Drug Administering Device and assembly method therefore

The present invention relates to a drug administering device, in particular to a device for repeatedly administering doses of a given drug from a same drug container and a method for assembly of such a device.

Devices of this type have become very popular for self-administration of certain drugs such as insulin or apomorphine by patients.

A conventional device of this type is known e.g. from US 2005/0137571 A1. This prior art device has a casing divided into front and rear portions which form front and rear parts, respectively, of a cavity in which a drug container is accommodated, and which can be taken apart in order to replace the drug container when empty.

Since the machinery needed for producing the drug containers and for filling them in a sterile manner is expensive, pharmaceutics manufacturers tend to use a same type of drug container for different drugs or for different preparations of a same drug.

If a patient uses such different drugs or different preparations, he might inadvertently replace an

empty drug container by a container of a different drug or a different preparation, and, in consequence, administer to himself a wrong dose of a required drug or even the wrong drug.

The present invention aims at eliminating this possibility.

According to an embodiment of the invention, this aim is achieved by a drug administering device comprising:
a casing front portion in which a cavity is formed and which comprises front connecting means,
a drug container received in said cavity,
a casing rear portion comprising a piston rod which is displaceable into the cavity, and rear connecting means for releasably connecting to said front connecting means,
wherein said casing front portion comprises at least two members which, in locking engagement which each other, delimit a front portion of said cavity and a rear portion the cross section of which is narrower than that of the front portion and too narrow for the drug container to pass.

Due to the narrow cross section of the cavity rear portion, a drug container received in the cavity front portion cannot be removed without taking apart the members of the casing front portion. Due to the locking engagement, the two members of the casing front portion cannot be separated from one another without being damaged. Therefore, a drug container which has been placed in the front portion of the cavity by the drug manufacturer cannot

be removed by the patient in a way which would allow the casing front portion to be re-used with another drug container. When the drug container installed in such a casing front portion by the manufacturer is empty, the patient must replace the casing front portion along with the drug container.

Further, securing the drug container within the casing front portion by bringing said members into locking engagement has the advantage that the use of glue for fixing the drug container can be avoided completely. There is no risk, therefore, that the drug container might be stuck to the casing front portion in a position in which its contents cannot be injected. Rather, if not placed correctly, the drug container will prevent the members from engaging each other. No curing time for the glue has to be respected, and there is no possibility of solvent from the glue contaminating the drug.

While the container, for the economical reasons presented above, tends to have a same shape for different types of drugs or preparations, no such restraint exists for the casing front portion. The casing front portion can therefore come in a variety of shapes or colours which a patient is unlikely to confuse. More importantly, the type of connecting means can vary depending on the type of drug or drug preparation contained in said casing front portion. If each type of drug or drug preparation has specific connecting means associated to it, and if a drug container is empty and is discarded along with its casing front portion, it can

only be replaced by a casing front portion having the same type of front connecting means, matching the rear connecting means of the casing rear portion. Therefore, it is practically impossible to combine a drug container with a casing rear portion for which it is not specified.

Since the casing rear portion can be used again and again, the aim of the invention is also achieved by a sub-assembly of the drug administering device described above, which does not comprise the casing rear portion, but in which are combined:
a casing front portion in which a cavity for receiving a drug container is formed and which comprises front connection means for releasably connecting the casing front portion to the casing rear portion, wherein said casing front portion comprises at least two members which, in locking engagement with each other, delimit a front portion of said cavity and a rear portion having a narrower cross section than the front portion,
and a drug container received in the front portion of the cavity and having a piston facing the rear portion of the cavity, in order to be engaged by a piston rod of the casing rear portion, when connected to the casing front portion.

The first one of said two members of the casing front portion may be tubular, and the rear portion of said cavity is formed by a second one of said members being inserted into a rear end of said tubular first member.

In order to achieve a tight fit within the tubular first member and to allow the passage of the piston rod, the second member preferably is ring-shaped, and the piston rod is displaceable through said ring-shaped second member.

For locking the second member within the first one, the second member can have an outer surface facing an inner wall surface of said tubular first member, and at least one locking boss of that second member projects beyond said outer surface and engages a cutout of said inner wall surface. Preferably, the number of locking bosses is at least two.

When the second member has a ring portion, the locking boss is preferably formed on a tab which protrudes from said ring portion in the axial direction thereof. While the ring portion is extremely hard to compress in the radial direction, the tab may yield radially when the second member is inserted into the tubular first member, and may resiliently engage the cutout when the second member reaches its target position.

