

METHOD INVOLVING A NEEDLE-BASED DEVICE WITH A SAFETY MECHANISM
IMPLEMENTED THEREIN

5 CLAIM OF PRIORITY

[0001] This Application claims priority to co-pending U.S. Patent Application No.17/494,904 titled "NEEDLE-BASED DEVICE WITH A SAFETY MECHANISM IMPLEMENTED THEREIN" filed on October 6, 2021, which is a U.S. Continuation Application of U.S. Patent Application No.16/831,824 titled "NEEDLE-BASED DEVICE
10 WITH A SAFETY MECHANISM IMPLEMENTED THEREIN" filed on March 27, 2020 and issued on November 16, 2021 as U.S. Patent No. 11,173,254, and U.S. Patent Application No. 17/234,793 also titled "NEEDLE-BASED DEVICE WITH A SAFETY MECHANISM IMPLEMENTED THEREIN" filed on April 19, 2021 and issued as U.S. Patent No. 11,224,699 on January 18, 2022. U.S. Patent Application No. 17/234,793 is a Continuation-in-Part
15 Application of and claims priority to U.S. Patent Application No. 16/831,824. U.S. Patent Application 16/831,824 was also filed as a PCT Application PCT/IB2020/057811 on August 19, 2020. The contents of each of the aforementioned applications are incorporated in entirety thereof in this Application by reference.

FIELD OF TECHNOLOGY

20 [0002] This disclosure relates generally to needle-based devices and, more particularly, to a needle-based device with a safety mechanism implemented therein.

BACKGROUND

[0003] A needle-based device may be a syringe, a hypodermic needle, a pen injector and/or a fluid collection device. Following a use of a needle thereof to inject a fluid (e.g., a medication)
25 into a body of a patient or to extract another fluid therefrom, the needle may be covered with a cap for storage purposes. The needle may also be covered with the cap prior to the use thereof. Covering the needle with the cap and/or removing the cap of the needle may result in injuries to a user of the needle-based device. Some implementations of the needle-based device may employ a spring in a barrel of the needle-based device configured to enable retraction of the
30 needle after use. However, a space in the barrel occupied by the spring may result in the needle-based device capable of taking in a lesser quantity of a fluid compared to a spring-less implementation.

SUMMARY

[0004] Disclosed are methods, a device and/or a system of a needle-based device with a safety
35 mechanism implemented therein.

[0005] In one aspect, a method includes protecting an entire length of a needle of a needle-based device protruding from a needle mount coupled to a body of the needle-based device in a first state of disuse of the needle-based device based on providing a needle cap completely encompassing the needle in the first state of disuse of the needle-based device, and encompassing, by a needle shield, the entire length of the needle of the needle-based device and at least a partial length of the needle cap in the first state of disuse of the needle-based device. A length of the needle cap protrudes outside the needle shield from an end of the needle shield farthest away from the needle mount in the first state of disuse of the needle-based device.

[0006] The method also includes encompassing the entire protruding length of the needle cap within a safety cap and securing the safety cap onto an outer surface of the needle shield proximate the end farthest away from the needle mount such that the needle and the needle cap are completely protected and covered during the first state of disuse of the needle-based device, removing the safety cap along with the needle cap from the end of the needle shield farthest away from the needle mount in the first state of disuse of the needle-based device such that the encompassing of the entire length of the needle by the needle shield is maintained, and, following the removing of the safety cap along with the needle cap in the first state of disuse of the needle-based device, retracting the needle shield in a first direction toward the body of the needle-based device to cause the needle to emerge out of the needle shield to prepare the needle-based device for a second state of use thereof.

[0007] In another aspect, a method includes utilizing a barrel of a syringe, a hypodermic needle, a pen injector and/or a fluid collection device as a body of a needle-based device, protecting an entire length of a needle of the needle-based device protruding from a needle mount coupled to the body of the needle-based device in a first state of disuse of the needle-based device based on providing a needle cap completely encompassing the needle in the first state of disuse of the needle-based device, and encompassing, by a needle shield, the entire length of the needle of the needle-based device and at least a partial length of the needle cap in the first state of disuse of the needle-based device. A length of the needle cap protrudes outside the needle shield from an end of the needle shield farthest away from the needle mount in the first state of disuse of the needle-based device.

[0008] The method also includes encompassing the entire protruding length of the needle cap within a safety cap and securing the safety cap onto an outer surface of the needle shield proximate the end farthest away from the needle mount such that the needle and the needle cap are completely protected and covered during the first state of disuse of the needle-based device, removing the safety cap along with the needle cap from the end of the needle shield farthest away from the needle mount in the first state of disuse of the needle-based device such that the

encompassing of the entire length of the needle by the needle shield is maintained, and, following the removing of the safety cap along with the needle cap in the first state of disuse of the needle-based device, retracting the needle shield in a first direction toward the body of the needle-based device to cause the needle to emerge out of the needle shield to prepare the needle-based device for a second state of use thereof.

[0009] In yet another aspect, a method includes protecting an entire length of a needle of a needle-based device protruding from a needle mount coupled to a body of the needle-based device in a first state of disuse of the needle-based device based on providing a needle cap completely encompassing the needle in the first state of disuse of the needle-based device, and encompassing, by a needle shield, the entire length of the needle of the needle-based device and at least a partial length of the needle cap in the first state of disuse of the needle-based device. A length of the needle cap protrudes outside the needle shield from an end of the needle shield farthest away from the needle mount.

[0010] The method also includes encompassing the entire protruding length of the needle cap within a safety cap and securing the safety cap onto an outer surface of the needle shield proximate the end farthest away from the needle mount such that the needle and the needle cap are completely protected and covered during the first state of disuse of the needle-based device, removing the safety cap along with the needle cap from the end of the needle shield farthest away from the needle mount in the first state of disuse of the needle-based device such that the encompassing of the entire length of the needle by the needle shield is maintained, and, following the removing of the safety cap along with the needle cap in the first state of disuse of the needle-based device, retracting the needle shield in a first direction toward the body of the needle-based device to cause the needle to emerge out of the needle shield to prepare the needle-based device for a second state of use thereof.

[0011] Further, the method includes automatically transitioning the needle-based device back to the first state of disuse thereof immediately following the second state of use in accordance with a force applied in a second direction diametrically opposite to the first direction..

[0012] Other features will be apparent from the accompanying drawings and from the detailed description that follows.

30 BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The embodiments of this invention are illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

[0014] **Figure 1** is a schematic view of a needle-based device, according to one or more embodiments.

[0015] **Figure 2** is a schematic view of multiple configurations of a needle mount of the needle-based device of **Figure 1**, according to one or more embodiments.

[0016] **Figure 3** is a schematic view of coupling of a needle shield to the needle-based device of **Figure 1** to encompass a needle thereof, according to one or more embodiments.

5 [0017] **Figure 4** is a schematic view of the needle-based device of **Figure 1** with wings on lateral sides of an outer wall of a barrel thereof, according to one or more embodiments.

[0018] **Figure 5** is a schematic view of the needle-based device of **Figure 1** with a ring on the outer wall of the barrel thereof, according to one or more embodiments.

10 [0019] **Figure 6** is a schematic view of the needle-based device of **Figure 1** in a spring-based configuration of a needle shield thereof, according to one or more embodiments.

[0020] **Figure 7** is a schematic view of an external cap configured to at least partially cover the needle shield of the needle-based device of **Figures 1** and **3**, according to one or more embodiments.

15 [0021] **Figure 8** is a process flow diagram detailing the operations involved in implementing a security mechanism in the needle-based device of **Figure 1**, according to one or more embodiments.

