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(54) **Manually operable fluid dispensing device**

(57) Manually operable fluid dispensing device, comprising a housing (10, 110), an actuation member (30, 130) attached to the housing (10, 110) so that it can be manually actuated in an actuation direction, a movable member (22, 122) being movable in a direction substantially perpendicular to the actuation direction of the actuation member (30, 130) in order to enable a discharge of fluid from the fluid dispensing device, a conversion mechanism for converting a movement of the actuation member (30, 130) into a movement of the moveable member, wherein the conversion mechanism includes a groove (32, 132) and a sliding portion (24, 124) slidably accommodated in the groove (32, 132), with the groove (32, 132) being provided on the actuation member (30, 130) or the movable member (22, 122) and the sliding portion (24, 124) being provided on the other one of the actuation member (30, 130) and the movable member (22, 122).

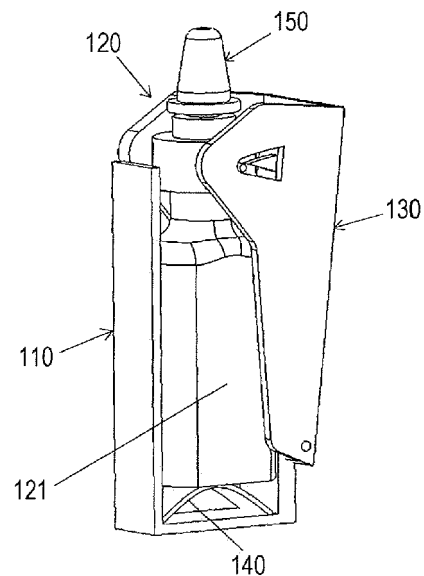


FIG. 4

Description

[0001] This invention relates to a manually operable fluid dispensing device. In particular, the present invention relates to a fluid dispensing device which is used to dispense a liquid substance (e.g. a pharmaceutical product) which is applied in the spray form. The dispensing device is designed to be operated manually in such a way that the force necessary to actuate the device is provided by the palm or fingers. Specifically, the dispensing device comprises a conversion mechanism which allows the direction of the actuating force (side actuation) to be perpendicular (or nearly so) to the axis of the spray leaving the device (longitudinal direction of the device).

[0002] In the prior art there are known manually operable fluid dispensing devices being side actuated, wherein the side actuating force is converted into a longitudinal force for the fluid pump triggering by means of a system of leverages, cams and suitable fluid container collars (see for example WO 2009/068877 A1). The used systems, however, consist of many parts leading to increased manufacturing costs as well as a complex assembly work.

[0003] It is the object of the present invention to provide a manually operable fluid dispensing device being side actuated, which can be manufactured at low costs and which is easy to assemble.

[0004] The object of the invention is solved with the fluid dispensing device according to the below items.

[0005] Item 1: Manually operable fluid dispensing device, comprising

a housing,
an actuation member attached to the housing so that it can be manually actuated in an actuation direction, a movable member being movable in a direction substantially perpendicular to the actuation direction of the actuation member in order to enable a discharge of fluid from the fluid dispensing device,
a conversion mechanism for converting a movement of the actuation member into a movement of the moveable member, wherein
the conversion mechanism includes a groove and a sliding portion slidably accommodated in the groove, with the groove being provided on the actuation member or the movable member and the sliding portion being provided on the other one of the actuation member and the movable member.

[0006] Item 2: The fluid dispensing device according to item 1, wherein the groove has a first guideway portion and a second guideway portion, the first guideway and the second guideway being continuously connected to one another other in series such that they form a closed guideway.

[0007] Item 3: The fluid dispensing device according to item 2, wherein the configuration of the first and second guideway portions being such that, when actuating the

actuating member from its rest position in the actuation direction, the sliding portion slides from its rest position along the first guideway portion towards an end thereof, thereby moving the movable member from its starting position so as to prepare a discharge of fluid from the fluid dispensing device, and after the actuating member has exceeded a predetermined distance, the sliding portion enters the second guideway portion, thereby moving the movable member in the opposite direction so as to discharge fluid from the fluid dispensing device.

[0008] Item 4: The fluid dispensing device according to item 3, wherein the configuration of the first and second guideway portions is such that, after the actuation force on the actuating member is released and the actuating member moves back to its rest position, the sliding portion moves on along the second guideway portion to its rest position, thereby returning the movable member to its starting position.

[0009] Item 5: The fluid dispensing device according to any one of items 2 to 4, wherein the groove is provided with a stopper, the stopper preventing the sliding portion from moving from its rest position directly into the end of the second passageway near the rest position.

[0010] Item 6: The fluid dispensing device according to item 5, wherein the stopper is a ramp or step.

[0011] Item 7: The fluid dispensing device according to any one of items 2 to 6, wherein the first guideway portion extends in a direction being inclined with respect to the actuation direction and the moving direction of the movable member.

[0012] Item 8: The fluid dispensing device according to any one of items 2 to 7, wherein at least a part of the second guideway substantially extends in the moving direction of the movable member.

[0013] Item 9: The fluid dispensing device according to any one of items 1 to 8, wherein the fluid dispensing device comprises a first urging means for urging the movable member to its rest position.

[0014] Item 10: The fluid dispensing device according to item 9, wherein the first urging mechanism is a spring of a fluid pump mechanism of the fluid dispensing device or a spring mounted between the housing and a fluid reservoir connected to the movable member.

[0015] Item 11: The fluid dispensing device according to any one of items 1 to 10, wherein the fluid dispensing device comprises a second urging mechanism urging the actuation member to its rest position.

[0016] Item 12: The fluid dispensing device according to item 11, wherein the second urging mechanism is a spring arranged between the housing and the actuation member and/or an elastic portion of the actuation member, which is supported by the housing.

[0017] Item 13: The fluid dispensing device according to any one of items 1 to 12, wherein the groove is, in top view, substantially in the shape of an oval ring or a triangle.

[0018] Item 14: The fluid dispensing device according to item 13, wherein a major axis of the oval ring or at least

one side of the triangle is inclined with respect to with respect to the actuation direction and the moving direction of the movable member.

[0019] Item 15: The fluid dispensing device according to any one of items 1 to 14, further comprising guiding means for guiding the movable member in its moving direction.

[0020] Item 16: The fluid dispensing device according to item 15, wherein the guiding means are constituted by at least one projection/recess formed on the movable member, and at least one corresponding recess/projection formed on the housing and engaging with the at least one projection/recess of the movable member.

[0021] Item 17: The fluid dispensing device according to any one of items 1 to 16, wherein the groove is formed on the actuation member.

[0022] Item 18: The fluid dispensing device according to item 17, wherein the actuation member comprises two arms sandwiching the movable member, wherein each arm is provided with the groove.

[0023] Item 19: The fluid dispensing device according to item 18, wherein the arms are elastically deformable such that the arms are able to slightly move away from each other.

[0024] Item 20: The fluid dispensing device according to any one of items 1 to 19, wherein the sliding portion is formed on the movable member.

[0025] Item 21: The fluid dispensing device according to item 20, wherein the movable member is provided with two sliding portions on opposite sides of the movable member.

[0026] Item 22: The fluid dispensing device according to any one of items 1 to 21, wherein the movable member is connected to a closure of a fluid reservoir or is a part thereof.

[0027] Item 23: The fluid dispensing device according to any one of items 1 to 22, wherein

the fluid dispensing device further comprises a pump mechanism,
the movable member is connected to the pump mechanism or being a part thereof, and
the pump mechanism being actuated by a movement of the movable member.

[0028] Item 24: The fluid dispensing device according to any one of items 1 to 23, wherein the actuation member is a handle to be gripped by the palm or fingers of a user, and pivotally connected to the housing.

[0029] According to the solution of item 1, the groove and the sliding portion being provided on the actuation member and the movable member, respectively, provide the conversion mechanism. Thus, there are no additional movable parts between the movable member and the actuation member (for example a single lever/button to be gripped/pushed by a user) compared to the prior art systems consisting of the leverages, cams and collars, so that the following advantages are achieved:

- the fluid dispensing device is simple to operate and easy to assemble;
- the fluid dispensing device can be manufactured with a low number of parts, in particular no additional leverages or cams are required; and
- there are only two moving parts, namely the actuation member and the movable member which reduces the production costs and improves the reliability of the fluid dispensing device.

