Description

Drive assembly for a drug delivery device and drug delivery device

The present invention relates to a drive assembly with a reset mechanism for a drug delivery device and a drug delivery device incorporating such a drive assembly.

Portable drug delivery devices are used for the administration of a medicinal fluid or drug that is suitable for the self-administration by a patient. A drug injection device is especially useful in the shape of a pen, which can be handled easily and kept everywhere available. A type of drug delivery device is constructed to be refillable and reusable many times. A dose of a drug is delivered by means of a drive mechanism, which also allows to set the dose that is to be dispensed.

US 5,827,232 discloses a medication delivery pen comprising a reusable pen body and a disposable cartridge assembly including a plunger. The cartridge assembly can be disassembled from the pen body after the medication therein has been exhausted, and the used cartridge assembly may be replaced.

It is an object of the present invention to disclose a new drive assembly for a drug delivery device and a new drug delivery device.

~~This object is achieved by a drive assembly according to claim 1 and a drug delivery device according to claim 14. Further objects are achieved by variants and embodiments according to the dependent claims.~~

The drive assembly for a drug delivery device, comprises:
a piston rod,
a guide nut, the guide nut being rotatable around an axis of the assembly,
a locking means, the locking means being radially movable with respect to the axis in order to engage with the guide nut and to inhibit a rotation of the guide nut,
a body in which the guide nut and the locking means are arranged, the locking means being fastened to the body,
a cartridge holder, which can be attached to and removed from the body, and

a fastener, the fastener being part of or fastened to the cartridge holder and being provided to move the locking means radially with respect to the axis , engaging the locking means with the guide nut, when the cartridge holder is attached to the body, and to hold the locking means in a position in which the locking means is engaged with the guide nut for drug delivery,

characterized in that

a screw thread coupling the guide nut and the piston rod enables a helical movement of the piston rod with respect to the guide nut, the helical movement comprising a rotation around the axis and a simultaneous shift along the axis,

the fastener is a protruding part of the cartridge holder, and

the fastener is made to slide over the locking means and engages the locking means with the guide nut by a rotation of the cartridge holder with respect to the body.~~comprises a guide nut, a locking means, which can be moved radially with respect to an axis of the assembly in order to engage with the guide nut and to inhibit a rotation of the guide nut, and a fastener, which is provided to move the locking means radially with respect to the axis and to hold the locking means in a position in which the locking means is engaged with the guide nut.~~

The guide nut can be a single component or can be composed of two or more parts. It can especially be formed to guide the movement of a piston rod, by means of a screw

thread, for example, and can have a threaded circular opening. The guide nut may be provided to engage with another component of the device by means of friction or by means of a structured surface, which may comprise teeth, grooves or spikes, for example, or similar structure elements.

The locking means can be any component that is suitable to engage with the guide nut in such a way as to inhibit a movement of the guide nut in some direction relatively to the locking means or to any device component that is stationary with respect to the locking means. The locking means can be designed according to the requirements of individual embodiments as described in the following. The locking means can comprise a pawl, a hook, a cantilever, or a leaf spring, for example. It can be resilient or resiliently mounted with respect to the guide nut and/or with respect to the fastener.

The fastener can be any component that is suitable to effect an engagement of the locking means with the guide nut. The fastener can be rigid or flexible, and can be formed of only one part or assembled of two or more parts. It can be formed to be a part of a component of the device or provided as a separate component. It can be designed to engage or couple with the locking means in any mechanical way that is suitable to change the relative position of the locking means with respect to the guide nut. The fastener can be moved or removed in such a way that an engagement of the locking means with the guide nut is released to allow a rotation of the guide nut; this feature can especially be provided for a reset operation.

~~An embodiment of the drive assembly may further comprise a body, in which the guide nut and the locking means are arranged.~~ The body can be any housing or any component that forms part of a housing, for example. The body can also be some kind of an insert connected with an exterior housing. The body may be designed to enable the safe, correct, and/or easy handling of the assembly or of a device comprising the assembly. The body may be designed to engage with one or several further components, which may be a dosing mechanism, a cartridge, a plunger, a piston rod, or the like. The body can be intended to house, fix and/or guide the assembly or the device, and particularly to protect it from harmful liquids, dust or dirt. The body can be unitary or a multipart component of tubular or non-tubular shape. The body may house a cartridge,

from which doses of a drug can be dispensed. The body can especially have the shape of an injection pen.

In an embodiment of the drive assembly, the guide nut may be rotatable with respect to a body. The locking means inhibits a rotation of the guide nut with respect to the body when the fastener engages the locking means with the guide nut.

An embodiment of the drive assembly may be provided to be used with a cartridge holder, which can be attached to and removed from a body. In such an embodiment, the fastener can be part of or fastened to the cartridge holder. The fastener engages the locking means with the guide nut when the cartridge holder is attached to the body. The fastener can particularly be provided by a protruding element of the cartridge holder.

A cartridge holder can be any unitary or multipart component that is intended to hold a cartridge containing a drug. The cartridge holder may be of cylindrical or tubular shape, for instance. It may be made of a transparent or opaque, a rigid or elastic material. The cartridge holder or an insert of the cartridge holder can be provided with engaging means like a screw thread or a bayonet joint, for instance. It may be provided with a nozzle and/or a means for attaching a needle or a needle assembly.

In an embodiment of the drive assembly, the locking means may be fastened to a body, and a cartridge holder may be attached to the body. A rotation of the cartridge holder with respect to the body moves the fastener into or out of the position, in which the fastener engages the locking means with the guide nut.

