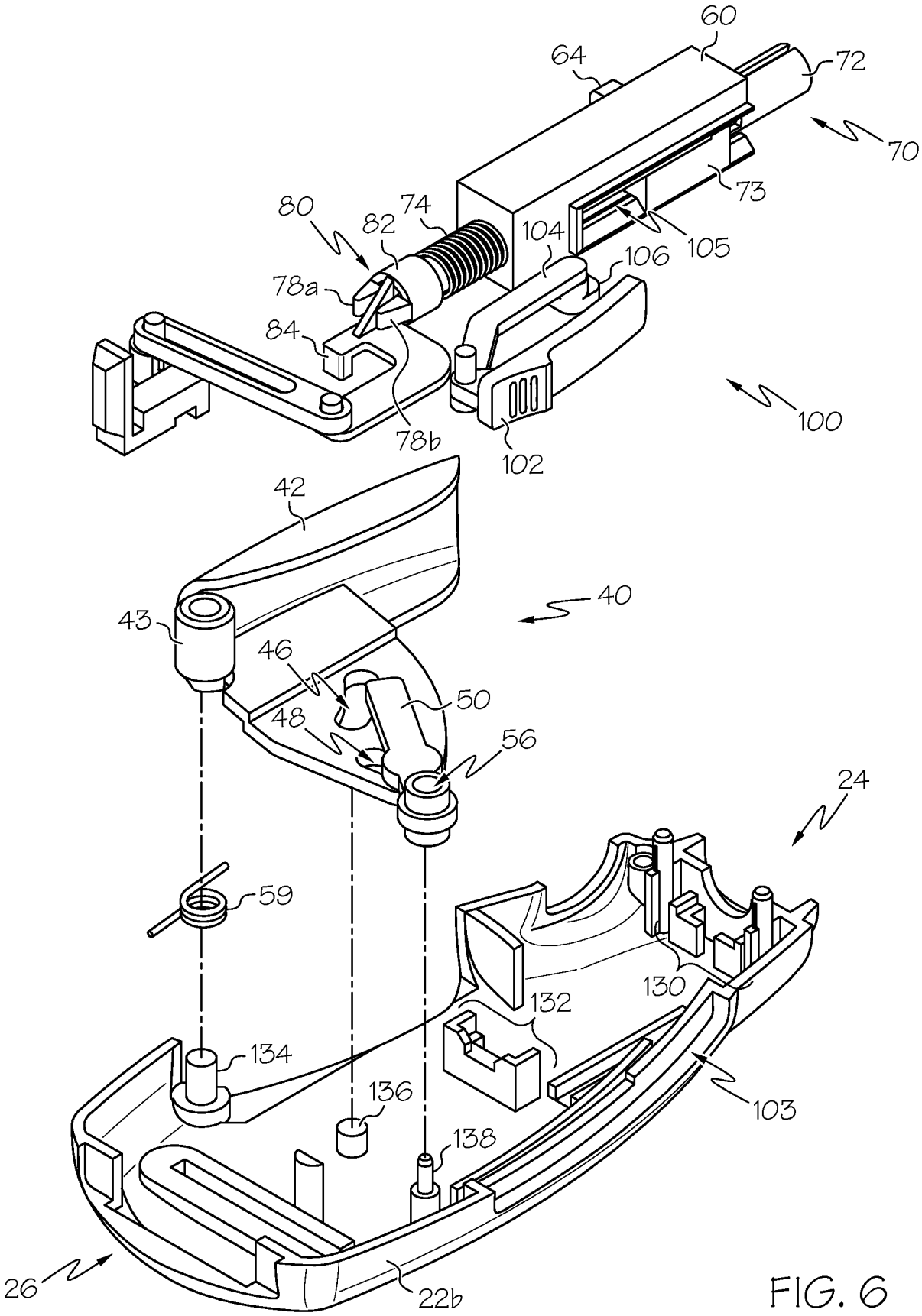
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FIG. 6