[0022] **Figure 9** is a schematic view of the spring-based embodiment of **Figures 6-7** with external cap, needle mount and needle shield thereof as modular elements.

20 [0023] **Figure 10** is an illustrative view of retraction of the needle shield in the spring-based embodiment of **Figure 6**.

[0024] **Figure 11** is a schematic view of a locking mechanism of a needle-based device in accordance with the embodiments of **Figures 6** and **7**, but as a variant thereof.

[0025] **Figure 12** is a schematic view of an external lock button utilized in the needle-based device of **Figure 6**.

25 [0026] **Figure 13** is an illustrative view of a safety mechanism of the needle-based device of **Figure 6**, with a longer needle mount.

[0027] **Figure 14** is a schematic view of another embodiment of the needle mount of the needle-based device of **Figures 1-7** and **9-13**.

30 [0028] **Figure 15** is a schematic view of a needle-based device analogous to the needle-based device of **Figures 1-7** and **9-13** in a state of disuse thereof in accordance with the embodiment of the needle mount of **Figure 14**.

[0029] **Figure 16** is a schematic view of another embodiment of the needle-based device of **Figure 15** in the state of disuse thereof.

35 [0030] **Figure 17** is a schematic view of a state of enablement of use of the needle-based device in accordance with the embodiments of **Figures 14-16**.

[0031] **Figure 18** is a schematic view of the needle-based device of **Figure 15** with guide elements, according to one or more embodiments.

[0032] Other features of the present embodiments will be apparent from the accompanying drawings and from the detailed description that follows.

5 DETAILED DESCRIPTION

[0033] Example embodiments, as described below, may be used to provide methods, a system and/or a device of a needle-based device with a safety mechanism implemented therein. Although the present embodiments have been described with reference to specific example embodiments, it will be evident that various modifications and changes may be made to these
10 embodiments without departing from the broader spirit and scope of the various embodiments.

[0034] **Figure 1** shows a needle-based device 100, according to one or more embodiments. In one or more embodiments, needle-based device 100 may be a syringe, a hypodermic needle, a pen injector, a fluid (e.g., blood) collection device and/or a fluid injector/extractor. It should be noted that needle-based device 100 may not only be limited in use to medical applications
15 but may also be used in biological applications and/or chemical applications. For example, needle-based device 100 may be used to extract a requisite quantity of a solvent/fluid from a vial/bottle. All reasonable applications are within the scope of the exemplary embodiments discussed herein.

[0035] In one or more embodiments, needle-based device 100 may include a plunger 102
20 configured to be moved in and out of a barrel 104 thereof. In one example implementation, barrel 104 may be cylindrical and plunger 102 may be appropriately designed (e.g., also cylindrical) to enable slidable movement thereof within barrel 104 and in and out of barrel 104. In another example implementation, barrel 104 may be shaped like a square prism or a rectangular prism and plunger 102 may be appropriately shaped to enable the aforementioned
25 slidable movement. All possible shapes and configurations of barrel 104 and plunger 102 that enable the slidable movement of plunger 102 within barrel 104 and in and out of barrel 104 are within the scope of the exemplary embodiments discussed herein.

[0036] In one or more embodiments, a base 106 of plunger 102 may enable a user 150 to
30 press plunger 102 into barrel 104 using a thumb of a hand 152 thereof; base 106 may also enable user 150 to draw plunger 102 out of barrel 104 using the thumb and/or other fingers of hand 152. In one or more embodiments, user 150 may be able to use the other fingers (e.g., forefinger and middle finger) and, optionally, a palm of hand 152 to stabilize needle-based device 100 while utilizing the thumb to press plunger 102 into barrel 104; user 150 may hold needle-based device 100 through another hand (e.g., hand 154) and draw plunger 102 out of barrel 104 using
35 the thumb and/or the other fingers of hand 152. The use of plunger 102 and barrel 104 are well

known to one skilled in the art with respect to needle-based devices; detailed discussion thereof is, therefore, skipped for the sake of convenience, brevity and clarity.

[0037] It should be noted that, in all states of operation of needle-based device 100, at least some portion of plunger 102 (e.g., at least base 106) may be outside barrel 104. It should also be noted that at least some portion of plunger 102 may be inside barrel 104 in all states of operation of needle-based device 100. For example, an end of plunger 102 farthest away from an end thereof including base 106 may be a plunger head 108. In one or more embodiments, plunger head 108 may be inside barrel 104 in all states of operation of needle-based device 100. In one or more embodiments, as shown in **Figure 1**, a cross-sectional diameter of plunger head 108 may be less than a cross-sectional diameter of barrel 104, and a cross-sectional diameter of base 106 may be more than the cross-sectional diameter of barrel 104. The aforementioned designs are crucial to enable plunger 102 to move within barrel 104 to perform functionalities associated with needle-based device 100. Without base 106, it may not be possible for a position of plunger head 108 within barrel 104 to be desirably controlled. Without plunger head 108, plunger 102 may fall out of barrel 104 in a vertical position of needle-based device 100 with base 106 at a bottom thereof. Also, a portion of barrel 102 between plunger head 108 and an end 110 of barrel 104 farthest away from base 106 may include a fluid drawn from a vial/bottle by needle-based device 100. Said portion may not be able to hold the fluid without plunger head 108.

[0038] **Figure 1** also shows a needle mount 112, according to one or more embodiments. In one or more embodiments, an end 114 of a needle 116 may be inserted into needle mount 112 (e.g., a needle hub) such that needle 116 protrudes from needle mount 112. In one or more embodiments, needle 116 may include a hollow (e.g., cylindrical) bore along a length thereof. In one or more embodiments, another end 118 of needle 116 may be beveled into a point. In one or more embodiments, end 118 of needle 116 may be configured to first touch a vial/bottle during extraction of a fluid therefrom or an arm of a patient during injection of the fluid therein. In one or more embodiments, needle mount 112, in turn, may be directly coupled to barrel 104 by way of end 110 thereof farthest from base 106. Thus, in an implementation where barrel 104 and plunger 102 together may form a syringe, needle mount 112 and, thereby, needle 116 may be attached to the syringe.

[0039] **Figure 2** shows multiple configurations of needle mount 112, according to one or more embodiments. In a first configuration, needle mount 112 may have a wing 202_{1,2} on each lateral side thereof in a direction approximately perpendicular to a length of barrel 104 when needle mount 112 is coupled to barrel 104. A portion 204 of needle mount 112 with no wings may be configured to be directly coupled (e.g., based on a screw mechanism) to barrel 104. In

the first configuration, wings 202₁₋₂ may be of uniform width. In a second configuration, again, needle mount 112 may have a wing 212_{1,2} on each lateral side thereof in the direction approximately perpendicular to the length of barrel 104 when needle mount 112 is coupled to barrel 104. Again, in the second configuration, a portion 214 of needle mount 112 with no wings may be configured to be directly coupled (e.g., based on a screw mechanism) to barrel 104. However, unlike the first configuration, wings 212₁₋₂ may be only partially of uniform width, only to then taper off to a reduced width (or no width).

[0040] **Figure 3** shows coupling of a needle shield 302 to needle-based device 100 to encompass needle 116 thereof, according to one or more embodiments. Here, in one or more embodiments, needle shield 302 may be cylindrical or shaped like a rectangular prism/square prism based on the design of needle mount 112 and/or barrel 104. Additionally, in one or more embodiments, needle shield 302 may be hollow to enable encompassing the protruding needle 116 therewithin. In one or more embodiments, an outer wall 304 of barrel 104 proximate end 110 may have a connector 306 thereon to enable an end 308 of needle shield 302 to clasp onto connector 306 while needle shield 302 completely encompasses the protruding needle 116 therewithin. In one or more embodiments, an inner cross-sectional diameter of needle shield 302 may be more than an outer cross-sectional diameter of needle mount 112 and an outer cross-sectional diameter of barrel 104 to enable the sliding of needle shield 302 over needle mount 112 and barrel 104.