In further embodiments of the drive assembly, the guide nut may be a toothed wheel having notches or interspaces between the teeth, and the locking means may be a resilient or resiliently mounted pawl or cantilever comprising an edge or hook engaging the notches or interspaces.

Further embodiments comprise a piston rod and a screw thread, the screw thread coupling the guide nut and the piston rod and enabling a helical movement of the piston rod with respect to the guide nut, the helical movement comprising a rotation around an axis and a simultaneous shift along the axis. The guide nut, the locking means and the

piston rod may be arranged in athe body, and a web or interface of the body may be provided to inhibit a movement of the guide nut in the direction of the axis while permitting a rotation of the guide nut with respect to the body around the axis when the locking means is not engaged with the guide nut.

Further embodiments comprise a drive sleeve arranged within a body, the drive sleeve being coupled with a piston rod by means of a further screw thread. The screw thread and the further screw thread can have opposite senses of rotation.

Further embodiments comprise a clutch, by which the drive sleeve can be rotationally locked with respect to the body in a releasable manner. A shift of the drive sleeve with respect to the body along the axis may thus be converted into a helical movement of the piston rod with respect to the body when the drive sleeve is rotationally locked with respect to the body and the locking means is engaged with the guide nut.

The invention further relates to a drug delivery device comprising a drive assembly having a guide nut, a locking means, and a fastener, the fastener being movable with respect to the locking means into and out of a position, in which the fastener engages the locking means with the guide nut. The drug delivery device can have additional features according to the various embodiments of the drive assembly. Such a drug delivery device can particularly have the shape of an injection pen.

The drug delivery device can generally be a disposable or re-usable device designed to dispense a dose of a drug, which may be insulin, a growth hormone, a heparin, or an analogue and/or derivative thereof, for example. The device may be designed to be operated manually or electrically and may comprise a mechanism for setting a dose. The device may be further designed to monitor physiological properties like blood glucose levels, for example. Furthermore, said device may comprise a needle or may be needle-free.

These and other features of the invention will become apparent from the following brief description of the drawings, detailed description and appended claims and drawings. Same elements are related with same reference numerals.

Claims

1. A drive assembly for a drug delivery device, comprising:
a piston rod ~~(17)~~,
a guide nut ~~(4)~~, the guide nut being rotatable around an axis of the assembly,
a locking means ~~(9)~~, the locking means being radially movable with respect to the axis in order to engage with the guide nut and to inhibit a rotation of the guide nut,
a body ~~(3)~~ in which the guide nut and the locking means are arranged, the locking means being fastened to the body,
a cartridge holder ~~(2)~~, which can be attached to and removed from the body, and
a fastener ~~(14)~~, the fastener being part of or fastened to the cartridge holder and being provided to move the locking means radially with respect to the axis , engaging the locking means with the guide nut, when the cartridge holder is attached to the body, and to hold the locking means in a position in which the locking means is engaged with the guide nut for drug delivery,
characterized in that
a screw thread ~~(8, 15)~~ coupling the guide nut and the piston rod enables a helical movement of the piston rod with respect to the guide nut, the helical movement comprising a rotation around the axis and a simultaneous shift along the axis,
the fastener is a protruding part of the cartridge holder, and
the fastener is made to slide over the locking means and engages the locking means with the guide nut by a rotation of the cartridge holder with respect to the body.

2. The drive assembly according to claim 1, wherein
the fastener ~~(14)~~ is provided by a protruding element of the cartridge holder ~~(2)~~.

3. The drive assembly according to claim 1 or 2, wherein
the locking means ~~(9)~~ is not engaged with the guide nut ~~(4)~~ during a reset operation, when the cartridge holder is not attached to the body ~~(3)~~.

4. The drive assembly according to <u>any</u> one of claims 1 to 3, wherein

the guide nut ~~(4)~~ is a toothed wheel having notches or interspaces between the teeth, and

the locking means ~~(9)~~ is a resilient or resiliently mounted pawl or cantilever comprising an edge or hook engaging the notches or interspaces.

5. The drive assembly according to any one of claims 1- 4, further comprising:

a web ~~(32)~~ of the body ~~(3)~~ inhibiting a movement of the guide nut ~~(4)~~ in the direction of the axis while permitting a rotation of the guide nut around the axis when the locking means ~~(9)~~ is not engaged with the guide nut.

6. The drive assembly according to claim 5, further comprising:

a drive sleeve ~~(19)~~ arranged within the body ~~(3)~~, the drive sleeve being coupled with the piston rod ~~(17)~~ by means of a further screw thread ~~(16)~~.

7. The drive assembly according to claim 6, wherein

the screw thread ~~(8, 15)~~ and the further screw thread ~~(16)~~ have opposite senses of rotation.

8. The drive assembly according to claim 6 or 7, further comprising:

a clutch ~~(24)~~, by which the drive sleeve ~~(19)~~ can be rotationally locked with respect to the body ~~(3)~~ in a releasable manner.

9. The drive assembly according to claim 8, wherein

a shift of the drive sleeve ~~(19)~~ with respect to the body ~~(3)~~ along the axis is converted into a helical movement of the piston rod ~~(17)~~ with respect to the body when the drive sleeve is rotationally locked with respect to the body and the locking means ~~(9)~~ is engaged with the guide nut ~~(4)~~.

10. A drug delivery device comprising a drive assembly according to any one of claims 1 to 9.

11. A drug delivery device according to claim 10, having a shape of an injection pen.