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Medication delivery device including disposable and reusable portions

Abstract

A medication delivery device includes a disposable portion and a reusable portion. The disposable portion includes a therapeutic agent delivery assembly, and the therapeutic agent delivery assembly includes a needle. The therapeutic agent delivery assembly is translatable from a stowed configuration to a deployed configuration. The reusable portion includes a first rack and pinion mechanism and a second rack and pinion mechanism. The first rack and pinion mechanism is actuatable to translate the therapeutic agent delivery assembly from the stowed configuration to the deployed configuration. The second rack and pinion mechanism is actuatable to translate a plunger and thereby cause the therapeutic agent delivery assembly to deliver a therapeutic agent from the needle.

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Background/Summary

BACKGROUND

(1) The present disclosure pertains to medication delivery devices, and, in particular, to a portable medication delivery device such as an injector pen.

(2) Patients suffering from a number of different diseases frequently must inject themselves with medication. To allow a person to conveniently and accurately self-administer medicine, a variety of devices broadly known as injector pens or injection pens have been developed. Generally, these pens are equipped with a cartridge including a piston and one or more doses of liquid medication. A drive member, extending from within a base of the injector pen and operably connected with typically more rearward mechanisms of the pen that control drive member motion, is movable forward to advance the piston in the cartridge in such a manner to dispense the contained medication from an outlet at the opposite cartridge end, typically through a needle that penetrates a stopper at that opposite end. In disposable pens, after a pen has been used and exhausted the supply of medication within the cartridge, the entire pen is discarded by a user, who may then begin using a replacement pen. In reusable pens, after a pen has been used and exhausted the supply of medication within the cartridge, the pen is disassembled, the spent cartridge is replaced with a fresh cartridge, and the pen is reassembled for its subsequent use.

(3) It would be desirable to provide a medication delivery device with improved features, such as a providing a reusable device that facilitates ease of replacement of a spent cartridge with a fresh cartridge and reduces the size and/or the number of components of the spent cartridge to reduce waste.

SUMMARY

(4) According to an embodiment of the present disclosure, a medication delivery device is provided. The medication delivery device includes a disposable portion and a reusable portion. The disposable portion includes a housing having a distal end and a therapeutic agent delivery assembly carried by the housing. The therapeutic agent delivery assembly includes a chamber including a passageway, a therapeutic agent carried in the passageway, and a needle in communication with the passageway. The therapeutic agent delivery assembly is translatable relative to the housing from a stowed configuration to a deployed configuration, in the stowed configuration the needle is disposed proximally relative to the distal end of the housing, and in the deployed configuration the needle at least partially extends distally from the distal end of the housing. The reusable portion includes a housing and a drive mechanism carried by the housing of the reusable portion. The drive mechanism includes a first rack and pinion mechanism and a frame translatably carried by the housing of the reusable portion via the first rack and pinion mechanism. The drive mechanism further includes a second rack and pinion mechanism coupled to the frame and a plunger translatably carried by the frame via the second rack and pinion mechanism. The first rack and pinion mechanism is actuatable to translate the frame relative to the housing of the reusable portion, and the frame thereby translates the therapeutic agent delivery assembly relative to the housing of the disposable portion from the stowed configuration to the deployed configuration. The second rack and pinion mechanism is actuatable to translate the plunger relative to the frame, the plunger thereby causes the therapeutic agent delivery assembly to deliver the therapeutic agent from the needle.

(5) According to another embodiment of the present disclosure, a method for delivering a therapeutic agent from a medication delivery device to a patient is provided. The medication delivery device includes a reusable portion and a disposable portion that is detachably carried by the reusable portion, and the disposable portion carries the therapeutic agent. The method includes positioning a distal end of the disposable portion adjacent to the skin of the patient, and a needle of

the disposable portion is disposed proximally relative to the distal end of the disposable portion. The method further includes actuating a first rack and pinion mechanism of the reusable portion to thereby drive the needle relative to the distal end of the disposable portion such that the needle at least partially extends distally from the distal end of the disposable portion and pierces the skin of the patient. The method further includes actuating a second rack and pinion mechanism of the reusable portion to thereby cause the disposable portion to deliver the therapeutic agent from the needle to the patient.

(6) According to yet another embodiment of the present disclosure, a disposable portion for a medication delivery device is provided. The medication delivery device includes a reusable portion that is configured to detachably carry the disposable portion. The disposable portion includes a housing having a distal end and a therapeutic agent delivery assembly translatably carried in the housing. The therapeutic agent delivery assembly includes a chamber having a passageway, a therapeutic agent carried in the passageway, and a needle in communication with the passageway. A biasing element is carried in the housing, and the biasing element biases the therapeutic agent delivery assembly toward a stowed configuration. In the stowed configuration the needle is disposed proximally relative to the distal end of the housing. A proximal cover is carried by the housing. The proximal cover retains the therapeutic agent delivery assembly in the housing, and the proximal cover includes a securing feature that is configured to detachably secure the disposable portion to the reusable portion. The therapeutic agent delivery assembly is translatable by the reusable portion relative to the housing from the stowed configuration to a deployed configuration. In the deployed configuration the needle at least partially extends distally from the distal end of the housing.

(7) According to yet another embodiment of the present disclosure, a drive portion of a medication delivery device is provided. The drive portion includes a housing and a drive mechanism carried by the housing. The drive mechanism includes a first rack and pinion mechanism, and a frame translatably carried by the housing via the first rack and pinion mechanism. Also includes is a second rack and pinion mechanism coupled to the frame, and a plunger translatably carried by the frame via the second rack and pinion mechanism. The first rack and pinion mechanism is actuatable to translate the frame relative to the housing configured to translate a therapeutic agent delivery assembly from a stowed configuration to a deployed configuration. The second rack and pinion mechanism is actuatable to translate the plunger relative to the frame to deliver a therapeutic agent from a needle of the therapeutic agent delivery assembly.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) The above-mentioned and other advantages and objects of this invention, and the manner of attaining them, will become more apparent, and the invention itself will be better understood, by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

(2) FIG. **1** is a perspective view of a medication delivery device according to an embodiment of the present disclosure.

(3) FIG. **2** is a side view of the medication delivery device of FIG. **1**.

(4) FIG. **3** is a side view of a reusable portion of the medication delivery device of FIG. **1**.

(5) FIG. **4** is an exploded perspective view of the reusable portion of FIG. **3**.

(6) FIG. **5** is a perspective view of a first housing portion of the reusable portion of FIG. **3**.

(7) FIG. **6** is a side view of the first housing portion of FIG. **5**.

(8) FIG. **7** is a perspective view of a second housing portion of the reusable portion of FIG. **3**.

(9) FIG. **8** is a side view of the second housing portion of FIG. **7**.

