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(71) Applicant: **LEK Pharmaceuticals d.d.**
1526 Ljubljana (SI)

(72) Inventors:
- **Svete, Peter**
  1526 Ljubljana (SI)
- **Avanzo, Matej**
  1526 Ljubljana (SI)
- **Injac, Rade**
  1526 Ljubljana (SI)
- **Golobic, Iztok**
  1000 Ljubljana (SI)
- **Diaci, Janez**
  1000 Ljubljana (SI)

(74) Representative: **TBK**
Bavariaring 4-6
80336 München (DE)

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

(57) Manually operable fluid dispensing device, comprising: a housing (10a, 10b; 110; 210), an actuation member (30; 130; 230) attached to the housing (10a, 10b; 110; 210) so that it can be manually actuated in an actuation direction, a movable member (20; 120; 220) being movable in a direction substantially perpendicular to the actuation direction of the actuation member (30; 130; 230) 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; 230) into a movement of the moveable member, wherein the conversion mechanism includes a flexible member (40; 140; 240) being elastically deformable, the flexible member (40; 140; 240) being in engagement with the movable member (20; 120; 220) and supported by the actuation member (30; 130; 230) such that it is able to elastically deform in connection with an actuation of the actuation member (30; 130; 230), the flexible member (40; 140; 240) applying a force onto the movable member (20; 120; 220) for moving the movable member (20; 120; 220).

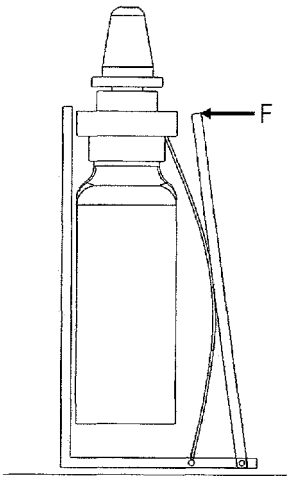

FIG. 3B

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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 an actuation 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). The actuator mechanism includes at least one flexible element, which transmits/converts the applied actuating force in side direction into a longitudinal force for actuating a fluid dispensing mechanism having a fluid pump (in particular, the triggering of the fluid dispensing mechanism/activation of the fluid pump) is effected by lifting a fluid container comprising the fluid pump within a housing thereof by means of the transmitted force.

[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.

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 flexible member being elastically deformable,
the flexible member being in engagement with the movable member and supported by the actuation member such that it is able to elastically deform in connection with an actuation of the actuation member, the flexible member applying a force onto the movable member for moving the movable member.

Item 2: The fluid dispensing according to item 1, wherein the flexible member urges the actuation member and/or the movable member towards its rest position.

Item 3: The fluid dispensing device according to item 1 or 2, wherein the flexible member has the shape of a flat beam or a thin plate.

Item 4: The fluid dispensing device according to any one of items 1 to 3, wherein the flexible member is mounted under pre-tension by being initially curved.

Item 5: The fluid dispensing device according to any one of items 1 to 4, wherein the flexible member is arranged such it is able to elastically deform continuously over a range corresponding to the maximum possible movement range of the movable member, thereby enabling a movement of the movable member over the maximum possible movement range.

Item 6: The fluid dispensing device according to any one of items 1 to 5, wherein the flexible member is supported such that it maintains its initial direction of curvature throughout the maximum possible actuation distance of the actuation member.

Item 7: The fluid dispensing device according to any one of items 1 to 6, wherein an end of the flexible member is in contact with the movable member.

Item 8: The fluid dispensing device according to any one of items 1 to 7, wherein the flexible member is integrally provided on the movable member.

Item 9: The fluid dispensing device according to any one of items 1 to 7, wherein the flexible member is attached to the housing.

Item 10: The fluid dispensing device according to item 9, wherein an end of the flexible member is fixed to a bottom of the housing.

Item 11: The fluid dispensing device according to item 9 or 10, wherein a central portion of the flexible member is supported by the actuation member.

Item 12: The fluid dispensing device according to any one of items 1 to 5, wherein the movable member is configured such that it can change its initial direction of curvature in connection with an actuation of the actuation member, thereby generating a force impulse for moving the movable member.

Item 13: The fluid dispensing device according to item 12, wherein the movable member changes its direction of curvature after a predetermined threshold force has been applied to the actuation member.

