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United States Patent Application Publication

20250256041

Kind Code

A1

Publication Date

August 14, 2025

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ADMINISTRATION ASSEMBLY FOR A MEDICAMENT DELIVERY DEVICE AND A MEDICAMENT DELIVERY DEVICE COMPRISING THE SAME

Abstract

An administration assembly for a medicament delivery device is presented having a plunger rod, a plunger rod holder and an activation sleeve configured to receive a portion of the plunger rod holder. The triggering member is configured to move the activation sleeve from a first position to a second position relative to the plunger rod holder. The plunger rod is configured to be axially locked relative to the plunger rod holder when the activation sleeve is in the first position. The plunger rod is released from being axially locked when the activation sleeve is moved towards the second position.

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Family ID: 59325199

Appl. No.: 19/192536

Filed: April 29, 2025

Foreign Application Priority Data

EP 17180913.0

Jul. 12, 2017

Related U.S. Application Data

parent US continuation 17725201 20220420 parent-grant-document US 12311155 child US 19192536

parent US continuation 16630379 20200110 parent-grant-document US 11357927 WO

continuation PCT/EP2018/067779 20180702 child US 17725201

Publication Classification

Int. Cl.: A61M5/32 (20060101); A61M5/20 (20060101); A61M5/315 (20060101)

U.S. Cl.:

CPC A61M5/326 (20130101); A61M5/3158 (20130101); A61M2005/208 (20130101); A61M2005/3267 (20130101)

Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS [0001] The present application is a continuation of U.S. patent application Ser. No. 17/725,201, filed Apr. 20, 2022, which is a continuation of U.S. patent application Ser. No. 16/630,379, filed Jan. 10, 2020, now U.S. Pat. No. 11,357,927, which is a U.S. National Phase Application pursuant to 35 U.S.C. § 371 of International Application No. PCT/EP2018/067779 filed Jul. 2, 2018, which claims priority to European Patent Application No. 17180913.0 filed Jul. 12, 2017. The entire disclosure contents of these applications are herewith incorporated by reference into the present application.

TECHNICAL FIELD

[0002] The present disclosure generally relates to medical devices. In particular, it relates to an administration assembly for a medicament delivery device, and to a medicament delivery device comprising an administration assembly.

BACKGROUND

[0003] Medicament delivery devices, in particular automated administration devices such as auto-injectors, are typically spring-biased. A device of this type may be activated for example by pushing the device towards the injection site, whereby a delivery member cover is moved in the proximal direction further into the housing, causing the device activation, or by means of an external button or slider.

[0004] WO2011043714 discloses a medicament delivery device comprising a housing, a first activator member, a second activator member, a drive mechanism including a plunger rod and a first compression spring, and a needle shield sleeve. The second activator comprises proximally extending flexible tongues configured to engage with the plunger rod to retain the plunger rod in an axial position prior to activation. This engagement is obtained due to the first activator member, which circumferentially encloses the flexible tongues and delimits the radial movement by the flexible tongues. The flexible tongues are thus prevented from flexing radially outwards. The first activator member is configured to be moved in the distal direction inside the housing by the needle shield sleeve, away from the flexible tongues, allowing the flexible tongues to flex radially outwards to disengage from the plunger rod. The plunger rod is thereby able to travel in the proximal direction.

[0005] Prior to use, the flexible tongues are thus subjected to the forward-biasing force provided by the first compression spring, causing the flexible tongues to weaken over time. This mechanical weakening is obtained because the cross-sectional dimension of the flexible tongues is reduced over time since they are axially stretched by the spring force. Thus, if for example the medicament delivery device is kept in storage for a longer period of time, for example a couple of years, the plastic structure of the flexible tongues may be substantially weakened. The first compression spring will therefore have to be designed to provide a forward-biasing force which does not cause damage to the flexible tongues even after a long period of storage.

SUMMARY

[0006] There has been a trend towards liquid medicaments with higher viscosity. This trend has been driven due to medicaments which nowadays contain larger molecules than in the past. Such medicaments are typically biosimilars. To be able to expel medicaments with higher viscosity, a higher biasing force on the plunger rod is required. It would therefore be desirable to be able to provide a high plunger rod biasing.

[0007] In view of the above, a general object of the present disclosure is to provide an administration assembly for a medicament delivery device which solves or at least mitigates problems of the prior art.