[0030] Besides, all parts/members of the fluid dispensing device can be made of plastics.

[0031] As a result, the fluid dispensing device can be manufactured at low production and assembly costs.

[0032] Preferably, the sliding portion is a projection/pin integrally formed on the movable member or the sliding portion, and the groove is formed on the other of the movable member and the actuation member. As a result of this configuration, the conversion mechanism can be realized in a simple way, thereby further reducing the production costs and facilitating the assembly work.

[0033] The fluid dispensing device according to the above-mentioned items has in addition the following advantages:

- its spray characteristics do not depend on the way a user presses the button;
- a desired threshold force required for dispensing the fluid (i.e. for actuating the actuation member) can be achieved by modifying the shape of the actuation member and/or the groove and/or the sliding portion also in terms of geometry, dimensions and material properties; the dispensing device can thus be adapted to the special requirements of certain classes of users (children, elderly, disabled, etc.); and
- the dose of the dispensed fluid can be made independent of the way a user presses the actuation member.

[0034] The invention is described in detail below by means of preferred embodiments with respect to the attached drawings.

Fig. 1 is a schematic view of a fluid dispensing device according to a first embodiment of the invention.

Fig. 2 is a schematic view of the sliding portion of the fluid dispensing device according to the first embodiment.

Figures 3A, 3B and 3C are schematic views of the fluid dispensing device according to the first embodiment for illustrating the operation thereof.

Fig. 4 is a schematic view of a fluid dispensing device according to a second embodiment of the present invention.

Figures 5A, 5B and 5C are schematic side views of the fluid dispensing device according to the second embodiment for illustrating the operation thereof.

Fig. 6 is a schematic view of the sliding portion of the fluid dispensing device according to the second embodiment.

Fig. 7 is a schematic view of a fluid dispensing device according to a third embodiment.

Figures 8A and 8B are schematic views for illustrating an operation of the fluid dispensing device according to the third embodiment.

Fig. 9 is a schematic view of the fluid dispensing device according to a fourth embodiment.

Figures 10A and 10B are schematic side views of the fluid dispensing device according to the fourth embodiment for illustrating an operation thereof.

Figures 11A and 11B are schematic view of the fluid dispensing device according to a fifth embodiment.

Fig. 12A is a perspective view of a fluid dispensing device according to a sixth embodiment.

Fig. 12B is an exploded view of the fluid dispensing device according to the sixth embodiment.

Figures 13A, 13B and 13C are schematic drawings for illustrating the operation of the fluid dispensing device according to the sixth embodiment.

Fig. 14 is a schematic perspective view of a fluid dispensing device according to a seventh embodiment.

Fig. 15 is a schematic side view of the fluid dispensing device according to the seventh embodiment.

Fig. 16A is a schematic side view illustrating a fluid dispensing device according to an eighth embodiment, and Fig. 16B is a schematic perspective view of the fluid dispensing device according to the eighth embodiment.

Fig. 17A is a schematic side view illustrating a fluid dispensing device according to a ninth embodiment, and Fig. 17B is a schematic perspective view of the fluid dispensing device according to the ninth embodiment.

(First embodiment)

[0035] Fig. 1 is a simplified view of the fluid dispensing device according to the first embodiment of the present

invention, wherein not all parts of the fluid dispensing device are shown in Fig. 1 (for example an upper housing part and a nozzle, cap etc. are not shown in the drawing).

[0036] As shown in this figure, the fluid dispensing device comprises a housing 10 (the upper portion of which is cut away in the view of Fig. 1), wherein only the lower part of the housing is shown in Fig. 1. Inside the housing, a fluid container assembly 20 is accommodated. The fluid container assembly 20 basically comprises a fluid container or reservoir 21, a closure (not shown) closing the fluid container, a dispensing mechanism (not shown) provided in the closure and including a fluid pump for pumping out fluid from the fluid container 21, and a cap 22 which is fixed over closure (for example via an unshown ring) such that the cap 22 is integrally movable with the fluid container 21. A fluid container assembly and a dispensing mechanism, respectively, having such a basic configuration are known from the prior art, for example from WO 2009/153512, WO 2005/087615 A1 or WO 2009/068877.

[0037] On the cap 22 there are integrally formed projections 23 in the form of thin plates which project in the side direction of the longitudinal device and which are aligned in the longitudinal direction of the device. These projections 23 act as vertical guides (guides in the longitudinal direction) in combination with corresponding slots or grooves formed in the upper housing part such that, on the one hand, the fluid container assembly 20 can be moved in the longitudinal direction (the vertical direction in Fig. 1) only, and, on the other hand, a rotation of the cap 22 and the fluid container 21, respectively, around the longitudinal axis is prevented. Further, pins 24 are integrally formed on opposite sides of the cap 22, which project sideways from the cap 22.

[0038] The fluid dispensing device further comprises an actuation button or lever 30 (movable member) which is attached at its lower end, constituting a pivot, to the lower housing part such that it can be rotated about the pivot substantially in the side direction (being the actuation direction) being perpendicular to the longitudinal direction.

[0039] At the upper portion of the lever 30, there are integrally formed two arms 31 which project in the actuation direction so as to form a kind of fork such that they sandwich the cap 22 laterally. A groove 32 is formed on the internal face of each arm 31, wherein each pin 24 is accommodated in the corresponding groove 32 such that the pins 24 can slide in the grooves 32.

[0040] With respect to Fig. 2 being an enlarged view the groove 32 of one arm 31, the configuration of the grooves 32 is described below in detail. As can be seen from the figure, the groove 32 is, in plan view (i.e. in view of the lateral direction of the fluid dispensing device) substantially in the shape of a closed oval ring, wherein a major axis of the oval ring is inclined with respect to the actuation direction of the lever 30 and the moving direction of the fluid container assembly 20.

[0041] As shown in Fig. 2, the groove 32 has a first

guideway portion 32a and a second guideway portion 32b which are continuously connected to one another in series such that they form a closed guideway for the pins 24, i.e. the groove 32 forms, in plan view, a closed ring. Both, the first guideway portion 32a and the second guideway portion 32b, each of which forms a half of the oval shape, extend in a direction being inclined with respect to the actuation direction and the moving direction of the fluid container assembly 20. Further, the groove 32 is provided, at the end of the second guideway portion 32b, with a ramp 32c being a portion of the groove 32 where its depth gradually reduces. The ramp 32c is used as a stopper, the function of which will be explained below.

[0042] The function/operation of the fluid dispensing device according to the first embodiment will be described below with respect to Figures 2 and 3A to 3C.

[0043] Besides, a nozzle 50 for discharging fluid in the longitudinal direction from the device is provided at the top of the upper housing part 10a.

[0044] For dispensing fluid (for example a pharmaceutical product) from the fluid dispensing device, a user exerts a pushing force onto the lever 30 in the side direction (actuation direction). After a predetermined threshold force has been exceeded, the lever 30 moves, from its rest position toward the inside of the housing. In connection with this movement of the lever 30, the pins 24 are pressed, from their rest position (denoted with "R" in Fig. 2), upwardly by the lower lateral face of the first guideway portion 32a while sliding thereon, thereby moving the fluid container assembly 20 upwardly in the longitudinal direction, as illustrated in Fig. 3A. Along with the movement of the fluid container assembly 20, the fluid dispensing mechanism is prepared for operation (for example by means of a discharge tube of the dispensing mechanism which abuts against a nozzle (unshown) fixed to the housing so that the discharge tube is relatively moved with respect to the fluid container, thereby preparing the discharge of fluid). Further, during that movement, the guides 23 being in engagement with the corresponding recesses/grooves in the housing 10, prevent a rotation of the fluid container assembly 20 around the longitudinal axis in case of an unequal distribution of the pressure on the pins 24.