(10) FIG. **9** is a perspective view of a frame and first and second actuators of the reusable portion of FIG. **3**.
(11) FIG. **10** is another perspective view of the frame and the first and second actuators of FIG. **9**.
(12) FIG. **11** is a perspective view of a plunger of the reusable portion of FIG. **3**.
(13) FIG. **12** is a schematic representation of an electronics assembly of the reusable portion of FIG. **3**.
(14) FIG. **13** is a side view of a disposable portion of the medication delivery device of FIG. **1**.
(15) FIG. **14** is an exploded side view of the disposable portion of FIG. **13**.
(16) FIG. **15** is a top perspective view of a proximal cover of the of the disposable portion of FIG. **13**.
(17) FIG. **16** is a bottom perspective view of the proximal cover of FIG. **15**.
(18) FIG. **17** is a side view of a therapeutic agent delivery assembly of the disposable portion of FIG. **13**.
(19) FIG. **18** is a longitudinal sectional view of the therapeutic agent delivery assembly along line **18-18** of FIG. **17**.
(20) FIG. **19** is a side view of a housing of the disposable portion of FIG. **13**.
(21) FIG. **20** is a longitudinal sectional view of the housing along line **20-20** of FIG. **19**.
(22) FIG. **21** is a top perspective view of a baseplate of the disposable portion of FIG. **13**.
(23) FIG. **22** is a bottom perspective view of the baseplate of FIG. **21**.
(24) FIG. **23** is a longitudinal sectional view of the baseplate along line **23-23** of FIG. **22**.
(25) FIG. **24** is an exploded perspective view of a base portion of the disposable portion of FIG. **13**.
(26) FIG. **25** is another exploded perspective view of the base portion of FIG. **24**.
(27) FIG. **26** is a perspective view of an alternative shield puller for the base portion of FIG. **24**.
(28) FIG. **27** is a perspective view of an alternative basecap for the base portion of FIG. **24**.
(29) FIG. **28** is a longitudinal sectional view of the medication delivery device of FIG. **1** before coupling the disposable portion to the reusable portion.
(30) FIG. **29** is a longitudinal sectional view of the medication delivery device of FIG. **1** upon coupling the disposable portion to the reusable portion.
(31) FIG. **30** is a longitudinal sectional view of the medication delivery device of FIG. **1** upon detaching the base portion from the disposable portion.
(32) FIG. **31** is a longitudinal sectional view of the medication delivery device of FIG. **1** upon abutting the skin of a patient and actuating a user input of the device.
(33) FIG. **32** is a longitudinal sectional view of the medication delivery device of FIG. **1** upon deploying a needle from the device and piercing the skin of the patient.
(34) FIG. **33** is a longitudinal sectional view of the medication delivery device of FIG. **1** upon delivering a therapeutic agent to the patient via the needle.
(35) FIG. **34** is a longitudinal sectional view of the medication delivery device of FIG. **1** upon retracting the needle from the patient.
(36) FIG. **35** is a longitudinal sectional view of the medication delivery device of FIG. **1** upon retracting the plunger from the therapeutic agent delivery assembly.
(37) FIG. **36** is a longitudinal sectional view of the medication delivery device of FIG. **1** while detaching the disposable portion from the reusable portion.
(38) FIG. **37** is a partial longitudinal sectional view of the medication delivery device of FIG. **1** after detaching the disposable portion from the reusable portion.
(39) Corresponding reference characters indicate corresponding parts throughout the several views. Although the drawings represent embodiments of the present invention, the drawings are not necessarily to scale, and certain features may be exaggerated or omitted in some of the drawings in order to better illustrate and explain the present invention.

DETAILED DESCRIPTION

(40) Any directional references used with respect to any of the Figures, such as right or left, up or

down, or top or bottom, are intended for convenience of description, and does not limit the present disclosure or any of its components to any particular positional or spatial orientation.

(41) FIGS. **1** and **2** illustrate a medication delivery device **10** according to an exemplary embodiment of the present disclosure. Illustratively, the medication delivery device **10** has an injector pen-like shape, although other shapes may alternatively be used. The medication delivery device **10** generally includes a reusable portion **12**, which may also be referred to as a drive portion, and a disposable portion **14**, which may also be referred to as a drug carrying portion. The reusable portion **12** facilitates delivery of a therapeutic agent (shown elsewhere) from the disposable portion **14**. In addition, the reusable portion **12** detachably couples to the disposable portion **14** such that after the therapeutic agent has been delivered from the disposable portion **14**, the disposable portion **14** may be detached from the reusable portion **12** and discarded. Another disposable portion (not shown—for example, having the same or different features than the disposable portion **14**) may then be attached to the reusable portion **12**, and the medication delivery device **10** is thereby ready for subsequent use. In one embodiment, the reusable portion **12** and the disposable portion **14** may be permanently secured to one another to define a disposable device.

(42) The medication delivery device **10** also includes a proximal end **16** and an opposite distal end **18**. During use of the medication delivery device **10**, the proximal end **16** would be farther from the patient and configured to be actuated by the user, and the distal end **18** would be closer to the patient and configured to deliver the therapeutic agent (shown elsewhere) to the patient. The medication delivery device **10** also includes a longitudinal axis A extending between the proximal end **16** and the distal end **18**. These and other features of the medication delivery device **10** are described in further detail below.

(43) FIGS. **3** and **4** illustrate the reusable portion **12** of the medication delivery device **10**. With specific reference to the exploded view of FIG. **4**, the reusable portion **12** generally includes a housing **20** that carries a drive mechanism **22**, a biasing element **24** (illustratively, a compression spring), and a user input or button **26**. The reusable portion **12** further includes an electronics assembly (shown elsewhere) that facilitates actuating the drive mechanism **22**.

(44) The housing **20** illustratively includes a first housing portion **28** and a second housing portion **30** that carry the drive mechanism **22**. The housing **20** further includes a third housing portion **32** that carries the user input **26**. Illustratively, the drive mechanism **22** includes a frame **34** that is translatably carried by the housing **20** and a plunger **36** that is translatably carried by the frame **34**. The drive mechanism **22** further includes a first rack and pinion mechanism **38** (only partially visible in FIG. **4**) and a second rack and pinion mechanism **40**. The first rack and pinion mechanism **38** and the second rack and pinion mechanism **40** are actuatable to drive the frame **34** relative to the housing **20** and the plunger **36** relative to the frame **34**, respectively, to facilitate delivery of the therapeutic agent from the medication delivery device **10**. The housing **20**, the drive mechanism **22**, and other features of the reusable portion **12** of the medication delivery device **10** are described in further detail below. In one embodiment the device includes one of the first or second rack and pinion mechanisms and another mechanism that is not a rack and pinion may be used for the syringe drive and plunger drive, such as a spring drive, a rotary or linear electric motor drive, chemical reaction drive, or the like.

(45) FIGS. **5** and **6** illustrate the first housing portion **28** of the housing **20**. The first housing portion **28** includes an external surface **42** and an opposite internal surface **44**. The internal surface **44** partially defines an inner chamber **46** that receives the drive mechanism **22** (shown elsewhere). The internal surface **44** also defines a first rack **48** of the first rack and pinion mechanism **38** (shown elsewhere). Stated another way, the first housing portion **28** and the first rack **48** are monolithically formed with each other. The first housing portion **28** further includes upper and lower coupling surfaces **50** on opposite sides of the internal surface **44**. The coupling surfaces **50** each include one or more coupling features **52** (illustratively, a plurality of threaded holes) that facilitate coupling the first housing portion **28** to the second housing portion **30** (shown elsewhere).