[0008] There is hence according to a first aspect of the present disclosure provided an administration assembly for a medicament delivery device, comprising: a plunger rod, a first resilient member configured to bias the plunger rod in the proximal direction, an elongated plunger rod holder configured to receive the plunger rod, an activation sleeve configured to receive a portion of the plunger rod holder, and configured to move axially from a first position relative to the plunger rod holder to a second position, wherein the activation sleeve is configured to be biased towards the first position, wherein the plunger rod holder has a first hold and release structure and the plunger rod has a second hold and release structure, wherein in the first position the activation sleeve is configured to maintain the first hold and release structure in an axially locking contact position with the second hold and release structure in which the second hold and release structure is prevented from proximally directed movement relative to the first hold and release structure, thereby locking the plunger rod axially relative to the plunger rod holder, wherein in the second position the activation sleeve is configured to allow the first hold and release structure to move from the axially locking contact position, whereby biasing of the plunger rod provided by the first resilient member causes the second hold and release structure to act with a proximally directed force on the first hold and release structure, moving the first hold and release structure radially outwards from the axially locking contact position to thereby release the plunger rod from the plunger rod holder.

[0009] According to one embodiment the triggering member is a delivery member cover having a distal end configured to bear against a proximal end of the activation sleeve.

[0010] One embodiment comprises a second resilient member configured to bias the activation sleeve in the proximal direction towards the first position.

[0011] According to one embodiment the first hold and release structure includes a radially flexible first arm and a radially flexible second arm, the first arm and the second arm extending parallel with each other in the distal direction from their attachment to a main body of the plunger rod holder.

[0012] Thus, contrary to the prior art solution, the first arm will initially be in a compressed state. The first arm will thus not be subjected to a pulling force when the activation sleeve is in the first position, and consequently, there the first arm will not become mechanically weakened if stored for a longer period of time.

[0013] According to one embodiment the activation sleeve is configured to prevent radially outward flexing of the first arm and the second arm when the activation sleeve is in the first position, whereby the first hold and release structure is maintained in the axially locking contact position with the second hold and release structure.

[0014] According to one embodiment in the second position of the activation sleeve, the first arm and the second arm are allowed to be flexed or pivoted radially outwards.

[0015] According to one embodiment the first arm has a first radially inwards extending portion and the second arm has a second radially inwards extending portion.

[0016] According to one embodiment the first radially inwards extending portion and the second radially inwards extending portion are configured to extend towards each other, and are configured to be located proximally relative to the second hold and release structure when the activation sleeve is in the first position to block proximal movement of the second hold and release structure.

[0017] According to one embodiment the second hold and release structure comprises a radially outwards extending protrusion configured to bear against the first radially inwards extending portion and the second radially inward extending portion when the activation sleeve is in the first position.

[0018] According to one embodiment the second hold and release structure includes a first opening and a second opening, wherein the first radially inwards extending portion is configured to engage with the first opening and the second radially inwards extending portion is configured to engage with the second opening in the axially locking contact position of the first hold and release structure with the second hold and release structure, and wherein the first radially inwards extending portion is allowed to disengage from the first opening and the second radially inwards extending portion is allowed to disengage from the second opening when the activation sleeve is in the second position.

[0019] According to one embodiment the first radially inwards extending portion and the first opening have cooperating bevelled surfaces and the second radially inwards extending portion and the second opening have cooperating bevelled surfaces.

[0020] According to one embodiment the second hold and release structure includes a first radially outwards extending protrusion and a second radially outwards extending protrusion, wherein the first radially inwards extending portion is configured to bear against a first proximal face of the first radially outwards extending protrusion and the second radially inwards extending portion is configured to bear against a second proximal face of the second radially outwards extending portion in the axially locking contact position of the first hold and release structure, and wherein the first arm and the second arm are configured to flex radially outwards when the activation sleeve is moved to the second position thereby disengaging the first radially outwards extending protrusion and the second radially outwards extending protrusion from the first arm and the second arm.

[0021] According to one embodiment the first radially inwards extending portion and the first proximal face have cooperating bevelled surfaces, and the second radially inwards extending portion and the second proximal face have cooperating bevelled surfaces.

[0022] There is according to a second aspect of the present disclosure provided a medicament delivery device comprising: a housing, a triggering member configured to move the activation sleeve from the first position towards the second position, and an administration assembly according to the first aspect, configured to be received by the housing.