Item 14: The fluid dispensing device according to item 12 or 13, wherein an end portion of the flexible member is clamped by a clamping portion of the actuation member.

Item 15: The fluid dispensing device according to item 14, wherein the clamping portion has such a shape in order to assist the change of the initial curvature.

Item 16: The fluid dispensing device according to any one of items 12 to 15, wherein the flexible member extends substantially in the actuation direction.

Item 17: The fluid dispensing device according to any one of items 12 to 16, wherein a central portion of the flexible member is in contact with the movable member.

Item 18: The fluid dispensing device according to item 17, wherein the flexible member has a through-hole into which the movable member is inserted.

Item 19: The fluid dispensing device according to any one of items 12 to 18, wherein the flexible member is attached to the housing.

Item 20: The fluid dispensing device according to item 19, wherein an end of the flexible member is fixed to a side wall of the housing.

Item 21: The fluid dispensing device according to any one of items 1 to 20, further comprising guiding means for guiding the movable member in its moving direction.

Item 22: The fluid dispensing device according to item 21, 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, or by the shape of the housing itself.

Item 23: The fluid dispensing device according to any one of items 1 to 22, wherein the fluid dispensing device comprises a first urging means for urging the movable member to its rest position.

Item 24: The fluid dispensing device according to item 23, 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.

Item 25: The fluid dispensing device according to any one of items 1 to 24, wherein the fluid dispensing device comprises a second urging mechanism urging the actuation member to its rest position.

Item 26: The fluid dispensing device according to item 25, 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.

Item 27: The fluid dispensing device according to any one of items 1 to 26, wherein the movable member is connected to a closure of a fluid reservoir or is a part thereof.

Item 28: The fluid dispensing device according to any one of items 1 to 27, 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.

Item 29: The fluid dispensing device according to any one of items 1 to 28, wherein the actuation member is a handle to be gripped by the palm or fingers of a user, and pivotally connected to the housing.

[0005] According to the solution of item 1, the flexible member (for example a leave spring) exclusively provides the conversion mechanism, i.e. only the flexible member is used to convert the movement of the actuation member (for example a single lever/button to be gripped/pushed by a user) in the side direction (below also called "horizontal direction") into a movement of the movable member in the longitudinal direction (below also called "vertical direction") for achieving the dispensing of fluid. Thus, since instead of a system of leverages, cams, and collars, the flexible member is used for converting the actuation force/movement in the side direction into a fluid dispensing force/movement in the longitudinal direction, 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
- the members/parts of the fluid dispensing device are not required to have a certain shape, thereby reducing its complexity.

[0006] Besides, all parts/members of the fluid dispensing device can be made of plastics.

[0007] As a result, the fluid dispensing device can be manufactured at low production and assembly costs.

[0008] According to the solution of item 2, no additional spring or elastic member is required in order to urge the

actuation member and/or the movable member toward its rest position. As a result, the number of parts can be reduced.

[0009] The solution according to item 3 has the advantage that the flexible member is of a very simple shape, i.e. of low complexity, so that the manufacturing costs can be reduced.

[0010] According to the solution of item 4, a force higher than the pre-tension has to be applied to the actuation member. Accordingly, an unintended actuation of the fluid dispensing device can be avoided.

[0011] The configuration according to item 12, i.e. "snap-like" change of the direction of curvature and, thus, the impulse-like movement of the movable member, leads to a quick discharge of fluid from the fluid dispensing device. Also, this discharge speed is independent of the way a user presses the actuation member.

[0012] 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 flexible member and/or the actuation member in terms of geometry, dimensions, 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.

[0013] The invention is described in detail below by means of preferred embodiments with respect to the attached drawings.

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

Fig. 2 is a schematic view of a fluid dispensing device according to a second embodiment of the invention.

Figures 3a and 3b are schematic side views of the fluid dispensing device according to the second embodiment in a non-actuated state and an actuated state, respectively.

Fig. 4 is a schematic diagram in a perspective view showing a fluid dispensing device according to a third embodiment of the present invention.

Figures 5a and 5b are schematic side views of the fluid dispensing device according to the third embodiment in a non-actuated state and an actuated state, respectively.