The locking boss may have a forward facet which is which is slanted in the direction of the insertion. Such a facet facilitates a displacement of the locking boss in the radial direction when the second member is beginning to be inserted in the first member.

A rearward facet of the locking boss should be substantially perpendicular to the direction of insertion, in order to ensure locking engagement of the

two members when the second member has reached its target position.

The front connecting means might be formed on either member of the casing front portion. Preferably, it is formed on the first member, so that the second member may be concealed completely within the first when casing front and rear portions are connected to each other.

Preferably, the front and rear connecting means are threads. These may be provided in left- or right-handed form, with different cross sectional shapes, leads and pitches, so that a specific type of thread may be provided for a large variety of drugs or drug preparations, ensuring that a specific casing rear portion can only be used for the drug preparation for which it was certified.

In order to enable cost-effective manufacture of a large variety of drug-specific types of casing rear portion, the casing rear portion preferably comprises a main assembly in which the piston rod is mounted and which comprises a dosing mechanism for controlling displacement of the piston rod, and an adapter member in which the rear connecting means is formed. Such an adapter member may be connected to the main assembly e.g. by gluing or welding.

The aim of the invention is also achieved by a method for assembling at least a sub-assembly of the drug administering device describe above, comprising the steps of

- providing said at least two members of the casing front portion and the drug container,
- joining the drug container to the first member,
- forming the cavity receiving the drug container by connecting said first and second members.

The drug administering device may be completed by the manufacturer of the sub-assembly, by joining said sub-assembly to the casing rear portion. Alternatively, a patient, having emptied the drug container of the administering device used by him, may detach the casing rear portion of said device and combine it with a new sub-assembly comprising a full drug container.

Further features and advantages of the invention will become apparent from the subsequent description of embodiments thereof, referring to the appended drawings.

Fig. 1 is a perspective view of the drug administering device in a closed configuration;

Fig. 2 is a perspective view of the device with its cap removed;

Fig. 3 is a perspective view of a tubular member of a casing front portion of the device;

Fig. 4 is a perspective view of an annular retaining member of the casing front portion;

Fig. 5 is a cross section of the retainer member;

Fig. 6 is a perspective view of an adapter member of a casing rear portion;

Fig. 7 is a sectional view of components of the casing rear portion prior to assembly;

Fig. 8 is a sectional view of the casing rear portion after assembly;

Fig. 9 is a sectional view of components of the casing front portion before assembly;

Fig. 10 is a sectional view of the casing front portion after assembly; and

Fig. 11 is a sectional view of the device with casing front and rear portions connected to each other.

Fig. 1 is a perspective view of a drug administering device according to the present invention. The device is similar to a pen in that its overall shape is elongate and can be assigned a longitudinal axis 30. A casing portion referred to here as casing rear portion 1 because it faces away from a patient's skin when administering a drug, comprises a casing member 3 in which a dosing mechanism, not

shown in Fig. 1, is accommodated. The casing member 3 may comprise a clip for attaching the device e.g. to a garment. Buttons 4, 5, 6, 7 may be provided for controlling operation of the dosing mechanism, e.g. a button 4 for retrieving a previously administered dose from an electronic memory of the device, buttons 5, 6 for increasing or decreasing, respectively, the dose to be administered, and a button 7 for triggering injection of the dose. As can be seen in Fig. 2, a display 8 may be provided for displaying the dose set by manipulating buttons 4, 5, 6. Additionally or as an alternative to dose setting buttons 4, 5 6, a rotatable ring 9 or some other kind of displaceable member may be provided on casing rear portion 1, which is connected the dosing mechanism inside casing rear portion 1 for controlling the dose to be injected.

In Fig. 1, a removable cap 10 is concealing a casing front portion 2 of the device. In Fig. 2, the cap 10 is removed, and casing front portion 2 is shown. At the foremost tip of front portion 2, there is a thread 11 which, when in use, holds an injection needle, not shown in Fig. 2.

Fig. 3 is a perspective view of a tubular member 12 of casing front portion 2 according to an embodiment of the invention. The tubular member 12 is injection-moulded in one piece from plastic, e.g. from ABS. It comprises the thread 11, a tapering portion 13 and a hollow cylindrical portion 14. A male thread 15 is formed on the outside of cylindrical portion 14 adjacent to its rearward end, facing the viewer in Fig. 3. Next to thread 15, two

diametrically opposed holes 16 are formed in tubular member 12, one of which is shown in Fig. 3.