[0023] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to “a/an/the element, apparatus, component, means, etc. are to be interpreted openly as referring to at least one instance of the element, apparatus, component, means, etc., unless explicitly stated otherwise.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The specific embodiments of the inventive concept will now be described, by way of example, with reference to the accompanying drawings, in which:

[0025] FIG. 1 is a perspective view of an example of a medicament delivery comprising an administration assembly;

[0026] FIG. 2 shows an exploded view of the medicament delivery device in FIG. 1;

[0027] FIG. 3a shows a perspective view of a first example of an administration assembly of the medicament delivery device in FIG. 1;

[0028] FIG. 3b shows a perspective view of a plunger rod holder and a plunger rod of the

administration assembly shown in FIG. 3a;

[0029] FIG. 4a shows a side view of the administration assembly;

[0030] FIG. 4b shows a side view of the administration assembly;

[0031] FIG. 5 show side a view of the administration assembly in FIGS. 4a and 4b with certain components removed;

[0032] FIG. 6 is a perspective view of a second example of an administration assembly;

[0033] FIG. 7 depicts a perspective view of a plunger rod holder and a plunger rod of the administration assembly shown in FIG. 6;

[0034] FIG. 8a shows a longitudinal section of a distal portion of a medicament delivery device containing the administration assembly shown in FIG. 6 in one state of operation;

[0035] FIG. 8b shows a longitudinal section of a distal portion of a medicament delivery device containing the administration assembly shown in FIG. 6 in one state of operation;

[0036] FIG. 8c shows a longitudinal section of a distal portion of a medicament delivery device containing the administration assembly shown in FIG. 6 in one state of operation;

[0037] FIG. 9a shows a longitudinal section of a distal portion of a medicament delivery device containing a variation of the administration assembly shown in FIG. 6 in one state of operation;

[0038] FIG. 9b shows a longitudinal section of a distal portion of a medicament delivery device containing a variation of the administration assembly shown in FIG. 6 in one state of operation; and

[0039] FIG. 9c shows a longitudinal section of a distal portion of a medicament delivery device containing a variation of the administration assembly shown in FIG. 6 in one state of operation.

DETAILED DESCRIPTION

[0040] The inventive concept will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplifying embodiments are shown. The inventive concept may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the inventive concept to those skilled in the art. Like numbers refer to like elements throughout the description.

[0041] In the present disclosure, when the term “distal direction” is used, this refers to the direction pointing away from the dose delivery site during use of the medicament delivery device. When the term “distal part/end” is used, this refers to the part/end of the delivery device, or the parts/ends of the members thereof, which under use of the medicament delivery device is/are located furthest away from the dose delivery site. Correspondingly, when the term “proximal direction” is used, this refers to the direction pointing towards the dose delivery site during use of the medicament delivery device. When the term “proximal part/end” is used, this refers to the part/end of the delivery device, or the parts/ends of the members thereof, which under use of the medicament delivery device is/are located closest to the dose delivery site.

[0042] Further, the terms “longitudinal”, “longitudinally”, “axially” and “axial” refer to a direction extending from the proximal end to the distal end and along the device or components thereof, typically in the direction of the longest extension of the device and/or component.

[0043] Similarly, the terms “transverse”, “transversal” and “transversally” refer to a direction generally perpendicular to the longitudinal direction.

[0044] FIG. 1 shows a perspective view of an example of a medicament delivery device 1. The exemplified medicament delivery device 1 is an auto-injector comprising an administration assembly, not shown, as will be described in more detail in what follows.

[0045] The medicament delivery device 1 comprises a housing 3 having a proximal end 3a and a distal end 3b, a delivery member cover 5 extending from a proximal opening in the proximal end 3a of the housing 3, and a rear end cap 7.

[0046] The delivery member cover 5 is biased in the proximal direction. The delivery member cover 5 is configured to be moved linearly, or axially, relative to the housing 3. The delivery member cover 5 is configured to be moved between an extended position relative to the housing 3,

shown in FIG. 1, and a retracted position relative to the housing 3. In the retracted position, a greater portion of the delivery member cover 5 is received by the housing 3 than in the extended position. The delivery member cover 5 is configured to be biased towards the extended position. [0047] FIG. 2 shows an exploded view of the medicament delivery device 1. The delivery member cover 5 has a first delivery member cover arm 5a and a second delivery member cover arm 5b, and a cylindrical proximal portion 5c configured to extend from the housing 3 in the extended position of the delivery member cover 5. The first delivery member cover arm 5a and the second delivery member cover arm 5b extend in the distal direction from the proximal portion 5c.

