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Medicament delivery device

Abstract

The present disclosure relates to a medicament delivery device. The medicament delivery device comprises a housing, a dispensing mechanism and an actuator. The housing has first and second portions. The dispensing mechanism comprises a reservoir disposed in the housing. The dispensing mechanism is operable to dispense medicament from the reservoir when the reservoir contains medicament. The first portion of the housing comprises a distal end and the second portion is moveable towards the distal end from an initial position to a primed position. The dispensing mechanism is rendered inoperable when the second portion is in the initial portion. The actuator is actuatable to operate the dispensing mechanism when the second portion is in the primed position.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS (1) The present application is a continuation of U.S. application Ser. No. 16/336,268, filed on Mar. 25, 2019, which is the national stage entry of International Patent Application No. PCT/EP2017/073720, filed on Sep. 20, 2017, and claims priority to Application No. EP 16190880.1, filed on Sep. 27, 2016, the disclosures of which are incorporated herein by reference.

TECHNICAL FIELD
(1) The present disclosure relates to a medicament delivery device.
BACKGROUND
(2) A variety of diseases exist that require regular treatment by injection of a medicament and such injections can be performed by using injection devices. Various injection devices for delivering injections of medicament are known in the art. Another type of injection pump that is gaining traction is the bolus injector device. Some bolus injector devices are intended to be used with relatively large volumes of medicament, typically at least 1 ml and maybe a few ml. Injection of such large volumes of medicament can take some minutes or even hours. Such high capacity bolus injector devices can be called large volume devices (LVDs). Generally such devices are operated by the patients themselves, although they may also be operated by medical personnel.
SUMMARY
(3) The present disclosure relates to an improved medicament delivery device.
(4) There is provided a medicament delivery device comprises: a housing having first and second portions; a dispensing mechanism that comprises a reservoir disposed in the housing, wherein the dispensing mechanism is operable to dispense medicament from the reservoir when the reservoir contains medicament; and, an actuator, wherein the first portion of the housing comprises a distal end and the second portion is moveable towards the distal end from an initial position, wherein actuation of the actuator is impeded such that the dispensing mechanism is rendered inoperable, to a primed position, wherein the actuator is actuatable to operate the dispensing mechanism.
(5) Advantageously, when the second portion of the housing is in the initial position the patient is prevented from accidentally operating the dispensing mechanism. The patient is able to easily render the actuator actuatable to enable operation of the dispensing mechanism by moving the second portion of the housing towards the first portion of the housing.
(6) In one embodiment, the dispensing mechanism further comprises a dispensing member and a biasing member configured to urge the dispensing member to move in a first direction relative to the housing to expel medicament from the reservoir when the reservoir contains medicament.
(7) In one embodiment, the biasing member is configured to resiliently deform when the second portion of the housing is moved from the initial position to the primed position such that the biasing member exerts a biasing force on the dispensing member to urge the dispensing member in the first direction. Thus, the biasing member only needs to be primed immediately before use,

rather than being stored in resiliently deformed state which may otherwise result in degradation of the biasing member over time causing a reduction in the biasing force.
(8) In one embodiment, the medicament delivery device comprises a dispensing lock that is moveable between a locked state, wherein the dispensing member is held in position relative to the housing against the biasing force of the biasing member, and an unlocked state, wherein the dispensing member is able to move in the first direction.
(9) In one embodiment, the actuator is retracted into the housing when the second portion is in the initial position to prevent actuation of the actuator and protrudes out of the housing when the second portion is in the primed position. Advantageously, such a configuration makes it clear to the patient whether the second portion is in the initial or primed position and prevents the patient from trying to force operation of the actuator.
(10) The actuator may comprise a push button. The medicament delivery device may comprise a needle that is configured to protrude from the distal end of the first portion.
(11) In one embodiment, the first and second portions of the housing comprise respective peripheral walls, and wherein the peripheral wall of one of the first and second portions is configured to be received within the peripheral wall of the other one of the first and second portions.
(12) In one embodiment, the housing is configured such that the second portion is slidable relative to the first portion from the initial position to the primed position. This sliding motion of the second portion may be easy for the patient to perform, which is particularly advantageous if the patient is elderly or infirm.
(13) In one embodiment, at least one of the first and second portions comprises a screw thread.
(14) In one embodiment, the medicament delivery device comprises a latch configured to resist movement of the second portion relative to the first portion from the primed position to the initial position. This helps to prevent the actuator from being accidentally rendered operable.
(15) In one embodiment, the first and/or second portion of the housing comprises a filling port for supplying the reservoir with medicament.
(16) The reservoir may contain medicament.
(17) In one embodiment, the distal end of the first portion of the housing comprises an adhesive layer. Therefore, the first portion may be attached to an injection site of the patient.
(18) In one embodiment, the second portion comprises a proximal end wall and, preferably, the proximal end wall has a substantially flat surface.
(19) In one embodiment, the first portion of the housing comprises a proximal end that is remote to the distal end.
(20) In one embodiment, the reservoir is located between the first and second portions of the housing.
(21) In one embodiment, the actuator is at least partially received in the second portion of the housing. The actuator may be moveably mounted to the second portion of the housing. The actuator may be slidably mounted to the second portion of the housing. The actuator may be retracted into the second portion of the housing when the second portion of the housing is in the initial position.
(22) In one embodiment, the first and second portions of the housing define a chamber that receives the dispensing mechanism.
(23) There is also provided a method of preparing a medicament delivery device comprising a housing having first and second portions, a dispensing mechanism that comprises a reservoir disposed in the housing, and an actuator, the method comprising: positioning a distal end of the first portion in proximity to an injection site of a patient; and, moving the second portion towards the distal end of the first portion from an initial position, wherein actuation of the actuator is impeded such that operation of the dispensing mechanism is prevented, to a primed position, wherein the actuator is moveable relative to the housing to operate the dispensing mechanism to dispense medicament from the reservoir to the injection site.

(24) These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

Description

BRIEF DESCRIPTION OF THE FIGURES

(1) Embodiments will now be described, by way of example only, with reference to the accompanying drawings, in which:

(2) FIG. **1** is a schematic cross-sectional side view of a medicament delivery device according to a first embodiment, wherein a proximal portion of the housing is in an initial position;

(3) FIG. **2** is a schematic cross-sectional side view of the medicament delivery device of FIG. **1**, wherein the proximal portion is in a primed position and a button projects from the proximal portion;

(4) FIG. **3** is a close-up schematic cross-sectional side view of part of the medicament delivery device of FIG. **1**;

(5) FIG. **4** is a schematic cross-sectional side view of the medicament delivery device of FIG. **1**, wherein the button is partially depressed into the housing and a needle is in a retracted position;

(6) FIG. **5** is a close-up schematic cross-sectional side view of a needle extension lock of the medicament delivery device of FIG. **1**, wherein a pair of needle locking members are moved to an unlocked state;

(7) FIG. **6** is a close-up schematic cross-sectional side view of a dispensing lock of the medicament delivery device of FIG. **1**, wherein a pair of extension locking members are moved to an unlocked state;

(8) FIG. **7** is a schematic cross-sectional side view of the medicament delivery device of FIG. **1**, wherein the needle is in an extended position and medicament is dispensed from the needle;

(9) FIG. **8** is a schematic cross-sectional side view of the medicament delivery device of FIG. **1**, wherein the needle is in the retracted position;

(10) FIG. **9**A is a close-up schematic cross-sectional side view of a needle retraction lock of the medicament delivery device of FIG. **1**, wherein a pair of retraction locking members are in a locked state;

(11) FIG. **9**B is a close-up schematic cross-sectional side view of the needle retraction lock of the medicament delivery device of FIG. **1**, wherein the pair of retraction locking members are in an unlocked state;

(12) FIG. **10** is a schematic cross-sectional side view of a medicament delivery device according to a second embodiment, wherein a proximal portion of the housing is in an initial position;

(13) FIG. **11** is a schematic cross-sectional side view of the medicament delivery device of FIG. **10**, wherein the proximal portion is in a primed position and a button projects from the proximal portion;

(14) FIG. **12** is a schematic cross-sectional side view of a medicament delivery device according to a third embodiment, wherein a proximal portion of the housing is in an initial position;

(15) FIG. **13** is a schematic cross-sectional side view of the medicament delivery device of FIG. **12**, wherein the proximal portion is in a primed position and a button projects from the proximal portion;

(16) FIG. **14** is a schematic cross-sectional side view of the medicament delivery device of FIG. **12**, wherein the button is depressed into the housing and a needle is in an extended position;

(17) FIG. **15** is a schematic cross-sectional side view of the medicament delivery device of FIG. **12**, wherein the needle is in the extended position and medicament is dispensed from the needle; and,

(18) FIG. **16** is a schematic cross-sectional side view of the medicament delivery device of FIG. **12**, wherein the needle is in the retracted position.

DETAILED DESCRIPTION

(19) A medicament delivery device, as described herein, may be configured to inject a medicament into a patient. For example, delivery could be sub-cutaneous, intra-muscular, or intravenous. Such a device could be operated by a patient or care-giver, such as a nurse or physician, and can include various types of safety syringe, pen-injector, or auto-injector. The device can include a cartridge-based system that requires piercing a sealed ampule before use. Volumes of medicament delivered with these various devices can range from about 0.5 ml to about 2 ml. Yet another device can include a large volume device ("LVD") or patch pump, configured to adhere to a patient's skin for a period of time (e.g., about 5, 15, 30, 60, or 120 minutes) to deliver a "large" volume of medicament (typically about 2 ml to about 10 ml).