Fig. 4 illustrates a retaining member 24 of casing front portion 2. Retaining member 24 has a ring shaped body 25 with a cylindrical outer surface 26. At a rear side of body 25, two tabs 27 extend in the axial direction and carry locking bosses 28 which project beyond the outer surface 26 in the radial direction. As shown in Fig. 5 in an enlarged section, each boss 28 has a front facet 29 extending in a plane which intersects the axis 30 at a pointed angle α of less than 45°. A rear facet 31 extends in a plane which intersects axis 30 at an angle β larger than α. The angle β may be a right angle. Two notches 32 are formed at diametrically opposite locations of the rear side of body 25.

Fig. 6 is a perspective section view of an adapter member 17 of casing rear portion 1. On the outside, the adapter member 17 is cylindrical. At its rear end, a projection 18 of reduced diameter is formed. In Fig. 6, the adapter member 17 is shown cut open along a plane extending in its axial direction, in order to show a passage 19 extending through it. In a front portion 22 of passage 19, a female thread 20 is formed which matches the thread 15 of tubular member 12. A rear portion 21 of passage 19 has no thread formed in it and is narrower than threaded front portion 22.

Fig. 7 is an exploded section view of casing member 3 and adapter member 17 of the casing rear portion 1. Casing member 3 has a recess 23 which mates pro-

jection 18 of adapter member 17 and a cavity 33 extending from recess 23 along axis 30. An outer wall of recess 23 might be formed by ring 9.

During the assembly of casing rear portion 1 and as shown in Fig 8, the dosing mechanism mentioned above, referred to here by reference numeral 34, is inserted into cavity 32. Dosing mechanism 34 carries a piston rod 35 and controls its displacement. When adapter member 17 is fixed to casing member 32, e.g. by gluing or welding, piston rod 35 extends through it.

Fig. 9 shows tubular member 12, a drug container 36 and retaining member 24 prior to assembly. In a first step of the assembly process, drug container 36 is slid into a cavity 37 of tubular member 12 until it abuts against its tapering portion 13. The retaining member 24 is then pushed into tubular member 12 until it abuts against drug container 36. Due to the inclination of the front facets 29, the tabs 27 of retaining member 24 are resiliently displaced towards axis 30 upon entry into tubular member 12 and relax into holes 16 when retaining member 24 has reached a target position in contact with drug container 36.

There is a possibility that when the retaining member 24 abuts against drug container 36, the bosses 28 are displaced with respect to the holes 16 in the circumferential direction, and it may be necessary to rotate retaining member 24 around axis 30 in order to have the bosses 28 engage into the holes 16. The torque necessary for this may be ap-

plied by a blade-type tool, e.g. a screwdriver, engaging the notches 32 of retaining member 24.

Fig. 10 shows the retaining member 24 locked to tubular member 12 by the bosses 28 engaging holes 16. It is readily appreciated when the retaining member 24 is inserted into tubular member 12, it defines a front portion 38 of cavity 37, having a large enough diameter to accommodate drug container 36, and a rear portion 39, namely the passage through its body 25, which is too narrow for the drug container 36 to pass, so that drug container is locked in the position shown in Fig. 10.

If the drug container 36 was not placed correctly within cavity 37, but was e.g. stuck in tubular member 12 without reaching tapered portion 13, it is easily seen from Fig. 10 that retaining member 24 would not be able to lock in tubular member 12.

Due to the rear facets 31 being substantially perpendicular to axis 30, it is practically not possible to remove the retaining member 24 without breaking its tabs 27, eroding the bosses 28 or inflicting some other damage to casing front portion 2 that prevents it re-use.

In Fig. 11, the casing rear portion of Figs. 7, 8 and the casing front portion of Figs. 9, 10 are screwed together. Drug container 36 is partly shown in section here, so that piston rod 35 is seen to be in contact with a piston 40 of drug container 36.

Upon actuation of button 7 by the user, the dosing mechanism 34 advances piston rod 35, thereby displacing piston 40 and ejecting liquid drug preparation from container 36. The ejected volume is directly proportional to an amount of drug set by the user by means of buttons 4, 5, 6, but the amount of drug dispensed will only correspond to the set amount if the proportionality factor is adapted to the drug in container 36 and its concentration. Therefore, the casing rear portion 1 should be used with one drug and one concentration, as specified by its manufacturer.

Drug containers 36 may come in various types which differ not by their shapes but by the drugs contained in them and/or their concentration. When a drug manufacturer assembles drug containers 36 and casing front portions 2, a tubular member 12 having a different type of thread 15 should be used for each type of container 36. Since a given type of male thread 15 of the tubular member 12 matches with only one type of female thread 20 of an adapter member 17, it can be ensured that a casing front portion 2 and the drug container 36 installed therein can only be combined with a casing rear portion 1 having a dosing mechanism 34 adapted to the type of drug in container 36 and to its concentration. In this way, patients can be reliably prevented from administering themselves a wrong type of drug or a wrong dose.