[0041] In one or more embodiments, needle shield 302 may first receive the protruding needle 116 on needle mount 112 through end 308 thereof. In one or more embodiments, needle shield 302 may then be slid over needle mount 112 until end 308 clasps onto connector 306 on outer wall 304 of barrel 104. In the state of needle shield 302 completely encompassing the protruding needle 116, the other end (e.g., end 310) of needle shield 302 may completely enclose end 118 of needle 116. **Figure 3** shows needle shield 302 to be transparent (e.g., needle shield 302 may be made of plastic, glass etc.). However, it should be noted that needle shield 302 may be translucent or opaque in certain embodiments. Here, the outer wall of needle shield 302 may include cuts (not shown) that reveal needle 116 while needle 116 is still protected by needle shield 302. All reasonable variations are within the scope of the exemplary embodiments discussed herein.

[0042] In one or more embodiments, the sliding of needle shield 302 over needle mount 112 may be facilitated by wings 202₁₋₂ on needle mount 112. For the aforementioned purpose, optionally, grooves 312₁₋₂ may be provided on an inner wall 314 of needle shield 302. In one or more embodiments, wings 202₁₋₂ of needle mount 112 may be received within grooves 312₁₋₂ during relative sliding of wings 202₁₋₂ with respect to grooves 312₁₋₂. While **Figure 3** shows

grooves 312₁₋₂ as cutting across inner wall 314 of needle shield 302 into an entire thickness thereof, it should be noted that grooves 312₁₋₂ may not cut across inner wall 314 of needle shield 302 completely in one or more alternative embodiments. In one or more embodiments, needle shield 302 may slide until reception thereof within connector 306. In one or more embodiments, connector 306 may be constituted by flexible pairs of flaps 316₁₋₂, each forming a groove 318₁₋₂ to receive end 308 of needle shield 302 therewithin.

[0043] Thus, in one or more embodiments, user 150 may cover needle 116 with needle shield 302 for temporary protection (e.g., for transportation to a site of a patient). In one or more embodiments, needle 116 may be covered using needle shield 302 also after use thereof. In one or more embodiments, the covering of needle 116 with needle shield 302 may not only protect needle 116 but also prevent undesirable accidents arising out of unwanted contact therewith. In one or more embodiments, in order to enable injection of a fluid (e.g., a medication) into a body of a patient, needle 116 may be uncovered based on pushing needle shield 302 further downward. In one or more embodiments, as connector 306 may be flexible, user 150 may be able to apply enough downward pressure to enable end 308 of needle shield 302 to pop out of grooves 318₁₋₂ of connector 306 and slide further downward along barrel 104. In one or more embodiments, during the course of needle shield 302 sliding further downward along barrel 104, needle 116 pops out of end 310 of needle shield 302 such that needle 116 is uncovered.

[0044] In one or more embodiments, needle shield 302 may indirectly move further downward along barrel 104 when user 150, after drawing plunger 102 outward from barrel 104, places needle shield 302 against a cap of a vial or a bottle and pushes barrel 104 inward toward the vial or the bottle. In one or more embodiments, this may automatically cause end 308 of needle shield 302 to pop out of grooves 318₁₋₂ of connector 306 and slide further downward along barrel 104, thereby uncovering needle 116. In one or more embodiments, user 150 may hold needle shield 302 to maintain a position thereof in which needle 116 is exposed to inject a fluid (e.g., medication) into a body of a patient or extract blood therefrom. In one or more embodiments, once the task is done, a force may be applied in an opposite direction on needle shield 302 by user 150 to restore a state of complete encompassment of needle 116 by needle shield 302.

[0045] Thus, in one or more embodiments, needle-based device 100 may be provided with needle shield 302 configured to protect needle 116 in a state of disuse thereof (e.g., storage, transportation, post-injection of a fluid, post-collection of a fluid) and to be retractable to reveal needle 116 for use (e.g., injection of a fluid, collection of a fluid) thereof. It should be noted that while **Figures 2 and 3** show wings (202₁₋₂, 212₁₋₂) on lateral sides of needle mount 112, it

is possible that wings may be present on lateral sides of barrel 104 instead in one or more alternative embodiments. Here, in one or more embodiments, needle mount 112 may be smaller in size and plainer. Also, it should be noted that needle shield 302 need not be coupled to barrel 104 merely by way of connector 306. In certain embodiments, needle shield 302 may merely
5 be mounted on an element analogous to needle mount 112. In this case, said element may encompass needle mount 112 and needle shield 302 may be indirectly coupled to barrel 104 by way of being coupled to said element. In certain cases, needle mount 112 may also be interpreted as a mount (e.g., based on the element encompassing needle mount 112) for needle shield 302.

10 [0046] **Figure 4** shows needle-based device 100 with wings 402₁₋₂ on lateral sides of barrel 104 on outer wall 304 thereof proximate end 110, according to one or more embodiments. Here, in one or more embodiments, needle shield 302 may slide over wings 402₁₋₂ to lock onto connector 306 on outer wall 304 to shield needle 116. In one or more embodiments, needle shield 302 may pushed further downward along barrel 104, thereby uncovering/revealing
15 needle 116, based on pressure applied to needle shield 302 such that end 308 pops out of connector 306. Again, in one or more embodiments, needle shield 302 may be pulled back to a position in which needle shield 302 completely encompasses the protruding needle 116.

[0047] It is to be noted that while **Figure 4** shows wings 402₁₋₂ in a configuration similar to the first configuration thereof in needle mount 112 of **Figure 2**, wings 402₁₋₂ may also be in a
20 configuration similar to the second configuration thereof in needle mount 112 of **Figure 2**. Further, all reasonable variations that allow for relative movement between needle shield 302 and needle mount 112/barrel 104 are within the scope of the exemplary embodiments discussed herein. In **Figure 4**, needle mount 112 may be smaller than the embodiments of **Figures 2-3** because of the absence of wings thereon.

25 [0048] Referring back to **Figure 3**, it should be noted that configuration of wings 202₁₋₂ therein may, again, not be limited. It may be possible for wings 212₁₋₂ to be on lateral sides of needle mount 112 instead of wings 202₁₋₂. Further, as discussed above, grooves 312₁₋₂ may not completely cut across inner wall 314 of needle shield 302. In this embodiment, wings 212₁₋₂ may be received within grooves 312₁₋₂ and may slide relatively thereto. Here, the tapering on
30 wings 212₁₋₂ may enable needle shield 302 to be locked onto needle mount 112/barrel 104, without a requirement of connector 306. Again, needle shield 302 may be pushed downward to reveal/uncover needle 116, as discussed above. Needle shield 302 may then be manually restored to an original position thereof in which needle shield 302 completely encompasses the protruding needle 116.

[0049] **Figure 5** shows needle-based device 100 with a ring 502 on outer wall 304 of barrel 104 proximate end 110, according to one or more embodiments. Here, needle mount 112 may be in the same configurations as in **Figures 2-3**; alternatively, needle mount 112 may be smaller and without any wings thereon. In one implementation, ring 502 (e.g., of uniform thickness) may protrude from outer wall 304 of barrel 104; in addition, an underside of ring 502 may have a groove 504 complementary to a protrusion 506 on end 308 of needle shield 302. Again, needle shield 302 may first receive needle 116 on needle mount 112 through end 308 thereof. Needle shield 302 may be moved downward toward barrel 104 such that, after a point, protrusion 506 of needle shield 302 locks onto groove 504 of ring 502. In this state, needle shield 302 may completely encompass the protruding needle 116 therewithin.