(20) In combination with a specific medicament, the presently described devices may also be customized in order to operate within required specifications. For example, the device may be customized to inject a medicament within a certain time period (e.g., about 3 to about 20 seconds for auto-injectors, and about 10 minutes to about 60 minutes for a large volume device). Other specifications can include a low or minimal level of discomfort, or to certain conditions related to human factors, shelf-life, expiry, biocompatibility, environmental considerations, etc. Such variations can arise due to various factors, such as, for example, a drug ranging in viscosity from about 3 cP to about 50 cP. Consequently, a drug delivery device will often include a hollow needle ranging from about 25 to about 31 Gauge in size. Common sizes are 27 and 29 Gauge.

(21) FIGS. **1** to **9**B show a medicament delivery device **10**, which in the exemplary embodiment comprises a bolus injector device, according to a first embodiment. The medicament delivery device **10** may be in the form of a large volume device.

(22) The medicament delivery device **10** comprises a housing **11**, a needle **12**, a needle actuating mechanism **13**, a dispensing mechanism **14** and an actuator **15**.

(23) The housing **11** comprises a distal portion **16** and a proximal portion **17**. The term "distal" refers to a location that is relatively closer to a site of injection and the term "proximal" refers to a location that is relatively further away from the injection site.

(24) The distal portion **16** of the housing **11** comprises a cylindrical peripheral wall **18** and an end wall **19** that together have a generally U-shaped cross-section. The distal portion **16** of the housing **11** further comprises a cylindrical internal wall **16**A that is arranged concentrically with the cylindrical peripheral wall **18** of the distal portion **16**. The proximal portion **17** of the housing **11** comprises a cylindrical peripheral wall **20** and an end wall **21** that together have a generally U-shaped cross-section. The proximal portion **17** of the housing **11** comprises a cylindrical internal wall **17**A that is arranged concentrically with the cylindrical peripheral wall **20** of the proximal portion **17**.

(25) The peripheral wall **18** of the distal portion **16** of the housing **11** is slidably received in the peripheral wall **20** of the proximal portion **17** such that the end wall **19** of the distal portion **16** is spaced from the end wall **21** of the proximal portion **17** and a recess **22** is formed therebetween. The distal and proximal portions **16**, **17** of the housing **11** together form a generally cylindrical shape that has a central axis (see the dashed line A-A in FIG. **2**).

(26) The end wall **19** of the distal portion **16** has an outer surface **19**A and an inner surface **19**B and the end wall **21** of the proximal portion **17** has an outer surface **21**A and an inner surface **21**B. One or both of the outer surfaces **19**A, **21**A of the end walls **19**, **21** of the distal and proximal portions **16**, **17** may be substantially flat.

(27) The outer surface **19**A of the end wall **19** of the distal portion **16** comprises an adhesive layer (not shown) that is initially covered by a label (not shown). In use, the label is removed from the adhesive layer and then the adhesive layer is stuck to the patient's skin at the injection site of the patient such that the end wall **19** of the distal portion **16** is adhered to the injection site.

(28) The dispensing mechanism **14** comprises a medicament reservoir **23**, a dispensing member **24**, a dispensing biasing member **25** and a dispensing lock **26**.

(29) The medicament reservoir **23** is in the form of an annular flexible bag **23**. The flexible bag **23** is disposed in the recess **22** in the housing **11** and abuts the inner surface **19**B of the end wall **19** of the distal portion **16**. The flexible bag **23** is fluidly connected to an aperture **18**A in the peripheral wall **18** of the distal portion **16**. The aperture **18**A forms a filling port **18**A that allows for the flexible bag **23** to be filled with medicament through the peripheral wall **18** of the distal portion **16**. The flexible bag **23** and/or the aperture **18**A may comprise a one-way valve (not shown) that is configured to prevent medicament from flowing out of the flexible bag **23** via the aperture **18**A. Alternatively, or additionally, a bung (not shown) may be provided that is inserted into the aperture **18**A to seal the aperture **18**A after the flexible bag **23** has been filled with medicament.
(30) The dispensing member **24** is in the form of a plate **24**. The plate **24** may be annular. The plate **24** is disposed in the recess **22** in the housing **11** such that the flexible bag **23** is located between a distal-facing surface **24**A of the plate **24** and the inner surface **19**B of the end wall **19** of the distal portion **16**. The plate **24** is slidable in the recess **22** in the direction of the central axis A-A of the housing **11** such that the plate **24** is moveable relative to flexible bag **23**.
(31) The dispensing biasing member **25** is in the form of a dispensing spring **25**. The dispensing spring **25** may be a helical spring. The dispensing spring **25** is disposed in the recess **22** in the housing **11** and extends about the central axis A-A of the housing **11**. The dispensing spring **25** is positioned between the internal wall **17**A of the proximal portion **17** and the peripheral wall **20** of the proximal portion **17**.
(32) The dispensing spring **25** is disposed on the opposite side of the plate **24** to the flexible bag **23**. A first end of the dispensing spring **25** is located against the inner surface **21**B of the end wall **21** of the proximal portion **17** and a remote second end of the dispensing spring **25** is located against a proximal-facing surface **24**B of the plate **24**.
(33) The proximal portion **17** is moveable relative to the distal portion **16** of the housing **11** between an initial position (shown in FIG. **1**) and a primed position (shown in FIGS. **2**, **4**, **7** and **8**). When the proximal portion **17** is in the initial position, the end wall **21** of the proximal portion **17** is spaced from the plate **24** and the end wall **19** of the distal portion **16** such that the dispensing spring **25** is substantially uncompressed. Furthermore, when the proximal portion **17** is in the initial position, only a small section of the peripheral wall **18** of the distal portion **16** is received in the peripheral wall **20** of the proximal portion **17**.
(34) When the proximal portion **17** is moved to the primed position, the end wall **21** of the proximal portion **17** is moved towards the end wall **19** of the distal portion **16** such that the distance between the end walls **19**, **21** is reduced. An increased amount of the peripheral wall **18** of the distal portion **16** is received in the peripheral wall **20** of the proximal portion **17** when the proximal portion **17** is in the primed position.
(35) The dispensing lock **26** comprises a pair of dispensing locking members **27** that are connected to the distal portion **16** of the housing **11** by corresponding pivotal couplings **28**. Each of the dispensing locking members **27** comprises an elongate member **29** and a projection **30** that is integrally formed with the elongate member **29**.
(36) The elongate members **29** have a first end **29**A and a second end **29**B. The elongate members **29** are each attached to a corresponding pivotal coupling **28** towards the first end **29**A of the elongate members **29**. The second end **29**B of each elongate member **29** is spaced from the corresponding pivotal coupling **28** such that each second end **29**B is pivotable about the corresponding pivotal coupling **28**. A recess **29**C is provided in the second end **29**B of each elongate member **29**.
(37) The projection **30** of each dispensing locking member **27** extends at an angle from a corresponding elongate member **29** and is located proximate to the first end **29**A of the elongate member **29**. Each projection **30** has a free end **30**A that is remote to said corresponding elongate member **29**. The elongate member **29** and projection **30** may be arranged such that the dispensing locking members **27** are each generally L-shaped or V-shaped.

(38) The dispensing locking members **27** are pivotable from a locked state (shown in FIGS. **2** and **3**) to an unlocked state (shown in FIGS. **4** and **6**). In the locked state, each of the dispensing locking members **27** is positioned such that the elongate member **29** extends towards the end wall **21** of the proximal portion **17** at an angle away from the central axis A-A of the housing **11** in the direction from the first end **29**A to the second end **29**B of the elongate member **29**. Moreover, in the locked state, the dispensing locking members **27** are positioned such that the projections **30** extend towards the end wall **21** of the proximal portion **17** at an angle towards the central axis A-A of the housing **11** in the direction towards the free end **30**A of the projection **30**.
(39) When the dispensing locking members **27** are in the locked state, the plate **24** is located in the recesses **29**C of the elongate members **29** such that the plate **24** is prevented from moving towards the end wall **19** of the distal portion **16** of the housing **11**. The configuration of the recesses **29**C is such that a portion of each elongate member **29** abuts a radially inwardly facing surface **24**C of the plate **24** and therefore, when the dispensing locking members **27** are in the locked state and abut the plate **24**, the dispensing locking members **27** are prevented from rotating in a direction wherein the second ends **29**B of the elongate members **29** move radially outwardly away from the central axis A-A of the housing **11**.
(40) The dispensing locking members **27** are moveable to the unlocked state, wherein the dispensing locking members **27** are rotated (in the direction of arrow **13**′ in FIG. **6**) such that the second end **29**B of each elongate member **29** and the free end **30**A of the corresponding projection **30** pivot about the respective pivotal couplings **28** to move radially inwardly towards the central axis A-A of the housing **11**. When the dispensing locking members **27** are in the unlocked state, the second end **29**B of each elongate member **29** is spaced from the plate **24** such that the plate **24** is not received in the recesses **29**C of the elongate members **29**. Therefore, the plate **24** is not restricted from moving towards the end wall **19** of the distal portion **16** by the dispensing locking members **27**.
(41) The actuator **15** is in the form of a button **15** that has a peripheral wall **15**A and an end wall **15**B. The button **15** is received in the proximal portion **17** of the housing **11** such that the peripheral wall **15**A of the button **15** is located on the inside of the internal wall **17**A of the proximal portion **17** and is concentrically aligned therewith. The button **15** is slidable within the internal wall **17**A of the proximal portion **17** in the direction of the central axis A-A of the housing **11**.
(42) The needle **12** is moveable relative to the distal portion **16** of the housing **11** between a retracted position (shown in FIGS. **1** to **4**, **8** and **9**B) and an extended position (shown in FIGS. **7** and **9**A). When the needle **12** is in the retracted position, the needle **12** is fully received in the recess **22** in the housing **11** such that the needle **12** is shielded to prevent damage to the needle **12** and to protect the patient from being accidentally injured by the needle **12**.
(43) When the needle **12** is moved from the retracted position to the extended position, the needle **12** is moved linearly in the direction of the central axis A-A of the housing **11** such that the end of the needle **12** projects out of an aperture **19**C in the end wall **19** of the distal portion **16**. Thus, when the adhesive layer of the distal portion **16** is adhered to the injection site of a patient, the needle **12** pierces the patient's skin to extend into the injection site to deliver medicament thereto.
(44) The medicament delivery device **10** further comprises a septum **31** that is fixed to the inner surface **19**B of the end wall **19** of the distal portion **16**. The septum **31** is located over the aperture **19**C in the end wall **19** of the distal portion **16**. The needle **12**, which is initially in the retracted position, is protected by the septum **31**. More specifically, the septum **31** prevents the ingress of contaminants through the aperture **19**C in the end wall **19** of the distal portion **16** and into contact with the sterile needle **12**. When the needle **12** is moved to the extended position, the needle **12** pierces the septum **31** and the end of the needle **12** passes through the septum **31** to project from the end wall **19**. The septum **31** may be manufactured from an impermeable material such as plastic, rubber or metal foil. In alternative embodiments, the septum **31** is fixed to the outer surface **19**A of the end wall **19** of the distal portion **16** or is located in the aperture **19**C in the end wall **19**.