(First embodiment)

[0014] Fig. 1 is a simplified view of the fluid dispensing device according to the first embodiment of the present invention. As shown in Fig. 1, the fluid dispensing device comprises a housing made up of two housing parts 10a, 10b which are in snap-engagement. 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 22 closing the fluid container 21, a dispensing mechanism 23 provided in the closure 22 and including a fluid pump for pumping out fluid from the fluid container 21, and a cap 24 which is fixed to the closure 22 via a ring 25 such that the cap 24 is integrally movable with the closure 22 and the fluid container 21, respectively. A fluid container assembly and a dispensing mechanism, respectively, having such a configuration are known from the prior art, for example from WO 2009/153512, WO 2005/087615 A1 or WO 2009/068877. The fluid container assembly 20 is guided in the housing, e.g. by means of guiding projections guiding the fluid container 21, such that it is movable in the longitudinal direction only.

[0015] Further, the fluid dispensing device comprises an actuation button or lever 30 (movable member) which is attached at its lower end 31, constituting a pivot, to the lower housing part 10b such that it can be rotated about the pivot substantially in the side direction (actuation direction) being perpendicular to the longitudinal direction.

[0016] At an upper portion of the lever 30, there is integrally provided an elastically deformable, flexible beam 40 (flexible member) which is in engagement (direct contact) with the cap 24. Specifically, the flexible beam 40 projects upwardly such that it is inclined with respect to the actuation direction as well as the longitudinal direction, and engages with a portion (for example a projection or a recess) of the cap 24 so as to be able, in connection with a movement of the lever 30 in the actuation direction, to move the cap 24 in the longitudinal direction of the fluid dispensing device. Further, the flexible beam 40 is pre-curved (toward the inside of the housing as shown in Fig. 1) and mounted under pre-tension such that it urges the lever 30 towards its rest position, i.e. to a position where an outward movement of the lever 30 is restricted by the housing. In other words, when the lever 30 is in its rest position, the flexible beam 40 still applies the urging force onto the same in the radial outward direction, so that the lever 30 can be actuated not until a predetermined threshold force is applied to the lever 30.

[0017] 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.

[0018] The function/operation of the above described fluid dispensing device is as follows:

[0019] 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, in the side direction, from its rest position toward the inside of the housing. Since the flexible beam 40 is, at its lower end, integrally connected to the lever 30 and is, at its upper end, in engagement with the cap 24 which is allowed to move in the longitudinal direction only (due to e.g. the guidance of the fluid container 21), with the flexible beam 40 being inclined with respect to the side direction as well as the longitudinal direction, the flexible beam 40 converts the applied pushing force in the side direction into a pushing force directed upwardly. I.e. in connection with the movement of the lever 30 and the lower end of the flexible beam 40, respectively, toward the inside of the housing, the upper end of the flexible beam 40 moves upwardly in the longitudinal direction under elastic deformation of the flexible beam 40, thereby moving the cap 24 and, thus, the fluid container assembly 20 upwardly. In this respect, the flexible beam 40 maintains its initial direction of curvature (curvature toward the radial inside of the housing throughout the whole movement range of the actuation member). Also in this embodiment, the flexible beam 40 elastically deforms continuously over the maximum possible movement range of the fluid container assembly 20, i.e. with increasing actuation distance of the lever 30 the elastic deformation of the flexible beam 40 constantly increases.

[0020] After the fluid container assembly 20 has been moved by means of the flexible beam 40 to a predetermined extent in the longitudinal direction, the dispensing mechanism 23 is activated (e.g. by a discharge tube of the dispensing mechanism 23 which abuts against the nozzle 50 so that it is relatively moved with respect to the fluid container 21, thereby actuating a fluid pump of the dispensing mechanism 23, as e.g. also exemplified in the above mentioned prior art documents), so that a certain dose of fluid is pumped out of the fluid container 21 and then dispensed in spray form via the nozzle 50 in the longitudinal direction.

[0021] After the user releases the force onto the lever 30, the fluid container assembly 20 moves in the opposite direction (downwardly) toward its original rest position by means of an urging force exerted for example by a spring of the dispensing mechanism 23 or a spring mounted between the housing and the cap 24. At the same time, the lever 30 is urged in the outward direction toward its rest position. This movement to the rest position is aided by the flexible beam 40 which, due to release of internal energy stored during its elastic deformation, urges the lever 30 toward the radially outside. I.e. the flexible beam 40 elastically re-deforms so as to assume its original position. Optionally, there can be mounted a further urging means, for example a spring provided between the lever 30 and the lower part 10b of the housing for urging the lever 30 to its rest position.