In other embodiments, different arrangements of the first housing portion **28** are possible. For example, the first housing portion **28** and the first rack **48** may be formed separately, and the first rack **48** may be coupled to the internal surface **44** of the first housing portion **28** via, for example, one or more fasteners (not shown) and/or adhesives (not shown).

(46) FIGS. **7** and **8** illustrate the second housing portion **30** of the housing **20**. The second housing portion **30** includes an external surface **54** and an opposite internal surface **56**. The internal surface **56** defines, together with the first housing portion **28** (shown elsewhere), the inner chamber **46** that receives the drive mechanism **22** (shown elsewhere). The internal surface **56** also defines a translation feature **58** that facilitates translatably carrying the frame **34**. Stated another way, the second housing portion **30** and the translation feature **58** are monolithically formed with each other. Illustratively, the translation feature **58** is provided as an elongated protrusion. The second housing portion **30** further includes upper and lower coupling surfaces **60** on opposite sides of the internal surface **56**. The coupling surfaces **60** each include one or more coupling features **62** (illustratively, a plurality of apertures for receiving threaded fasteners—not shown) that facilitate coupling the second housing portion **30** to the first housing portion **28**. The second housing portion **30** further includes a coupling portion **64** for detachably securing the reusable portion **12** to the disposable portion **14** (shown elsewhere). Illustratively, the coupling portion **64** includes a cylindrical wall **66** for receiving the disposable portion **14** and a plurality of securing features **68** (one of which is shown in FIG. **7**) for securing the disposable portion **14** to the reusable portion **12**. The securing features **68** may provide a bayonet-like or "twist-to-lock" connector; more specifically, the securing features **68** may be generally L-shaped protrusions. In other embodiments, different arrangements of the second housing portion **30** are possible. For example, the second housing portion **30** and the translation feature **58** may be formed separately, and the translation feature **58** may be coupled to the internal surface **56** of the second housing portion **30** via, for example, one or more fasteners (not shown) and/or adhesives (not shown). As another example, instead of providing the translation feature **58** as a positive feature (illustratively, the elongated protrusion), the translation feature **58** could be a negative feature (for example, an elongated slot—not shown). Other kinds of securing features **68** may be used, such as, for example, a flexing tab-in-slot connection, a threaded connection, a magnetic connection, or a key-in-slot connection.

(47) FIGS. **9** and **10** partially illustrate the drive mechanism **22** of the reusable portion **12** of the medication delivery device **10**. More specifically, FIGS. **9** and **10** illustrate the frame **34**, a first actuator **70** of the first rack and pinion mechanism **38** (shown elsewhere), and a second actuator **72** of the second rack and pinion mechanism **40** (shown elsewhere). The frame **34** includes a first mounting portion **74** that carries the first actuator **70** and a second mounting portion **76** that carries the second actuator **72**. Opposite the first mounting portion **74** and the second mounting portion **76**, the frame **34** further includes a translation feature **78** that couples to the translation feature **58** of the second housing portion **30** (shown elsewhere). Illustratively, the translation feature **58** is provided as an elongated slot. The frame **34** further includes a plunger aperture **80** that translatably receives the plunger **36** (shown elsewhere). In other embodiments, different arrangements of the frame **34** are possible. For example, instead of providing the translation feature **78** as a negative feature (illustratively, the elongated slot), the translation feature **78** could be a positive feature (for example, an elongated protrusion—not shown).

(48) With continued referenced to FIGS. **9** and **10**, the first actuator **70** includes a first motor **82** (for example, a stepper motor) that is carried by the first mounting portion **74** of the frame **34**. The first actuator **70** further includes a first pinion **84** that is rotatably driven by energizing the first motor **82**. The first pinion **84** drivingly engages the first rack **48** of the first rack and pinion mechanism **38** (shown elsewhere). As such, energizing the first motor **82** causes the first pinion **84** to rotate and drive the first rack **48**, which causes the frame **34** to translate relative to the housing **20** (both shown elsewhere). Similarly, the second actuator **72** includes a second motor **86** (for example, a stepper motor) that is carried by the second mounting portion **76** of the frame **34**. The

second actuator **72** further includes a second pinion **88** that is rotatably driven by energizing the second motor **86**. The second pinion **88** drivingly engages a second rack of the second rack and pinion mechanism **40** (shown elsewhere), which, as described in further detail below, is coupled to the plunger **36** (shown elsewhere). As such, energizing the second motor **86** causes the second pinion **88** to rotate and drive the second rack, which causes the plunger **36** to translate relative to the frame **34**.

(49) FIG. **11** illustrates the plunger **36** of the reusable portion **12** of the medication delivery device **10**. The plunger **36** includes an elongated shaft **92**, and a side of the shaft **92** defines the second rack **90** of the second rack and pinion mechanism **40** (shown elsewhere). Stated another way, the shaft **92** and the second rack **90** are monolithically formed with each other. The shaft **92** terminates at a distal end **94**. The distal end **94** is configured to engage and actuate the disposable portion **14** (shown elsewhere) and thereby facilitate delivering the therapeutic agent from the disposable portion **14**, as described in further detail below. In other embodiments, different arrangements of the plunger **36** are possible. For example, the plunger **36** and the second rack **90** may be formed separately, and the second rack **90** may be coupled to the plunger **36** via, for example, one or more fasteners (not shown) and/or adhesives (not shown).

(50) FIG. **12** illustrates the electronics assembly **96** of the reusable portion **12** of the medication delivery device **10**. The electronics assembly **96** includes an electronic controller **98** that is operatively coupled to and receives power from a power supply **100** (illustratively, a battery). The electronic controller **98** operatively couples to the user input **26**. Actuation of the user input **26** (for example, depressing the user input **26**) may cause the user input **26** to send an actuation signal to the electronic controller **98** (for example, by closing an electrical circuit). The electronic controller **98** also operatively couples to the first actuator **70** and the second actuator **72**. Upon receiving the actuation signal from the user input **26**, the electronic controller **98** may energize the first actuator **70** and the second actuator **72** (for example, sequentially, as described in further detail below). In other embodiments, the electronics assembly **96** may take other forms. For example, the electronics assembly **96** and the electronic controller **98** may operatively couple to and receive power from an external power supply (not shown—for example, a wall outlet).

(51) FIGS. **13** and **14** illustrate the disposable portion **14** of the medication delivery device **10**. With specific reference to the exploded view of FIG. **14**, the disposable portion **14** generally includes a housing **102** that carries a coupling element or proximal cover **104**, a biasing element **106** (illustratively, a compression spring), a therapeutic agent delivery assembly **108**, a baseplate **110**, and a base portion **112**.