(45) The needle actuating mechanism **13** comprises needle extension and retraction biasing members **32**, **33**, extension and retraction holding elements **34**, **35**, and needle extension and retraction locks **36**, **37**.
(46) The needle extension biasing member **32** is in the form of a needle extension spring **32**. The needle extension spring **32** may be a helical spring. The needle extension spring **32** is located inside the peripheral wall **15**A of the button **15** and extends about the central axis A-A of the housing **11**. The needle extension spring **32** is disposed between a base **12**A of the needle **12** and the extension holding element **34**.
(47) The extension holding element **34** is fixed relative to the distal portion **16** of the housing **11** and is located on the opposite side of the base **12**A of the needle **12** to the septum **31**. The extension holding element **34** is configured to act as a stop against which the proximal end of the needle extension spring **32** abuts such that the proximal end of the needle extension spring **32** is prevented from moving towards the end wall **21** of the proximal portion **17** in the direction of the central axis A-A of the housing **11**. When the needle **12** is in the initial retracted position, the needle extension spring **32** is compressed between the base **12**A of the needle **12** and the extension holding element **34** such that the needle extension spring **32** urges the needle **12** away from the extension holding element **34** in the direction of the central axis A-A of the housing **11** such that the needle **12** is biased to move into the extended position.
(48) The needle extension lock **36** comprises a pair of extension locking members **38** that are connected to the distal portion **16** of the housing **11** by respective pivotal couplings **39**. Each of the extension locking members **38** comprises an elongate member **38**A and first and second projections **40**, **41** that are integrally formed with the elongate member **38**A. The first projection **40** is located at the distal end of the elongate member **38**A and the second projection **41** is located towards the proximal end of the elongate member **38**A.
(49) Each elongate member **38**A is attached to the respective pivotal coupling **39** at a point between the proximal and distal ends of the elongate member **38**A such that the first and second projections **40**, **41** are pivotable about the respective pivotal coupling **39**.
(50) The extension locking members **38** are moveable from a locked state (shown in FIG. **3**) to an unlocked state (shown in FIG. **5**). In the locked state, the extension locking members **38** are positioned such that the elongate members **38**A extend substantially parallel to the central axis A-A of the housing **11** and the first projection **40** of each extension locking member **38** is located nearer to the end wall **21** of the proximal portion **17** of the housing **11** than the second projection **41**.
(51) The first projection **40** of each extension locking member **38** extends radially inwardly towards the central axis A-A of the housing **11** when the extension locking members **38** are in the locked state. Each of the first projections **40** comprises a proximal-facing surface **40**A that abuts the base **12**A of the needle **12** when the extension locking members **38** are in the locked state such that movement of the needle **12** in the direction of the central axis A-A of the housing **11** towards the end wall **19** of the distal portion **16** is prevented. Thus, when the extension locking members **38** are in the locked state, the extension locking members **38** retain the needle **12** in the retracted position against the force of the needle extension spring **32**, which is held in a compressed state between the base **12**A of the needle **12** and the extension holding element **34**.
(52) The second projection **41** of each extension locking member **38** extends radially outwardly away from the central axis A-A of the housing **11** when the extension locking members **38** are in the locked state. Each of the second projections **41** comprises an angled surface **41**A that faces at an angle away from the central axis A-A of the housing **11** and towards the end wall **21** of the proximal portion **17**.
(53) The button **15** comprises a lip **15**C that extends radially inwardly from the inside of the peripheral wall **15**A of the button **15** in the direction towards the central axis A-A of the housing **11**. The lip **15**C may be generally annular.
(54) The lip **15**C of the button **15** is configured to abut the angled surface **41**A of both of the

extension locking members **38** when the button **15** is moved within the housing **11** towards the end wall **19** of the distal portion **16**. This causes the second projection **41** of each extension locking member **38** to be urged radially inwardly towards the central axis A-A such that the extension locking members **38** are rotated from the locked state to the unlocked state (in the direction of arrow 'C' in FIG. **5**). In the unlocked state, the first projections **40** are moved radially outwardly such that they no longer abut the base **12**A of the needle **12** and therefore the base **12**A of the needle **12** is able to move away from the extension holding element **34** under the force of the needle extension spring **32**. Thus, when the extension locking members **38** are in the unlocked state, the needle **12** moves from the retracted position to the extended position under the force of the needle extension spring **32**.

(55) The needle retraction biasing member **33** is in the form of a needle retraction spring **33**. The needle retraction spring **33** may be a helical spring. The needle retraction spring **33** is located inside the distal portion **16** of the housing **11** and extends about the central axis A-A thereof. The needle retraction spring **33** is disposed between the retraction holding element **35** and the septum **31**. The septum **31** is fixed relative to the distal portion **16** of the housing **11** and therefore acts as a stop against which the distal end of the needle retraction spring **33** abuts.

(56) The retraction holding element **35** is slidably received in the internal wall **16**A of the distal portion **16** of the housing **11**. The needle retraction spring **33** is initially compressed between the septum **31** and the retraction holding element **35** such that the needle retraction spring **33** urges the retraction holding element **35** away from the septum **31** in the direction of the central axis A-A of the housing **11**. The needle retraction lock **37** initially retains the retraction holding element **35** in position against the force of the needle retraction spring **33** such that the needle retraction spring **33** is compressed.

(57) The needle retraction lock **37** comprises a pair of retraction locking members **42** that are connected to the distal portion **16** of the housing **11** by respective pivotal couplings **43**. Each of the retraction locking members **42** comprises first and second elongate members **44**, **45**, a recess **46**, and a projection **47**. The first and second elongate members **44**, **45** are integrally formed at one end. The first and second elongate members **44**, **45** extend at an angle to each other. In the present embodiment, the first and second elongate members **44**, **45** of each retraction locking member **42** extend substantially perpendicular to each other.

(58) The first and second elongate members **44**, **45** comprise respective free ends **44**A, **45**B that are remote to the pivotal coupling **43**. The recess **46** is located at the free end **44**A of the first elongate member **44** and the projection **47** is located at the free end **45**A of the second elongate member **45**.

(59) The retraction locking members **42** are pivotable from a locked state (shown in FIG. **9**A) to an unlocked state (shown in FIG. **9**B). In the locked state, each of the retraction locking members **42** is positioned such that the first elongate members **44** extend radially outwardly away from the central axis A-A of the housing **11** and, in one embodiment, are substantially perpendicular to the central axis A-A of the housing **11**. The free end **44**A of each first elongate member **44** overlaps the plate **24** in the radial direction. Moreover, in the locked state, each of the retraction locking members **42** is positioned such that the second elongate members **45** extend towards the end wall **21** of the proximal portion **17** from the respective pivotal coupling **43** and, in one embodiment, are substantially parallel to the central axis A-A of the housing **11**.

(60) When the retraction locking members **42** are in the locked state, the projection **47** of each retraction locking member **42** extends radially inwardly towards the central axis A-A of the housing **11** to abut a proximal-facing surface of the retraction holding element **35**. Thus, the retraction holding element **35** is prevented from moving towards the end wall **21** of the proximal portion **17** and thus the needle retraction spring **33** is held in a compressed state between the septum **31** and the retraction holding element **35**.

(61) Movement of the plate **24** within the housing **11** towards the end wall **19** of the distal portion **16**, due to operation of the dispensing mechanism **14**, causes the plate **24** to be urged against the

free end **44**A of each first elongate member **44** such that the plate **24** is received in the recess **46** of each first elongate member **44**. Thus, the movement of the plate **24** towards the end wall **19** of the distal portion **16** results in a force being exerted on the free end **44**A of each first elongate member **44**. This force causes the free end **44**A of each first elongate member **44** to be urged towards the end wall **19** of the distal portion **16** such that each retraction locking member **42** is urged to rotate about a respective pivotal coupling **43** from the locked state to the unlocked state (in the direction of arrow D′ in FIG. **9**B).