[0048] In a fully mounted state, the medicament delivery device 1 may comprise a medicament container 9, a stopper 11 and a medicament container holder 13. The medicament container holder 13 is mounted in the housing 3 and configured to hold the medicament container 9. The medicament container 9 is configured to receive the stopper 11 through an open distal end thereof.

[0049] The medicament delivery device 1 further comprises an administration assembly 10 including a plunger rod 15, a first resilient member 17, for example a spring, a guide rod 19, a plunger rod holder 21, an activation sleeve 23 and a second resilient member 25, for example a spring. The administration assembly 10 also includes a triggering member, here exemplified by the delivery member cover 5.

[0050] The plunger rod holder 21 is configured to receive the plunger rod 15. The plunger rod 15 has an inner axial channel, not shown. The first resilient member 17 is configured to be received by the plunger rod 15. In particular, the first resilient member 17 is configured to be received in the axial channel of the plunger rod 15. The first resilient member 17 is configured to receive the guide rod 19 when arranged in the axial channel. Bending of the highly stiff first resilient member 17 can thus be prevented.

[0051] The plunger rod 15 has a second hold and release structure 15a provided on a distal end portion of the outer surface of the plunger rod 15. In the present example, the second hold and release structure 15a includes a radially outwards extending protrusion, or wing 16.

[0052] The plunger rod holder 21 is configured to receive the plunger rod 15. Prior to use of the medicament delivery device 1, the plunger rod 15 is prevented from moving axially in the proximal direction relative to the plunger rod holder 21. Hereto, the plunger rod holder 21 has a first hold and release structure 21a configured to cooperate with the second hold and release structure 15a of the plunger rod 15. Prior to medicament administration, the first hold and release structure 21a is configured to be maintained by the activation sleeve 23 in an axially locking contact position with the second hold and release structure 15a.

[0053] The activation sleeve 23 is essentially cylindrical and configured to receive a portion of the plunger rod holder 21. The activation sleeve 23 is configured to be moved axially relative to the plunger rod holder 21 from a first or initial position to a second or release position located distally relative to the first or initial position. The activation sleeve 23 is configured to circumferentially enclose the plunger rod holder 21 and to cooperate with the first hold and release structure.

[0054] The activation sleeve 23 is configured to be moved by a triggering member, which in the present example is the delivery member cover 5, from the initial position to the release position. In particular, the delivery member cover 5 has a distal end 5d configured to bear against a proximal end 23b of the activation sleeve 23. In the present example, the first delivery member cover arm 5a and the second delivery member cover arm 5b are configured to bear against the proximal end 23b of the activation sleeve 23. When the activation sleeve 23 has been moved in the distal direction, to the second or release position, the first hold and release structure 21a is allowed to move from the axially locking contact position with the second hold and release structure 15a. The axially locking contact position of the first hold and release structure 21a with the second hold and release structure 15a is what maintains the plunger rod 15 in an axially interlocked state with the plunger rod holder 21. The plunger rod 15 will thus be allowed to move in the proximal direction, into the medicament container 9. A medicament contained therein may thereby be expelled.

[0055] The second resilient member **25** is configured to bias the activation sleeve **23** in the proximal direction. Due to this biasing, the activation sleeve **23** bears against the distal end **5d** of the delivery member cover **5**. According to the present example, the activation sleeve **23** has an outer surface provided with a distal flange **23a**. The second resilient member **25** is configured to be mounted between the flange **23a** and the rear end cap **7** so that it bears against the flange **23a** and the rear end cap **7**. The second resilient member **25** will thus bias the activation sleeve **23** in the proximal direction so that the proximal end **23b** of the activation sleeve **23** contacts the distal end **5d** of the delivery member cover **5**.

[0056] Turning now to FIG. **3a**, the medicament delivery device **1** is shown with the housing **3** removed. It can here be seen that the second resilient member **25** is provided between the rear end cap **7** and the flange **23a**. By pushing the delivery member cover **5** in the distal direction as shown by the arrow, the activation sleeve **23** will move from the first position shown towards the second position thereof. The second resilient member **25** will thus become compressed and bias the activation sleeve **23** and the delivery member cover **5** in the proximal direction, i.e. towards their first position and extended position, respectively.