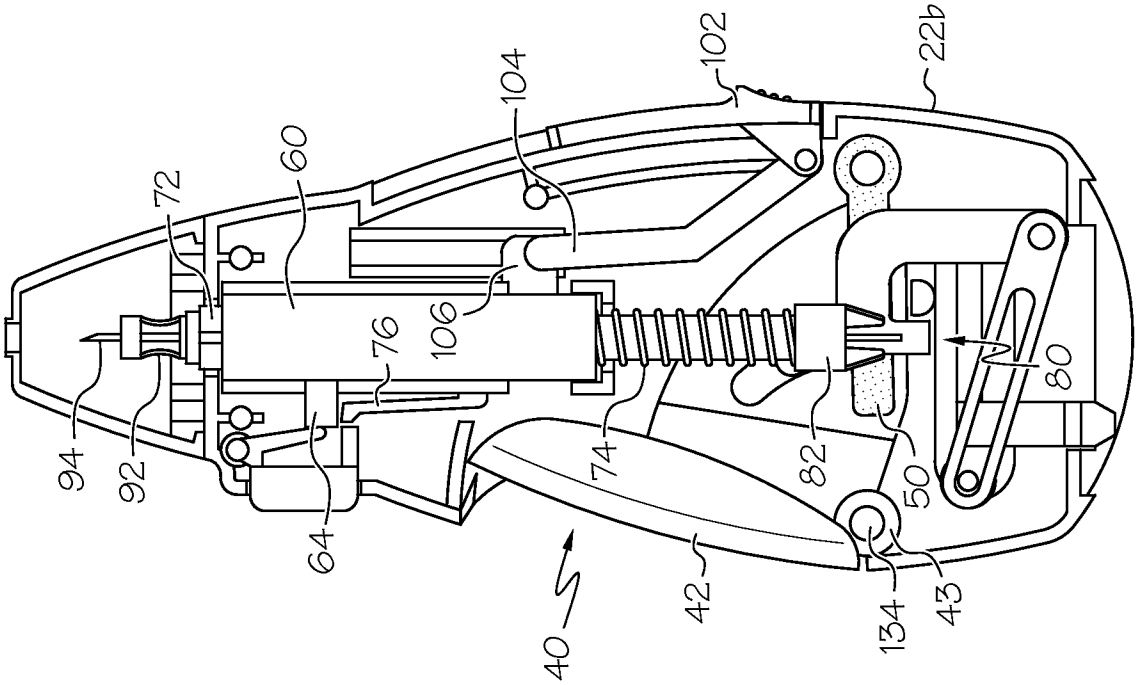
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FIG. 7B

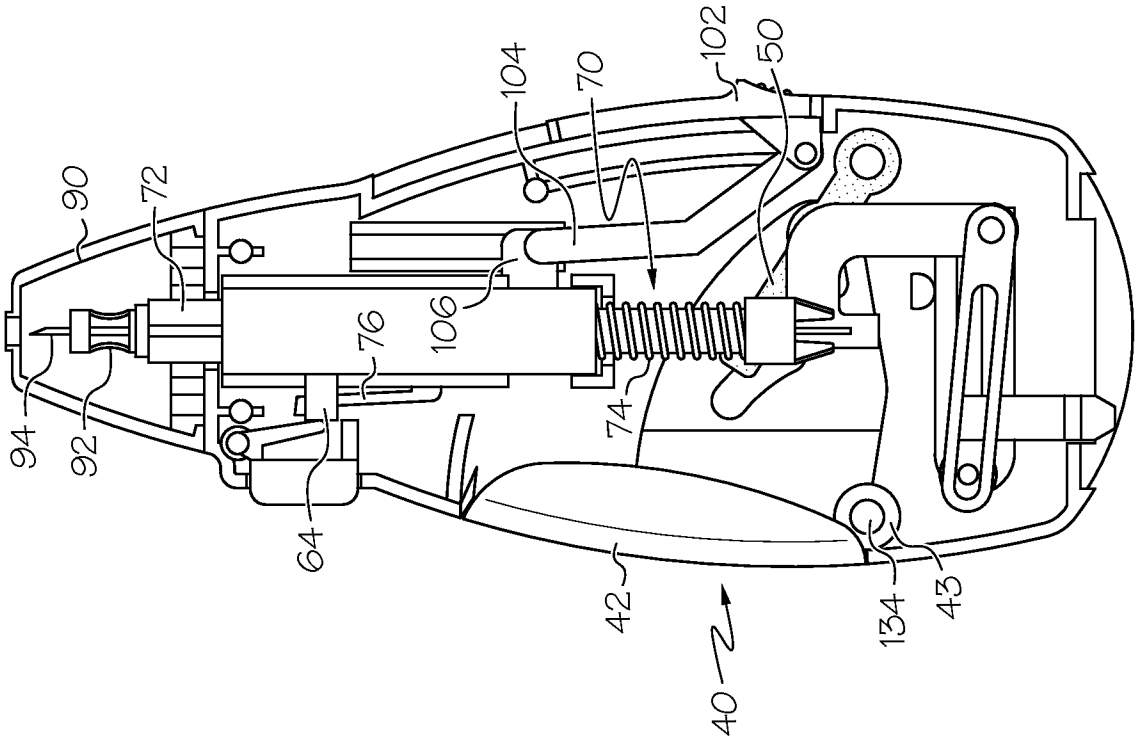
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FIG. 7A