[0022] Alternatively to the above described configuration, the flexible beam 40 can e.g. be in direct engagement with a part of the fluid dispensing mechanism 23, the closure 22 or the fluid container 21, i.e. the movable member can be any member which is to be moved in the longitudinal direction for dispensing fluid.

[0023] 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 including the flexible beam 40 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, shape (for example degree of curvature), and pre-tension of the flexible beam 40.

(Second embodiment)

[0024] Next, a second embodiment of the fluid dispensing device according to the invention is described with respect to Figures 2, 3a and 3b. 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, which actually would be designed in a manner taking into consideration ergonomic requirements.

[0025] The difference with respect to the above described first embodiment substantially lies in the arrangement of the flexible member which will be explained below in detail.

[0026] The device comprises a housing 110, a fluid container assembly 120, an actuation lever or button 130, a flexible curved beam 140 (flexible member) and a nozzle 150 as main parts. The fluid container assembly 120 can be configured as in the first embodiment and basically includes a fluid container, cap, closure, and dispensing mechanism as in the first embodiment. In this respect, it is pointed out that the housing 110, the fluid container assembly 120, the lever 130 and the other parts can be the same / have substantially the same shape as those parts of the first embodiment.

[0027] The fluid container assembly 120 is guided in the housing 110 so as to be movable in the longitudinal direction only, and the actuation lever 130 is, at its lower end, pivotally mounted to a lower portion of the housing, so as to be actuable in an actuation direction (side direction).

[0028] As already mentioned above, the difference with respect to the first embodiment lies in the arrangement of the flexible member, i.e. the flexible beam 140 which is pre-curved along its length direction. Specifical-

ly, the flexible beam 140 is fixed, at its lower end, to a bottom of the housing 110, whereas its other end engages with the cap of the fluid container, for example in the same manner as in the first embodiment. Further, a central portion of the flexible beam 140 is in sliding contact with a central portion of the actuation lever 130, as shown in Fig. 3a.

[0029] Like in the first embodiment, the flexible beam 140 is mounted under a certain pre-tension so that the actuation lever 130 is urged toward its rest position as shown in Fig. 3a and can not be moved until a certain threshold force has been applied onto the same.

[0030] In the following, the function/operation of the fluid dispensing device according to the second embodiment will be described with respect to Figures 3a and 3b.

[0031] Fig. 3a shows the fluid dispensing device in the non-actuated state with the actuation lever 130 being at its rest position. When a user applies a side force onto the lever 130 as indicated with the arrow F in Fig. 3b, the actuation lever 130 pivots around its pivoting axis toward the inside of the housing 110, thereby applying a side force onto the central portion of the flexible beam 140. Since the flexible beam 140 is, at its lower end, fixed to the housing 110 and is, at its upper end, in engagement with the fluid container assembly 120 which is allowed to move in the longitudinal direction only, in other words, since the ends of the flexible beam 140 cannot move in the side direction, the flexible beam 140 elastically deforms.

[0032] Specifically, the flexible beam 140 elastically deforms under reduction of its initial amount of curvature (the direction of curvature does not change) such that its upper end moves in the longitudinal direction relatively to the housing 110, while slightly sliding relatively with respect to the lever 130, as can be seen from a comparison of Fig. 3a and 3b. As a result, the flexible beam 140 pushes the fluid container assembly 120 upwardly in the longitudinal direction of the device, as shown in Fig. 3b. I.e. the flexible beam 140 converts the side force applied to the actuation lever 130 into a longitudinal force for moving the fluid container assembly 120 in the longitudinal direction.

[0033] After the fluid container assembly 120 has been moved by a predetermined distance upwardly in the longitudinal direction of the device, the dispensing mechanism provided in the closure of the fluid container is actuated (as described with respect to the first embodiment) so that fluid is pumped out of the fluid container and dispensed in the form of a spray through the nozzle 50.