[0045] After the pins 24 have reached the ends of the first guideway portions 32a (highest point in the longitudinal direction of the device), the pins 24 enter the second guideway portion 32b, as illustrated in Fig. 3B and move downwardly along the second guideway portions 32b. At that point, the dispensing mechanism mounted inside the closure is activated, so as to dispense the liquid from the fluid container 21 in spray form via the nozzle of the fluid dispensing device. In connection with the downward movement of the pins 24 along the second guideway portions 32b, the fluid container assembly 20 moves downward in the longitudinal direction. In this embodiment, a spring (not shown), which is part of the fluid dispensing mechanism, pushes the fluid container assembly

bly 20 in the downward direction.

[0046] The pins 24 further move along the second guideway portions 32b in the downward direction and move, at the end of the second guideway portions 32b, along the ramps 32c, as illustrated in Fig. 3C. While passing these ramps 32c, the two arms 31 deform slightly and elastically in the outward direction (i.e. the arms slightly move away from each other). After the pins 24 have passed the ramps 32c, the arms 31 re-deform to their initial position and the pins 24 snap into their starting position "R" at the beginning of the first guideway portion 32a. The ramps 32c thus ensure that the pins 24 start moving along the first guideway portion 32a towards the dispensing position, when the user presses the lever 30 again, i.e. the ramps 32c prevent a sliding of the pins 24 in the upward direction along the second guideway portions 32b.

[0047] When the user releases the manual pressure on the lever 30, the lever 30 is pushed in the outward direction into its initial position as shown in Fig. 1 by a spring (not shown) arranged between the housing and the lever 30. Additionally or alternatively, the lever 30 can be urged to its initial position by means of an elastic portion thereof, which is supported by the housing 10.

[0048] The above described embodiment has in particular the following advantages:

- the fluid dispensing device is simple in operation and assembly;
- there are basically only two moving parts/assemblies (the lever 30 as well as the fluid container assembly 20);
- all parts/members can be made of plastics, so that the manufacturing costs are low;
- the spray characteristics do not depend on the way a user presses the lever;
- it is possible to achieve a desired spray characteristics and a desired threshold force necessary in order to activate the fluid dispensing mechanism by specifically adapting the size and/or shape of the pins 24/guideway portions 32a, 32b and lever 30, as well as the pre-tension of the lever 30.

(Second embodiment)

[0049] Next, a second embodiment of the fluid dispensing device according to the invention is described with respect to Figures 4, 5A to 5C and 6.

[0050] In this respect, it is pointed out that these Figures are a very simplified view of the fluid dispensing device and do not show all parts and the actual shape thereof, respectively.

[0051] The difference with respect to the above described first embodiment substantially lies in the configuration of the groove which will be explained below in detail.

[0052] The device comprises a housing 110, a fluid container assembly 120 (which can be constituted of the

same parts as the fluid container assembly 20 of the first embodiment), an actuation lever 130, a leaf spring 140 and a nozzle 150.

[0053] The fluid container assembly 120 is guided in the housing 110 so as to be movable in the longitudinal direction only (e.g. by vertical guides as in the first embodiment), and is provided with two pins 124 which project sideways from a cap 122 of the fluid container assembly 120.

[0054] The actuation lever 130 is attached at its lower end, constituting a pivot, to the housing 110 such that it can be rotated about the pivot substantially in the side direction (being the actuation direction) being perpendicular to the longitudinal direction.

[0055] In this embodiment, the groove 132, provided on the internal surface of each arm 131 of the lever 130, has a shape as exemplified in Fig. 6. In particular, the groove 132 is, in plane view, substantially in the shape of a triangle. The lower side of the triangle as shown in Fig. 6 constitutes a first guideway portion 132a which is inclined with respect to the actuation direction (side direction) and the moving direction of the fluid container assembly 120 (i.e. the longitudinal direction of the fluid dispensing device). The right side and the upper side of the triangle form a second guideway portion 132b. The right side of the triangle extends substantially in the longitudinal direction of the fluid dispensing device, especially when the actuation lever 130 is in its actuated position, as shown in Fig. 5B, and the upper side of the triangle is inclined with respect to both the actuation direction and the moving direction of the fluid container assembly 120.

[0056] Further, a step 132c is provided between the transition of the second guideway portion 132b to the first guideway portion 132a, in order to prevent the pin 124 from moving from its rest position (marked with A1 in Fig. 6) directly into the end of the second passageway 132b, i.e. so as to ensure that the pin 124 moves only in one direction along the triangle.

[0057] The leaf spring 140 is mounted between the bottom of the housing 110 and the lower face of the fluid container 121 such that it urges the fluid container assembly 120 in the upwardly in the longitudinal direction.

[0058] Below, the function/operation of the fluid dispensing device according to the second embodiment is described with reference to Figures 5A to 5C.

[0059] Fig. 5A shows the fluid dispensing device at its rest position, i.e. with no force applied onto the actuation lever 130. For dispensing fluid (for example a pharmaceutical product) from the fluid dispensing device, a user presses the lever 130 in the side direction (actuation direction). After a predetermined threshold force has been exceeded, the lever 130 moves, from its rest position (as shown in Fig. 5A) toward the inside of the housing (as shown in Fig. 5B). In connection with this movement of the lever 130, the first guideway portions 132a presses the two pins 124 in the downward direction, while the pins 124 slide from their rest position A1 (see Fig. 6)

downwardly along the first guideway portion 132a to the position A2 (the position A2 in Fig. 6 corresponds to the state shown in Fig. 5B). The downward movement of the pins 124 in turn results - due to their fixed connection with the fluid container assembly 120 - in a downward movement of the fluid container assembly 120 in the longitudinal direction, as can be seen from a comparison between Figures 5A and 5B, against the urging force of the spring 140. Along with the movement of the fluid container assembly 120, the fluid dispensing mechanism is prepared for operation (for example in the same way as described with respect to the first embodiment).

[0060] After the pins 124 have reached the ends of the first guideway portions 132a (position A2), an upward movement of the pins 124 in the longitudinal direction into the second guideway portion 132b is allowed. At that point, the fluid container assembly 120 is moved impulse-like upwardly in the longitudinal direction by means of the urging force of the spring 140 (as illustrated in Fig. 5B), thereby activating the fluid dispensing mechanism so as to discharge fluid in spray form via the nozzle 150. During that movement, the pins 124 are moved from the position A2 to the position A3.

[0061] Subsequently, when the user releases the actuation force onto the lever 130, the lever 130 is moved back to its rest position (as illustrated in Fig. 5C) due to the urging force of an unshown spring mounted between the lever 130 and the housing 110. During this movement of the lever 130, the pins 124 slide along the upper side of the triangle from the position A3 to the position A4, and from A4 back into the starting position A1, wherein in the transition from A4 to A1, the pins 124 pass the respective steps 132c in the second guideway portions 132b, which block the path directly back to the position A4, when the lever 130 is to be pressed again.

[0062] The second embodiment can achieve the same advantages as the first embodiment.

(Third embodiment)

[0063] Next, a third embodiment of a fluid dispensing device is described with respect to Figures 7 and 8.

[0064] Fig. 7 shows a simplified side view of the dispensing device. The device substantially comprises a housing 210, a fluid container assembly 220 (which can be constituted of the same parts as the fluid container assembly 20 of the first embodiment) mounted in the housing 210, a button 230 used to manually actuate the device, and a ratchet mechanism 240.

[0065] The operation of the mechanism is explained with reference to Fig. 8.

[0066] The button 230 is pivoted at fixed pivot points on the housing 210 in such a way that it can be rotated in the inward-outward direction about the pivoted points by manually applying force along its outer side. A spring (not shown), mounted between the button 230 and the housing 210, returns the button 230 to the starting position when the applied force is removed. An integral part

of the spring loaded button 230 is a finger 231 (called a "pawl") that engages teeth of a first gear 241 that is rotatably mounted at the closure or cap 224 of the fluid container 220.