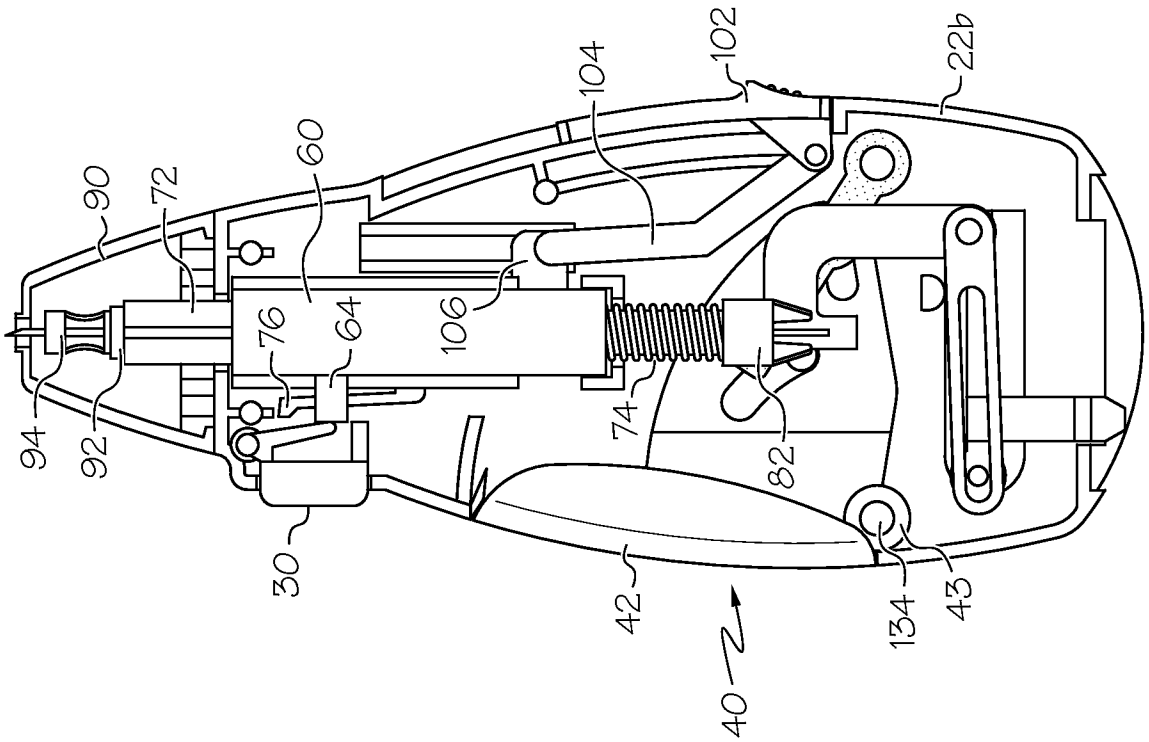
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FIG. 7D

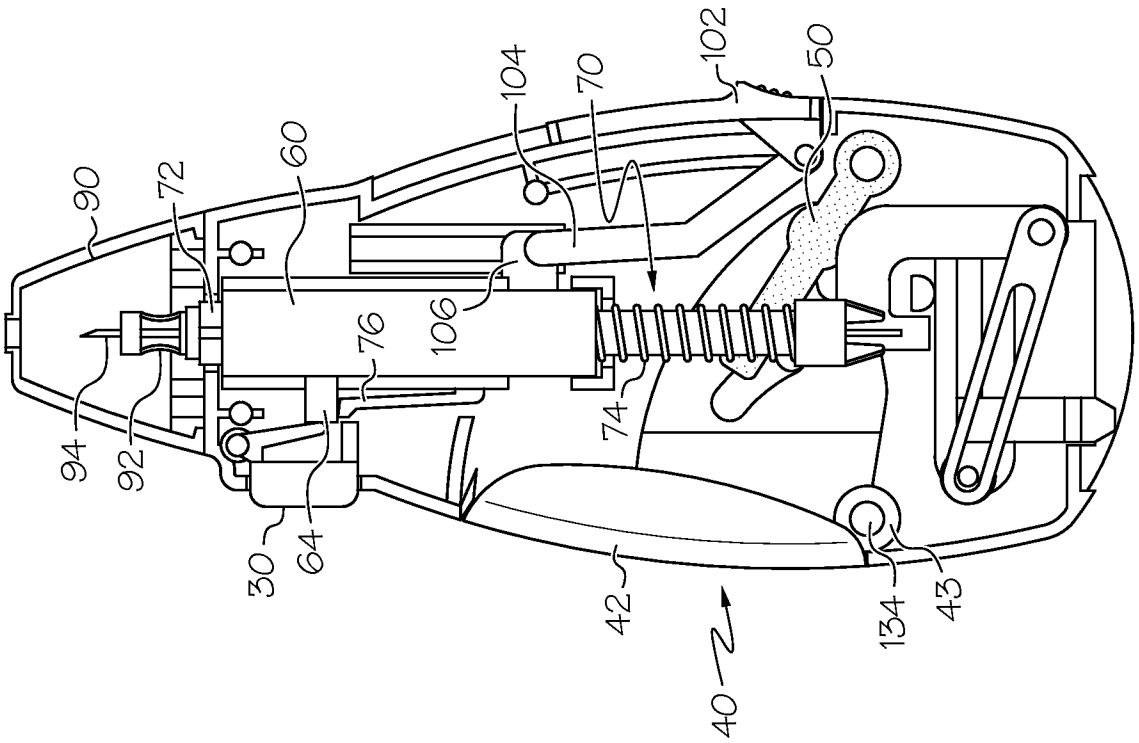
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FIG. 7C