[0050] In one or more embodiments, ring 502 may be made of a flexible material. Also, in one or more implementations, while ring 502 may change shape due to flexibility thereof, ring 502 may not change a position thereof along barrel 104. In one or more embodiments, an appropriate downward pressure (e.g., by user 150) may enable protrusion 506 to pop out of groove 504 and cause needle shield 302 to go further downward along barrel 104. In one or more embodiments, this may uncover/reveal needle 116 for use on a patient (e.g., to extract blood, to inject a fluid, to prick a finger) or on a vial/bottle (e.g., to extract a fluid). In one or more embodiments, following use of needle 116, an upward pressure may be applied to enable protrusion 506 to once again lock into groove 504 to enable needle shield 302 completely encompass needle 116 again.

[0051] The ring (e.g., ring 502) embodiment of **Figure 5** is merely an example embodiment. Other embodiments involving rings that facilitate covering of needle 116 and uncovering thereof are within the scope of the exemplary embodiments discussed herein. In one or more embodiments, wings (202₁₋₂, 212₁₋₂) on needle mount 112 may further aid the locking/unlocking/relocking of needle shield 302 at/from appropriate positions. All reasonable variations are within the scope of the exemplary embodiments discussed herein.

[0052] **Figure 6** shows needle-based device 100 in a spring-based configuration of needle shield 302, according to one or more embodiments. Here, in one or more embodiments, needle mount 112 with wings 212₁₋₂ may be directly inserted into barrel 104 via end 110 farthest from base 106. In one example implementation, barrel 104 may have grooves (not shown) on an inside wall thereof proximate end 110 onto which needle mount 112 may be screwed. Other forms of coupling needle mount 112 to barrel 104 are within the scope of the exemplary embodiments discussed herein. In one or more embodiments, barrel 104 may have a ring 602 (e.g., analogous to ring 502, but may be structurally different; ring 602 may be made of flexible material) formed on outer wall 304 thereof proximate end 110. In some embodiments, ring 602

may be integrally formed with barrel 104, while in some other embodiments, ring 602 may be an element separate from barrel 104.

[0053] In one or more embodiments, a spring 604 may be placed over needle mount 112 such that spring 604 encompasses the protruding needle 116 along an entire length thereof. In one or more embodiments, now when spring 604 encompassing needle 116 is received within needle shield 302 through end 308 thereof and needle shield 302 is moved downward toward barrel 104, end 308 of needle shield 302 may press against ring 602. In one or more embodiments, further application of pressure (e.g., through hand 152 of user 150) may compress ring 602 and push ring 602 inside end 308 to be received within needle shield 302. In one or more embodiments, in this state, needle shield 302 may completely encompass the entire lengths of both protruding needle 116 and spring 604.

[0054] In one or more embodiments, when no further external pressure is applied, needle shield 302 may comfortably shield the protruding needle 116 and spring 602. In one or more embodiments, although ring 602 may not lock needle shield 302 in a position, needle shield 302 may be prevented from falling outward when needle-based device 100 is flipped over because a cross-sectional inner diameter of ring 602 may be more than a cross-sectional inner diameter of end 308. In one or more embodiments, needle shield 302 may be hollow. In one or more embodiments, further, a cross-sectional inner diameter of end 310 of needle shield 302 farthest away from end 308 may be smaller than a cross-sectional diameter of spring 604. Thus, in one or more embodiments, needle shield 302 may be prevented from falling downward by spring 604 when needle-based device 100 is held in an upright position.

[0055] In one or more embodiments, if spring 604 were not present, needle shield 302 may slip and fall downward; alternatively or additionally, needle shield 302 may be prevented from falling downward based on an element mounted on needle mount 112, as discussed above. However, in one or more embodiments, upon further application of pressure in a downward direction toward barrel 104 by user 150 or by pressing end 310 of needle shield 302 against a surface (e.g., an arm of a patient, a cap of a vial/bottle) that exerts a normal reaction in the downward direction, needle shield 302 moves in the downward direction along barrel 104, thereby compressing spring 604 also in the same direction to uncover/reveal needle 116. In one or more embodiments, the uncovered/revealed needle 116 may then be utilized appropriately (e.g., for injecting a fluid into a patient, for pricking a finger/body part of the patient, for pricking a cap of a vial/bottle). Following use of needle 116, the force along the direction of compression of spring 604 may be relaxed (e.g., by taking needle-based device 100 out of the surface, user 150 stopping the application of pressure in the downward direction) to enable spring 604 revert to an uncompressed version thereof; in the uncompressed state of spring 604,

needle shield 302 may once again completely encompass the protruding needle 116 and spring 604.

[0056] In other words, immediately following relaxation of the application of the force along the direction of compression of spring 604, needle-based device 100 may be automatically transitioned back to the state of disuse thereof (e.g., a state where needle shield 302 completely encompasses needle 116 and spring 604) following use thereof in accordance with another force (e.g., a restoring force) provided by decompression of spring 604 that is automatically applied in a direction diametrically opposite to the direction of compression of spring 604.

[0057] In the scenario of injecting a fluid into the body of a patient, needle-based device 100 may first be placed against a cap of a vial/bottle from which the fluid is to be extracted. When end 310 is pressed against the cap, the normal reaction from the cap pushes needle shield 302 downward, thereby compressing spring 604. The downward movement of needle shield 302 and the compression of spring 604 exposes needle 116 that pricks the cap. Plunger 102 may also be pushed in by way of user 150 pressing base 106 in an upward direction toward needle mount 112 such that plunger head 108 contacts needle mount 112. Now, pulling plunger 102 back may create a gap between needle mount 112 and plunger head 108. Said gap may constitute a low pressure region, thereby enabling the fluid to fill the gap by way of gushing in through the hollow needle 116.

[0058] Now, the desired quantity of the fluid may be filled in the gap. The gap may be controlled based on graduated marks (e.g., shown as graduated marks 606) on barrel 104. Once the desired quantity of fluid is available in the gap, user 150 may take needle-based device 100 out of the vial/bottle, thereby decompressing spring 604 to restore spring 604 to the original shape thereof. User 150 may then place end 310 of needle shield 302 against the arm of a patient, which, again, compresses spring 604 as discussed above, and exposes needle 116. The exposed needle 116 may prick a skin of the patient; the pressing of base 106 may compress a volume of the gap, thereby creating a high pressure region therein. The fluid may be squeezed through the hollow needle 116 into the body of the patient.

[0059] Once the fluid is injected into the body of the patient, needle-based device 100 may be extracted out of the arm of the patient. This decompresses spring 604 and restores needle shield 302 to the position in which needle shield 302 completely encompasses the exposed needle 116 and spring 604. Needle-based device 100 may also be employed to prick a finger tip of the patient to extract blood or to extract another fluid from a bottle/vial; additionally, needle-based device 100 may be used to extract venom from a body portion of a mammal. The details with respect to the figures discussed above make the aforementioned uses obvious. All reasonable variations are within the scope of the exemplary embodiments discussed herein.