[0057] According to the present example, the rear end cap **7** has a tubular body **7a** which is configured to receive a portion of the plunger rod holder **21**. The tubular body **7a** is configured to engage with the plunger rod holder **21**. Hereto, the tubular body **7a** has a recess **7b** and the plunger rod holder **21** has a radial protrusion **21b** configured to be received by the recess **7c**. The rear end cap **7** and the plunger rod holder **21** thus become axially and rotationally locked relative to each other.

[0058] FIG. **3b** shows the plunger rod holder **21** and the plunger rod **15** received therein. The plunger rod holder **21** has a radially flexible first arm **21c** and a radially flexible second arm **21d**. The first arm **21c** and the second arm **21d** form part of the first hold and release structure **21a**. The first arm **21c** and the second arm **21d** extend parallel to each other from their attachment with the main body of the plunger rod holder **21**. The first arm **21c** and the second arm **21d** extend in the distal direction from their attachment. The first arm **21c** and the second arm **21d** are hence distally extending arms. It should be noted that the first arm **21c** and the second arm **21d** may be integral with the main body of the plunger rod holder **21**, as is the case in the present example.

[0059] According to the present example, the main body of the plunger rod holder **21** is provided with two radial through-openings **21e**, of which only one is shown in FIG. **3b**. The radial through-openings **21e** weaken the mechanical strength of the plunger rod holder structure, and can be seen to form part of a respective hinge structure. The radial through-openings **21e** hence facilitates for the first arm **21c** and the second arm **21d** to flex or pivot radially outwards.

[0060] The first arm **21c** has a first radially inwards extending portion **22a**. The second arm **21d** has a second radially inwards extending portion **22b**. The first radially inwards extending portion **22a** and the second radially inwards extending portion **22b** are axially aligned and provided at a distal end portion of the first arm **21c** and the second arm **21d**, respectively. The first radially inwards extending portion **22a** and the second radially inwards extending portion **22b** extend towards each other. The distance between the first arm **21c** and the second arm **21d** is hence shorter between the first radially inwards extending portion **22a** and the second radially inwards extending portion **22b** than elsewhere along the first arm **21c** and the second arm **21d**.

[0061] The plunger rod **15** is provided with the second hold and release structure **15a**, which in the present example includes the radially outwards extending protrusion **16**. The radially outwards extending protrusion **16** is provided on a distal end portion of the plunger rod **15**. The first radially inwards extending portion **22a** and the second radially inwards extending portion **22b** are located proximally relative to the radially outwards extending protrusion **16** when the activation sleeve **23** is in the first position. The radially outwards extending protrusion **16** bears against the first radially inwards extending portion and the second radially inwards extending portion, as shown in FIG. **3b**. In this case, the inner surface of the activation sleeve **23** bears against the first arm **21c** and the

second arm **21d**, preventing the first arm **21c** and the second arm **21d** to flex or pivot radially outwards. On the other hand, when the activation sleeve **23** has been moved axially from the first position to the second position, the inner surface which previously prevented the first arm **21c** and the second arm **21d** to move radially outwards, has also been moved in the distal direction, distally past the first arm **21c** and the second arm **21d**. There is in this situation no longer a radially delimiting surface which prevents the first arm **21c** and the second arm **21d** to flex or pivot radially outwards. Due to the high proximal biasing provided by the first resilient member **17**, the radially outwards extending protrusion **16** will urge the first arm **21c** and the second arm **21d** radially outwards. In this manner, the radially outwards extending protrusion will be able to move through the momentarily expanded gap between the first radially inwards extending portion **22a** and the second radially inwards extending portion **22b**.

[0062] FIG. **4a** shows the administration assembly **10** with the activation sleeve **23** provided over the plunger rod holder **21**. The activation sleeve **23** has a distal portion **23c** and a proximal portion **23d**. The distal portion **23c** has a smaller inner diameter than the proximal portion **23d**. In the first position of the activation sleeve **23**, shown in FIG. **4a**, the distal portion **23c** circumferentially encloses the first arm **21c** and the second arm **21d**, thus preventing radial outward movement of the first arm **21c** and the second arm **21d**. When the activation sleeve **23** has been moved distally to the second position, the proximal portion **23d**, which has a larger inner diameter than the distal portion **23c**, will enclose the first arm **21c** and the second arm **21d** circumferentially.

[0063] In FIG. **4b**, the activation sleeve **23** has been removed for the purpose of illustration of the components below. A line of activation **27** marks the axial position which the trailing edge of the distal portion **23d** of the activation sleeve **23** has to cross when being moved distally, before the first arm **21c** and the second arm **21d** are allowed to move radially outwards.