[0034] When the user subsequently releases the actuation force onto the actuation lever 130, the fluid container assembly 120 moves in the opposite direction back into the position shown in Fig. 3a under the influence of its own weight and the urging force exerted e.g. by a spring which is a part of the dispensing mechanism in the fluid container closure. Alternatively or additionally, there can be mounted a spring between the housing 110 and the cap of the fluid container. At the same time, the flexible beam 140 deforms back to its initial position due to its elasticity (due to release of energy stored during its elastic deformation), thereby also returning/urging the actuation lever 130 to its initial position as shown in Fig. 3a.

[0035] The second embodiment can achieve the same advantages as the first embodiment.

[0036] In addition, the force required for operating the flexible beam 240 via the lever 230 can be set by e.g. adjusting the contact point/portion between the flexible beam and the lever 230 (i.e. by adjusting the lever ratio).

(Third embodiment)

[0037] Next, a third embodiment of the fluid dispensing device according to the present invention is described with respect to Figures 4, 5a and 5b. In this respect, it is pointed out that these Figures are a very simplified schematic illustration of the fluid dispensing device for explaining the configuration and function thereof in principle, and do not show all parts and the actual shape thereof, respectively, which actually would be designed in a manner taking into consideration ergonomic requirements.

[0038] In the same manner as the fluid dispensing device according to the first embodiment and the second embodiment, the fluid dispensing device according to the third embodiment comprises as main parts a housing 210, a fluid container assembly 220 including basically the same parts as the fluid container assembly of the first and second embodiment (fluid container, cap, closure, fluid dispensing mechanism), a lever or button 230 as actuation member, a flexible plate 240, and a nozzle 250.

[0039] A major difference between the fluid dispensing device of the first and second embodiments lies in the configuration of the flexible member, which is in this embodiment the flexible plate 240.

[0040] As can be seen from Figures 4, 5a and 5b, the flexible plate 240 is arranged so as to substantially extend in the side direction of the fluid dispensing device, being substantially the actuation direction of the actuation button 230. As shown in Figures 4, 5a and 5b, one end of the flexible plate 240 is fixed to the housing, whereas the other end is clamped by a clamping portion 231 of the button 230, which is a kind of projection extending from the button 230 in the lateral direction and supporting the flexible plate 240 from below. The button 230 is pivotally attached to the housing 210 at its upper end, as exemplified illustrated in Figures 5a and 5b, so that it can be rotated toward the radial inside substantially in the lateral direction, when a user applies an actuation force thereon. Further, the flexible plate 240 comprises at its central portion a through hole into which the cap of the fluid container assembly 220 is inserted such that the fluid container assembly 220 is fixed to the flexible plate 240. With no force being applied to the actuation button 230, the flexible plate 240 has a slight S-shape, as shown best in Fig. 5a, with its central portion being slightly curved to-

ward the inside of the housing 210 (toward the bottom of the housing 210).

[0041] Generally, the flexible plate 240 is configured and arranged such that, in case a load (axial load) is applied substantially in its extension direction substantially corresponding to the side direction, it impulse-like changes its direction of curvature by elastic deformation, i.e. results in a "snap-buckling" of the flexible plate 240, as exemplified by Figs. 5a and 5b. In this respect, the shape/configuration of the clamping portion 231 of the button 230 in combination with the pivoting point of the button 230 at the upper end thereof ensures that the flexible plate 240 reliably changes its direction of curvature, i.e. snaps into the upward direction, when being applied with a predetermined axial load.

[0042] In the following, the function/operation of the fluid dispensing device according to the third embodiment is described.

[0043] When a user applies a push force F onto the button 230 in the side direction, then, after the force has exceeded a predetermined threshold value, the button 230 pivots, basically in the side direction, around its upper end, as can be seen from a comparison between Figures 5a and 5b. The force F applied to the button 230 is transmitted onto the flexible plate 240 and causes an axial loading of the plate 240. After a predetermined axial loading has been reached, this leads to a snap-buckling of the flexible plate 240, i.e. the flexible plate 240 changes impulse-like its direction of curvature. As can be seen from Fig. 5b, this impulse-like change of the direction of curvature, from the downward direction to the upward direction, results in a movement of the fluid container assembly 220 in the upward direction. This in turn actuates the fluid dispensing mechanism of the fluid container assembly 220, thereby discharging a dose of fluid in spray form via the nozzle 250 from the fluid dispensing device.