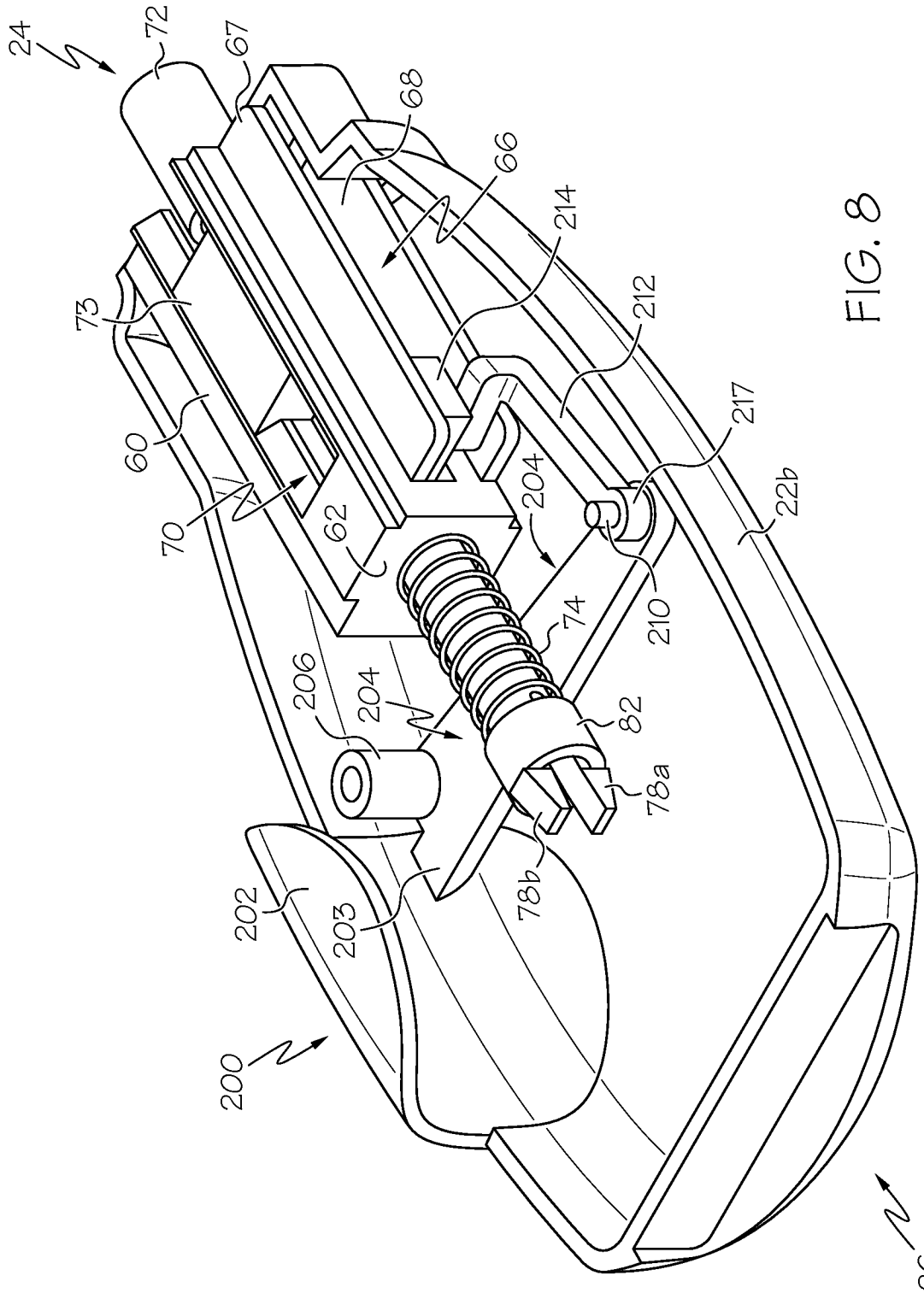
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FIG. 8