[0064] In FIG. **5** a situation is shown in which the medicament delivery device **1** is in use, during medicament administration. Prior to medicament administration, the delivery member cover **5** is placed against the site of administration and pushed towards the site. As a result, the delivery member cover **5** is moved into the housing, from the extended position towards the retracted position. The delivery member cover **5** hence pushes the activation sleeve **23** in the distal direction, as shown by the arrow. In FIG. **5**, the activation sleeve **23**, in particular the distal portion **23c** thereof, has moved past the line of activation **27**. This results in that the second hold and release structure **15a**, i.e. the radially outwards extending protrusion, pushes the first arm **21c** and the second arm **21d** radially outwards, allowing it to move past the first radially inwards extending portion **22a** and the second radially inwards extending portion **22d**. Once the second hold and release structure **15a** has moved past the first radially inwards extending portion **22a** and the second radially inwards extending portion **22b**, the first arm **21c** and the second arm **21c** and the second arm **21d** are moved back to their initial parallel positions shown in FIG. **5**. The plunger rod **15** is now disengaged from the plunger rod holder **21**, and can push the stopper **11** forward inside the medicament container, causing medicament expulsion.

[0065] FIG. **6** show another example of a medicament delivery device **1'** with its housing removed. This medicament delivery device **1'** has an administration assembly **10'** which differs from the previously described administration assembly **10**. The plunger rod holder and the plunger rod constructions are different compared to the previous example.

[0066] FIG. **7** shows plunger rod holder **21'** and plunger rod **15'** received by the plunger rod holder **21'**. Plunger rod holder **21'** includes a radially flexible first arm **21'c** and a radially flexible second arm **21'd**. The first arm **21'c** and the second arm **21'd** form part of the first hold and release structure **21'a**. The first arm **21'c** and the second arm **21'd** extend parallel to each other from their attachment with the main body of the plunger rod holder **21'** in the distal direction. The first arm **21'c** and the second arm **21'd** are hence distally extending arms.

[0067] FIG. **8a** shows a longitudinal section of a distal portion of the medicament delivery device **1'** in a default state, prior to medicament expulsion/administration.

[0068] According to the present example, the plunger rod **15'** has a second hold and release structure **15'a** including a first opening **16'a** and a second opening **16'b**. The first opening **16'a** and the second opening **16'b** are radial openings, provided in the outer surface of the plunger rod **15'**. The first opening **16'a** and the second opening **16'b** are provided at about 180 degrees apart in the circumferential direction of the plunger rod **15'**.

[0069] The first arm **21'c** is provided with a first radially inwards extending protrusion **22'a** and the second arm **21'd** is provided with a second radially inwards extending protrusion **22'b**. The first radially inwards extending protrusion **22'a** is a first gripping member and is configured to engage with the first opening **16'a** and the second radially inwards extending protrusion **22'b** is a second gripping member configured to engage with the second opening **16'b** when the activation sleeve **23** is in the first position, as shown in FIG. **8a**.

[0070] The activation sleeve **23** has a distal portion **23c** and a proximal portion **23d**. The distal portion **23c** has a smaller inner diameter than the proximal portion **23d**. The first arm **21'c** and the second arm **21'd** bear against the inner surface of the distal portion **23c** when the activation sleeve **23** is in the first position. The first arm **21'c** and the second arm **21'd** are hence in this situation prevented from flexing radially outwards. In the present example, the first arm **21'c** has a protrusion which bears against the inner surface of the distal portion **23c** and the second arm **21'd** has a protrusion which bears against the inner surface of the distal portion **23c** when the activation sleeve **23** is in the first position.

[0071] FIG. **8b** shows when medicament administration has commenced. The delivery member cover **5** has been moved from the extended position towards the retracted position and the activation sleeve **23** has been moved from the first position towards the second position. The activation sleeve **23** has just moved past the line of activation **27** and the first arm **21'c** and the second arm **21'd** have thus been allowed to flex radially outwards, as shown. The first radially inwards extending portion **22'a** and the second radially inwards extending portion **22'b** hence disengage from the first opening **16'a** and the second opening **16'b** of the plunger rod **15'**, allowing the plunger rod **15'** to move in the proximal direction.