[0067] The first gear 241 exhibits two sets of teeth 241a, 241b oriented perpendicularly to each other. The first set of teeth 241a meshes with the pawl. The second set of teeth 241b meshes with a second gear being a crown gear 242. The crown gear 241 is provided on the closure or cap 224 in such a way that the crown gear 242 can only translate in the direction of the axis of the fluid container (longitudinal direction) together with a movement of the fluid container assembly 220. Both teeth sets 241a, 241b exhibit teeth that are asymmetrically shaped, wherein each tooth has a moderate slope on one edge and a much steeper slope on the other edge. By meshing with the first gear 241 (sliding along the moderate slope of the teeth), the crown gear 242 moves upwards together with the fluid container assembly 220, which leads to dispensing of the liquid contained in the fluid container when a certain position is reached. When the meshing teeth of the gears 241, 242 pass the tooth tips, a spring (not shown), which is mounted in the closure as a part of the fluid dispensing mechanism, pushes the crown gear 242 back in the downward direction. Meshing teeth then slide along their steeper slopes. When the manual force on the button 230 ceases, the spring, mounted between the button 230 and the housing 210, returns the button 230 to the starting position. As an example, the gears 241, 242 in Fig. 8 comprise six teeth each. It should be noted, however, that other gear teeth numbers could be used as well.

[0068] Advantages of this embodiment are:

- simple operation and assembly,
- all parts of the mechanism are made of plastics,
- spray characteristic does not depend on the way a user presses the button,
- it is possible to optimize the teeth slopes and height to achieve the desired spray characteristics and the desired threshold force necessary to dispense the fluid.

(Fourth embodiment)

[0069] Next, a fourth embodiment of the fluid dispensing device is described with respect to Figures 9 and 10A, 10B.

[0070] Fig. 9 shows a simplified view of the dispensing device. The device substantially comprises a housing 310, a fluid container assembly 320 (which can be constituted of the same parts as the fluid container assembly 20 of the first embodiment) mounted in the housing 310, a button 330 used to manually actuate the device, and a gear 340 that is rotatably attached to the housing 310.

[0071] The operation of the mechanism is explained with reference to Fig. 10.

[0072] The button 330 is pivotally attached to the hous-

ing 310 at fixed pivot points in such a way that it can be rotated in the inward-outward direction about the pivoted points by manually applying force along its outer side. A spring (not shown), mounted between the button 330 and the housing 310, returns the button 330 to the starting position when the applied force is removed. An integral part of the spring loaded button 330 is a finger 331 that engages the teeth of the gear 340. By pressing the button 330 a user exerts force via the button finger 331 to a gear tooth of the gear 340. This brings the gear 340 into rotation. The next tooth of the gear 340 engages with the closure/cap 322 of the fluid container, thereby pushing the fluid container assembly 320 downwards. In doing so, a spring (not shown in the images) below the fluid container becomes compressed. In a certain position (Fig. 10B), the engaged tooth releases the downward pressure on the cap/closure 322 allowing the movement of the fluid container assembly 320 in the upward direction. At that point the spring pushes the fluid container assembly 320 upwardly, leading to a dispensing of the liquid contained in the fluid container via a nozzle 350. Another spring (not shown), mounted between the button 330 and the housing 310, returns the button 330 into the starting position (Fig. 10A).

[0073] Advantages of this embodiment are:

- simple operation and assembly,
- all parts of the mechanism are made of plastics,
- spray characteristic does not depend on the way a user presses the button,
- it is possible to optimize the shape of the teeth to achieve the desired spray characteristics and the desired threshold force necessary to dispense the fluid.

(Fifth embodiment)

[0074] Next, a fifth embodiment of the fluid dispensing device is described with respect to Figs. 11A and 11B.

[0075] Figs. 11A and 11B are simplified views of the dispensing device. The device substantially comprises a housing 410, a fluid container assembly 420 mounted in the housing 410, a button 430 used to manually actuate the device, and two gears 440 that are rotatably attached to the housing 410.

[0076] The operation of the dispensing device is as follows:

The button 430 is pivotally attached to the housing 410 at fixed pivot points in such a way that it can be rotated in the inward-outward direction about the pivoted points by manually applying force along its outer side. The button 430 exhibits two curved surfaces 431 that engage with corresponding pins 441 provided on the teeth of the two gears 440. By pressing the button 430 inwards the user brings thus the two gears 440 into rotation. Both gears 440 exhibit teeth that are asymmetrically shaped, wherein each tooth has a moderate slope on one edge and a much

steeper slope on the other edge.

[0077] Two pins 424 are provided on the opposite sides of the cap/closure of the fluid container, that slide along the teeth of the corresponding gears 440. A rotation of the gears 440 exerts an upward pressure onto the pins 424, while they slide along the moderate slopes of the teeth. In doing so, the cap/closure together with the fluid container assembly 420 moves upwardly in the longitudinal direction (a movement of the container in the side direction or around its axis is prevented by suitable guiding means). The movement of fluid container assembly 420 relative to the housing 410 leads to dispensing of the liquid contained in the fluid container. This occurs when the pins 424 approach the tips of the engaging teeth 440. When the pins 424 pass the tooth tips, a spring (not shown), which is mounted into the closure as a part of the fluid dispensing mechanism, pushes the cap/closure and, thus, the fluid container assembly 420 back in the downward direction. A spring (not shown in the figure), mounted between the button 430 and the housing 420, returns the button 430 into the starting position.

[0078] Advantages of this embodiment are as follows:

- simple operation and assembly,
- all parts of the mechanism are made of plastics,
- spray characteristic does not depend on the way a user presses the button,
- it is possible to optimize the shape of the teeth to achieve the desired spray characteristics and the desired threshold force necessary to dispense the fluid.

(Sixth embodiment)

[0079] Next, a sixth embodiment of the fluid dispensing device is described with respect to Figures 12A, 12B and 13A to 13C.

[0080] Figs. 12A, 12B are simplified views of the dispensing device. The device substantially comprises a housing (not shown), a fluid container assembly 520 (which can be constituted of the same parts as the fluid container assembly 20 of the first embodiment) mounted in the housing, a button 530 used to manually actuate the device, and a lever arm 540 which is used to move the fluid container assembly 520 in the vertical direction.

[0081] The button 530 is pivotally attached to the housing at fixed pivot points A1 in such a way that it can be rotated in the inward-outward direction about the pivoted points by manually applying force along its upper outer side. For the reasons of clarity, the button 530 is presented in a schematic way as a prismatic body particularly in the upper part where it is manually operated. It is to be noted that in a real application that part would be designed in a manner taking into consideration ergonomic requirements. In the lower part of the button 530 there is provided a hinge joint A2 connecting the button 530 to the lever arm 540. A leaf spring B1 is an integral part of the lever arm 540. The spring B1 is provided for the purpose

of storing the energy supplied manually via the button 530 and releasing it in an appropriate moment to move the fluid container assembly 520 in the upward direction. This movement of the fluid container assembly 520 leads to a dispensing of the fluid. Effecting the movement of the fluid container assembly 520 using the spring B1 provides the means to achieve repeatable dispensing of the fluid regardless of the way a user presses the button.

[0082] The operation of the mechanism is explained with reference to Figs. 13A to 13C. The starting position of the actuation mechanism is shown in 13A. In this position, the button 530 and the lever arm 540 are in state where they are locked to each other, i.e. where they are integrally movable. By applying a force to the upper outer part of the button 530, the button 530 and the lever arm 540 integrally rotate around the fixed pivot points A1. Specifically, they are locked together by means of a slider A3 (sliding pin), which is a part of the button 530, engaging with a groove B2, which is a part of the lever arm 540. The slider A3 is constrained to move in the longitudinal direction of the button 530 only by means of two grooves provided in the fork-like lower part of the button 530 which has the fork form. The slider A3 is attached to the button 530 by means of a V-spring that pushes the slider A3 in a direction to engage with the groove B2.

[0083] When the button 530 rotates towards the fluid container, the leaf spring B1 is deformed and the lever arm 540 gives way to the fluid container assembly 520 which moves downwards due to its own weight and the force exerted by a spring which is a part of the dispensing mechanism in the container closure. When the button 530 approaches the vertical position (see Fig. 13B), a wedge-like thorn C, which is an integral part of the housing 510, starts protruding through an opening in the center of the slider A3. The thorn C exerts an upwards force on the slider A3 which in the final position (see Fig. 13C) disengages from the groove B2. At that point the lever arm 540 becomes free to rotate around the hinge joint A2. Thus, the urging force of the leaf spring B1 is released, thereby moving the fluid container assembly 520 in the upward direction, which results in dispensing of fluid.