(52) FIGS. **15** and **16** illustrate the proximal cover **104** of the disposable portion **14** of the medication delivery device **10**. The proximal cover **104** includes a main body **114** that has a generally cylindrical shape. The main body **114** includes an inner passageway **116** that receives other components, including the biasing element **106** and the therapeutic agent delivery assembly **108** of the disposable portion **14** (both shown elsewhere) and the plunger **36** of the reusable portion **12** (shown elsewhere). An inner surface **118** of the proximal cover **104** carries a biasing platform **120** (illustratively, a radially-inwardly extending flange) that inhibits the therapeutic agent delivery assembly **108** from extending proximally through the inner passageway **116**. The inner surface **118** also includes a coupling feature **122** (illustratively, a threaded surface) for coupling the proximal cover **104** to the housing **102** (shown elsewhere). An outer surface **124** of the proximal cover **104** also includes a plurality of securing features **126** for selectively coupling to the securing features **68** of the reusable portion **12** (shown elsewhere) and thereby selectively securing the disposable portion **14** to the reusable portion **12**. The securing features **126** may provide a bayonet-like or "twist-to-lock" connector; more specifically, the securing features **126** may be generally L-shaped recesses. In other embodiments, different arrangements of the proximal cover **104** are possible. For example, the coupling feature **122** may be a welded connection to the housing **102**.

(53) FIGS. **17** and **18** illustrate the therapeutic agent delivery assembly **108** of the disposable

portion **14** of the medication delivery device **10**. The therapeutic agent delivery assembly **108** includes a syringe chamber **128**, and the syringe chamber **128** includes a syringe passageway **130** that has a proximal opening **132**. The proximal opening **132** receives the plunger **36** of the disposable portion **14** (shown elsewhere). The syringe passageway **130** carries a piston **134**, and the piston **134** translates away from the proximal opening **132** and towards an outlet portion **136** of the therapeutic agent delivery assembly **108** when the plunger **36** is driven by the drive mechanism **22** of the reusable portion **12** (shown elsewhere). The syringe passageway **130** also carries the therapeutic agent **138** (illustratively, 1 mL of the therapeutic agent **138**, although other volumes, including, for example, 0.5 mL, 1.5 mL, 1.75 mL, 2 mL, 2.25 mL, or 2.5 mL may alternatively be carried) between the piston **134** and the outlet portion **136**, more specifically a needle **140**. As such, translation of the piston **134** in the syringe passageway **130** causes the needle **140** to discharge the therapeutic agent **138** therefrom. The therapeutic agent delivery assembly **108** further includes a proximal stop element **142** (illustratively, a semi-annular ring) that is carried by the syringe chamber **128** adjacent to the proximal opening **132**. The proximal stop element **142** includes a distal side **144** that abuts the biasing element **106** (shown elsewhere), and the biasing element **106** thereby urges an opposite proximal side **146** of the proximal stop element **142** to abut the biasing platform **120** of the proximal cover **104** (shown elsewhere). The therapeutic agent delivery assembly **108** further includes a distal stop element **148** (illustratively, a semi-annular sleeve) that is carried by the syringe chamber **128** adjacent to the outlet portion **136**. The distal stop element **148** abuts the baseplate **110** (shown elsewhere) to limit distal translation of the therapeutic agent delivery assembly **108** relative to the baseplate **110**. In other embodiments, different arrangements of the therapeutic agent delivery assembly **108** are possible. For example, the therapeutic agent delivery assembly **108** could be replaced by or include another type of therapeutic agent container, such as a bellows or bladder structure.

(54) Medication delivery devices according to the present disclosure carry and dispense one or more therapeutic agents, which may also be referred to as medications or drugs. Such therapeutic agents **138** may include, for example, epinephrine, anesthetics, analgesics, steroids, insulins, insulin analogs, insulin derivatives, GLP-1 receptor agonists such as dulaglutide or liraglutide, glucagon, glucagon analogs, glucagon derivatives, gastric inhibitory polypeptide (GIP), GIP analogs, GIP derivatives, combined GIP/GLP-1 agonists such as tirzepatide, oxyntomodulin analogs, oxyntomodulin derivatives, basal insulins, therapeutic antibodies, which may include IL-17A antagonist such as ixekizumab, calcitonin-gene related peptide antagonist such as galcanezumab, IL-13 monoclonal antibody such as lebrikizumab, IL-23 antibody such as mirikizumab, IL-2 conjugate, PD-1 antibody agonist, ramucirumab or other cancer treatments, or any other therapeutic agent that is capable of delivery by devices according to the present disclosure. Medication delivery devices according to the present disclosure are operated in a manner generally as described herein by a user (for example, a healthcare professional, a caregiver, or another person) to deliver one or more therapeutic agents to a patient (for example, another person or the user).

(55) FIGS. **19** and **20** illustrate the housing **102** of the disposable portion **14** of the medication delivery device **10**. The housing **102** includes a main body **150** that has a generally cylindrical shape that flares outwardly at the distal end **18**. The main body **150** includes an inner passageway **152** that carries other components of the disposable portion **14**, specifically the therapeutic agent delivery assembly **108**, the biasing element **106**, the baseplate **110**, and the base portion **112** (all shown elsewhere). Adjacent to the inner passageway **152**, an inner surface **154** of the housing **102** carries a biasing platform **156** (illustratively, a radially-inwardly extending flange) that abuts the biasing element **106** (shown elsewhere). As such, the housing **102** carries the biasing element **106** between the biasing platform **156** and the proximal stop element **142** of the therapeutic agent delivery assembly **108** (shown elsewhere). Externally and at a proximal end **158**, the housing **102** further includes a coupling feature **160** (illustratively, a threaded surface) for coupling to the

proximal cover **104** (shown elsewhere), and the proximal cover **104** retains the therapeutic agent delivery assembly **108** in the inner passageway **152** of the housing **102**. In other embodiments, different arrangements of the housing **102** are possible. For example, the coupling feature **160** may be a welded connection to the proximal cover **104**. As another example, the housing **102** may have a non-flaring shape at the distal end **18**.

(56) FIGS. **21-23** illustrate the baseplate **110** of the disposable portion **14** of the medication delivery device **10**. The baseplate **110** includes a main body **162** that has a generally cylindrical shape with an outwardly extending flange **164** at the distal end **18**. The main body **162** includes an inner passageway **166** that carries other components of the disposable portion **14**, specifically the therapeutic agent delivery assembly **108** and the base portion **112** (both shown elsewhere). Adjacent to the inner passageway **166**, an inner surface **168** of the baseplate **110** carries a stop element **170** (illustratively, a radially-inwardly extending flange) that abuts the distal stop element **148** of the therapeutic agent delivery assembly **108** (shown elsewhere) to limit distal translation of the therapeutic agent delivery assembly **108** relative to the baseplate **110**. A distal portion **172** of the inner surface **168** also carries one or more guard features **174** (illustratively, a plurality of elongated ridges, more specifically three ridges) that inhibit objects (such as a fingertip of the user or patient) from entering the inner passageway **166** and contacting the needle **140** of the therapeutic agent delivery assembly **108** (shown elsewhere). In other embodiments, other arrangements of the baseplate **110** are possible. For example, the baseplate **110** may lack the outwardly extending flange **164** at the distal end **18**.