[0044] When the user releases the actuation force onto the button 230, the fluid container assembly 220 moves downward under the influence of its own weight and a force exerted by for example a spring which is part of the dispensing mechanism in the fluid container closure. Further, the flexible plate 240, which simultaneously elastically re-deforms to its initial position, as shown in Fig. 5a, aids the downward movement of the fluid container assembly 220, i.e. applies a downward urging force onto the fluid container assembly 220. Furthermore, its elastic re-deformation also returns the button 230 back to its starting position.

[0045] The third embodiment can achieve the same advantages as the first embodiment.

[0046] Further, in this embodiment, the threshold force F that is necessary to dispense the fluid depends on the critical value of the axial load which initiates the snap-buckling of the flexible plate 240, and also on the geometric and elastic parameters of the flexible plate 240. By optimization of these parameters, it is possible to set a desired threshold force F. By using different flexible members, it is thus possible to finely set the threshold force F according to the requirements under consideration of different users (for example disabled people, children, etc.).

[0047] Especially in that embodiment, since the snap-buckling of the flexible plate 240 leads to an impulse-like movement of the fluid container assembly 220 and, thus, to an impulse-like actuation of the fluid dispensing mechanism, the spray characteristics do not depend on how slow/fast a user presses the button 230.

Claims

1. Manually operable fluid dispensing device, comprising

   • a housing (10a, 10b; 110; 210),
   • an actuation member (30; 130; 230) attached to the housing (10a, 10b; 110; 210) so that it can be manually actuated in an actuation direction,
   • a movable member (20; 120; 220) being movable in a direction substantially perpendicular to the actuation direction of the actuation member (30; 130; 230) 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; 230) into a movement of the moveable member, wherein
   • the conversion mechanism includes a flexible member (40; 140; 240) being elastically deformable,
   • the flexible member (40; 140; 240) being in engagement with the movable member (20; 120; 220) and supported by the actuation member (30; 130; 230) such that it is able to elastically deform in connection with an actuation of the actuation member (30; 130; 230), the flexible member (40; 140; 240) applying a force onto the movable member (20; 120; 220) for moving the movable member (20; 120; 220).

2. The fluid dispensing according to claim 1, wherein the flexible member (40; 140; 240) urges the actuation member (30; 130; 230) and/or the movable member (20; 120; 220) towards its rest position.

3. The fluid dispensing device according to claim 1 or 2, wherein the flexible member (40; 140; 240) has the shape of a flat beam or a thin plate.

4. The fluid dispensing device according to any one of claims 1 to 3, wherein the flexible member (40; 140; 240) is mounted under pre-tension by being initially curved.

5. The fluid dispensing device according to any one of

claims 1 to 4, wherein the flexible member (40; 140; 240) is arranged such it is able to elastically deform continuously over a range corresponding to the maximum possible movement range of the movable member (20; 120; 220), thereby enabling a movement of the movable member (20; 120; 220) over the maximum possible movement range.

6. The fluid dispensing device according to any one of claims 1 to 5, wherein the flexible member (40; 140) is supported such that it maintains its initial direction of curvature throughout the maximum possible actuation distance of the actuation member (30; 130).

7. The fluid dispensing device according to any one of claims 1 to 6, wherein an end of the flexible member (40; 140) is in contact with the movable member (20; 120).

8. The fluid dispensing device according to any one of claims 1 to 7, wherein the flexible member (40) is integrally provided on the movable member (20).

9. The fluid dispensing device according to any one of claims 1 to 7, wherein the flexible member (140; 240) is attached to the housing (110; 210).

10. The fluid dispensing device according to claim 9, wherein an end of the flexible member (140) is fixed to a bottom of the housing (110).

11. The fluid dispensing device according to claim 9 or 10, wherein a central portion of the flexible member (140) is supported by the actuation member (130).