[0084] A spring (not shown), mounted between the button 530 and the housing 510, returns the button 530 into the starting position when the applied force is removed. During the returning movement of the button 530, the thorn C disengages with the opening in the slider A3 and the V-spring pushes the slider A3 downwards to engage with the groove B2. The operation cycle of the actuating mechanism is thus completed.

[0085] Advantages of this embodiment are as follows:

- simple operation and assembly,
- all parts of the mechanism are made of plastics,
- spray characteristic does not depend on the way a user presses the button,
- it is possible to optimize the mechanical advantage

of the button - lever arm assembly to achieve the desired spray characteristics and the desired threshold force necessary to dispense the fluid.

(Seventh embodiment)

[0086] Next, a seventh embodiment of the fluid dispensing device is described with respect to Figures 14 and 15.

[0087] Fig. 14 shows a simplified view of the dispensing device. The device substantially comprises a housing (not shown), a fluid container assembly 620 (which can be constituted of the same parts as the fluid container assembly 20 of the first embodiment) mounted in the housing, a button 630 used to manually actuate the device, and a lever arm 640 which is used to move the fluid container assembly 620 in the vertical direction. Further, a pair of linear guides 611, which constrain the motion of the button 630, are integrally provided on the housing, and a spring (not shown) for urging the fluid container assembly 620 in the upward direction is mounted between the housing and the fluid container of the fluid container assembly 620.

[0088] The operation of the device is explained with reference to Fig. 15. The purpose of the button 630 is the reception and transmission of the manual force in order to drive the actuation mechanism. The user applies pressure to the slightly concave actuation surface A of the button 630. The button 630 integrally includes two arms/handles B that protrude into the interior of the housing at right angles with respect to the actuation surface A. At the end of the two handles B, there are provided cylindrical pins oriented at right angles with respect to the handles B. The inside parts C1 of the pins are used for a sliding engagement with the lever arm 640, and the outside pins C2 engage with the linear guides 611 of the housing. A plate D, below the actuation surface A, of the button 630 includes a leaf spring E urges the button 630 to its initial position when the pressure on the same is released.

[0089] The lever arm 640 converts the horizontal displacement of the button 630 into a vertical displacement of the fluid container assembly 620 so as to discharge fluid from the device, and, thus, ensures cyclical operation of the actuation mechanism. The lever arm 640 is in its lower part (point K) pivotally attached to the housing. Two handles I in the upper part of the lever arm 640 extend towards the cap/closure of the fluid container assembly 620. The angle between the lever arm 640 and the axis of the spray leaving the device (longitudinal axis) is approximately 45°. There are two pins G attached to the opposite sides of the container closure. The two inner lower surfaces of the lever arm handles I slide along the closure pins G.

[0090] In the resting position, the container cap/closure (and, thus, the fluid container assembly 620) is located in its uppermost position, while the button 630 is located in its outermost position. The two button pins C1 are lo-

cated on the upper sliding surface of the handles I just above the lower groove H1.

[0091] Pressing the actuation surface A causes horizontal displacement of the button 630 constrained by the external pins C2 traveling along the linear guides 611 in the housing. The internal pins C1 slide along the upper sliding surface of the handles I from the lower groove H1 towards the upper groove H2. Thereby the two internal pins C1 exert a force F1 onto the lever arm 640. As a consequence, the lever handles exert a force F2 onto the closure pins G. This force causes a downward motion of the fluid container assembly 620 and a compression of the spring (not shown in the figures) below the fluid container. When the internal pins C1 reach and fall through the upper grooves H2, the force F1 ceases. The spring below the container releases the stored energy, thereby pushing the fluid container assembly 620 upwards. This triggers dispensing of the liquid contained in the fluid container. The upward motion of the closure pins G pushes the lever arm 640 back towards its starting position.

[0092] After dispensing the fluid, the user releases pressure onto the button 630. The spring E releases stored energy and pushes the button 630 back to the starting position until the internal pins C1 abut against the underside of the sliding surface of the lever arm 640.

[0093] The spring E is stronger than the weak spring J of the lever arm 640. When the internal pins C1 collide with the sliding surface, the stronger spring E overcomes the weaker spring J. This causes the lever handles I to lift slightly, so that the pins C1 can pass through the lower grooves H1 to the upper sliding surface of the handles I. The spring J causes a small downward force onto the lever arm 640 in the initial position and thus ensures that the next pressing of the button 630 makes the pins C1 again slide along the upper surface of the handles I.

[0094] Advantages of this embodiment are as follows:

- all parts of the mechanism are made of plastics,
- spray characteristic does not depend on the way a user presses the button,
- it is possible to optimize the mechanical advantage of the button - lever arm assembly to achieve the desired spray characteristics and the desired threshold force necessary to dispense the fluid.

(Eighth embodiment)

[0095] Next, an eighth embodiment of the fluid dispensing device is described with respect to Figs. 16A and 16B.

[0096] Figs. 16A and 16B are simplified views of the dispensing device. The device substantially comprises a housing (not shown), a fluid container assembly 720 (which can be constituted of the same parts as the fluid container assembly 20 of the first embodiment) mounted in the housing, and a mechanism 730 that allows two-sided manual actuation.

[0097] The single-piece actuating mechanism 730 simultaneously performs the functions of actuating buttons, levers and springs that return the actuating buttons to the original position.

[0098] The key function of the mechanism 730 is to receive horizontal forces F acting on the buttons E and to convert them into vertical forces that cause vertical displacement of the fluid container assembly 720, which leads to dispensing of the fluid from the fluid container.

[0099] The mechanism 730 is symmetrical in relation to the plane passing through the axis of the container (longitudinal direction) and dividing the mechanism 730 into two equal parts, which exhibit a characteristic V-shape. The front and the rear part of the mechanism 730 shown in Figs. 16A, 16B are thus the same. The front and the rear parts of the mechanism 730 are joined by means of surfaces E, which serve as the actuating buttons, receiving the pressure exerted by the palm and/or the fingers of a user.

[0100] The mechanism 730 is pivotally attached to the housing at two points A. The lower part of the mechanism 730 consists of two flexible arms B that have the characteristic V-form. In the upper part there are provided four circular segments having spur gear teeth C1, C2. The spur gear teeth C1, C2 mesh with corresponding pinion spur gears D which are rotatably mounted on opposites sides of the cap/closure of the fluid container assembly 720 e.g. by means of revolute joints.

[0101] In the rest position of the mechanism, the fluid container assembly 720 is located in its lowest position, so that the pinion gears D mesh with the bottom parts of the spur gear teeth C1, C2. The actuator surfaces E are in their outermost positions; the flexible arms B are straight and take the V-shape (as shown in Figs. 16A, 16B).

[0102] When a user exerts a pressing force F upon the surfaces E, the flexible arms B deform elastically storing a part of the energy supplied by manual pressure, thereby moving the spur gear teeth C1, C2 move towards each other. This causes a corresponding rotation and upward motion of the pinion gears D and the fluid container assembly 720, because the pinion gears D are connected to the container closure and, thus, to the fluid container assembly 720 by means of the revolute joints. The spur gears C1, C2 are fixed to the respective surface E in such a way that they do not interfere with each other when they move inwards. When a certain vertical displacement is reached, the dispensing mechanism in the container closure is activated leading to dispensing of the fluid from the container.

[0103] When the user releases the pressing force F onto the actuator surfaces E, the energy stored by the deformation of the arms B is released such that the buttons E are pushed outwards into the initial (rest) position.

[0104] A desired triggering characteristic of the mechanism 730 can be determined by a suitable design of the key elements: curvature of circular segments, gear teeth C1, C2 and deflection properties of the arms B.

[0105] Advantages of this embodiment are as follows:

- low number of parts,
- all parts are made of plastics,
- spray characteristic does not depend on the way a user presses the button,
- it is possible to optimize the mechanism design to achieve the desired spray characteristics and the desired threshold force necessary to dispense the fluid.

(Ninth embodiment)

[0106] Next, a ninth embodiment of the fluid dispensing device is described with respect to Figs. 17A and 17B.