[0060] With respect to **Figure 6**, it is obvious that needle shield 302 may be retracted to reveal needle 116 and released to close needle 116 at will. Also, wings 212₁₋₂ on needle mount 112 may aid the secure coupling between needle shield 302 and barrel 104. It is possible to envision the embodiment of **Figure 6** without wings 212₁₋₂. To summarize, the embodiment of **Figure 6** may be employed in two distinct modes of operation with respect to the use of needle-based device 100 where needle shield 302 is retracted to compress spring 604 and to reveal needle 116. In one or more embodiments, the first distinct mode of operation of use of needle-based device 100 may be the extraction of a fluid from a vial/bottle or a body (e.g., arm) of a mammal (e.g., a human), and the second distinct mode of operation of use of needle-based device 100 may be the injection of said fluid into the body of the mammal or a body of another mammal. No current solutions exist where an analogous needle is shielded and exposed for use during both the extraction of a fluid and the injection thereof. Yet another mode of operation of the embodiment of **Figure 6** may be related the state of disuse of needle-based device 100 where needle 116 is completely shielded/encompassed by spring 604 and needle shield 302.

[0061] **Figure 7** shows an external cap 702 configured to at least partially cover needle shield 302, according to one or more embodiments. In one or more embodiments, external cap 702 may be made of a transparent (e.g., plastic, glass), a translucent (e.g., rubber) or an opaque material to cover the slits and cuts on needle shield 302. In one or more embodiments, an outer surface 704 of external cap 702 may have a groove 706 therein. Correspondingly, in one or more embodiments, needle shield 302 may have a lock button 708 on an outer surface thereof. In one or more embodiments, lock button 708 of needle shield 302 may be configured to be received into groove 706 on external cap 702 to lock needle-based device 100 (e.g., in a state of disuse thereof).

[0062] In one or more embodiments, the use of external locking may prevent reuse of needle-based device 100, or at least needle 116 therein. Although **Figure 7** shows needle shield 302 as covering needle 116 and spring 604, concepts associated with the external locking may also be applicable across the embodiments of **Figures 1-5**. In one or more embodiments, the external locking may prevent movement of needle shield 302, which, in turn, prevents reuse of needle-based device 100. Alternatively, needle shield 302 itself may include both lock button 708 and groove 706. Here, locking may be done merely using elements of needle shield 302. In another alternative implementation, lock button 708 may be external to needle shield 302. For example, lock button 708 may be on external cap 702 and groove 706 may be on needle shield 302. Here, lock button 708 of external cap 702 may be received within groove 706 of needle shield 302.

[0063] In yet another alternative implementation, external cap 702 may cover lock button 708 of needle shield 302 to prevent premature/accidental locking during transportation or handling of needle-based device 100. In one example implementation, external cap 702 may be designed like a pen cap. Other configurations of external cap 702 are within the scope of the exemplary
5 embodiments herein.

[0064] Thus, exemplary embodiments discussed above provide for safety mechanisms with respect to needle-based device 100. The manual shielding available in typical syringes may require capping a needle after use thereof. The capping and uncapping may cause needle injuries to a user. Additionally, in a spring-based typical implementation of a syringe that
10 allows for a needle to be retracted therewithin, some space may be reserved in a barrel for the spring. This may result in loss of space for medication. The automatic retraction of needle shield 302 in the exemplary embodiments discussed herein may also allow for one-handed operation of needle-based device 100. All reasonable variations are within the scope of the exemplary embodiments discussed herein.

[0065] It should be noted that exemplary embodiments discussed above have been placed in the context of a syringe and needle 116, with barrel 104 and plunger 102. However, concepts associated with the exemplary embodiments discussed herein are applicable across
15 embodiments where needle mount 112 is coupled to a body (alternative to barrel 104) of needle-based device 100 and needle 116 protrudes from needle mount 112. In one or more
20 embodiments, needle shield 302 may encompass the protruding needle 116 in a state of operation; needle shield 302 may be retracted to reveal/uncover needle 116. In one or more embodiments, needle shield 302 may also be protected through external cap 702, as discussed above. All reasonable variations in and combinations of the exemplary embodiments discussed with respect to **Figures 1-7** are within the scope of the exemplary embodiments discussed
25 herein.

[0066] **Figure 8** shows a process flow diagram detailing the operations involved in implementing a security mechanism in a needle-based device (e.g., needle-based device 100), according to one or more embodiments. In one or more embodiments, operation 802 may involve protecting an entire length of a needle (e.g., needle 116) of the needle-based device
30 protruding from a needle mount (e.g., needle mount 112) coupled to a body (e.g., barrel 104) of the needle-based device based on providing a needle shield (e.g., needle shield 302) configured to completely encompass the entire protruding length of the needle in a first state of disuse of the needle-based device. In one or more embodiments, operation 804 may involve retracting the needle shield in a first direction toward the body of the needle-based device to

cause the needle to emerge out of the needle shield to prepare the needle-based device for a second state of use thereof.

[0067] In one or more embodiments, operation 806 may involve transitioning the needle-based device back to the first state of disuse thereof following the second state of use in accordance with a force applied in a second direction diametrically opposite to the first direction. In one or more embodiments, operation 808 may then involve securedly maintaining the encompassing of the entire protruding length of the needle by the needle shield in the first state of disuse of the needle-based device based on coupling between the needle shield and the body of the needle-based device.

10 [0068] **Figure 9** shows the spring-based embodiment of **Figures 6-7** with external cap 702, needle mount 112 and needle shield 302 as modular elements. In one or more embodiments, as clearly indicated by **Figures 6** and **9** and as discussed above, needle shield 302 may be mounted onto barrel 104 (body of needle-based device 100) directly or, for example, through the user of a connector (such as ring 602) such that needle shield 302 encompasses both spring 15 604 and needle 116. As discussed with reference to **Figure 6**, the relative cross-sectional areas/diameters of needle mount 112, needle shield 302 and ring 602 may automatically enable protection of needle 116 and prevent accidental sticks caused by needle 116 otherwise. It should be noted that there may be snaps (not shown) formed on barrel 104 (or body of needle-based device 100) to enable direct coupling of needle shield 302 thereonto.

20 [0069] **Figure 10** shows retraction of needle shield 302 in the spring-based embodiment of **Figure 6**, according to one or more embodiments. As discussed above, once pressure is applied in a downward direction toward barrel 104 by user 150 or by pressing end 310 of needle shield 302 against a surface (e.g., an arm of a patient, a cap of a vial/bottle), needle shield 302 moves in the same downward direction, thereby compressing spring 604 as shown in **Figure 10**.

25 **Figure 11** shows a locking mechanism 1100 of needle-based device 100 in accordance with the embodiments of **Figures 6** and **7**, but as a variant thereof. Here, in one or more embodiments, locking mechanism 1100 may include a lock button 1102 (analogous to lock button 708) on needle shield 302 on a location proximate to end 114/top of needle mount 112; however, here, lock button 1102 may have a hook 1104 thereon configured to get between coils 1106 of spring 30 604 to touch the top of needle mount 112 and lock needle shield 302 by way of a hook tooth 1110 on hook 1104 catching onto one or more wire(s) of spring 604, as shown in **Figure 11**; for the aforementioned purpose, needle shield 302 may have a groove 1108 on an outer wall thereof through which hook 1104 and hook tooth 1110 pass to lock into coils 1106 of spring 604 and the top of needle mount 112. This increases the lock force compared to the lock force 35 in the embodiment of **Figure 7**, where lock button 708 engages with external cap 702 instead.