[0072] The first opening **16'a** and the first radially inwards extending portion **22'a** may have cooperating bevelled surfaces. The second opening **16'b** and the second radially inwards extending portion **22'b** may have cooperating bevelled surfaces. These cooperating bevelled surfaces facilitate disengagement between the plunger rod holder **21'** and the plunger rod **15'**.

[0073] In FIG. **8c**, the plunger rod **15'** has been released from its engagement with the plunger rod holder **21'** and moved in the proximal direction relative to the plunger rod holder **21'**. The first arm **21'c** and the second arm **21'd** have been moved back radially inwards to their initial position.

[0074] FIGS. **9a-9c** show a variation of the plunger rod **15'** and the plunger rod holder **21'**. In this example plunger rod **15''** has a second hold and release structure **15''** including a first radially outwards extending protrusion **15''b** and a second radially outwards extending protrusion **15''c**. The first radially outwards extending protrusion **15''b** and the second radially outwards extending protrusion **15''c** are arranged at a distal end portion of the plunger rod **15''**. The plunger rod holder **21''** is similar to the example in FIGS. **8a-8c** but here the inner surface of the first arm **21''c** is inclined, with the radial thickness of the first arm **21''c** increasing in the proximal direction. Moreover, the inner surface of the second arm **21''d** is inclined, with the radial thickness of the second arm **21''d** increasing in the proximal direction. This configuration facilitates radial outwards flexing/bending of the first arm **21''c** and the second arm **21''d**.

[0075] The first radially outwards extending protrusion **15''b** has a first proximal face **15''d** configured to bear against the first radially inwards extending portion **22''a**. The second radially outwards extending protrusion **15''c** has a second proximal face **15''e** configured to bear against the second radially inwards extending portion **22''b**. The first proximal face **15''d** is bevelled as is the corresponding surface of the first radially inwards extending portion **22''a**. The second proximal face **15''e** is bevelled as is the corresponding surface of the second radially inwards extending

portion 22''b. This configuration facilitates radial expansion of the first arm 21''c and the second arm 21''d when the distal portion of the activation sleeve 23 moves past the line of activation 27 shown in FIG. 9b.

[0076] In FIG. 9b the distal portion 23c of the activation sleeve 23 has moved past the line of activation 27. The first arm 21''c and the second arm 21''d will hence be flexed radially outwards, allowing the proximally biased plunger rod 15'', and in particular the first radially outwards extending portion 15''b and the second radially outwards extending portion 15''c, to pass under the first radially inwards extending portion 22''a and the second radially inwards extending portion 22''b.

[0077] FIG. 9c shows when the first radially outwards extending protrusion 15''b and the second radially outwards extending protrusion 15''c have moved past the first radially inwards extending portion 22''a and the second radially inwards extending portion 22''b and the plunger rod 15'' has moved in the proximal direction.

[0078] The inventive concept has mainly been described above with reference to a few examples. However, as is readily appreciated by a person skilled in the art, other embodiments than the ones disclosed above are equally possible within the scope of the inventive concept, as defined by the appended claims.

Claims

1. An activation mechanism for a medicament delivery device, comprising: a housing; a plunger rod having a first axial position, wherein the activation of the medicament delivery device causes the plunger rod to move relative to the housing from a first axial position to a second axial position; a first resilient member that is operatively engaged with the plunger rod to exert a biasing force on the plunger rod in a proximal direction; a plunger rod holder comprising a first hold and release structure that is releasably engaged with a second hold and release structure on the plunger rod when the plunger rod is in the first axial position, wherein the biased plunger rod exerts a radial biasing force on the first hold and release structure, and wherein the plunger rod holder is rotationally and axially fixed with respect to the housing throughout a duration of the activation of the medicament delivery device; and an activation sleeve slidably positioned relative to and partially surrounding the first hold and release structure, wherein axial movement of the activation sleeve from a first position to a second position causes disengagement of the first hold and release structure from the second hold and release structure, wherein the activation sleeve when in the first position maintains the engagement of first hold and release structure with the second hold and release structure to lock the plunger rod axially relative to the plunger rod holder, and wherein the disengagement of the first hold and release structure from the second hold and release structure is caused by the proximal biasing of the plunger rod which causes the second hold and release structure to act with a proximally directed force on the first hold and release structure such that the first hold and release structure moves radially outwards to unlock the plunger rod from the first axial position so that it can move to the second axial position.
2. The activation mechanism as claimed in claim 1, wherein the first hold and release structure includes a radially flexible arm that extends in a distal direction from a main body of the plunger rod holder.
3. The activation mechanism as claimed in claim 1, wherein the first hold and release structure comprises two radially flexible arms that extend in a distal direction from a main body of the plunger rod holder.
4. The activation mechanism as claimed in claim 2, wherein the activation sleeve has an inside surface that prevents radially outward flexing of the radially flexible arm when the activation sleeve is in the first position such that the first hold and release structure remains in engagement with the second hold and release structure.