[0107] Figs. 17A and 17B are simplified views of the dispensing device. The device substantially comprises a housing (not shown), a fluid container assembly 820 (which can be constituted of the same parts as the fluid container assembly 20 of the first embodiment) mounted in the housing, a button E used to manually actuate the device, a rack G and a pinion gear D constituting a mechanism 830.

[0108] The key function of the mechanism 830 is to receive a horizontal force F acting on the button E and to convert it into a vertical force that causes vertical displacement of the fluid container assembly 820, which leads to a dispensing of the fluid from the fluid container.

[0109] The mechanism 830 is symmetrical in relation to a plane passing through the axis of the container (longitudinal axis) and dividing the mechanism 830 into two equal parts. The front and the rear part of the mechanism 830 shown in Fig. 17A are thus the same. The front and the rear parts of the mechanism 830 are joined by means of a surface E, which serves as the actuating button, receiving the pressure applied manually by a user.

[0110] The mechanism 830 is pivoted to the housing in two points A. The lower part of the mechanism 830 consists of two lever arms B and two leaf springs H. In the upper part there are two circular segments with spur gear teeth C. The two spur gear teeth C mesh with the corresponding pinion spur gears D which are rotatably mounted at opposite sides of the cap/closure of the fluid container assembly 820 using revolute joints. Also meshing with the corresponding pinion gears D are racks G mounted to the housing. The racks G serve as guides for a vertical movement of the fluid container assembly 820.

[0111] When a user exerts a pressing force F upon the surface E, the spur gear teeth C move inwards towards the pinion gears B. This causes a rotation and upward motion of the corresponding pinion gear D and, thus, the fluid container assembly 820. When a certain vertical displacement is reached, the dispensing mechanism in the container closure is activated leading to dispensing of the fluid from the fluid container. A leaf spring H deforms during actuation and stores a part of the energy supplied by manual pressure.

[0112] When the user releases the pressing force F

onzo the actuator surface E, the energy stored by the leaf spring E is released so that the button E is pushed outwards into the initial (rest) position.

[0113] A desired triggering characteristic of the mechanism 830 can be determined by a suitable design of the key elements: curvature of the circular segments, gear teeth C and stiffness of the leaf spring E.

[0114] Advantages of this embodiment are as follows:

- low number of parts,
- all parts are made of plastics,
- spray characteristic does not depend on the way a user presses the button,
- it is possible to optimize the mechanism design to achieve the desired spray characteristics and the desired threshold force necessary to dispense the fluid.

Claims

1. Manually operable fluid dispensing device, comprising

- a housing (10, 110),
- an actuation member (30, 130) attached to the housing (10, 110) so that it can be manually actuated in an actuation direction,
- a movable member (22, 122) being movable in a direction substantially perpendicular to the actuation direction of the actuation member (30, 130) in order to enable a discharge of fluid from the fluid dispensing device,
- a conversion mechanism for converting a movement of the actuation member (30, 130) into a movement of the moveable member, wherein
- the conversion mechanism includes a groove (32, 132) and a sliding portion (24, 124) slidably accommodated in the groove (32, 132), with the groove (32, 132) being provided on the actuation member (30, 130) or the movable member (22, 122) and the sliding portion (24, 124) being provided on the other one of the actuation member (30, 130) and the movable member (22, 122).

2. The fluid dispensing device according to claim 1, wherein the groove (32, 132) has a first guideway portion (32a, 132a) and a second guideway portion (32b, 132b), the first guideway portion (32a, 132a) and the second guideway portion (32b, 132b) being continuously connected to one another other in series such that they form a closed guideway.

3. The fluid dispensing device according to claim 2, wherein the configuration of the first and second guideway portions (32a, 32b, 132a, 132b) is such that, when actuating the actuation member (30, 130) from its rest position in the actuation direction, the

sliding portion (24, 124) slides from its rest position along the first guideway portion (32a, 132a) towards an end thereof, thereby moving the movable member (22, 122) from its starting position so as to prepare a discharge of fluid from the fluid dispensing device, and after the actuation member (30, 130) has exceeded a predetermined distance, the sliding portion (24, 124) enters the second guideway portion (32b, 132b), thereby moving the movable member (22, 122) in the opposite direction so as to discharge fluid from the fluid dispensing device.

4. The fluid dispensing device according to claim 3, wherein the configuration of the first and second guideway portion (32a, 32b, 132a, 132b) is such that, after the actuation force on the actuation member (30, 130) is released and the actuation member (30, 130) moves back to its rest position, the sliding portion (24, 124) moves on along the second guideway portion (32b, 132b) to its rest position, thereby returning the movable member (22, 122) to its starting position.

5. The fluid dispensing device according to any one of claims 2 to 4, wherein the groove (32, 132) is provided with a stopper (32c, 132c), the stopper (32c, 132c) preventing the sliding portion (24, 124) from moving from its rest position directly into the end of the second passageway portion (32b, 132b) near the rest position, wherein preferably the stopper (32c, 132c) is a ramp or step.

6. The fluid dispensing device according to any one of claims 2 to 5, wherein the first guideway portion (32a, 132a) extends in a direction being inclined with respect to the actuation direction and the moving direction of the movable member (22, 122).

7. The fluid dispensing device according to any one of claims 2 to 6, wherein at least a part of the second guideway portion (132b) substantially extends in the moving direction of the movable member (122).

8. The fluid dispensing device according to any one of claims 1 to 7, wherein the fluid dispensing device comprises a first urging means for urging the movable member (22, 122) to its rest position, wherein preferably the first urging mechanism is a spring of a fluid pump mechanism of the fluid dispensing device or a spring mounted between the housing (10, 110) and a fluid reservoir (21, 121) connected to the movable member (22, 122).

9. The fluid dispensing device according to any one of claims 1 to 8, wherein the fluid dispensing device comprises a second urging mechanism urging the actuation member (30, 130) to its rest position, wherein preferably the second urging mechanism is

a spring arranged between the housing (10, 110) and the actuation member (30, 130) and/or an elastic portion of the actuation member (30, 130), which is supported by the housing (10, 110).

5

10. The fluid dispensing device according to any one of claims 1 to 9, wherein the groove (32, 132) is, in plan view, substantially in the shape of an oval ring or a triangle, wherein preferably a major axis of the oval ring or at least one side of the triangle is inclined with respect to the actuation direction and the moving direction of the movable member (22, 122). 10
11. The fluid dispensing device according to any one of claims 1 to 10, further comprising guiding means (24) for guiding the movable member (22, 122) in its moving direction, wherein preferably the guiding means are constituted by at least one projection/recess formed on the movable member, and at least one corresponding recess/projection formed on the housing (10, 110) and engaging with the at least one projection/recess of the movable member (22, 122). 15 20
12. The fluid dispensing device according to any one of claims 1 to 11, wherein the groove (32, 132) is formed on the actuation member (30, 130). 25
13. The fluid dispensing device according to claim 12, wherein the actuation member (30, 130) comprises two arms (31, 131) sandwiching the movable member (22, 122), wherein each arm (31, 131) is provided with the groove (32, 132), wherein preferably the arms (31, 131) are elastically deformable such that the arms (31, 131) are able to slightly move away from each other. 30 35
14. The fluid dispensing device according to any one of claims 1 to 13, wherein the sliding portion (24, 124) is formed on the movable member (22, 122), wherein preferably the movable member (22, 122) is provided with two sliding portions (24, 124) on opposite sides of the movable member (22, 122). 40
15. The fluid dispensing device according to any one of claims 1 to 14, wherein 45
 - the movable member (22, 122) is connected to a closure of a fluid reservoir (21, 121) or is a part thereof, and/or
 - the fluid dispensing device further comprises a pump mechanism, the movable member (22, 122) is connected to the pump mechanism or being a part thereof, and the pump mechanism being actuated by a movement of the movable member, and/or 50 55
 - the actuation member (30, 130) is a handle to be gripped by the palm or fingers of a user, and pivotally connected to the housing (10, 110).