[0070] As discussed above, other possible embodiments include lock button 708 being a separate element that engages with needle shield 302 or both with needle shield 302 and spring 604. **Figure 12** shows an external lock button 1202 (e.g., part of locking mechanism 1200) that is configured to engage both with a groove 1204 on needle shield 302 (e.g., by way of a hook 1208 on external lock button 1202) and coils 1106 (e.g., through groove 1108 by way of another hook 1206 including a hook tooth 1210 on external lock button 1202) of spring 604. Again, the embodiment context of external lock button 1202 is similar to that of **Figure 6**. In one or more embodiments, spring 604 discussed above may be a separate element or integrated with needle mount 112 discussed above or needle shield 302. In one or more embodiments, spring 604 may be a metal spring or molded spring. In one or more embodiments, needle shield 302 across all embodiments, along with other elements such as needle mount 112 and spring 604, may be sold as a safety mechanism distinct from a syringe or another form of needle-based device 100.

[0071] **Figure 13** shows the embodiment of **Figure 6**, but with a longer needle mount 112. Here, needle mount 112 may be longer such that ring 602 may be formed thereon instead of barrel 104. Thus, needle 116 with needle mount 112 and needle shield 302 may be sold as a separate safety mechanism 1300 distinct from needle based device 100. It should be noted that the manual embodiment of **Figure 3** also can include the lock mechanisms (e.g., those of **Figure 7** and **Figures 11-12** (without catching wires of spring 604 as spring 604 does not exist in the embodiment of **Figure 3**); it is easy to envision the embodiment of **Figure 7** without spring 604) discussed herein. All reasonable variations are within the scope of the exemplary embodiments discussed herein. Also, it should be noted that mechanisms of injection of a fluid into a body of a mammal and extraction of a fluid from a vial/bottle/body of the mammal are known to one skilled in the art, especially with regard to needle-based device 100. Detail discussion and illustration thereof are, therefore, skipped for the sake of convenience and clarity.

[0072] **Figure 14** shows yet another embodiment of needle mount 112, according to one or more embodiments. Here, needle mount 112 may have end 114 thereof to which needle 116 is to be attached. Starting from end 114, a body 1402 of needle mount 112 may have a narrow first portion 1404 (e.g., cylindrical) configured to receive needle 116 through end 114. Said cylindrical first portion 1404 may open out into a wider second portion 1406 (e.g., again, cylindrical) that continues till another end 1408 of needle mount 112 opposite to end 114.

[0073] As shown in **Figure 14**, second portion 1406 may be threaded (e.g., with threads 1410) on an undersurface (e.g., inner surface) thereof. **Figure 14** also shows barrel 104 being threaded (e.g., with threads 1412) around an end (e.g., end 110) thereof. Threads 1410 of second portion

1406/needle mount 112 and threads 1412 of barrel 104 may be complementary to one another such that needle mount 112 is coupled to barrel 104 by way of needle mount 112 being screwed onto barrel 104 by way of threads 1410 and threads 1412. The design of needle mount 112 with a hollow and narrow first portion 1404 and wider second portion 1406 may enable needle
5 116 to approximately reach second portion 1406 from one side and barrel 104 to approximately reach first portion 1404 from the other following coupling between needle mount 112 and barrel 104. Obviously, needle mount 112 may include wings 1450₁₋₂ on lateral sides of first portion 1404 and second portion 1406 to enable needle mount 112 move along inner walls of needle shield 302 which may/may not include grooves (e.g., analogous to grooves 312₁₋₂ of **Figure 3**)
10 to facilitate the aforementioned movement.

[0074] Several embodiments may be possible. In one embodiment, second portion 1406 may be tapered in a direction toward first portion 1404. In other words, second portion 1406 may be widest at end 1408 and narrowest when closest to first portion 1404. Here, around the end (e.g., end 110) discussed above, barrel 104 may be tapered in a manner complementary to the
15 tapering of second portion 1406. Second portion 1406 may be non-tapered in another embodiment. In yet another embodiment, threads 1412 may be on an inner surface/inner wall of barrel 104 and threads 1410 may be on an outer surface of second portion 1406. The coupling of needle mount 112 to barrel 104 may then involve screwing needle mount 112 into barrel 104. Further, in another embodiment, the tapered portion of barrel 104 may be a modular element in
20 itself that is replaceable with another tapered portion. All reasonable variations are within the scope of the exemplary embodiments discussed herein.

[0075] As discussed above, as needle 116 approximately reaches second portion 1406 from one side when coupled to needle mount 112 and barrel 104 approximately reaches first portion 1404 of needle mount 112 when barrel 104 is coupled to needle mount 112, the design of needle
25 mount 112 may ensure that the dead space for fluid loss is minimized. **Figure 14** also shows an example means of coupling between barrel 104 and needle mount 112 of needle-based device 100, according to one or more embodiments. Obviously, spring 604 and needle shield 302 in various configurations thereof discussed above may be part of needle-based device 100 in the embodiments disclosed and anticipated by **Figure 14**.

[0076] In one or more embodiments, as shown in **Figure 14**, needle-based device 100 may further include a needle cap 1414 configured to cover needle 116 in a state of disuse thereof. **Figure 15** shows needle-based device 100 in accordance with the embodiment of **Figure 14** in a state of disuse thereof, according to one or more embodiments. Needle shield 302 is shown as transparent for the sake of illustrative convenience. In one or more embodiments, needle-
35 based device 100 may include needle 116 completely covered with needle cap 1414 in the state

of disuse thereof. As seen in the spring embodiments of **Figures 6-7** and **Figures 9-13**, needle 116, in turn, may be completely encompassed by spring 604 in the state of disuse of needle-based device 100; needle cap 1414 covering needle 116 may at least be partially encompassed by spring 604.

5 [0077] It is easily possible to envision embodiments discussed herein without spring 604, but exemplary embodiments discussed herein include spring 604 for the sake of convenience. In one or more embodiments, needle cap 1414 may be a hollow cylindrical or tapered element to accommodate needle 116 therewithin. In one or more embodiments, in the state of disuse of needle-based device 100, needle shield 302 may completely encompass needle 116 and spring
10 604 therewithin. In one or more embodiments, needle shield 302 may also completely encompass needle cap 1414 therewithin, save for a small portion (e.g., protruding portion 1502) that protrudes out of needle shield 302 (e.g., out of end 310). In one or more embodiments, protruding portion 1502 may be covered with a safety cap 1504 that clings onto grooves 1506 on an outer surface of needle shield 302 such that safety cap 1504 is coupled to needle shield
15 302 and covers protruding portion 1502 of needle cap 1414 completely. It should be noted that the uncompressed spring 604 completely encompasses needle 116 (and partially encompasses needle cap 1414) in this state of disuse of needle-based device 100.

[0078] In one or more embodiments, the presence of safety cap 1504 ensures that needle cap 1414 is kept stable and that needle 116 within is completely covered by needle cap 1414 in the
20 state of disuse of needle-based device 100. Further, if needle cap 1414 includes a hole on an end 1508 thereof farthest to needle mount 112, needle 116 may not pop out of needle shield 302 in case of needle 116 accidentally disengaging from needle mount 112 in the state of disuse of needle-based device 100. **Figure 15** also shows needle cap 1414 locking onto needle mount 112 at end 1510 thereof; said coupling may be based on threads (not shown) or any other
25 possible means therefor.

[0079] **Figure 16** shows another embodiment of needle-based device 100 where needle shield 302 completely covers needle 116, needle cap 1414 and spring 604 in the state of disuse of needle-based device 100. In this embodiment, needle cap 1414 may not protrude out of needle-based device 100. For example, a surface of a top portion of needle cap 1414 may be flush with
30 end 310 of needle shield 302 in the state of disuse of needle-based device 100. In one or more embodiments, safety cap 1504 may again couple to needle cap 1414 and cling onto grooves 1506 in the state of disuse of needle-based device 100 to maintain stability of needle 116 therein and to prevent movement of needle 116 out of needle-based device 100.