(57) FIGS. **24** and **25** illustrate the base portion **112** of the disposable portion **14** of the medication delivery device **10**. The base portion **112** is initially and detachably carried at the distal end **18** of the disposable portion **14**. The base portion **112** includes a needle shield **176**, which may also be referred to as a rigid needle shield, a shield puller **178**, and a basecap **180**. The needle shield **176** initially covers and maintains sterility of the needle **140** of the therapeutic agent delivery assembly **108** (shown elsewhere). The shield puller **178** couples the needle shield **176** to the basecap **180** and facilitates separating the needle shield **176** from the needle **140** upon detaching the basecap **180** from the housing **102** (shown elsewhere). The basecap **180** initially obscures the inner passageway **166** of the baseplate **110** (shown elsewhere) and retains the shield puller **178** and the needle shield **176** adjacent to the needle **140**. The base portion **112** may be appropriate for use with a medication delivery device **10** carrying a specific volume of the therapeutic agent **138**, such as 1 mL of the therapeutic agent **138**. The base portion **112** or one or more components thereof, such as the puller **178** and the basecap **180**, may alternatively have different features and/or dimensions, for example, for a medication delivery device **10** carrying a different volume of the therapeutic agent **138**, such as 2 mL of the therapeutic agent **138**.

(58) In other embodiments, other arrangements of the base portion **112** are possible. For example, FIG. **26** illustrates an alternative shield puller **182** and FIG. **27** illustrates an alternative basecap **184** that may be used instead of the shield puller **178** and the basecap **180**, respectively. The shield puller **182** and the basecap **184** include the same features as the shield puller **178** and the basecap **180**, respectively, except that the shield puller **178** and the basecap **180** include guard-receiving features **186** and **188** that, as the name implies, receive the guard features **174** of the baseplate **110**. Illustratively, the guard-receiving features **186** and **188** include a plurality of elongated slots for receiving the elongated ridges of the baseplate **110**.

(59) The medication delivery device **10** may include various alternative or additional features. For example, the medication delivery device **10** may include one or more features that facilitate unlocking the device **10**. As a specific example, the device may include a second user input (not shown—for example, a button) that is actuatable by a user to unlock the device **10** and permit actuation of the first user input **26**. Similarly, the device may include a second user input (not shown—for example, a button) that is actuatable by a user to activate or awaken the electronics assembly **96**. As another specific example, the user input **26** may be a two-stage button that is

initially depressed to unlock the device **10** and further depressed to actuate the device **10**. As yet another example, the disposable portion **14** may include a sensor (not shown) that activates or awakens the electronics assembly **96** upon detecting that the distal end **18** is in contact with a patient. The electronics assembly **96** may include a wireless or wired connection for operatively coupling such a sensor to the electronic controller **98**. As another specific example, the device **10** may include a cover (not shown) for inhibiting accidental actuation of the user input **26**. In some embodiments, the device **10** may include one or more indicators (not shown) that change states to indicate that the device **10** is unlocked. For example, such indicators may include an electronic display or one or more LEDs, such as a yellow LED that illuminates to indicate that the device **10** is locked and a green LED that illuminates to indicate that the device **10** is unlocked.

(60) As another example, the electronics assembly **96** may include various alternative or additional features. As a specific example, the first actuator **70** and/or the second actuator **72** may include sensors (not shown—for example, rotary encoder sensors) to facilitate monitoring and/or providing feedback for the positions of the frame **34** and/or the plunger **36**, respectively. As another specific example, the electronics assembly **96** may include a sensor (not shown) for determining if the disposable portion **14** is coupled to the reusable portion **12**. Such a sensor may activate or "awaken" the electronics assembly **96** upon detecting that the disposable portion **14** is coupled to the reusable portion **12**. As yet another example, the disposable portion **14** may include an identifier (for example, an RFID transmitter or EEPROM) to facilitate providing properties of the therapeutic agent **138** to the reusable portion **12**. Such properties may include, for example, the type and/or volume of the therapeutic agent **138** carried by the therapeutic agent delivery assembly **108**. The reusable portion **12** may use the properties of the therapeutic agent **138** to determine, for example, an appropriate rate for driving the plunger **36** and delivering the therapeutic agent **138** to a patient.

(61) Illustratively, a method of using the medication delivery device **10** is as follows. Referring to FIG. **28**, the medication delivery device **10** is illustrated before coupling the disposable portion **14** to the reusable portion **12**. The disposable portion **14** is coupled to the reusable portion **12** by coupling the securing features **126** of the disposable portion **14** to the securing features **68** of the reusable portion **12**. More specifically, the disposable portion **14** is translated relative to the reusable portion **12** in a proximal direction D**1** until the proximal cover **104** of the disposable portion **14** is received in the coupling portion **64** of the reusable portion **12**, and then the disposable portion **14** is rotated relative to the reusable portion **12** in a rotational direction R**1** to secure the L-shaped recesses of the proximal cover **104** to the L-shaped protrusions of the reusable portion **12**. The medication delivery device **10** may be provided to a user before or after coupling the disposable portion **14** to the reusable portion **12**.

(62) Referring to FIG. **29**, upon coupling the disposable portion **14** to the reusable portion **12**, the device **10** occupies a "loaded" or "ready" configuration. In the ready configuration, the frame **34** of the drive mechanism **22** abuts the proximal stop element **142** of the therapeutic agent delivery assembly **108** and the plunger **36** abuts the piston **134** of the therapeutic agent delivery assembly **108**. In addition, the base portion **112** obscures the needle **140**, and the therapeutic agent delivery assembly **108** is disposed in a stowed configuration in which the needle **140** is disposed proximally relative to the distal end **18** of the device **10**.

(63) Referring to FIG. **30**, the base portion **112** is next detached from the disposable portion **14**. More specifically, the base portion **112** is translated relative to the disposable portion **14** in a distal direction D**2**. Upon detaching the base portion **112** from the disposable portion **14**, the inner passageway **166** of the baseplate **110** is unobscured, but the therapeutic agent delivery assembly **108** remains in the stowed configuration.

(64) Referring to FIG. **31**, the device **10** is then positioned such that the distal end **18** abuts the skin S of a patient. The user input **26** is next actuated (illustratively, depressed in a distal direction D**3** for 3 seconds) to, generally, actuate the device **10** and deliver the therapeutic agent **138** to the