5. The activation mechanism as claimed in claim 2, wherein when the activation sleeve is in the second position, the radially flexible arm will be flexed or pivoted radially outwards as a result of the biasing force exerted on the plunger rod by the resilient member.
6. The activation mechanism as claimed in claim 2, wherein the radially flexible arm has a radially inwards extending portion.
7. The activation mechanism as claimed in claim 6, wherein the radially inwards extending portion will be located proximally relative to the second hold and release structure when the activation sleeve is in the first position to block proximal movement of the second hold and release structure.
8. The activation mechanism as claimed in claim 6, wherein the second hold and release structure comprises a radially outwards extending surface that abuts the radially inwards extending portion when the activation sleeve is in the first position.
9. The activation mechanism as claimed in claim 8, wherein the radially inwards extending portion and the radially outwards extending surface both have cooperating beveled surfaces.
10. The activation mechanism as claimed in claim 1, wherein the second hold and release structure includes a first radially outwards extending surface and a second radially outwards extending surface, wherein the first hold and release structure comprises a first arm having a first radially inwards extending portion and a second arm having a second radially inwards extending portion, wherein the first radially inwards extending portion abuts against a first proximal face of the first radially outwards extending surface and the second radially inwards extending portion abuts against a second proximal face of the second radially outwards extending surface when the activation sleeve is in the first position, and wherein the first arm and the second arm flex radially outwards when the activation sleeve is moved to the second position causing disengagement of the first radially outwards extending surface and the second radially outwards extending surface from the first arm and the second arm.
11. The activation mechanism as claimed in claim 10, wherein the first radially inwards extending portion and the first proximal face have cooperating beveled surfaces, and the second radially inwards extending portion and the second proximal face have cooperating beveled surfaces.
12. The activation mechanism as claimed in claim 1, wherein the activation sleeve has a first inside diameter and a second inside diameter, and wherein the first inside diameter is smaller than the second inside diameter and abuts the first hold and release structure when the activation sleeve is in the first position.
13. The activation mechanism as claimed in claim 1, wherein the housing comprises a front housing part and a rear housing part, wherein the front housing part is rotationally and axially fixed to the rear housing part throughout the duration of the activation of the medicament delivery device, and wherein the plunger rod is rotationally and axially fixed to the front housing part throughout the duration of the activation of the medicament delivery device.
14. The activation mechanism as claimed in claim 1, further comprising a delivery member cover configured to move the activation sleeve from the first position towards the second position.
15. The activation mechanism as claimed in claim 14, wherein the delivery member cover has a distal end configured to bear against a proximal end of the activation sleeve when the delivery member cover is retracted into the housing.
16. The activation mechanism as claimed in claim 14, wherein the delivery member cover is biased in a proximal direction by a second resilient member.
17. A medicament delivery device comprising: the activation mechanism as claimed in claim 1; and a delivery member cover configured to move the activation sleeve from the first position towards the second position.
18. The medicament delivery device according to claim 17, wherein the delivery member cover has a distal end configured to bear against a proximal end of the activation sleeve when the delivery member cover is retracted into the housing.
19. The medicament delivery device of claim 17, wherein the first hold and release structure further

comprises: a radially flexible first arm; and a radially flexible second arm, wherein the first arm and the second arm extend parallel with each other in a distal direction from their attachment to a main body of the plunger rod holder, wherein when the activation sleeve is in a first position, the first arm and the second arm cannot flex radially outward, and wherein when the activation sleeve is in the second position, the first arm and the second arm will flex or pivot radially outwards relative to the plunger rod.

20. The medicament delivery device of claim 17, wherein the activation sleeve has a first inside diameter and a second inside diameter, where the first inside diameter is smaller than the second inside diameter and abuts the first hold and release structure when the activation sleeve is in the first position, and wherein when the delivery member cover moves distally, the activation sleeve moves distally relative to the first hold and release structure such that the second inside diameter is adjacent to the first hold and release structure.