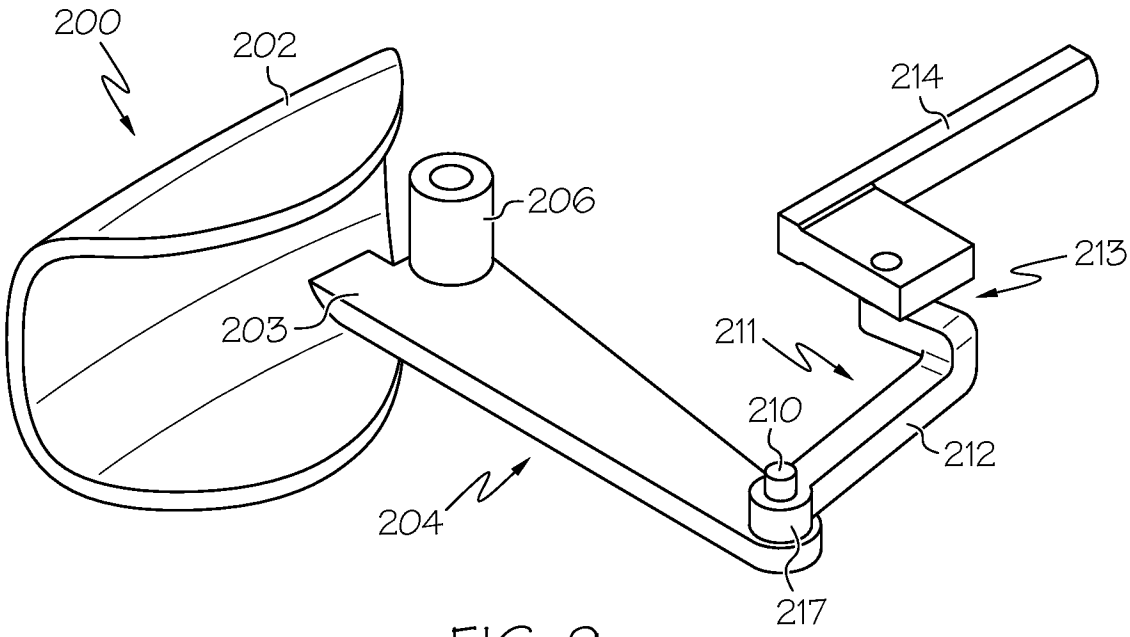
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FIG. 9

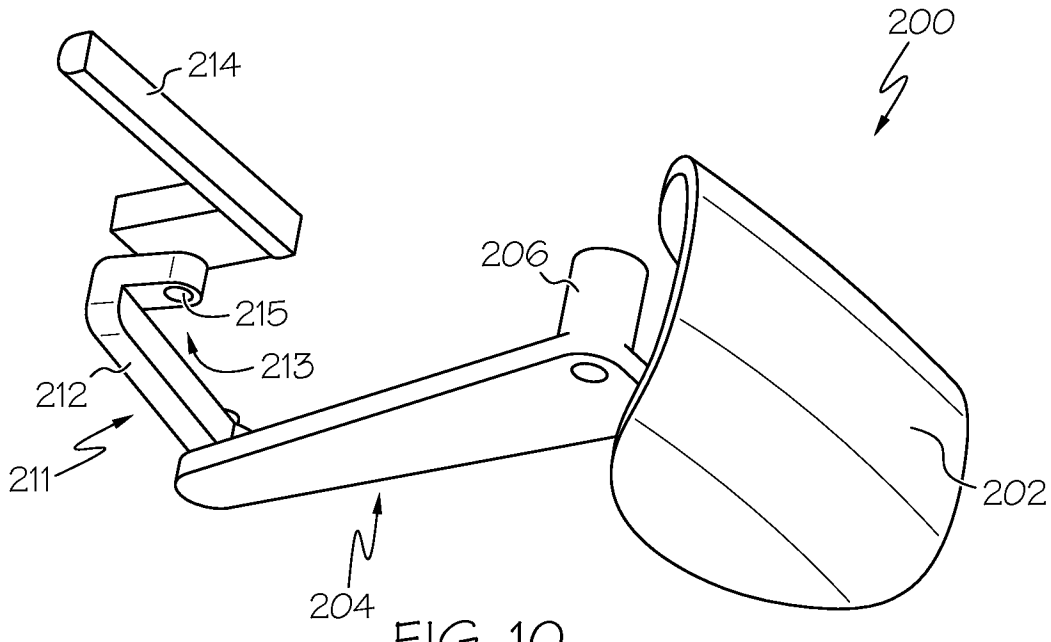
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FIG. 10