(62) When the retraction locking members **42** are rotated to the unlocked state, the projection **47** at the free end **45**A of each second elongate member **45** is moved radially outwardly away from the central axis A-A of the housing **11** such that the projections **47** are spaced from the retraction holding element **35**. Thus, the projections **47** no longer hold the retraction holding element **35** in place against the force of the needle retraction spring **33** and so the retraction holding element **35** is moved towards the end wall **21** of the proximal end **17** by the needle retraction spring **33**.

(63) The needle **12** extends through an aperture **35**A in the retraction holding element **35** such that when the needle **12** is in the extended position and the retraction locking members **42** are in the locked state (as shown in FIG. **9**A) the base **12**A of the needle **12** is located in proximity to the retraction holding element **35**. Thus, when the retraction locking members **42** are subsequently moved to the unlocked state, the retraction holding element **35** is released such that the needle retraction spring **33** urges the retraction holding element **35** against the base **12**A of the needle **12** to move the needle **12** towards the end wall **21** of the proximal portion **17** and into the retracted position (as shown in FIG. **9**B).

(64) A clearance gap (not shown) may be provided between each retraction locking member **42** and the septum **31** and end wall **19** of the distal portion **16** to facilitate movement of the retraction locking members **42** between the locked and unlocked states. Alternatively, the septum **31** may be manufactured from a flexible material that facilitates movement of the retraction locking members **42**.

(65) The medicament delivery device **10** further comprises a coupling **48** between the distal and proximal portions **16**, **17** of the housing **11**. The coupling **48** is configured to resist the proximal portion **17** from being moving away from the primed position towards the initial position. The coupling **48** may be configured to prevent the force of the dispensing spring **25**, which is located between the plate **24** and the end wall **21** of the proximal portion **17**, from moving the end wall **21** of the proximal portion **17** away from the end wall **19** of the distal portion **16** when the proximal portion **17** is in the primed position.

(66) The coupling **48** is in the form of a latch **48**. The latch **48** comprises first, second and third stops **49**, **50**, **51**. The first stop **49** is in the form of a first lip **49** that is integrally formed with the peripheral wall **20** of the proximal portion **17** of the housing **11**. The first lip **49** extends radially inwardly towards the central axis A-A of the housing **11**. The first lip **49** extends from the end of the peripheral wall **20** of the proximal portion **17** that is remote to the end wall **21** of the proximal portion **17**. The first lip **49** comprises a proximal-facing surface **49**A.

(67) The second stop **50** is in the form of a second lip **50** that is integrally formed with the peripheral wall **18** of the distal portion **16**. The second lip **50** extends radially outwardly away from the central axis A-A of the housing **11**. The second lip **50** extends from the end of the peripheral wall **18** of the distal portion **16** that is remote to the end wall **19** of the distal portion **16**. The second lip **50** comprises a distal-facing surface **50**A.

(68) When the proximal portion **17** of the housing **11** is in the initial position (as shown in FIG. **1**), the proximal-facing surface **49**A of the first lip **49** abuts the distal-facing surface **50**A of the second lip **50** to limit the range of axial movement between the proximal portion **17** and the distal portion **16** such that the proximal portion **17** is prevented from moving away from the distal portion **16** and being separated therefrom.

(69) The third stop **51** is in the form of a recess **51** that extends into the outer surface of the

peripheral wall **18** of the distal portion **16**. A distal-facing surface **51**A is formed at the edge of the recess **51**.
(70) The latch **48** further comprises an angled surface **52** that extends between the distal-facing surface **50**A of the second stop **50** and the distal-facing surface **51**A of the third stop **51**. The angled surface **52** is angled slightly with respect to the central axis A-A of the housing **11** such that the angled surface **52** extends slightly away from the central axis A-A of the housing in the direction from the second stop **50** to the third stop **51**. The angled surface **52** is formed from a portion of the outer surface of the peripheral wall **18** of the distal portion **16**.
(71) The angled surface **52** is configured such that when the proximal portion **17** is moved from the initial position to the primed position the first lip **49** moves over the angled surface **52** and is urged radially outwardly by the angled surface **52** such that the first lip **49** is urged away from the central axis A-A of the housing **11**. The thickness and material of the proximal portion **17** is such that when the first lip **49** moves over the angled surface **52** the peripheral wall **20** of the proximal portion **17** resiliently deforms radially outwardly. This flexing of the peripheral wall **20** facilitates movement of the first lip **49** over the angled surface **52**. Similarly, the distal portion **16** may also have a thickness and/or be manufactured from a material that allows for the peripheral wall **18** of the distal portion **16** to flex radially inwardly as the first lip **49** moves over the angled surface **52**. The distal and proximal portions **16**, **17** may be manufactured from, for example, plastic or metal.
(72) Movement of the proximal portion **17** from the initial positon to the primed position causes the first lip **49** to move over the angled surface **52** from the second lip **50** towards the recess **51**. When the first lip **49** reaches the recess **51**, the first lip **49** moves radially inwardly to ‘snap’ into the recess **51** such that the proximal-facing surface **49**A of the first lip **49** abuts the distal-facing surface **51**A at the edge of the recess **51**. Thus, the proximal portion **17** is held in place in the primed position such that the end wall **21** of the proximal portion **17** is resisted from moving away from the end wall **19** of the distal portion **16**.
(73) The angled surface **52** is arranged to provide a small amount of resistance to the first lip **49** moving over the angled surface **52** from the second lip **50** towards the recess **51**, due to the first lip **49** being urged radially outwardly when the proximal portion **17** is moved towards the primed position. Therefore, the patient must overcome a small amount of resistance to move the proximal portion **17** relative to the distal portion **16** from the initial position to the primed position. This reduces the likelihood of the proximal portion **17** being accidentally moved to the primed position.
(74) An exemplary operation of the medicament delivery device **10** will now be described. The medicament delivery device **10** is typically stored in a sterile packaging (not shown). The patient first removes the medicament delivery device **10** from the sterile packaging. When the medicament delivery device **10** is removed from the sterile packaging the proximal portion **17** of the housing **11** is in the initial position, the needle **12** is in the retracted position, and the button **15** is retracted into the proximal portion **17** (as shown in FIG. **1**) such that the patient is not able to access the button **15** to actuate the button **15**. For example, the inner dimension of the internal wall **17**A of the proximal portion **17** may be sufficiently small that the patient is not able to insert a finger into the internal wall **17**A to access the button **15**. Thus, the patient is not able to depress the button **15** to operate the dispensing mechanism **14** to dispense medicament from the flexible bag **23** and thus the dispensing mechanism **14** is rendered inoperable. Moreover, the patient is not able to operate the needle actuating mechanism **13** to move the needle **12** to the extended position.
(75) The patient then supplies medicament to the dispensing mechanism **14** of the medicament delivery device **10**. More specifically, the patient supplies medicament to the flexible bag **23** via the filling port **18**A in the peripheral wall **18** of the distal portion **16** of the housing **11**. The medicament may be supplied from, for example, a syringe, container, or pressurised canister. In an alternative embodiment, the medicament reservoir **23** is pre-filled with medicament, in which case the filling port **18**A may be omitted.
(76) The label (not shown) is then removed from the adhesive layer (not shown) on the outer

surface **19**A of the end wall **19** of the distal portion **16**. The adhesive layer is then adhered to the patient's skin at the injection site such that the end wall **19** of the distal portion **16** is secured to the injection site.

(77) The patient then applies a force to the proximal portion **17** of the housing **11** to move the proximal portion **17** from the initial position to the primed position. For example, the patient may use one hand to apply a force to the outer surface **21**A of the distal wall **21** of the proximal portion **17** to push said distal wall **21** towards the distal wall **19** of the distal portion **16**. As the proximal portion **17** is moved towards the primed position, the dispensing spring **25** is compressed between the inner surface **21**B of the distal wall **21** of the proximal portion **17** and the proximal facing surface **24**B of the plate **24** such that a biasing force is exerted on the plate **24** that urges the plate **24** towards the end wall **19** of the distal portion **16**. However, the dispensing locking members **27** are initially in the locked state to hold the plate **24** in position against the force of the dispensing spring **25**.

(78) When the proximal portion **17** reaches the primed position, the first stop **49** engages with the third stop **51** such that the proximal portion **17** is retained in the primed position. The dispensing spring **25**, which is compressed, urges the distal wall **21** of the proximal portion **17** away from the plate **24** when the proximal portion **17** is in the primed position such that the proximal portion **17** is biased away from the primed position by the force of the dispensing spring **25**. However, the engagement between the first and third stops **49**, **51** is such to prevent the proximal portion **17** from moving away from the primed position under the force of the dispensing spring **25**. Therefore, once the patient has moved the proximal portion **17** to the primed position the patient no longer needs to apply a force to the end wall **21** of the proximal portion **17** to retain the proximal portion **17** in the primed position.

(79) The button **15** is received in the internal wall **17**A of the proximal portion **17** of the housing **11** such that when the proximal portion **17** is moved to the primed position the proximal portion **17** slides relative to the button **15**. This causes the button **15** to project from the proximal portion **17** (as shown in FIG. **2**). Therefore, the button **15** may be actuated by the patient. The button **15** projects from the end wall **21** of the proximal portion **17** when the proximal portion **17** is in the primed position.