patient.
(65) Referring to FIG. **32**, the electronic controller **98** (shown elsewhere) energizes the first actuator **70** to distally advance the needle **140**. More specifically, the electronic controller **98** energizes the first motor **82**, and the first motor **82** rotatably drives the first pinion **84** in a rotational direction R**2**. The driving engagement of the first pinion **84** with the first rack **48** causes the drive mechanism **22** to translate relative to the housing **20** in a distal, first drive direction D**4**. As illustrated, the first drive direction D**4** may be substantially parallel to the longitudinal axis A (that is, parallel±5 degrees). The biasing element **24** may expand to assist translating the drive mechanism **22** relative to the housing **20** in the first drive direction D**4**. The frame **34** of the drive mechanism **22** pushes the therapeutic agent delivery assembly **108** in the first drive direction D**4** and compresses the biasing element **106**. The therapeutic agent delivery assembly **108** thereby moves from the stowed configuration to a deployed configuration. In the deployed configuration, the needle **140** at least partially extends distally from the distal end **18** of the device **10** and pierces the skin S of the patient.
(66) Referring to FIG. **33**, the electronic controller **98** (shown elsewhere) next energizes the second actuator **72** to deliver the therapeutic agent **138** to the patient. More specifically, the electronic controller **98** energizes the second motor **86**, the second motor **86** rotatably drives the second pinion **88** in a rotation direction R**3**. The second pinion **88** translatably drives the second rack **90** and the plunger **36** relative to the frame **34** in a distal, second drive direction D**5**. As illustrated, the second drive direction D**5** may be substantially parallel to the longitudinal axis A (that is, parallel±5 degrees). The plunger **36** pushes the piston **134** of the therapeutic agent delivery assembly **108** in the second drive direction D**5**. The piston **134** thereby pushes the therapeutic agent **138** distally to the needle **140**, and the needle **140** delivers the therapeutic agent **138** to the patient.
(67) Referring to FIG. **34**, the electronic controller **98** (shown elsewhere) then energizes the first actuator **70** to proximally retract the needle **140**. More specifically, the electronic controller **98** energizes the first motor **82**, and the first motor **82** rotatably drives the first pinion **84** in a rotational direction R**4**. The driving engagement of the first pinion **84** with the first rack **48** causes the drive mechanism **22** to translate relative to the housing **20** in a proximal, first retraction direction D**6**. As illustrated, the first retraction direction D**6** may be substantially parallel to the longitudinal axis A (that is, parallel±5 degrees). This motion of the drive mechanism **22** permits the biasing element **106** to expand and translate the therapeutic agent delivery assembly **108** in the first retraction direction D**6**. The therapeutic agent delivery assembly **108** thereby moves from the deployed configuration to a retracted configuration. In the retracted configuration, the needle **140** is withdrawn from the skin S of the patient and is disposed proximally relative to the distal end **18** of the device **10**.
(68) Referring to FIG. **35**, the electronic controller **98** (shown elsewhere) next energizes the second actuator **72** to retract the plunger **36** from the therapeutic agent delivery assembly **108**. More specifically, the electronic controller **98** energizes the second motor **86**, the second motor **86** rotatably drives the second pinion **88** in a rotation direction R**5**. The second pinion **88** translatably drives the second rack **90** and the plunger **36** relative to the frame **34** in a proximal, second retraction direction D**7**. As illustrated, the second retraction direction D**7** may be substantially parallel to the longitudinal axis A (that is, parallel±5 degrees). The device **10** may be moved away from the skin S of the patient before or after retracting the plunger **36**.
(69) Referring to FIG. **36**, the disposable portion **14** may then be detached from the reusable portion **12**. The disposable portion **14** is detached from the reusable portion **12** by uncoupling the securing features **126** of the disposable portion **14** from the securing features **68** of the reusable portion **12**. More specifically, the disposable portion **14** is rotated relative to the reusable portion **12** in a rotational direction R**6** to disengage the L-shaped recesses of the proximal cover **104** from the L-shaped protrusions of the reusable portion **12**, and then the disposable portion **14** is translated relative to the reusable portion **12** in a distal direction D**8** until the proximal cover **104** of the

disposable portion **14** is detached from the coupling portion **64** of the reusable portion **12**.
(70) Referring to FIG. **37**, upon detaching the spent disposable portion **14** from the reusable portion **12**, the spent disposable portion **14** may be discarded, and the method of using the device **10** may be repeated with a fresh disposable portion **14**.
(71) While this invention has been shown and described as having preferred designs, the present invention may be modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains.
(72) Various aspects are described in this disclosure, which include, but are not limited to, the following aspects:
(73) 1. A medication delivery device, including: a disposable portion, including: a housing having a distal end; a therapeutic agent delivery assembly carried by the housing, the therapeutic agent delivery assembly including: a chamber including a passageway to carry a therapeutic agent; a needle in communication with the passageway; the therapeutic agent delivery assembly being translatable relative to the housing from a stowed configuration to a deployed configuration, in the stowed configuration the needle being disposed proximally relative to the distal end of the housing, and in the deployed configuration the needle at least partially extending distally from the distal end of the housing; a reusable portion detachably carrying the disposable portion, the reusable portion including: a housing; a drive mechanism carried by the housing of the reusable portion, the drive mechanism including: a first rack and pinion mechanism; a frame translatably carried by the housing of the reusable portion via the first rack and pinion mechanism; a second rack and pinion mechanism coupled to the frame; a plunger translatably carried by the frame via the second rack and pinion mechanism; the first rack and pinion mechanism being actuatable to translate the frame relative to the housing of the reusable portion, the frame thereby translating the therapeutic agent delivery assembly relative to the housing of the disposable portion from the stowed configuration to the deployed configuration, and the second rack and pinion mechanism being actuatable to translate the plunger relative to the frame to deliver the therapeutic agent from the needle.
(74) 2. The medication delivery device of aspect 1, wherein the medication delivery device is elongated along a longitudinal axis extending between the disposable portion and the reusable portion, the first rack and pinion mechanism is actuatable to translate the frame relative to the housing of the reusable portion in a drive direction, the drive direction being substantially parallel to the longitudinal axis, and the frame thereby translating the therapeutic agent delivery assembly relative to the housing of the disposable portion in the drive direction and from the stowed configuration to the deployed configuration.
(75) 3. The medication delivery device of aspect 2, wherein the drive direction is a first drive direction, and wherein the second rack and pinion mechanism is actuatable to translate the plunger relative to the frame in a second drive direction, the second drive direction being substantially parallel to the longitudinal axis, and the plunger thereby causing the therapeutic agent delivery assembly to deliver the therapeutic agent from the needle.
(76) 4. The medication delivery device of aspect 1, wherein the medication delivery device is elongated along a longitudinal axis extending between the disposable portion and the reusable portion, the second rack and pinion mechanism is actuatable to translate the plunger relative to the frame in a drive direction, the drive direction being substantially parallel to the longitudinal axis, and the plunger thereby causing the therapeutic agent delivery assembly to deliver the therapeutic agent from the needle.
(77) 5. The medication delivery device of any one of aspects 1-4, wherein the first rack and pinion mechanism includes: a motor carried by the frame; a pinion rotatably driven by the motor; and a rack carried by the housing of the reusable portion and translatably driven by the pinion.
(78) 6. The medication delivery device of aspect 5, wherein the rack is monolithically formed with