[0080] It is obvious that grooves 1506 on the outer wall of needle shield 302 may be holes
35 instead for elements (e.g., wings) of safety cap 1504 to latch onto. All possible means of

coupling between safety cap 1504 and needle shield 302 and safety cap 1504 and needle cap 1414 are within the scope of the exemplary embodiments discussed herein. **Figure 17** illustrates the state of enablement of use of needle-based device in accordance with the embodiments of **Figures 14-16**. Here, safety cap 1504 may be removed, for example, by twisting (e.g., by user 150) thereof that disengages safety cap 1504 from grooves 1506 (or, holes) on needle shield 302. The disengagement of safety cap 1504 may render it easy for user 150 to pull safety cap 1504 along with needle cap 1414 out of needle shield 302 to render needle 116 encompassed only by spring 604 and needle shield 302. Also, the aforementioned disengagement process does not dislodge needle 116 out of needle mount 112.

10 **[0081]** Now the functioning of needle-based device 100 with respect to withdrawing fluid and injecting fluid into user 150 (or, other mammals) is obvious in view of the discussion above relevant to **Figures 6-7** and **Figures 9-13**. The pressing of needle-based device 100 onto the arm of user 150 may move needle shield 302 downward toward barrel 104, which compresses spring 604. Immediately after the aforementioned force is relaxed or withdrawn, the restoring force of spring 604 may bring back needle shield 302 to an original position thereof that signifies disuse. In other words, the restoring force of spring 604 may decompress spring 604 and restore needle shield 302 back to a state of completely encompassing needle 116 and spring 604 in the state of disuse of needle-based device 100. In this state of disuse, needle 116 may additionally be protected through a lock button (to be discussed below), needle cap 1414 and safety cap 1504.

20 **[0082]** In the abovementioned embodiments of **Figures 14-16**, needle shield 302 may also include a lock button (e.g., lock button 1102, external lock button 1202) similar to the embodiments of **Figures 12-13**. **Figures 14-16** show needle-based device 100 as having lock button 1102 merely as an example. In the state of disuse of needle-based device 100, lock button 1102 may catch onto wires of spring 604 through hook 1104 and hook tooth 1110 thereof, which provides additional stability to needle-based device 100. It should be noted that lock button 1102 may also merely lock (e.g., through hook 1104) onto needle shield 302 without catching onto wires of spring 604 in the state of disuse of needle-based device 100.

30 **[0083]** **Figure 18** shows needle-based device 100 in the embodiment of **Figure 15** with guide elements 1802₁₋₂ on an inner surface thereof proximate end 310. **Figure 18** shows a frontal sliced view of needle shield 302 that illustrates the aforementioned guide elements 1802₁₋₂ clearly. In one or more embodiments, guide elements 1802₁₋₂ may be in the form of plates formed on an inner surface/inner wall of end 310 of needle shield 302 of needle-based device 100. In one or more embodiments, the formation of guide elements 1802₁₋₂ on an inner surface 35 1804 of end 310 of needle shield 302 may further constrict the space around needle cap 1414

in the state of disuse of needle-based device 100 based on guide elements 1802₁₋₂ protruding from end 310 inside needle shield 310 parallel to the length of needle shield 302 such that the distance between guide element 1802₁ and guide element 1802₂ is less than an inner diameter of needle shield 302. Such a constriction imposed through needle cap 1414 passing through
5 guide elements 1802₁₋₂ in the state of disuse of needle-based device 100 may prevent significant lateral movement/displacement of needle cap 1414 and, thereby, needle 116 in the state of disuse of needle-based device 100.

[0084] The prevention of significant lateral displacement may, in turn, prevent damage to needle 116 and injury to user 150 carrying needle-based device 100 in the state of disuse thereof.
10 Obviously, the length of guide elements 1802₁₋₂ may be significantly less than the length of needle shield 302 as guide elements 1802₁₋₂ may internally protrude from end 310 of needle shield 302 to a distance significantly less than the length of needle shield 302. Also, the distance between guide element 1802₁ and guide element 1802₂ along a direction perpendicular to the length of needle shield 302 may be less than an inner diameter of needle shield 302. Further,
15 the distance between guide element 1802₁ and guide element 1802₂ along the direction perpendicular to the length of needle shield 302 may be less than an inner diameter of spring 604 to enable guide elements 1802₁₋₂ to pass through spring 604 in the state of disuse of needle-based device 100, as shown in **Figure 18**.

[0085] It is obvious that the embodiments of **Figures 14-18** are enhancements of the
20 embodiments discussed with regard to **Figures 1-13**. Therefore, operations/functionalities discussed with regard to **Figures 1-13** are also applicable to the embodiments of **Figures 14-18**. All reasonable variations are within the scope of the exemplary embodiments discussed herein.

Although the present embodiments have been described with reference to specific example
25 embodiments, it will be evident that various modifications and changes may be made to these embodiments without departing from the broader spirit and scope of the various embodiments. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.

CLAIMS

1. A method comprising:
protecting an entire length of a needle of a needle-based device protruding from a needle mount
coupled to a body of the needle-based device in a first state of disuse of the needle-based device
5 based on providing a needle cap completely encompassing the needle in the first state of disuse
of the needle-based device;
encompassing, by a needle shield, the entire length of the needle of the needle-based device and
at least a partial length of the needle cap in the first state of disuse of the needle-based device,
a length of the needle cap protruding outside the needle shield from an end of the needle shield
10 farthest away from the needle mount in the first state of disuse of the needle-based device;
encompassing the entire protruding length of the needle cap within a safety cap and securing
the safety cap onto an outer surface of the needle shield proximate the end farthest away from
the needle mount such that the needle and the needle cap are completely protected and covered
during the first state of disuse of the needle-based device;
15 removing the safety cap along with the needle cap from the end of the needle shield farthest
away from the needle mount in the first state of disuse of the needle-based device such that the
encompassing of the entire length of the needle by the needle shield is maintained;
following the removing of the safety cap along with the needle cap in the first state of disuse of
the needle-based device, retracting the needle shield in a first direction toward the body of the
20 needle-based device to cause the needle to emerge out of the needle shield to prepare the needle-
based device for a second state of use thereof; and
providing guide elements protruding from the end of the needle shield farthest away from the
needle mount in the first state of disuse of the needle-based device internal to the needle shield
in a direction parallel to a length of the needle shield such that the needle cap passes through
25 the guide elements to prevent significant lateral movement of the needle and the needle cap in
the first state of disuse of the needle-based device,
wherein a distance between the guide elements along a direction perpendicular to the length of
the needle shield is less than an inner diameter of the needle shield, and
wherein a length of each of the guide elements along the direction of the length of the needle
30 shield is significantly less than the length of the needle shield.
2. The method of claim 1, further comprising:
additionally encompassing the entire protruding length of the needle of the needle-based device
with a spring resting on the needle mount in the first state of disuse of the needle-based device;
and

encompassing, through the needle shield, an entire length of the spring in addition to the entire protruding length of the needle in the first state of disuse of the needle-based device.

3. The method of claim 1, further comprising automatically transitioning the needle-based device back to the first state of disuse thereof immediately following the second state of use in accordance with a force applied in a second direction diametrically opposite to the first direction.

4. The method of claim 1, comprising providing the needle mount with a first hollow and narrow portion having an end thereof coupled to the needle and another end thereof opening into a second hollow and wide portion receiving a complementary end of the body of the needle-based device such that the complementary end approximately reaches the first hollow and narrow portion and the needle approximately reaches the second hollow and wide portion upon complete coupling between the needle mount and the complementary end of the body of the needle-based device.