FIG. 1

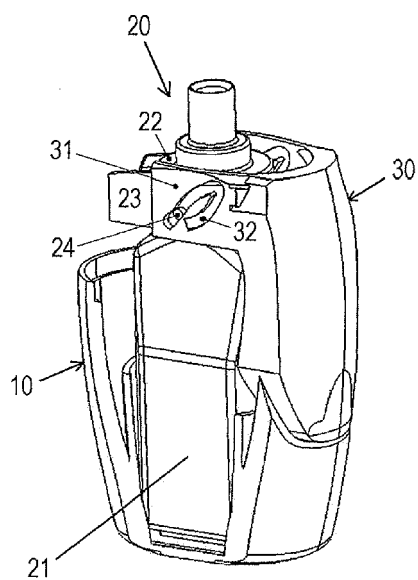
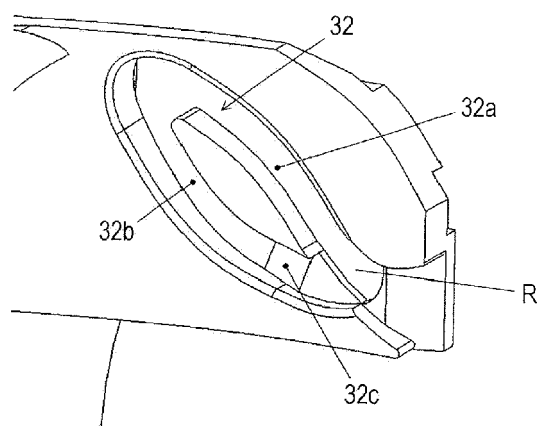


FIG. 2



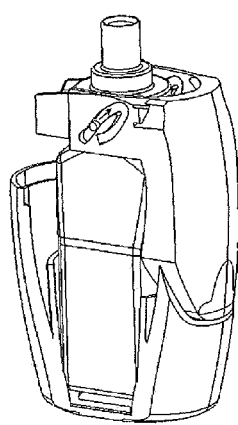


FIG. 3A

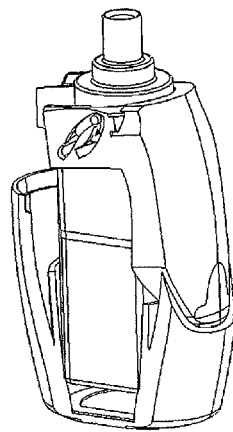


FIG. 3B

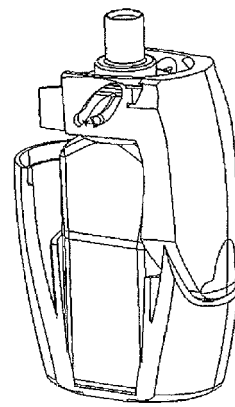


FIG. 3C

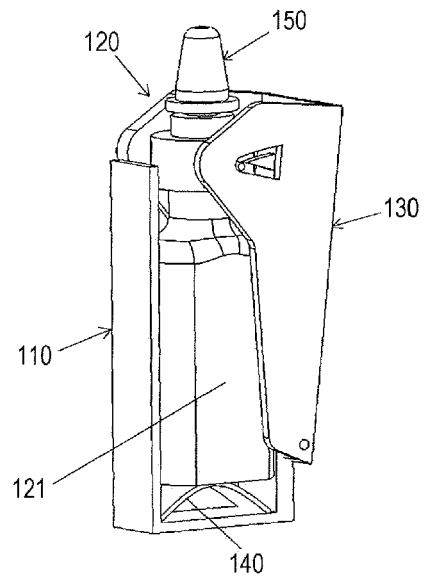


FIG. 4

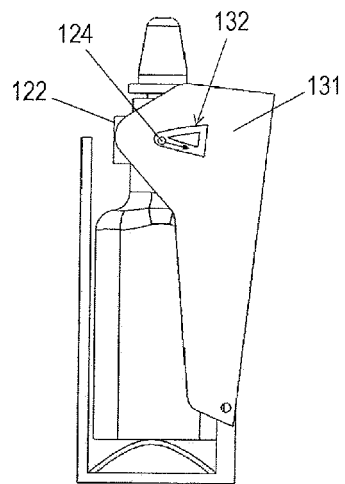


FIG. 5A

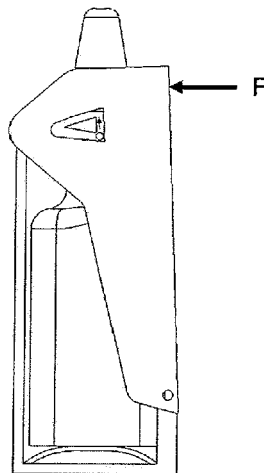


FIG. 5B

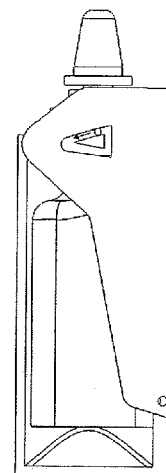
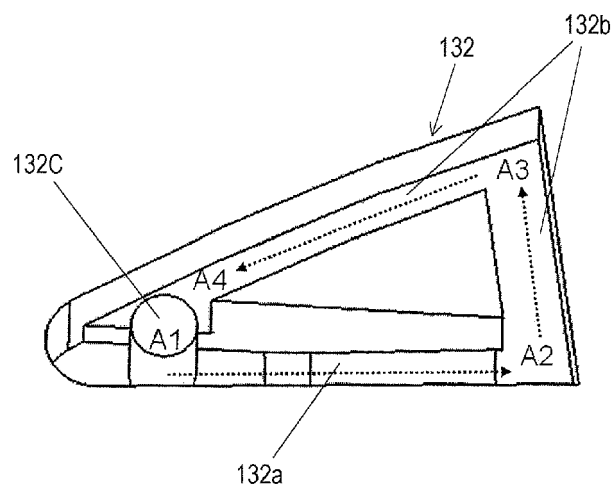


FIG. 5C

FIG. 6



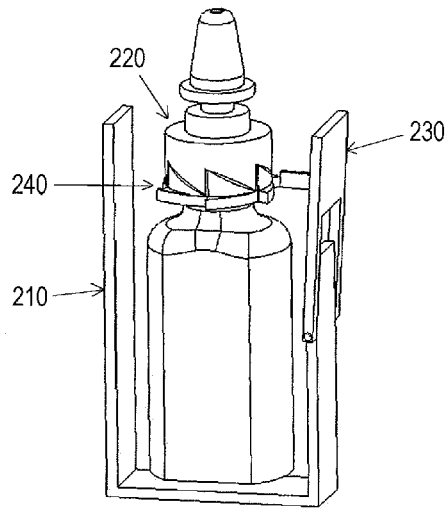


FIG. 7

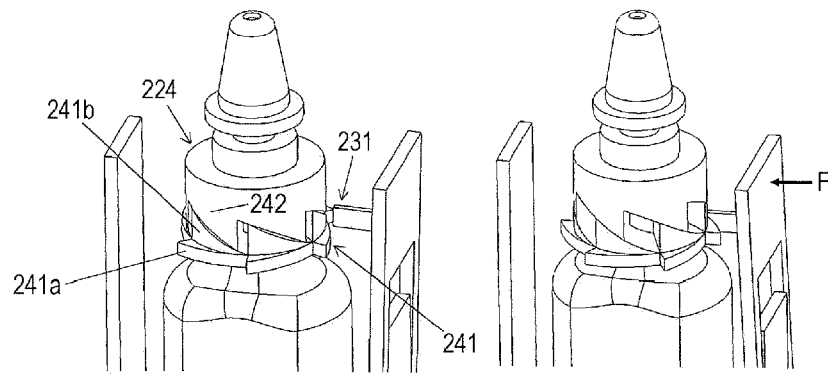
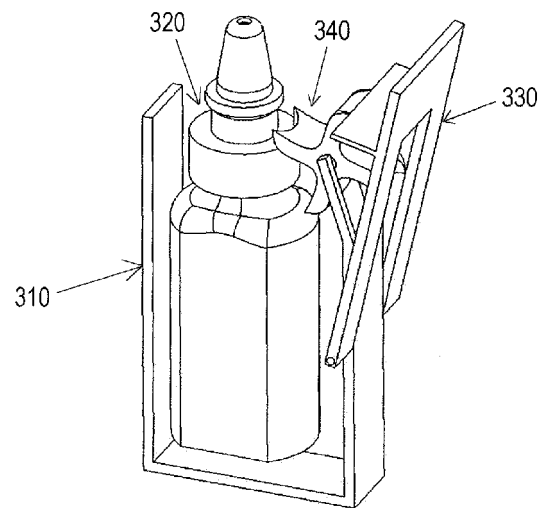