the housing of the reusable portion.
(79) 7. The medication delivery device of aspect 5, wherein the motor is a first motor, the pinion is a first pinion, and the rack is a first rack, and wherein the second rack and pinion mechanism includes: a second motor carried by the frame; a second pinion rotatably driven by the second motor; and a second rack carried by the plunger and translatably driven by the second pinion.
(80) 8. The medication delivery device of any one of aspects 1-7, wherein the second rack and pinion mechanism includes: a motor carried by the frame; a pinion rotatably driven by the motor; and a rack carried by the plunger and translatably driven by the pinion.
(81) 9. The medication delivery device of aspect 8, wherein the rack is monolithically formed with the plunger.
(82) 10. The medication delivery device of any one of aspects 1-9, wherein the therapeutic agent delivery assembly is translatable relative to the housing of the disposable portion from the deployed configuration to a retracted configuration, in the retracted configuration the needle being disposed proximally relative to the distal end of the housing of the disposable portion, wherein the first rack and pinion mechanism is actuatable to translate the frame relative to the housing of the reusable portion in a retraction direction, and wherein the therapeutic agent delivery assembly further includes a biasing element, the biasing element elongating when the first rack and pinion mechanism translates the frame relative to the housing of the reusable portion in the retraction direction, and the biasing element thereby translating the therapeutic agent delivery assembly relative to the housing of the disposable portion from the deployed configuration to the retracted configuration.
(83) 11. The medication delivery device of any one of aspects 1-10, wherein the second rack and pinion mechanism is actuatable to translate the plunger relative to the frame in a drive direction, the plunger thereby causing the therapeutic agent delivery assembly to deliver the therapeutic agent from the needle, and wherein the second rack and pinion mechanism is further actuatable to translate the plunger relative to the frame in a retraction direction, the retraction direction being opposite the drive direction.
(84) 12. The medication delivery device of any one of aspects 1-11, wherein the passageway of the chamber includes a therapeutic agent.
(85) 13. A method for delivering a therapeutic agent from a medication delivery device to a patient, the medication delivery device including a reusable portion and a disposable portion detachably carried by the reusable portion, the disposable portion carrying the therapeutic agent, the method including: positioning a distal end of the disposable portion adjacent to the skin of the patient, a needle of the disposable portion being disposed proximally relative to the distal end of the disposable portion; actuating a first rack and pinion mechanism of the reusable portion to thereby drive the needle relative to the distal end of the disposable portion such that the needle at least partially extends distally from the distal end of the disposable portion and pierces the skin of the patient; and actuating a second rack and pinion mechanism of the reusable portion to thereby cause the disposable portion to deliver the therapeutic agent from the needle to the patient.
(86) 14. The method of aspect 13, wherein actuating the first rack and pinion mechanism of the reusable portion to thereby drive the needle relative to the distal end includes driving the needle in a drive direction, and further including, after actuating the second rack and pinion mechanism of the reusable portion, actuating the first rack and pinion mechanism of the reusable portion to thereby drive the needle relative to the distal end of the disposable portion in a retraction direction such that the needle retracts from the skin of the patient.
(87) 15. The method of aspect 14, wherein the disposable portion is a first disposable portion and the therapeutic agent is a first therapeutic agent, the method further including: after actuating the second rack and pinion mechanism of the reusable portion a second time after delivering the first therapeutic agent from the needle to the patient, detaching the first disposable portion from the reusable portion; and attaching a second disposable portion to the reusable portion, the second

disposable portion carrying a second therapeutic agent.
(88) 16. The method of aspect 14, wherein: actuating the first rack and pinion mechanism to drive the needle includes rotating a first pinion in a first direction; actuating the second rack and pinion mechanism to deliver the therapeutic agent from the needle includes rotating a second pinion in a second direction; the method further including: actuating the first rack and pinion mechanism to retract the needle by rotating the first pinion in a third direction opposite the first direction; and actuating the second rack and pinion mechanism to retract a plunger of the reusable portion from the disposable portion by rotating the second pinion in a fourth direction opposite the second direction.
(89) 17. A disposable portion for a medication delivery device, the medication delivery device including a reusable portion configured to detachably carry the disposable portion, the disposable portion including: a housing having a distal end; a therapeutic agent delivery assembly translatably carried in the housing, the therapeutic agent delivery assembly including: a chamber including a passageway; a therapeutic agent carried in the passageway; a needle in communication with the passageway; a biasing element carried in the housing, the biasing element biasing the therapeutic agent delivery assembly toward a stowed configuration, in the stowed configuration the needle being disposed proximally relative to the distal end of the housing; and a proximal cover carried by the housing, the proximal cover retaining the therapeutic agent delivery assembly in the housing, and the proximal cover including a securing feature configured to detachably secure the disposable portion to the reusable portion; the therapeutic agent delivery assembly being translatable by the reusable portion relative to the housing from the stowed configuration to a deployed configuration, in the deployed configuration the needle at least partially extending distally from the distal end of the housing.
(90) 18. The disposable portion of aspect 17, wherein the securing feature of the proximal cover includes a twist-to-lock connector.
(91) 19. The disposable portion of any one of aspects 17-18, wherein the proximal cover includes an inner passageway, the inner passageway being configured to receive a plunger of the reusable portion and permit the plunger to translate the therapeutic agent delivery assembly from the stowed configuration to the deployed configuration.
(92) 20. The disposable portion of any one of aspects 17-19, further including a baseplate carried by the housing, the baseplate including an inner passageway that receives the therapeutic agent delivery assembly, and the baseplate further including a guard feature configured to inhibit entry of foreign objects into the inner passageway.
(93) 21. The disposable portion of aspect 20, wherein the guard feature includes an elongated ridge.
(94) 22. The disposable portion of any one of aspects 17-21, wherein the proximal cover is weldably connected to the housing.
(95) 23. A drive portion of a medication delivery device including: a housing; a drive mechanism carried by the housing, the drive mechanism including: a first rack and pinion mechanism; a frame translatably carried by the housing via the first rack and pinion mechanism; a second rack and pinion mechanism coupled to the frame; a plunger translatably carried by the frame via the second rack and pinion mechanism; the first rack and pinion mechanism being actuatable to translate the frame relative to the housing configured to translate a therapeutic agent delivery assembly from a stowed configuration to a deployed configuration, and the second rack and pinion mechanism being actuatable to translate the plunger relative to the frame to deliver a therapeutic agent from a needle of the therapeutic agent delivery assembly.
(96) 24. The drive portion of aspect 23, wherein the first rack and pinion mechanism includes: a motor carried by the frame; a pinion rotatably driven by the motor; and a rack carried by the housing of the reusable portion and translatably driven by the pinion.
(97) 25. The drive portion of aspect 24, wherein the rack is monolithically formed with the housing of the reusable portion.

(98) 26. The drive portion of any one of aspects 23-25, wherein the motor is a first motor, the pinion is a first pinion, and the rack is a first rack, and wherein the second rack and pinion mechanism includes: a second motor carried by the frame; a second pinion rotatably driven by the second motor; and a second rack carried by the plunger and translatably driven by the second pinion.
(99) 27. The drive portion of aspect 26, wherein the second rack and pinion mechanism includes: a motor carried by the frame; a pinion rotatably driven by the motor; and a rack carried by the plunger and translatably driven by the pinion.
(100) 28. The drive portion of aspect 27, wherein the rack is monolithically formed with the plunger.