(80) With the proximal portion **17** in the primed position, the medicament delivery device **10** is primed for supplying medicament to the injection site of the patient. The patient depresses the end wall **15**B of the button **15** such that the button **15** is slid into the proximal portion **17** of the housing **11**. This causes the button **15** to engage with the needle extension lock **36** such that the needle extension spring **32** is released to move the needle **12** to the extended position. In more detail, the button **15** is slid towards the end wall **19** of the distal portion **16** until the projection **15**C of the button **15** is urged against the angled surface **41**A of the second projection **41** of each extension locking member **38**, resulting in each extension locking member **38** rotating from the locked state (shown in FIG. **3**) to the unlocked state (shown in FIG. **5**). As discussed above, this allows the base **12**A of the needle **12** to move away from the extension holding element **34** under the force of the needle extension spring **32** such that the needle **12** moves axially to pass through the septum **31** to extend out of the aperture **19**C in the end wall **19** of the distal portion **16**. Thus, the needle **12** is moved to the extended position (as shown in FIG. **7**). The end wall **19** of the distal portion **16** is adhered to the patient's skin and therefore when the needle **12** is moved to the extended position the needle **12** enters the injection site of the patient.

(81) When the needle **12** is moved to the extended position the needle **12** is fluidly communicated with the inside of the flexible bag **23**. In one embodiment, a conduit (not shown) is provided that is fluidly connected to the inside of the flexible bag **23**. The needle **12** comprises an aperture (not shown) that aligns with the conduit to fluidly communicate therewith when the needle **12** is moved to the extended position such that medicament is able to flow out of the flexible bag **23**, through the conduit, and into the aperture of the needle **12** to be dispensed from the needle **12**.

(82) The patient continues to push the button **15** into the housing **11** to then engage the button **15** with the dispensing lock **26** such that, after the needle **12** has been moved to the extended position, the dispensing spring **25** is released to urge the plate **24** towards the end wall **19** of the distal portion **16** such that medicament is dispensed from the flexible bag **23**. More specifically, the distal end of the button **15** is urged against the free end **30**A of the projection **30** of each dispensing locking member **27**, resulting in each dispensing locking member **27** rotating from the locked state (shown in FIG. **3**) to the unlocked state (shown in FIG. **6**). As discussed above, this allows the plate **24** to move towards the end wall **19** of the distal portion **16** under the force of the dispensing spring **25**. Therefore, the flexible bag **23** is compressed between the plate **24** and the end wall **19** of the distal portion **16** such that the pressure of the medicament in the flexible bag **23** is increased and therefore the medicament flows out of the flexible bag **23** and flows through the needle **12** to enter the injection site of the patient.
(83) Once the button **15** has been depressed to the extent that the dispensing locking members **27** are moved to the unlocked state to commence medicament delivery, the patient may stop pressing the button **15**. The plate **24** will continue to move towards the end wall **19** of the distal portion **16** such that the flexible bag **23** is compressed and thus medicament is delivered to the injection site of the patient via the needle **12**. Therefore, the medicament delivery device **10** may be used to deliver medicament to the injection site of the patient over an extended time period, for example, several hours, without requiring the patient to continuously apply a force to the button **15**.
(84) Medicament will continue to be delivered to the injection site until the plate **24** moves to a position within the housing **11** wherein the plate **24** engages with the needle retraction lock **37** such that the needle retraction spring **33** is released to move the needle **12** to the retracted position. In more detail, the plate **24** is moved towards the end wall **19** of the distal portion **16** under the force of the dispensing spring **25** until the plate **24** is urged against the free end **44**A of each first elongate member **44** of the retraction locking members **42**, resulting in each retraction locking member **42** rotating from the locked state (shown in FIG. **9**A) to the unlocked state (shown in FIG. **9**B). As discussed above, this allows the retraction holding element **35** to move away from the end wall **19** of the distal portion **16** under the force of the needle retraction spring **33** such that the retraction holding element **35** is urged against the base **12**A of the needle **12** to move the needle **12** into the housing **11** to the retracted position (as shown in FIGS. **8** and **9**B). The patient may then remove the medicament delivery device **10** from the injection site.
(85) In one embodiment (not shown), a lock may be provided to lock the button **15** in position when the proximal portion **17** is in the initial positon. The lock may comprise a locking member that is in a locked state when the proximal portion **17** is in the initial position to prevent movement of the button **15** relative to the housing **11**. The locking member is moved to an unlocked state when the proximal portion **17** is moved to the primed position such that the button **15** can be moved relative to the housing **11**.
(86) Referring now to FIGS. **10** and **11**, a medicament delivery device **60** according to a second embodiment is shown. The medicament delivery device **60** of the second embodiment is similar to the medicament delivery device **10** of the first embodiment, with like features retaining the same reference numerals. A difference is that the coupling **48** of the medicament delivery device **10** of the first embodiment is omitted and is replaced with an alternative coupling **61**.
(87) The coupling **61** of the medicament delivery device **60** of the second embodiment comprises first and second screw threads **62**, **63**. The first screw thread **62** is formed in the inner surface of the peripheral wall **20** of the proximal portion **17**. The second screw thread **63** is formed in the outer surface of the peripheral wall **18** of the distal portion **16**.
(88) The first and second screw threads **62**, **63** are configured to engage to couple the distal and proximal portions **16**, **17** of the housing **11** such that the proximal portion **17** can be screwed to the distal portion **16** of the housing **11**. Therefore, the proximal portion **17** is moveable from an initial position (shown in FIG. **10**), wherein the proximal portion **17** is coupled to the distal portion **16**

such that the end walls **19**, **21** of the distal and proximal portions **16**, **17** are spaced apart, to a primed position (shown in FIG. **11**), wherein the proximal portion **17** is twisted such that the screw threads **62**, **63** engage and thus the end walls **19**, **21** of the distal and proximal portions **16**, **17** are moved closer together.

(89) The medicament delivery device **60** of the second embodiment comprises a needle actuating mechanism **13** and a dispensing mechanism **14** that are similar to those of the medicament delivery device **10** of the first embodiment described above.

(90) An exemplary operation of the medicament delivery device **60** will now be described. The medicament delivery device **60** is typically stored in a sterile packaging (not shown). The patient first removes the medicament delivery device **60** from the sterile packaging. When the medicament delivery device **60** is removed from the sterile packaging the proximal portion **17** of the housing **11** is in the initial position, the needle **12** is in the retracted position, and the button **15** is retracted into the proximal portion **17** (as shown in FIG. **10**) such that the patient is not able to access the button **15** to actuate the button **15**. Thus, the patient is not able to depress the button **15** to operate the dispensing mechanism **14** to dispense medicament from the flexible bag **23** or operate the needle actuating mechanism **13** to move the needle **12** to the extended position.

(91) The patient then supplies medicament to the flexible bag **23** of the medicament delivery device **60**, removes the label (not shown) from the adhesive layer (not shown), and adheres the adhesive layer to the patient's skin such that the end wall **19** of the distal portion **16** is secured to the injection site.

(92) When the patient wishes to commence the injection, the patient rotates the proximal portion **17** relative to the distal portion **16** such that the engagement of the first and second screw threads **62**, **63** causes the proximal portion **17** to move from the initial position to the primed position. More specifically, the rotation of the proximal portion **17** relative to the distal portion **16** causes the proximal portion **17** to move relative to the distal portion **16** in the direction of the central axis A-A of the housing **11** such that the end wall **21** of the proximal portion **17** moves towards the end wall **19** of the distal portion **16**. The patient may use one hand to twist the proximal portion **17** relative to the distal portion **16** to move the proximal portion **17** to the primed position.

(93) As the proximal portion **17** is moved towards the primed position, the dispensing spring **25** is compressed between the distal wall **21** of the proximal portion **17** and the plate **24** such that the dispensing spring **25** exerts a biasing force on the plate **24** that urges the plate **24** towards the end wall **19** of the distal portion **16**. However, the dispensing locking members (not shown) of the dispensing mechanism **14** are initially in the locked state to hold the plate **24** in position against the force of the dispensing spring **25**.

(94) When the proximal portion **17** reaches the primed position, the proximal portion **17** is retained in the primed position by the engagement of the first and second screw threads **62**, **63**. The dispensing spring **25**, which is compressed, urges the distal wall **21** of the proximal portion **17** away from the plate **24** when the proximal portion **17** is in the primed position such that the proximal portion **17** is biased away from the primed position by the force of the dispensing spring **25**. However, the configuration of the first and second screw threads **62**, **63** is such to prevent the proximal portion **17** from moving away from the primed position under the force of the dispensing spring **25**. This may be achieved, for example, due to the pitch of the first and second screw threads **62**, **63**. Therefore, once the patient has moved the proximal portion **17** to the primed position the patient no longer needs to apply a force to the proximal portion **17** to retain the proximal portion **17** in the primed position.

(95) The actuator **15** protrudes from the end wall **21** of the proximal portion **17** when the proximal portion **17** is in the primed position.

(96) The remaining operation of the medicament delivery device **60** is the same as that of the medicament delivery device **10** of the first embodiment and therefore, for the sake of brevity, a detailed description thereof is not repeated hereinafter. Briefly, when the proximal portion **17** is in

the primed position, the patient pushes the button **15** into the proximal portion **17** such that the button **15** engages with the needle extension lock of the needle actuating mechanism **13** such that the needle extension spring is released to move the needle **12** to the extended position. The patient further presses the button **15** into the proximal portion **17** until the button **15** engages with the dispensing lock of the dispensing mechanism **14** such that, after the needle **12** has been moved to the extended position, the dispensing spring **25** is released to urge the plate **24** towards the end wall **19** of the distal portion **16**. Therefore, medicament is dispensed from the flexible bag **23**. The patient may then stop pressing the button **15**. The plate **24** will continue to move towards the end wall **19** of the distal portion **16** such that the flexible bag **23** is compressed to dispense medicament to the injection site of the patient via the needle **12**.