FIG. 8A

FIG. 8B

FIG. 9



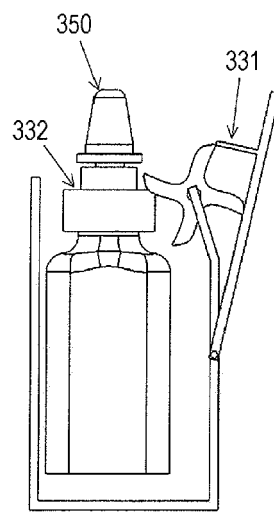


FIG. 10A

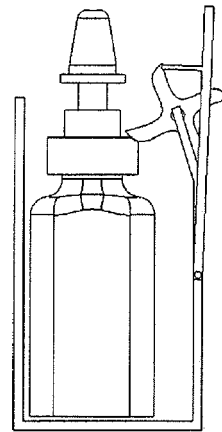


FIG. 10B

FIG. 11A

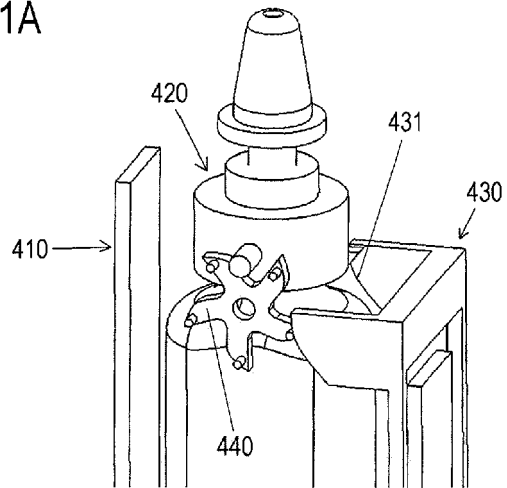
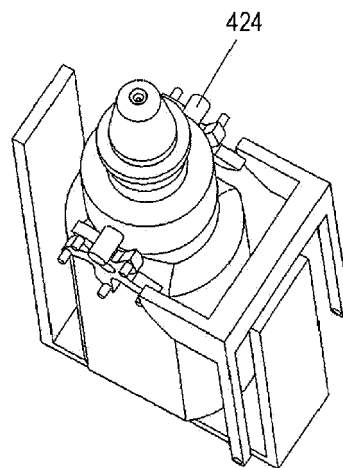


FIG. 11B



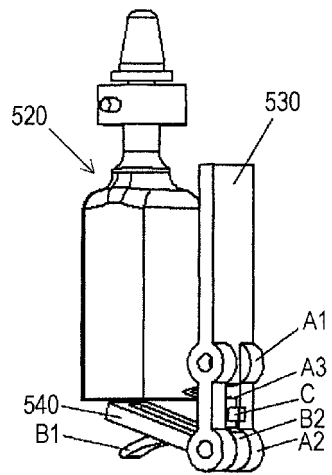


FIG. 12A

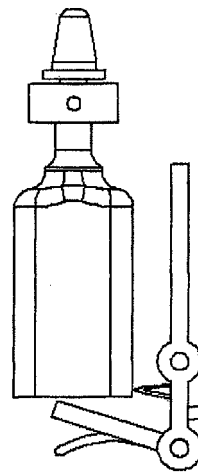


FIG. 12B

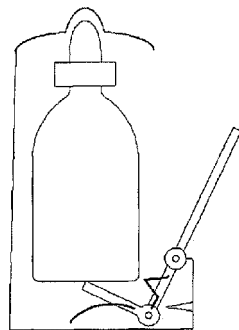


FIG. 13A

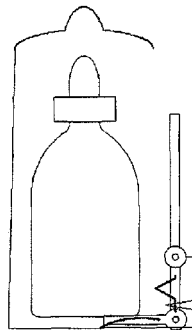


FIG. 13B

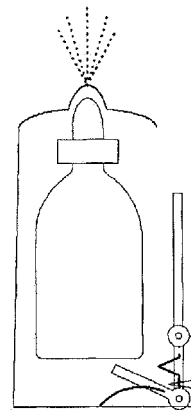


FIG. 13C

FIG. 14

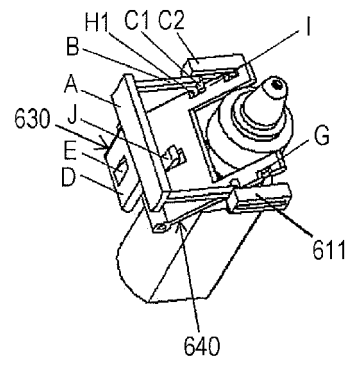
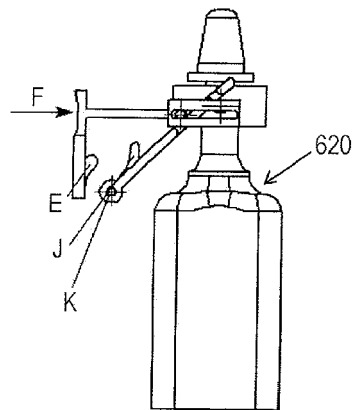


FIG. 15



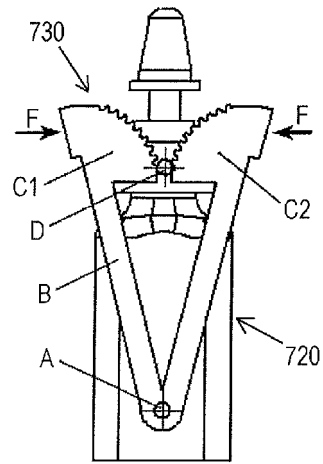


FIG. 16A

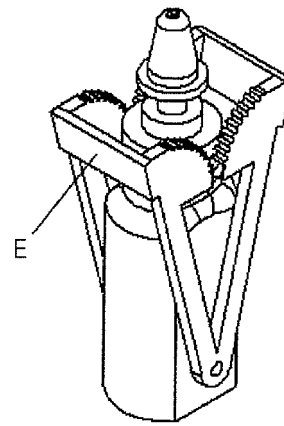


FIG. 16B

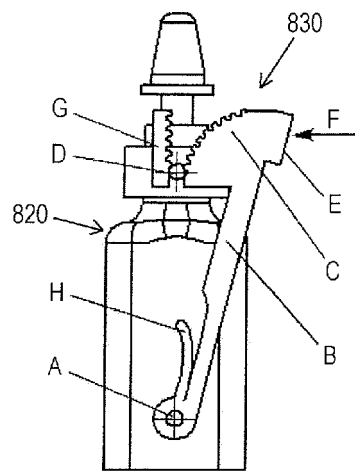


FIG. 17A

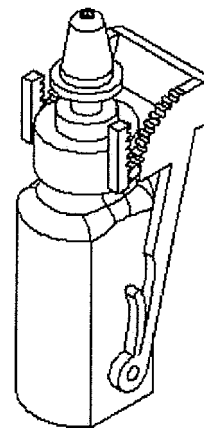


FIG. 17B



EUROPEAN SEARCH REPORT

Application Number
EP 11 18 5407

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 974 827 A1 (PFEIFFER ERICH GMBH & CO KG [DE]) 1 October 2008 (2008-10-01) * paragraph [0041] - paragraph [0049]; figures 3, 4, 5 *	1,2	INV. B05B11/00
A	FR 2 931 137 A1 (VALOIS SAS [FR]) 20 November 2009 (2009-11-20) * page 7, line 26 - page 8, line 20; figures 4-5 *	1-15	
A	WO 2005/075101 A1 (GLAXO GROUP LTD [GB]; BONNEY STANLEY GEORGE [GB]; DELLA-PORTA LOUIS AL) 18 August 2005 (2005-08-18) * page 13, paragraph 2 - page 17, paragraph 3; figures 2A-2I *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			B05B A61M
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 March 2012	Examiner Daintith, Edward
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

2
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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