Claims

1. A disposable portion for a medication delivery device, the medication delivery device comprising a reusable portion configured to detachably carry the disposable portion, the disposable portion comprising: a housing having a distal end; a therapeutic agent delivery assembly translatably carried in the housing, the therapeutic agent delivery assembly comprising: a chamber comprising a passageway configured to carry a therapeutic agent; a needle in communication with the passageway; a biasing element carried in the housing, the biasing element comprising a spring, the spring biasing the therapeutic agent delivery assembly toward a stowed configuration, in the stowed configuration the needle being disposed proximally relative to the distal end of the housing; and a proximal cover carried by the housing, the proximal cover retaining the therapeutic agent delivery assembly in the housing, and the proximal cover comprising a mechanical or magnetic connector configured to detachably secure the disposable portion to the reusable portion, the proximal cover including a main body and an inner passageway sized to inhibit proximal movement of the therapeutic agent delivery assembly through the inner passageway; the therapeutic agent delivery assembly being translatable by the reusable portion relative to the housing from the stowed configuration to a deployed configuration, in the deployed configuration the needle at least partially extending distally from the distal end of the housing.
2. The disposable portion of claim 1, wherein the mechanical or magnetic connector of the proximal cover comprises a twist-to-lock connector.
3. The disposable portion of claim 1, wherein the inner passageway is configured to receive a plunger of the reusable portion and permit the plunger to translate the therapeutic agent delivery assembly from the stowed configuration to the deployed configuration.
4. The disposable portion of claim 1, further comprising a baseplate carried by the housing, the baseplate comprising an inner passageway that receives the therapeutic agent delivery assembly, and the baseplate further comprising a guard feature configured to inhibit entry of foreign objects into the inner passageway.
5. The disposable portion of claim 4, wherein the guard feature comprises an elongated ridge.
6. The disposable portion of claim 1, wherein the proximal cover is connected to the housing, and the therapeutic agent delivery assembly includes a stop element configured to abut an inside of the proximal cover when being biased by the spring.
7. The disposable portion of claim 1, wherein the passageway of the chamber carries the therapeutic agent, the therapeutic agent comprising epinephrine, an anesthetic, an analgesics, a steroid, an insulin, an insulin analog, an insulin derivative, a GLP-1 receptor agonist, a glucagon, a glucagon analog, a glucagon derivative, a gastric inhibitory polypetide (GIP), a GIP analog, a GIP derivative, a combined GIP/GLP-1 agonist, an oxyntomodulin analog, oxyntomodulin derivative, a basal insulin, IL-17A antagonist, a calcitonin-gene related peptide antagonist, IL-13 monoclonal antibody, IL-23 antibody, IL-2 conjugate, PD-I antibody agonist, or ramucirumab.
8. A medication delivery device, comprising: a disposable portion comprising a housing having a

distal end, a therapeutic agent delivery assembly translatably carried in the housing, the therapeutic agent delivery assembly having a chamber comprising a passageway configured to carry a therapeutic agent, and a needle in communication with the passageway, a biasing element carried in the housing, the biasing element biasing the therapeutic agent delivery assembly toward a stowed configuration, in the stowed configuration the needle being disposed proximally relative to the distal end of the housing; and a proximal cover carried by the housing, the proximal cover retaining the therapeutic agent delivery assembly in the housing, and the proximal cover comprising a mechanical or magnetic configured to detachably secure the disposable portion to the reusable portion; the therapeutic agent delivery assembly being translatable by the reusable portion relative to the housing from the stowed configuration to a deployed configuration, in the deployed configuration the needle at least partially extending distally from the distal end of the housing; and a reusable portion comprising a reusable portion housing, a drive mechanism carried by the reusable portion housing, the drive mechanism comprising: a first rack and pinion mechanism; a frame translatably carried by the reusable portion housing via the first rack and pinion mechanism; a second rack and pinion mechanism coupled to the frame; a plunger translatably carried by the frame via the second rack and pinion mechanism; the first rack and pinion mechanism being actuatable to translate the frame relative to the reusable portion housing to translate the therapeutic agent delivery assembly from the stowed configuration to the deployed configuration, and the second rack and pinion mechanism being actuatable to translate the plunger relative to the housing of the disposable portion to a position closer to the needle of the therapeutic agent delivery assembly.

9. The medication delivery device of claim 8, wherein the first rack and pinion mechanism comprises: a motor carried by the frame; a pinion rotatably driven by the motor; and a rack carried by the reusable portion housing and translatably driven by the pinion.

10. The medication delivery device of claim 9, wherein the rack is monolithically formed with the reusable portion housing.

11. The medication delivery device of claim 9, wherein the motor is a first motor, the pinion is a first pinion, and the rack is a first rack, and wherein the second rack and pinion mechanism comprises: a second motor carried by the frame; a second pinion rotatably driven by the second motor; and a second rack carried by the plunger and translatably driven by the second pinion.

12. The medication delivery device of claim 8, wherein the second rack and pinion mechanism comprises: a motor carried by the frame; a pinion rotatably driven by the motor; and a rack carried by the plunger and translatably driven by the pinion.

13. The medication delivery device of claim 12, wherein the rack is monolithically formed with the plunger.

14. A disposable portion for a medication delivery device, the medication delivery device comprising a reusable portion configured to detachably carry the disposable portion, the disposable portion comprising: a disposable portion housing having a proximal end and a distal end; a syringe translatably carried in the housing, the syringe having a chamber comprising a passageway configured to carry a therapeutic agent, and a needle in communication with the passageway; a proximal stop element surrounding the chamber of the syringe; a compression spring carried in the disposable portion housing, the compression spring biasing the syringe toward a stowed configuration, in which the needle of the syringe is disposed proximally relative to the distal end of the housing; and a proximal cover coupled to the proximal end of the disposable portion housing, the proximal cover retaining the syringe and the compression spring in the disposable portion housing, the proximal cover including a main body and an inner passageway sized to inhibit proximal movement of the therapeutic agent delivery assembly through the inner passageway, the proximal cover comprising a connector to detachably secure the disposable portion to the reusable portion, wherein the syringe is translatable by the reusable portion relative to the disposable portion housing from the stowed configuration to a deployed configuration, in the deployed configuration

the needle of the syringe is at least partially extended distally from the distal end of the disposable portion housing, wherein the compression spring is disposed between the proximal stop element and a position along the syringe, and the compression spring is configured to bias the proximal stop element against an inside of the proximal cover.

15. The disposable portion of claim 14, wherein the compression spring is disposed between the proximal stop element and a platform defined by the disposable portion housing.

16. The disposable portion of claim 15, wherein when the syringe translates to the deployed configuration the syringe moves distally relative to the platform and the compression spring is further axially compressed.

17. The disposable portion of claim 16, wherein after therapeutic agent delivery the compression spring axially expands to move the syringe proximally relative to the platform to a retracted configuration, in the retracted configuration the needle being disposed proximally relative to the distal end of the housing.

18. A medication delivery device, comprising: the disposable portion of claim 17, the passageway of the chamber carrying the therapeutic agent; and a reusable portion comprising a reusable portion housing, a drive mechanism carried by the reusable portion housing, and a frame, the drive mechanism configured to translate the frame distally relative to the reusable portion housing to movably engage the proximal stop element and move the syringe from the stowed configuration to the deployed configuration, by which the compression spring is further axially compressed.

19. The medication delivery device of claim 18, the drive mechanism configured to translate the frame proximally relative to the reusable portion housing to allow the compression spring to axially expand, by which the syringe is moved from the deployed configuration to the retracted configuration.