(97) Medicament will continue to be delivered to the injection site until the plate **24** moves to a position within the housing **11** wherein the plate **24** engages with the needle retraction lock of the needle actuating mechanism **13** such that the needle retraction spring is released to move the needle **12** to the retracted position. In this position, the plate **24** is urged against the retraction locking members of the needle retraction lock such that further movement of the plate **24** towards the end wall **19** of the distal portion **16** is prevented. The patient may then remove the medicament delivery device **60** from the injection site.

(98) In an alternative embodiment, one of the first and second screw threads **62**, **63** is omitted and is replaced by a protrusion that engages with the other one of the first and second screw threads **62**, **63**.

(99) Referring now to FIGS. **12** to **16**, an injection device **70** according to a third embodiment is shown. The medicament delivery device **70** comprises a housing **71**, a needle **72**, a needle actuating mechanism **73**, a dispensing mechanism **74**, and an actuator **75** in the form of a button **75**.

(100) The housing **71** comprises a distal portion **76** and a proximal portion **77**. The distal portion **76** comprises a peripheral wall **78** and an end wall **79** and the proximal portion **77** comprises a peripheral wall **80** and an end wall **81**. The peripheral wall **78** of the distal portion **76** of the housing **71** is slidably received in the peripheral wall **80** of the proximal portion **77** such that the end wall **79** of the distal portion **76** is spaced from the end wall **81** of the proximal portion **77** and a recess **82** is formed therebetween. The end wall **79** of the distal portion **76** comprises an adhesive layer (not shown) that is initially covered by a label (not shown). In use, the label is removed from the adhesive layer and then the adhesive layer is stuck to the injection site of the patient such that the end wall **79** of the distal portion **76** is adhered to the injection site.

(101) The dispensing mechanism **74** comprises a medicament reservoir **83**, a dispensing member **84**, a dispensing biasing member **85** and a dispensing lock (not shown).

(102) The medicament reservoir **83** is in the form of rigid container **83**. The rigid container **83** may be a cylinder **83**. The dispensing member **84** is in the form of a plunger **84** that is slidably received in the cylinder **83**.

(103) The dispensing biasing member **85** is in the form of a dispensing spring **85**. The dispensing spring **85** extends between the plunger **84** and the end wall **81** of the proximal portion **77**. The dispensing spring **85** is configured to urge the plunger **84** to slide in the cylinder **83** towards the end wall **79** of the distal portion **76** to dispense medicament from the cylinder **83**.

(104) The proximal portion **77** is moveable relative to the distal portion **76** of the housing **71** between an initial position (shown in FIG. **12**) and a primed position (shown in FIGS. **13** to **16**). When the proximal portion **77** is in the initial position, the end wall **81** of the proximal portion **77** is spaced from the plunger **84** such that the dispensing spring **85** is substantially uncompressed. When the proximal portion **77** is moved to the primed position, the end wall **81** of the proximal portion **77** is moved towards the end wall **79** of the distal portion **76** such that the distance between said end walls **79**, **81** is reduced. The distance between the plunger **84** and the end wall **81** of the proximal portion **77** is also reduced such that the dispensing spring **85** is compressed therebetween.

(105) The dispensing mechanism **74** comprises a dispensing lock (not shown) that is configured to

retain the plunger **84** in position relative to the cylinder **83** against the force of the dispensing spring **85**. The dispensing lock of the medicament delivery device **70** of the third embodiment is similar to the dispensing lock **26** of the medicament delivery device **10** of the first embodiment and therefore, for the sake of brevity, a detailed description of the dispensing lock will not be repeated hereinafter. The dispensing lock comprises a locking member (not shown) that is moveable from a locked state, wherein the plunger **84** in held in position relative to the cylinder **83** against the force of the dispensing spring **85**, to an unlocked state, wherein the plunger **84** is able to move in the cylinder **83**.

(106) The needle **72** is slidable relative to the distal portion **76** of the housing **71** between a retracted position (shown in FIGS. **12**, **13** and **16**), wherein the needle **72** is fully received within the housing **71**, and an extended position (shown in FIGS. **14** and **15**), wherein the needle **72** projects from the end wall **79** of the distal portion **76** of the housing **71**.

(107) The needle actuating mechanism **73** of the medicament delivery device **70** of the third embodiment is similar to the needle actuating mechanism **13** of the medicament delivery device **10** of the first embodiment and so a detailed description will not be repeated hereinafter. Briefly, the needle actuating mechanism **73** includes needle extension and retraction springs, extension and retraction holding elements, and needle extension and retraction locks that are configured in a similar manner to those of the first embodiment. For example, the needle extension and retraction locks may comprise corresponding locking members that are moveable from a locked state, wherein the respective extension and retraction springs are held in a compressed position, to an unlocked state, wherein the respective extension and retraction springs are released.

(108) An exemplary operation of the medicament delivery device **70** will now be described. The medicament delivery device **70** is typically stored in a sterile packaging (not shown). The patient first removes the medicament delivery device **70** from the sterile packaging. When the medicament delivery device **70** is removed from the sterile packaging the proximal portion **77** of the housing **71** is in the initial position, the needle **72** is in the retracted position, and the button **75** is retracted into the proximal portion **77** (as shown in FIG. **12**) such that the patient is not able to access the button **75** to actuate the button **75**. Thus, the patient is not able to depress the button **75** to operate the dispensing mechanism **74** to dispense medicament from the medicament reservoir **83** or to operate the needle actuating mechanism **73** to move the needle **72** to the extended position. The medicament reservoir **84** may be pre-filled with medicament or may be filled by the patient via a filling port (not shown).

(109) The patient removes the label (not shown) from the adhesive layer (not shown), and adheres the adhesive layer to the patient's skin such that the end wall **79** of the distal portion **76** is secured to the injection site.

(110) When the patient wishes to commence the injection, the patient urges the end wall **81** the proximal portion **77** towards to the end wall **19** of the distal portion **76** such that the proximal portion **77** moves from the initial position to the primed position. As the proximal portion **77** is moved towards the primed position, the dispensing spring **85** is compressed between the plunger **84** and the distal wall **81** of the proximal portion **77** such that a biasing force is exerted on the plunger **84** that biases the plunger **84** to move within the cylinder **83** towards the end wall **79** of the distal portion **76**. However, the plunger **84** is initially held in position relative to the cylinder **83** by the needle extension lock (not shown).

(111) When the proximal portion **77** reaches the primed position, the proximal portion **77** is retained in the primed position by a coupling, for example, a latch (not shown). In another embodiment (not shown), the coupling comprises a pair of engaging screw threads. The button **75** protrudes from the end wall **81** of the proximal portion **77** when the proximal portion **77** is in the primed position.

(112) When the proximal portion **77** is in the primed position, the patient pushes the button **75** into the proximal portion **77** to engage the button **75** with the needle extension lock (not shown) such

that the needle extension spring is released to move the needle **72** to the extended position (as shown in FIG. **14**). When the needle **72** moves to the extended position, a passage **72**B in the base **72**A of the needle **72** aligns with a conduit **86** extending from an outlet **83**A in the cylinder **83**. Thus, the passage **72**B is fluidly communicated with the conduit **86**. The patient continues to depress the button **75** until the button **75** engages with the dispensing lock (not shown) such that, after the needle **72** has been moved to the extended position, the dispensing spring **85** is released to urge the plunger **84** towards the end wall **79** of the distal portion **76**. This causes the plunger **84** to move within the cylinder **83** to dispense medicament from the cylinder **83** (as shown in FIG. **15**). The medicament flows from the outlet **83**A in the cylinder **83** and into the conduit **86**. The medicament flows through the conduit **86** and enters the passage **72**B in the needle **72** wherein the medicament flows through the needle **72** to the injection site of the patient. The patient may then stop pressing the button **75**. The plunger **84** will continue to move within the cylinder **83** under the force of the dispensing spring **85** to dispense medicament from the cylinder **83**. Medicament will continue to be delivered to the injection site until the plunger **84** moves to a position within the cylinder **83** wherein the plunger **84** engages with the needle retraction lock (not shown) such that the needle retraction spring is released to move the needle **72** to the retracted position (as shown in FIG. **16**). The patient may then remove the medicament delivery device **70** from the injection site.

(113) In the above described embodiments the needle extension and retraction springs **32**, **33** are pre-compressed such that the springs **32**, **33** are in a compressed state prior to the proximal portion **17**, **77** of the housing **11**, **71** being moved to the primed position. However, in an alternative embodiment (not shown), the needle extension and retraction springs **32**, **33** are in a substantially uncompressed state when the proximal portion **17**, **77** is in the initial position and movement of the proximal portion **17**, **77** to the primed position compresses the extension and retraction springs **32**, **33**. For example, the extension holding element **34** may instead be fixed relative to the proximal portion **17**, **77** such that movement of the proximal portion **17**, **77** from the initial position to the primed position moves the extension holding element **34** towards the end wall **19**, **79** of the distal portion **16**, **76**. Thus, the needle extension spring **32** is compressed between the extension holding element **34** and the base **12**A, **72**A of the needle **12**, **72**.

(114) Although in the above described embodiment the proximal portion **17**, **77** is moved from the initial position to the primed position to compress the dispensing spring **25**, **85**, in an alternative embodiment (not shown) the dispensing spring **25**, **85** is pre-compressed.