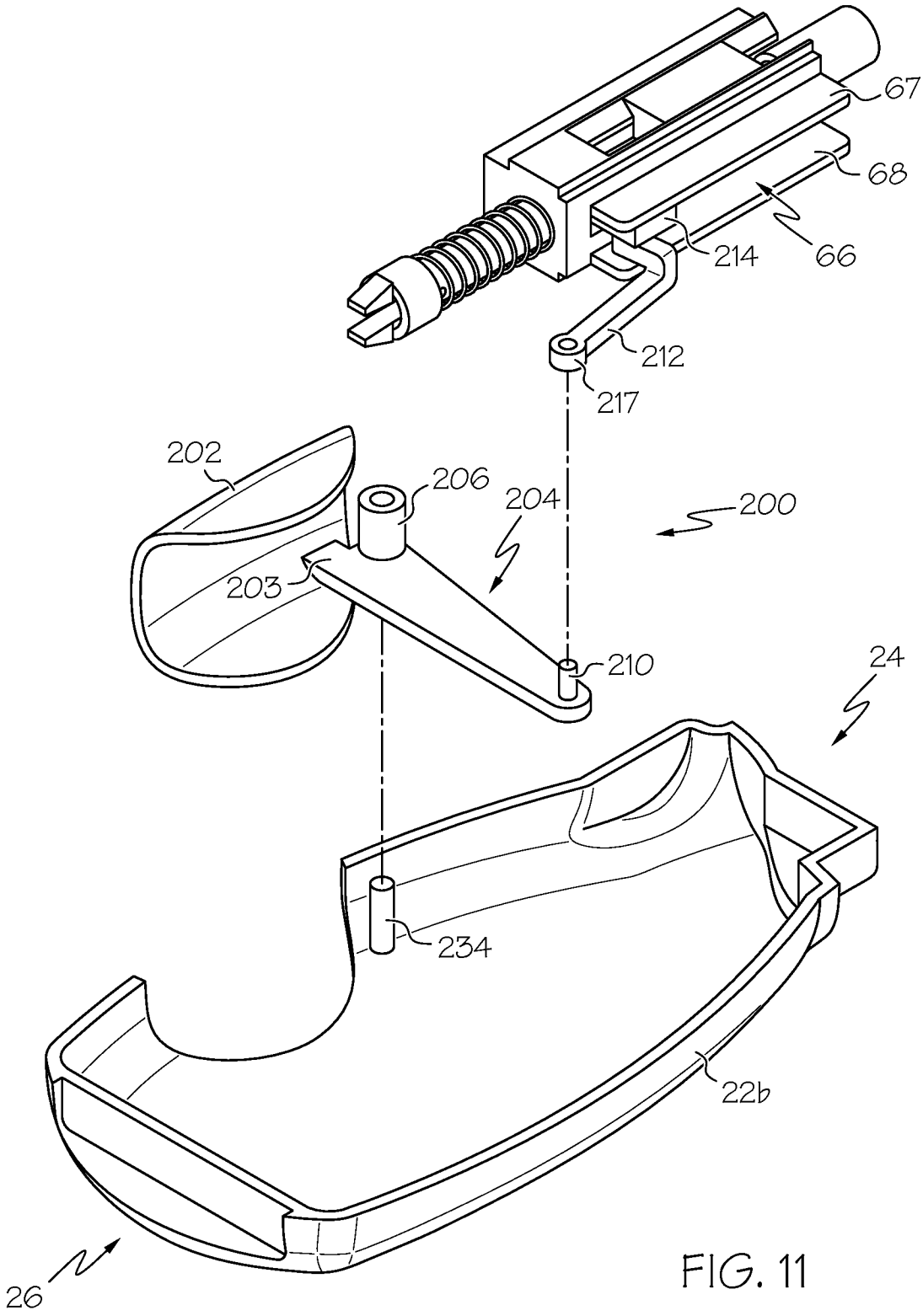

FIG. 11

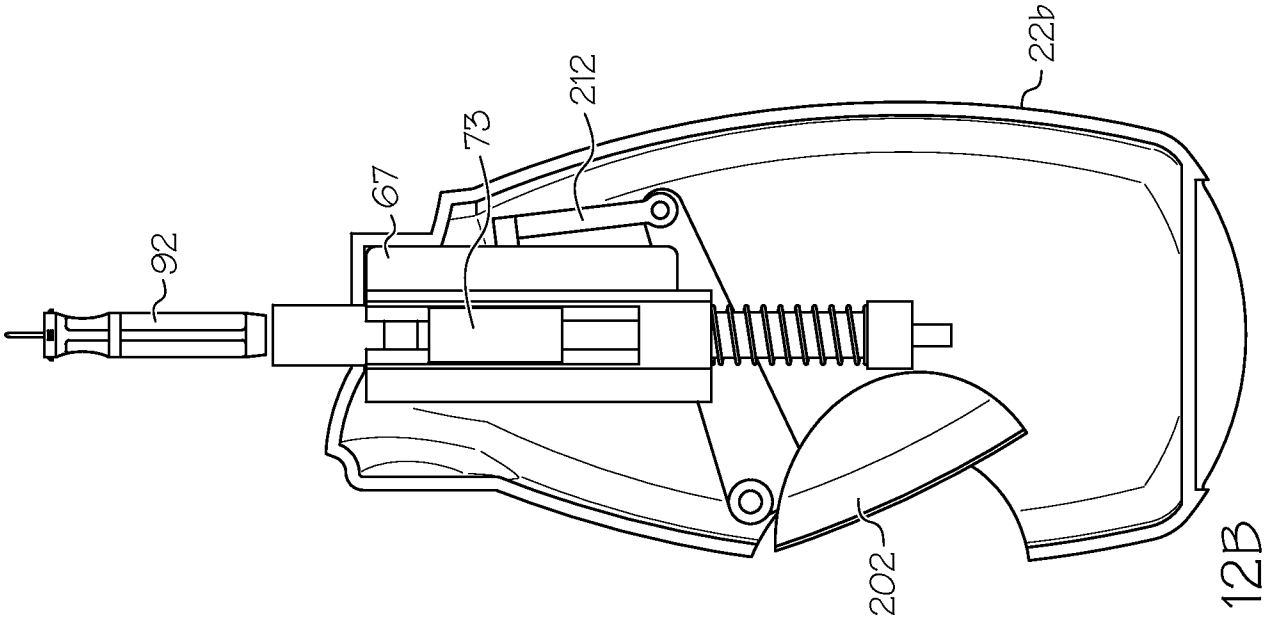

FIG. 12B

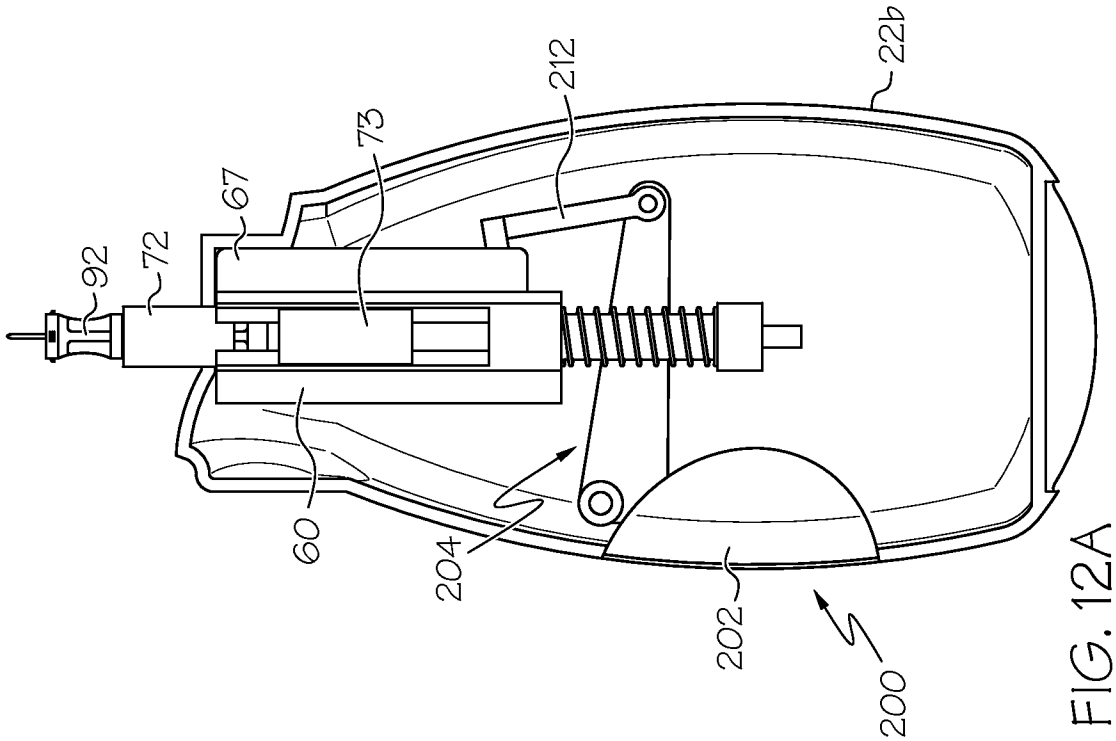

FIG. 12A

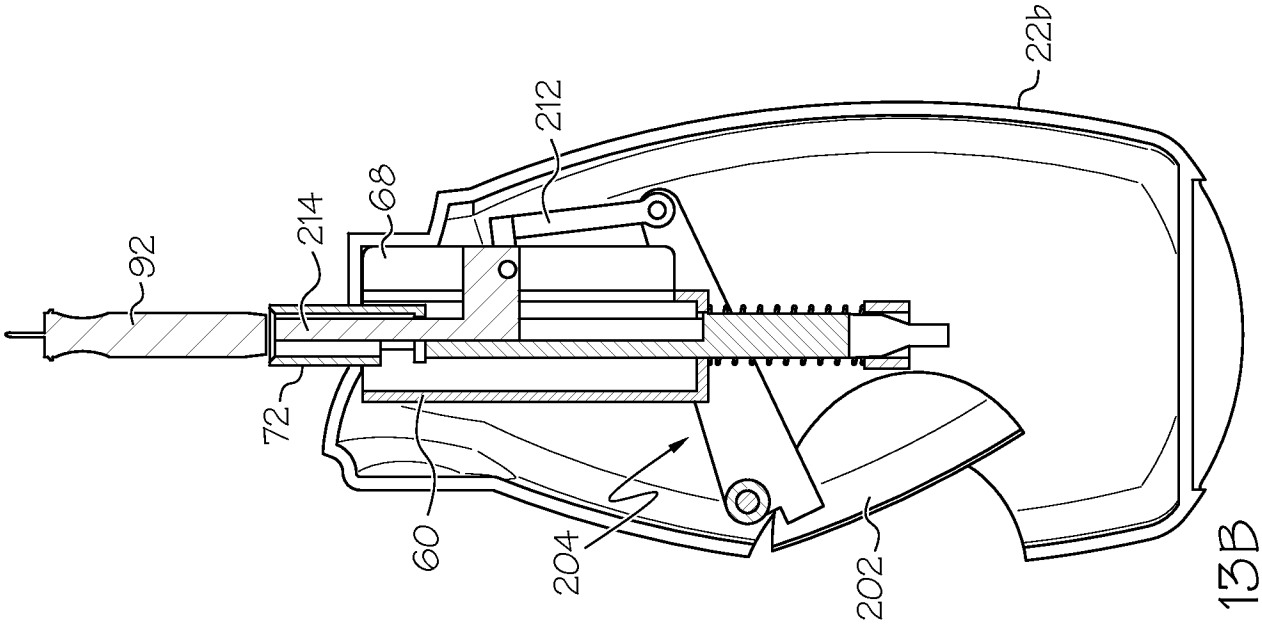

FIG. 13B

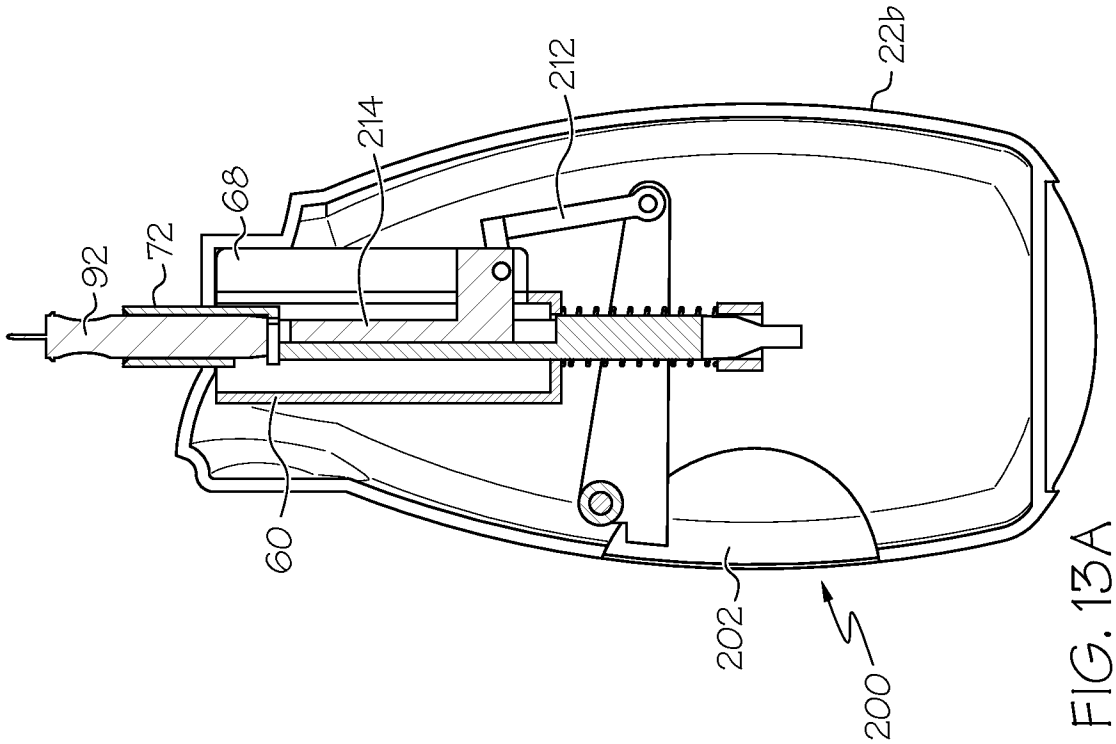

FIG. 13A

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/035974

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 2010/019741 A1 (ABBOTT DIABETES CARE INC [US]; CURRY SAMUEL MASON [US]; LATHROP RAY AD) 18 February 2010 (2010-02-18) figures 8,9	1-13,30
X	EP 1 090 584 A2 (ROCHE DIAGNOSTICS GMBH [DE]) 11 April 2001 (2001-04-11)	1-3, 8-13,30
A	figures	4-7
X	WO 2007/108967 A2 (BAYER HEALTHCARE LLC [US]; ZHONG WEIPING [US]) 27 September 2007 (2007-09-27)	1
A	figures 1,2,3a,7a,8a,9a	2-13,30

☐ 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

"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
10 July 2013	06/09/2013

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/035974

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-13, 30

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13, 30

Charging mechanism for energizing a drive spring.

---

2. claims: 14-29, 31

Ejection mechanism for removal of a lancet after use.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2013/035974

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010019741 A1	18-02-2010	US 2010042131 A1	18-02-2010
		US 2011319919 A1	29-12-2011
		WO 2010019741 A1	18-02-2010
EP 1090584 A2	11-04-2001	AT 525957 T	15-10-2011
		DE 19948759 A1	12-04-2001
		EP 1090584 A2	11-04-2001
		US 6409740 B1	25-06-2002
WO 2007108967 A2	27-09-2007	EP 2015677 A2	21-01-2009
		JP 2009529959 A	27-08-2009
		US 2009054920 A1	26-02-2009
		WO 2007108967 A2	27-09-2007