For a patient who uses two or more dispensing devices for administering himself different drugs, using the administering device could be made still

more convenient if each type of drug had associated to it not only specific type of threads 15, 20, but also a specific colour of at least part of casing rear and front portions 1, 2. Specifically, if the tubular member 12 and a matching adapter member 17 have the same colour, the patient can tell without trying, just by looking at separate casing front and rear portions, whether it will be possible to combine them or not.

Reference Numerals

1	casing rear portion
2	casing front portion
3	casing member
4	button
5	button
6	button
7	button
8	display
9	ring
10	cap
11	thread
12	tubular member
13	tapering portion
14	hollow cylindrical portion
15	male thread
16	hole
17	adapter member
18	projection
19	passage
20	female thread
21	rear portion
22	front portion
23	recess
24	retaining member
25	body
26	outer surface
27	tab
28	boss
29	front facet
30	axis
31	rear facet

32 notch
33 cavity
34 dosing mechanism
35 piston rod
36 drug container
37 cavity
38 cavity front portion
39 cavity rear portion
40 piston

Patent Claims

1. A drug administering device comprising:
- a casing front portion (2) in which a cavity (37) is formed and which comprises front connecting means (15),
- a drug container (36) received in said cavity (37),
- a casing rear portion (1) comprising a piston rod (35) which is displaceable into said cavity (37) and rear connecting means (20) for releasably connecting to said front connecting means (15),
wherein said casing front portion (2) comprises at least two members (12, 24) which, in locking engagement with each other, delimit a front portion (38) of said cavity (37) and a rear portion (39), the cross section of which is narrower than that of the front portion (38) and too narrow for the drug container (36) to pass.

2. The drug administering device of claim 1, wherein a first one (12) of said two members is tubular, and the rear portion (39) of said cavity is formed by a second one (24) of said members being inserted into a rear end of said first member (12).

3. The drug administering device of claim 2, wherein the second member (24) is ring-

shaped and the piston rod (35) is displaceable through said second member (24).

4. The drug administering device of claim 2 or 3, wherein the second member (24) has an outer surface (26) facing an inner wall surface of said first member (12) and at least one locking boss (28) of said second member (24) projects beyond said outer surface (26) and engages a cutout (16) of said inner wall surface.

5. The drug administering device of claim 4, wherein the second member (24) has an annular body (25) and the locking boss (28) is formed on a tab (27) which protrudes from said annular body (25) in the axial direction thereof.

6. The drug administering device of claim 4 or 5, wherein the locking boss (28) has a forward facet (29) which is slanted in the direction of insertion.

7. The drug administering device of claim 4, 5 or 6, wherein the locking boss (28) has a rearward facet (31) which is substantially perpendicular to the direction of insertion.

8. The drug administering device of one of claims 2 to 7, wherein the front connecting means (15) is formed on said first member (12).

9. The drug administering device of any of the preceding claims, wherein the front and rear connecting means (15, 20) are threads.

10. The drug administering device of any of the preceding claims, wherein the casing rear portion (1) comprises a casing member (3) in which the piston rod (35) is mounted and which accommodates a dosing mechanism (34) for controlling displacement of the piston rod (35), and an adapter member (17) in which the rear connecting means (20) is formed.

11. The drug administering device of any of the preceding claims, wherein the drug container (36) comprises a piston (40) which co-operates with the piston rod (35).

12. A subassembly for the drug administering device of any of the preceding claims, comprising
- a casing front portion (2) in which a cavity (37) for receiving a drug container (36) is formed and which comprises front connecting means (15) for releasably connecting the casing front portion (2) to a casing rear portion (1), wherein said casing front portion (2) comprises at least two members (12, 24) which, in locking engagement with each other, delimit a front portion (38) of said cavity (37) and a rear portion (39) having a narrower cross sec-

tion than the front portion (38), and
- a drug container (36) received in the front portion (38) of the cavity (37) and having a piston (40) facing the rear portion (39) of the cavity.

13. A method for assembling the drug administering device of any of claims 1 to 11 or the subassembly of claim 12, comprising the steps of:
- providing said at least two members (12, 24) of the casing front portion (2) and the drug container (36),
- joining the drug container (36) to said first member (12),
- forming the cavity (37) receiving the drug container (36) by connecting said first and second members (12, 24).