(115) In the above described embodiment the actuator **15**, **75** is fully received within the housing **11**, **71** when the proximal portion **17**, **77** is in the initial position. However, in an alternative embodiment, the actuator **15**, **75** is configured to project from the proximal portion **17**, **77** of the housing **11**, **71** when the proximal portion **17**, **77** is in the initial and primed positions. In one such embodiment, the actuator **15**, **75** is of sufficient length to project from the end wall **21**, **81** of the proximal portion **17**, **77** when the proximal portion **17**, **77** is in the initial position.

(116) In the above described embodiment, the dispensing biasing member **25**, **85** and the needle extension and retraction biasing members **32**, **33** comprise respective springs **25**, **85 32**, **33**. However, in alternative embodiments (not shown) one or more of the dispensing biasing member **25**, **85**, the needle extension biasing member **32** and the needle retraction biasing member **33** comprise a different type of biasing member, for example, a portion of resiliently deformable material that is compressed to exert a biasing force.

(117) In the above described embodiment, the needle **12**, **72** is moveable relative to the housing **11**, **71** between the retracted and extended positions. However, in an alternative embodiment the needle **12**, **72** is fixed in the extended position such that the needle **12**, **72** permanently projects from the housing **11**, **71**. Thus, when the end wall **19**, **79** of the distal portion **16**, **76** is secured to the patient's skin the needle **12**, **72** pierces the skin to enter the injection site of the patient.

(118) In the above described embodiment, the dispensing lock **26** is mechanically operated, the end of the button **15**, **75** being urged against the dispensing locking members **27** to rotate the dispensing

locking members **27** from the locked state to the unlocked state. However, in an alternative embodiment the dispensing lock **26** is electrically operated. For example, the dispensing lock may comprise an electromagnetic latch (not shown) that holds the dispensing member **24**, **84** in position relative to the distal portion **16**, **76** of the housing **11**, **71**. When the button **15**, **75** is depressed by the patient the electromagnetic latch changes state such that the dispensing member **24**, **84** is released to move towards the end wall **19**, **79** of the distal portion **16**, **76** under the force of the dispensing spring **25**, **85**. Similarly, the needle actuating mechanism **13**, **73** may instead be electrically operated, for example, comprising a motor (not shown) that moves the needle **12**, **72** between the retracted and extended positions.

(119) In the above described embodiments, the dispensing mechanism **14**, **74** comprises a dispensing member **24**, **84** and a dispensing biasing member **25**, **85** configured to urge the dispensing member **24**, **84** to move relative to the housing **11** to expel medicament from the reservoir **23**, **83**. However, it should be recognised that in alternative embodiments the dispensing mechanism may have a different arrangement. In one embodiment (not shown), the dispensing mechanism comprises a pump that is operable to pump medicament from the reservoir to deliver the medicament to the needle. For example, when the actuator is in the primed position, the patient may actuate the actuator to operate the pump to deliver medicament from the reservoir. In another embodiment (not shown), the reservoir comprises a barrel for containing medicament, wherein operation of the dispensing mechanism moves a plunger within the barrel to dispense medicament from the barrel, wherein the plunger is moved relative to the barrel by a drive mechanism, for example, an electric motor or a hydraulic or pneumatic drive mechanism. The motor may be a linear motor or may be a rotary motor that drives a rack and pinion gear assembly to move the plunger relative to the barrel.

(120) In some embodiments, actuation of the actuator may close a switch to operate the dispensing mechanism, for example, to operate a motor of a pump to dispense medicament from the reservoir or to operate a drive mechanism to move a plunger. Alternatively actuation of the actuator may be detected by a sensor, for example, a proximity sensor, wherein the dispensing mechanism is operated upon detection of actuation of the actuator.

(121) The terms “drug” or “medicament” are used herein to describe one or more pharmaceutically active compounds. As described below, a drug or medicament can include at least one small or large molecule, or combinations thereof, in various types of formulations, for the treatment of one or more diseases. Exemplary pharmaceutically active compounds may include small molecules; polypeptides, peptides and proteins (e.g., hormones, growth factors, antibodies, antibody fragments, and enzymes); carbohydrates and polysaccharides; and nucleic acids, double or single stranded DNA (including naked and cDNA), RNA, antisense nucleic acids such as antisense DNA and RNA, small interfering RNA (siRNA), ribozymes, genes, and oligonucleotides. Nucleic acids may be incorporated into molecular delivery systems such as vectors, plasmids, or liposomes. Mixtures of one or more of these drugs are also contemplated.

(122) The term “drug delivery device” shall encompass any type of device or system configured to dispense a drug into a human or animal body. Without limitation, a drug delivery device may be an injection device (e.g., syringe, pen injector, auto injector, large-volume device, pump, perfusion system, or other device configured for intraocular, subcutaneous, intramuscular, or intravascular delivery), skin patch (e.g., osmotic, chemical, micro-needle), inhaler (e.g., nasal or pulmonary), implantable (e.g., coated stent, capsule), or feeding systems for the gastro-intestinal tract. The presently described drugs may be particularly useful with injection devices that include a needle, e.g., a small gauge needle.

(123) The drug or medicament may be contained in a primary package or “drug container” adapted for use with a drug delivery device. The drug container may be, e.g., a cartridge, syringe, reservoir, or other vessel configured to provide a suitable chamber for storage (e.g., short- or long-term storage) of one or more pharmaceutically active compounds. For example, in some instances, the

chamber may be designed to store a drug for at least one day (e.g., 1 to at least 30 days). In some instances, the chamber may be designed to store a drug for about 1 month to about 2 years. Storage may occur at room temperature (e.g., about 20° C.), or refrigerated temperatures (e.g., from about −4° C. to about 4° C.). In some instances, the drug container may be or may include a dual-chamber cartridge configured to store two or more components of a drug formulation (e.g., a drug and a diluent, or two different types of drugs) separately, one in each chamber. In such instances, the two chambers of the dual-chamber cartridge may be configured to allow mixing between the two or more components of the drug or medicament prior to and/or during dispensing into the human or animal body. For example, the two chambers may be configured such that they are in fluid communication with each other (e.g., by way of a conduit between the two chambers) and allow mixing of the two components when desired by a user prior to dispensing. Alternatively or in addition, the two chambers may be configured to allow mixing as the components are being dispensed into the human or animal body.

(124) The drug delivery devices and drugs described herein can be used for the treatment and/or prophylaxis of many different types of disorders. Exemplary disorders include, e.g., diabetes mellitus or complications associated with diabetes mellitus such as diabetic retinopathy, thromboembolism disorders such as deep vein or pulmonary thromboembolism. Further exemplary disorders are acute coronary syndrome (ACS), angina, myocardial infarction, cancer, macular degeneration, inflammation, hay fever, atherosclerosis and/or rheumatoid arthritis.

(125) Exemplary drugs for the treatment and/or prophylaxis of diabetes mellitus or complications associated with diabetes mellitus include an insulin, e.g., human insulin, or a human insulin analogue or derivative, a glucagon-like peptide (GLP-1), GLP-1 analogues or GLP-1 receptor agonists, or an analogue or derivative thereof, a dipeptidyl peptidase-4 (DPP4) inhibitor, or a pharmaceutically acceptable salt or solvate thereof, or any mixture thereof. As used herein, the term “derivative” refers to any substance which is sufficiently structurally similar to the original substance so as to have substantially similar functionality or activity (e.g., therapeutic effectiveness).

(126) Exemplary insulin analogues are Gly(A21), Arg(B31), Arg(B32) human insulin (insulin glargine); Lys(B3), Glu(B29) human insulin; Lys(B28), Pro(B29) human insulin; Asp(B28) human insulin; human insulin, wherein proline in position B28 is replaced by Asp, Lys, Leu, Val or Ala and wherein in position B29 Lys may be replaced by Pro; Ala(B26) human insulin; Des(B28-B30) human insulin; Des(B27) human insulin and Des(B30) human insulin.

(127) Exemplary insulin derivatives are, for example, B29-N-myristoyl-des(B30) human insulin; B29-N-palmitoyl-des(B30) human insulin; B29-N-myristoyl human insulin; B29-N-palmitoyl human insulin; B28-N-myristoyl LysB28ProB29 human insulin; B28-N-palmitoyl-LysB28ProB29 human insulin; B30-N-myristoyl-ThrB29LysB30 human insulin; B30-N-palmitoyl-ThrB29LysB30 human insulin; B29-N—(N-palmitoyl-gamma-glutamyl)-des(B30) human insulin; B29-N—(N-lithocholyl-gamma-glutamyl)-des(B30) human insulin; B29-N-(ω-carboxyheptadecanoyl)-des(B30) human insulin and B29-N-(ω-carboxyhepta¬decanoyl) human insulin. Exemplary GLP-1, GLP-1 analogues and GLP-1 receptor agonists are, for example: Lixisenatide/AVE0010/ZP10/Lyxumia, Exenatide/Exendin-4/Byetta/Bydureon/ITCA 650/AC-2993 (a 39 amino acid peptide which is produced by the salivary glands of the Gila monster), Liraglutide/Victoza, Semaglutide, Taspoglutide, Syncria/Albiglutide, Dulaglutide, rExendin-4, CJC-1134-PC, PB-1023, TTP-054, Langlenatide/HM-11260C, CM-3, GLP-1 Eligen, ORMD-0901, NN-9924, NN-9926, NN-9927, Nodexen, Viador-GLP-1, CVX-096, ZYOG-1, ZYD-1, GSK-2374697, DA-3091, MAR-701, MAR709, ZP-2929, ZP-3022, TT-401, BHM-034. MOD-6030, CAM-2036, DA-15864, ARI-2651, ARI-2255, Exenatide-XTEN and Glucagon-Xten.