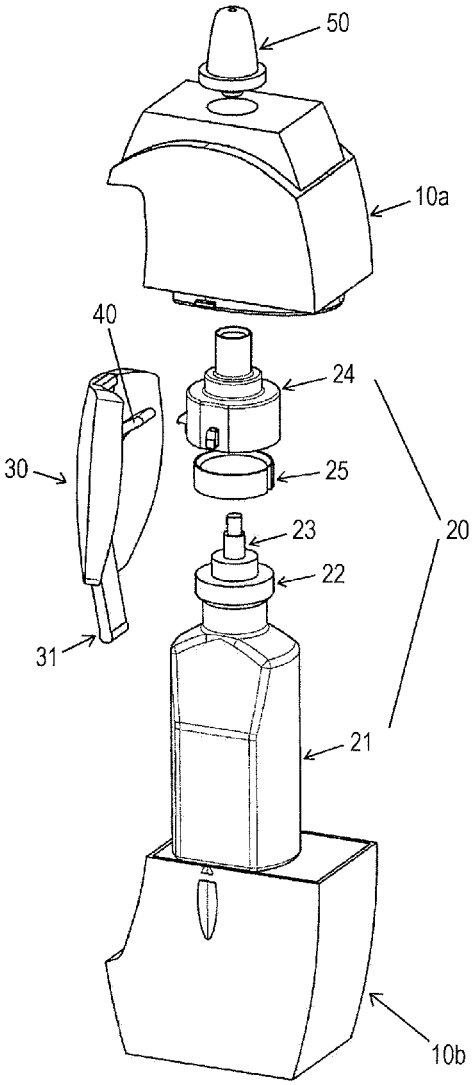
12. The fluid dispensing device according to any one of claims 1 to 5, wherein the movable member (220) is configured such that it can change its initial direction of curvature in connection with an actuation of the actuation member (230), thereby generating a force impulse for moving the movable member (220).

13. The fluid dispensing device according to claim 12, wherein the movable member (220) changes its direction of curvature after a predetermined threshold force has been applied to the actuation member (230).

14. The fluid dispensing device according to claim 12 or 13, wherein an end portion of the flexible member (240) is clamped by a clamping portion (231) of the actuation member (230).

15. The fluid dispensing device according to claim 14, wherein the clamping portion (231) has such a shape in order to assist the change of the initial curvature.