5. The method of claim 2, further comprising:
automatically transitioning the needle-based device back to the first state of disuse thereof immediately following the second state of use based on automatic decompression of the spring that provides for a force applied in a second direction diametrically opposite to the first direction, the force applied in the second direction being an automatic restoring force of the spring.

6. The method of claim 1, further comprising utilizing a barrel of at least one of: a syringe, a hypodermic needle, a pen injector and a fluid collection device as the body of the needle-based device.

7. The method of claim 5, further comprising locking the needle shield with a lock button based on at least one of: the lock button latching onto coils of the spring via a groove formed on the needle shield and the lock button merely locking onto the needle shield via the groove in the first state of disuse of the needle-based device.

8. The method of claim 5, further comprising the distance between the guide elements along the direction perpendicular to the length of the needle shield being less than an inner diameter of the spring to enable the spring to accommodate the guide elements therewithin in the first state of disuse of the needle-based device.

9. A method comprising:
utilizing a barrel of at least one of: a syringe, a hypodermic needle, a pen injector and a fluid collection device as a body of a needle-based device;
protecting an entire length of a needle of the needle-based device protruding from a needle mount coupled to the body of the needle-based device in a first state of disuse of the needle-

- based device based on providing a needle cap completely encompassing the needle in the first state of disuse of the needle-based device;
- encompassing, by a needle shield, the entire length of the needle of the needle-based device and at least a partial length of the needle cap in the first state of disuse of the needle-based device,
- 5 a length of the needle cap protruding outside the needle shield from an end of the needle shield farthest away from the needle mount in the first state of disuse of the needle-based device;
- encompassing the entire protruding length of the needle cap within a safety cap and securing the safety cap onto an outer surface of the needle shield proximate the end farthest away from the needle mount such that the needle and the needle cap are completely protected and covered
- 10 during the first state of disuse of the needle-based device;
- removing the safety cap along with the needle cap from the end of the needle shield farthest away from the needle mount in the first state of disuse of the needle-based device such that the encompassing of the entire length of the needle by the needle shield is maintained;
- following the removing of the safety cap along with the needle cap in the first state of disuse of
- 15 the needle-based device, retracting the needle shield in a first direction toward the body of the needle-based device to cause the needle to emerge out of the needle shield to prepare the needle-based device for a second state of use thereof; and
- providing guide elements protruding from the end of the needle shield farthest away from the needle mount in the first state of disuse of the needle-based device internal to the needle shield
- 20 in a direction parallel to a length of the needle shield such that the needle cap passes through the guide elements to prevent significant lateral movement of the needle and the needle cap in the first state of disuse of the needle-based device,
- wherein a distance between the guide elements along a direction perpendicular to the length of the needle shield is less than an inner diameter of the needle shield, and
- 25 wherein a length of each of the guide elements along the direction of the length of the needle shield is significantly less than the length of the needle shield.
10. The method of claim 9, further comprising:
- additionally encompassing the entire protruding length of the needle of the needle-based device with a spring resting on the needle mount in the first state of disuse of the needle-based device;
- 30 and
- encompassing, through the needle shield, an entire length of the spring in addition to the entire protruding length of the needle in the first state of disuse of the needle-based device.
11. The method of claim 9, further comprising automatically transitioning the needle-based device back to the first state of disuse thereof immediately following the second state of use in

accordance with a force applied in a second direction diametrically opposite to the first direction.

12. The method of claim 9, comprising providing the needle mount with a first hollow and narrow portion having an end thereof coupled to the needle and another end thereof opening
5 into a second hollow and wide portion receiving a complementary end of the body of the needle-based device such that the complementary end approximately reaches the first hollow and narrow portion and the needle approximately reaches the second hollow and wide portion upon complete coupling between the needle mount and the complementary end of the body of the needle-based device.

10 13. The method of claim 10, further comprising:
automatically transitioning the needle-based device back to the first state of disuse thereof immediately following the second state of use based on automatic decompression of the spring that provides for a force applied in a second direction diametrically opposite to the first direction, the force applied in the second direction being an automatic restoring force of the
15 spring.

14. The method of claim 13, further comprising locking the needle shield with a lock button based on at least one of: the lock button latching onto coils of the spring via a groove formed on the needle shield and the lock button merely locking onto the needle shield via the groove in the first state of disuse of the needle-based device.

20 15. The method of claim 13, further comprising the distance between the guide elements along the direction perpendicular to the length of the needle shield being less than an inner diameter of the spring to enable the spring to accommodate the guide elements therewithin in the first state of disuse of the needle-based device.

16. A method comprising:
25 protecting an entire length of a needle of a needle-based device protruding from a needle mount coupled to a body of the needle-based device in a first state of disuse of the needle-based device based on providing a needle cap completely encompassing the needle in the first state of disuse of the needle-based device;
encompassing, by a needle shield, the entire length of the needle of the needle-based device and
30 at least a partial length of the needle cap in the first state of disuse of the needle-based device, a length of the needle cap protruding outside the needle shield from an end of the needle shield farthest away from the needle mount;
encompassing the entire protruding length of the needle cap within a safety cap and securing the safety cap onto an outer surface of the needle shield proximate the end farthest away from

the needle mount such that the needle and the needle cap are completely protected and covered during the first state of disuse of the needle-based device;

removing the safety cap along with the needle cap from the end of the needle shield farthest away from the needle mount in the first state of disuse of the needle-based device such that the encompassing of the entire length of the needle by the needle shield is maintained;

following the removing of the safety cap along with the needle cap in the first state of disuse of the needle-based device, retracting the needle shield in a first direction toward the body of the needle-based device to cause the needle to emerge out of the needle shield to prepare the needle-based device for a second state of use thereof;

automatically transitioning the needle-based device back to the first state of disuse thereof immediately following the second state of use in accordance with a force applied in a second direction diametrically opposite to the first direction; and

providing guide elements protruding from the end of the needle shield farthest away from the needle mount in the first state of disuse of the needle-based device internal to the needle shield in a direction parallel to a length of the needle shield such that the needle cap passes through the guide elements to prevent significant lateral movement of the needle and the needle cap in the first state of disuse of the needle-based device,

wherein a distance between the guide elements along a direction perpendicular to the length of the needle shield is less than an inner diameter of the needle shield, and

wherein a length of each of the guide elements along the direction of the length of the needle shield is significantly less than the length of the needle shield.

17. The method of claim 16, further comprising:

additionally encompassing the entire protruding length of the needle of the needle-based device with a spring resting on the needle mount in the first state of disuse of the needle-based device;

and

encompassing, through the needle shield, an entire length of the spring in addition to the entire protruding length of the needle in the first state of disuse of the needle-based device.

18. The method of claim 17, further comprising:

automatically transitioning the needle-based device back to the first state of disuse thereof immediately following the second state of use based on automatic decompression of the spring that provides for the force applied in the second direction diametrically opposite to the first direction, the force applied in the second direction being an automatic restoring force of the spring.

19. The method of claim 18, further comprising locking the needle shield with a lock button based on at least one of: the lock button latching onto coils of the spring via a groove formed

on the needle shield and the lock button merely locking onto the needle shield via the groove in the first state of disuse of the needle-based device.

20. The method of claim 18, further comprising the distance between the guide elements along the direction perpendicular to the length of the needle shield being less than an inner
5 diameter of the spring to enable the spring to accommodate the guide elements therewithin in the first state of disuse of the needle-based device.