(128) An exemplary oligonucleotide is, for example: mipomersen/Kynamro, a cholesterol-reducing antisense therapeutic for the treatment of familial hypercholesterolemia.

(129) Exemplary DPP4 inhibitors are Vildagliptin, Sitagliptin, Denagliptin, Saxagliptin, Berberine.

(130) Exemplary hormones include hypophysis hormones or hypothalamus hormones or regulatory active peptides and their antagonists, such as Gonadotropine (Follitropin, Lutropin, Choriongonadotropin, Menotropin), Somatropine (Somatropin), Desmopressin, Terlipressin, Gonadorelin, Triptorelin, Leuprorelin, Buserelin, Nafarelin, and Goserelin.
(131) Exemplary polysaccharides include a glucosaminoglycane, a hyaluronic acid, a heparin, a low molecular weight heparin or an ultra-low molecular weight heparin or a derivative thereof, or a sulphated polysaccharide, e.g. a poly-sulphated form of the above-mentioned polysaccharides, and/or a pharmaceutically acceptable salt thereof. An example of a pharmaceutically acceptable salt of a poly-sulphated low molecular weight heparin is enoxaparin sodium. An example of a hyaluronic acid derivative is Hylan G-F 20/Synvisc, a sodium hyaluronate.
(132) The term “antibody”, as used herein, refers to an immunoglobulin molecule or an antigen-binding portion thereof. Examples of antigen-binding portions of immunoglobulin molecules include F(ab) and F(ab′)2 fragments, which retain the ability to bind antigen. The antibody can be polyclonal, monoclonal, recombinant, chimeric, de-immunized or humanized, fully human, non-human, (e.g., murine), or single chain antibody. In some embodiments, the antibody has effector function and can fix complement. In some embodiments, the antibody has reduced or no ability to bind an Fc receptor. For example, the antibody can be an isotype or subtype, an antibody fragment or mutant, which does not support binding to an Fc receptor, e.g., it has a mutagenized or deleted Fc receptor binding region.
(133) The terms “fragment” or “antibody fragment” refer to a polypeptide derived from an antibody polypeptide molecule (e.g., an antibody heavy and/or light chain polypeptide) that does not comprise a full-length antibody polypeptide, but that still comprises at least a portion of a full-length antibody polypeptide that is capable of binding to an antigen. Antibody fragments can comprise a cleaved portion of a full length antibody polypeptide, although the term is not limited to such cleaved fragments. Antibody fragments that are useful include, for example, Fab fragments, F(ab′)2 fragments, scFv (single-chain Fv) fragments, linear antibodies, monospecific or multispecific antibody fragments such as bispecific, trispecific, and multispecific antibodies (e.g., diabodies, triabodies, tetrabodies), minibodies, chelating recombinant antibodies, tribodies or bibodies, intrabodies, nanobodies, small modular immunopharmaceuticals (SMIP), binding-domain immunoglobulin fusion proteins, camelized antibodies, and VHH containing antibodies. Additional examples of antigen-binding antibody fragments are known in the art.
(134) The terms “Complementarity-determining region” or “CDR” refer to short polypeptide sequences within the variable region of both heavy and light chain polypeptides that are primarily responsible for mediating specific antigen recognition. The term “framework region” refers to amino acid sequences within the variable region of both heavy and light chain polypeptides that are not CDR sequences, and are primarily responsible for maintaining correct positioning of the CDR sequences to permit antigen binding. Although the framework regions themselves typically do not directly participate in antigen binding, as is known in the art, certain residues within the framework regions of certain antibodies can directly participate in antigen binding or can affect the ability of one or more amino acids in CDRs to interact with antigen.
(135) Exemplary antibodies are anti PCSK-9 mAb (e.g., Alirocumab), anti IL-6 mAb (e.g., Sarilumab), and anti IL-4 mAb (e.g., Dupilumab).
(136) The compounds described herein may be used in pharmaceutical formulations comprising (a) the compound(s) or pharmaceutically acceptable salts thereof, and (b) a pharmaceutically acceptable carrier. The compounds may also be used in pharmaceutical formulations that include one or more other active pharmaceutical ingredients or in pharmaceutical formulations in which the present compound or a pharmaceutically acceptable salt thereof is the only active ingredient. Accordingly, the pharmaceutical formulations of the present disclosure encompass any formulation made by admixing a compound described herein and a pharmaceutically acceptable carrier.
(137) Pharmaceutically acceptable salts of any drug described herein are also contemplated for use

in drug delivery devices. Pharmaceutically acceptable salts are for example acid addition salts and basic salts. Acid addition salts are e.g. HCl or HBr salts. Basic salts are e.g. salts having a cation selected from an alkali or alkaline earth metal, e.g. Na+, or K+, or Ca2+, or an ammonium ion N+(R1)(R2)(R3)(R4), wherein R1 to R4 independently of each other mean: hydrogen, an optionally substituted C1 C6-alkyl group, an optionally substituted C2-C6-alkenyl group, an optionally substituted C6-C10-aryl group, or an optionally substituted C6-C10-heteroaryl group. Further examples of pharmaceutically acceptable salts are known to those of skill in the arts.
(138) Pharmaceutically acceptable solvates are for example hydrates or alkanolates such as methanolates or ethanolates.
(139) Those of skill in the art will understand that modifications (additions and/or removals) of various components of the substances, formulations, apparatuses, methods, systems and embodiments described herein may be made without departing from the full scope and spirit of the present invention, which encompass such modifications and any and all equivalents thereof.

Claims

1. A medicament delivery device comprising: a housing comprising a first portion and a second portion, the first portion of the housing having a distal end and the second portion of the housing being moveable towards the distal end from an initial position to a second position, wherein when the second portion of the housing is in the second position, the medicament delivery device is in a primed position; a dispensing mechanism that comprises a reservoir disposed in the housing, the reservoir being a flexible bag, wherein the dispensing mechanism is operable to dispense a medicament from the reservoir when the reservoir contains the medicament; and an actuator, wherein actuation of the actuator is impeded such that the dispensing mechanism is rendered inoperable when the second portion is in the initial position, and the actuator is actuatable to operate the dispensing mechanism when the second portion is in the second position.
2. The medicament delivery device according to claim 1, wherein the reservoir is annular in shape.
3. The medicament delivery device according to claim 1, wherein the reservoir is a compressible bag.
4. The medicament delivery device according to claim 1, wherein the flexible bag is disposed in a recess in the housing.
5. The medicament delivery device according to claim 1, wherein the flexible bag abuts an inner proximal surface of the distal end of the first portion.
6. The medicament delivery device according to claim 1, wherein the dispensing mechanism further comprises a dispensing member and a biasing member configured to urge the dispensing member to move in a first direction relative to the housing to expel the medicament from the reservoir when the reservoir contains the medicament.
7. The medicament delivery device according to claim 6, wherein the biasing member is configured to resiliently deform when the second portion of the housing is moved from the initial position to the second position such that the biasing member exerts a biasing force on the dispensing member to urge the dispensing member in the first direction.
8. The medicament delivery device according to claim 7, further comprising a dispensing lock that is moveable between a locked state and an unlocked state, wherein the dispensing member is held in position relative to the housing against the biasing force of the biasing member when the dispensing lock is in the locked state, wherein the dispensing member is able to move in the first direction when the dispensing lock is in the unlocked state.
9. The medicament delivery device according to claim 6, wherein the flexible bag is located between a distal surface of the dispensing member and an inner proximal surface of the distal end of the first portion.
10. The medicament delivery device according to claim 9, wherein the flexible bag is compressed

between the distal surface of the dispensing member and the inner proximal surface of the distal end of the first portion to dispense fluid from the flexible bag when the dispensing member moves in the first direction.

11. The medicament delivery device according to claim 6, wherein the dispensing member is moveable relative to the flexible bag.

12. The medicament delivery device according to claim 1, wherein the actuator is retracted into the housing when the second portion is in the initial position to prevent actuation of the actuator, and the actuator protrudes out of the housing when the second portion is in the second position.

13. The medicament delivery device according to claim 1, wherein the actuator comprises a push button.

14. The medicament delivery device according to claim 1, further comprising a needle that is configured to protrude from the distal end of the first portion.

15. The medicament delivery device according to claim 14, wherein the reservoir abuts the needle in a direction perpendicular to a longitudinal axis.

16. The medicament delivery device according to claim 14, wherein an interior of the flexible bag is fluidly connected to the needle when the second portion is in the second position.

17. The medicament delivery device according to claim 16, wherein the interior of the flexible bag is fluidly connected to the needle via a conduit when the second portion is in the second position.

18. The medicament delivery device according to claim 1, further comprising a latch configured to resist movement of the second portion relative to the first portion from the second position to the initial position.

19. The medicament delivery device according to claim 1, wherein the first portion of the housing comprises a filling port for supplying the reservoir with the medicament.

20. The medicament delivery device according to claim 19, wherein the filling port and/or the reservoir comprise a one-way valve.

21. The medicament delivery device according to claim 1, wherein the second portion of the housing comprises a filling port for supplying the reservoir with the medicament.

22. The medicament delivery device according to claim 1, wherein the medicament delivery device is a large volume device.

23. The medicament delivery device according to claim 1, wherein the reservoir contains the medicament.

24. The medicament delivery device according to claim 1, wherein the actuator is at least partially received in the second portion of the housing.