FIG. 1



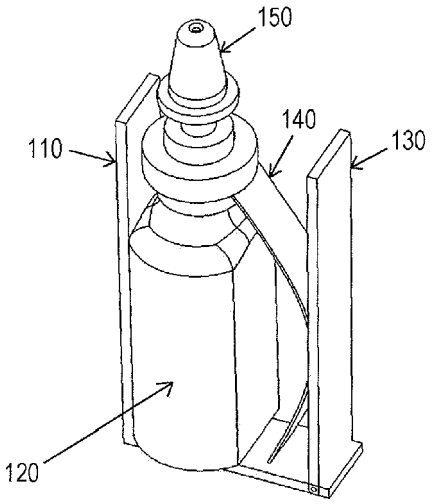


FIG. 2

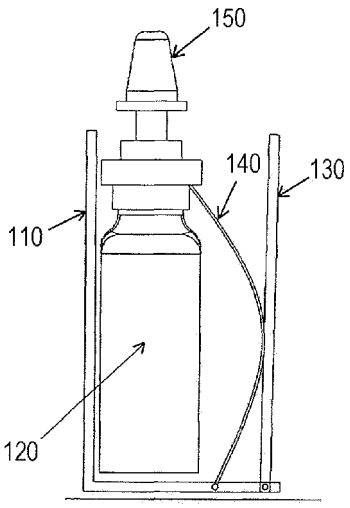


FIG. 3A

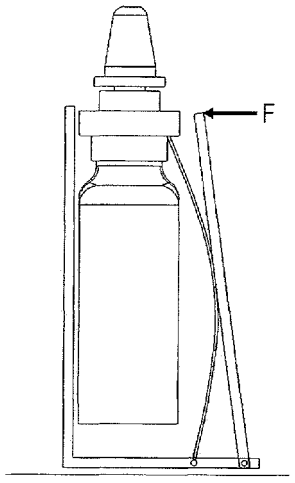


FIG. 3B

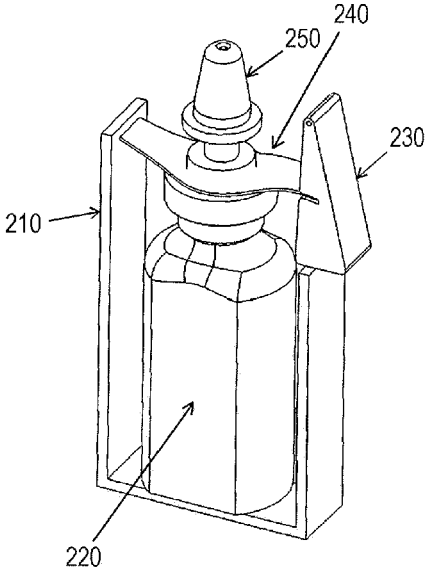


FIG. 4

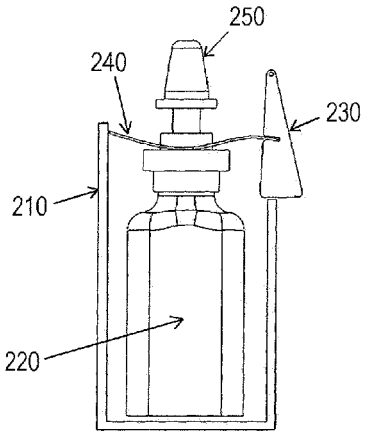


FIG. 5A

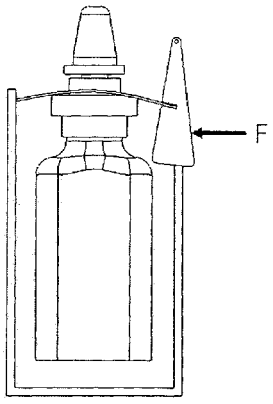


FIG. 5B

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EUROPEAN SEARCH REPORT

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EP 11 18 5424

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	WO 2006/097746 A1 (GLAXO GROUP LTD [GB]; LINTERN RICHARD DAVID [GB]; RAND PAUL KENNETH [G) 21 September 2006 (2006-09-21) * page 12, paragraph 4 - page 15, paragraph 3; figures 1-7 *	1-13	INV. B05B11/00
X	WO 2004/012799 A2 (GLAXO GROUP LTD [GB]; DAVIES MICHAEL BIRSHA [GB]) 12 February 2004 (2004-02-12) * page 28, line 1 - page 31, line 4; figures 7-10 *	1-5,7, 12-14	
X	FR 2 807 954 A1 (CMC JEAN LOUIS VERMEIL [FR]) 26 October 2001 (2001-10-26) * line 5 - page 4, line 18; figure 1 *	1-6	
X	FR 2 832 329 A1 (VALOIS SA [FR]) 23 May 2003 (2003-05-23) * page 6, line 13 - line 31; figures 3a, 3b, 4 *	1,2,7,11	
			TECHNICAL FIELDS SEARCHED (IPC)
			B05B B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 March 2012	Daintith, Edward

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14-03-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006097746 A1	21-09-2006	EP 1861146 A1	05-12-2007
		JP 2008532675 A	21-08-2008
		US 2008210230 A1	04-09-2008
		WO 2006097746 A1	21-09-2006
WO 2004012799 A2	12-02-2004	AU 2003253367 A1	23-02-2004
		BR 0312230 A	12-04-2005
		CA 2494016 A1	12-02-2004
		CN 1671434 A	21-09-2005
		EP 1525017 A2	27-04-2005
		JP 2005534392 A	17-11-2005
		MX PA05000821 A	19-04-2005
		US 2005258191 A1	24-11-2005
		WO 2004012799 A2	12-02-2004
		ZA 200410105 A	31-05-2006
FR 2807954 A1	26-10-2001	NONE	
FR 2832329 A1	23-05-2003	AU 2002356248 A1	10-06-2003
		CN 1633382 A	29-06-2005
		DE 60217545 T2	15-11-2007
		EP 1456098 A2	15-09-2004
		FR 2832329 A1	23-05-2003
		JP 4695333 B2	08-06-2011
		JP 2005509572 A	14-04-2005
		US 2005040188 A1	24-02-2005
		WO 03043909 A2	30-05-2003

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Patent documents cited in the description

- WO 2009068877 A1 **[0002]**
- WO 2009153512 A **[0014]**
- WO 2005087615 A1 **[0014]**
- WO 2009068877 A **[0014]**