(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 017 601 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
**20.02.2002 Bulletin 2002/08**

(21) Application number: **97931060.4**

(22) Date of filing: **05.06.1997**

(51) Int Cl.$^{7}$: **B65D 83/22**

(86) International application number:
**PCT/US97/09797**

(87) International publication number:
**WO 98/55378 (10.12.1998 Gazette 1998/49)**

# (54) A NOZZLE FOR PRESSURIZED CONTAINERS

DÜSE FÜR DRUCKBEHÄLTER

BUSE POUR RECIPIENTS SOUS PRESSION

(84) Designated Contracting States:
**DE FR GB IT**

(43) Date of publication of application:
**12.07.2000 Bulletin 2000/28**

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**EP-A- 0 811 563**
**FR-A- 2 637 870**
**US-A- 2 954 904**

## Description

**[0001]** The present invention relates to a nozzle for a pressurized container.

**[0002]** A pressurized container usually contains a product together with a propellant. The propeltant usually creates the necessary pressure inside the container. The propellant may be a liquid or a gaseous propellant. When the propellant is a liquid propellant, the pressure inside the container is created by the vapour pressure of the liquid propellant. The gaseous propellant and the vapour phase of the liquid propellant are usually located in the headspace of the container when the container stands-in its upright position. The pressure inside the container is higher than the normal outside atmospheric pressure. The inside pressure of the container is maintained by closing the container with a valve. Consequently, the propellant tends to exit from the inside of the container once the valve of the container is opened. Thereby the propellant also drives the product out of the container.

**[0003]** In order that all of the product can be expelled out of the container it has to be ensured that enough propellant is available in the container with respect to the amount of product. Consequently, it has to be ensured that the propellant is not allowed to exit unnecessarily, i.e. the product must be expelled at the same time as the propellant. If product is not expelled at the same time as the propellant, the propellant may be progressively emptied out of the pressurized container until the remaining amount of propellant may become too low, with respect to the rest of product remaining in the container, to ensure the complete dispensing of the rest of product from inside the pressurized container. The rest of the product which cannot be expelled from inside the pressurized container is then wasted. Other possible drawbacks of propellant exiting unnecessarily from the container are deterioration of the characteristics of the expelled product. For example, when the product is a foaming product, the density of the foam may increase in an undesirable manner.

**[0004]** The discharge of propellant without product may happen whenever the product is not placed between the propellant and the discharging opening of the pressurized container. Indeed, it has to be ensured that the propellant is obliged to pass through the product pushing at least part of the product out of the pressurized container. This undesirable positioning of the propellant with respect to the product and the discharging opening of the pressurized container may be reached when the pressurized container is allowed to discharge in an undesired direction.

**[0005]** For example, when the pressurized container comprises a dip tube connecting the discharging opening at the top of the container with the inside of the pressurized container, the undesired direction would be to invert the pressurized container, i.e. to turn it upside down. In this position the gaseous propellant is directly in contact with the dip tube and is capable of escaping directly from the inside of the container through the dip tube without pushing the product through the dip tube. By contrast, when the pressurized container does not comprise any dip tube, the undesired direction would be when the container is not inverted, i.e. the container is held upright. This substantially upright position leads to the escape of gaseous propellant from the inside of the container, because the product is not positioned between the discharging opening and the propellant. In both cases this leads to the escape of propellant from the inside of the container without any corresponding expulsion of product, resulting in the corresponding drawbacks as discussed before.

**[0006]** It is well known in the industry making pressurized containers that there is a need to provide the pressurized containers with a blocking mechanism which prevents the opening of the pressurized container when the pressurized container is in an undesired orientation. WO-91103 408 and WO-95/06 606 describe blocking mechanisms, e.g. in form of a ball, located inside the pressurized container so as to block the discharging opening of the pressurized container when the pressurized container is in an undesired orientation. The blocking mechanism is thereby in direct contact with the product and the propellant during the discharging flow when the valve of the pressurized. container is opened.

**[0007]** It has been found that the blocking mechanism positioned in this way in the discharging flow only works for low discharging rates of about 0.5 grams of product per second as the maximum limit. Indeed, the discharging rate has to be low enough such that the blocking means, e.g. the ball, is not dragged by the product and/or propellant in the discharging flow. Otherwise the blocking means may be pushed by the discharging product and/or propellant into the blocking position of the valve even when the valve is oriented in the correct position. Therefore, it would be preferable to have a blocking mechanism separated from the discharging flow of the product and/or the propellant.

**[0008]** A blocking mechanism which is separated from the discharging flow of the product and /or of the propellant is, for example, described in WO-89/10881, FR-A-2 637 870 and US-2 954 904. In all these documents the blocking mechanism is located within the nozzle outside the pressurized container whereby the blocking mechanism is not in the discharging flow. However, the blocking mechanism described in WO-89/10881 does not block the opening of the pressurized container when the container is held horizontal with respect to its upright position. It has been found that already in the horizontal position the propellant is able to escape from within the pressurized container without expelling the contained product.

**[0009]** The blocking mechanism described in FR-A-2 637 870 is not symmetrical. The nozzle is blocked in the horizontal position shown in Figure 2, since the inclined wall on which the non-compressible ball sits guides the ball into the recess. However, if the container is held again in the horizontal position but such that the ball does not sit on the inclined wall, than the ball may not fall into the recess at this inclination of the container. The ball does not sit on the inclined wall when the position of the discharging opening of the nozzle is reversed with respect to the blocking mechanism. Therefore, there is a need to provide a blocking mechanism in the valve actuator which blocks the nozzle at the desired inclination of the container independently from the handling orientation of the container.

**[0010]** US-2 954 904 describes another blocking mechanism in a nozzle. This blocking mechanism has not the drawbacks of the previous documents. Indeed, the opening of the pressurized container is prevented in the horizontal position regardless of the handling orientation of the container. However, this blocking mechanism is only effective, if the valve of the pressurized container can be opened along the axis of the container. Indeed, it has been found that the nozzle can still move when the movable, non-compressible barrier is outside the apex. Although the valve is not pressed exactly along the axis of the container, the valve may still open. Therefore, this blocking mechanism is not efficient for valve systems which open in whichever direction the valve is pressed regardless of any specific pressing direction.

**[0011]** Therefore, it is an object of the present invention to provide a nozzle with blocking means, whereby the blocking means prevents the opening of the valve when the discharging opening of the nozzle is in an undesired inclination independently of the handling orientation of the container and regardless of the pressing direction on the nozzle.

## Summary of the Invention

**[0012]** The present invention is a nozzle for a pressurized container comprising a discharging tube, an actuator and blocking means. The discharging tube is coupled to a valve of a pressurized container when the nozzle is applied on a pressurized container. The valve in its open position allows the discharge of a product contained in the pressurized container through the discharging tube when the actuator is pressed. The blocking means prevent the opening of the valve when the discharging tube is in an undesired inclination. The blocking means comprises a movable, non-compressible barrier and a recess. The recess is such that the recess contains at least partially the barrier. The recess further has a 360° access symmetry for the barrier so that the access of the barrier into the recess is obtained at a desired inclination of the discharging tube independently of the orientation of the nozzle when the nozzle is handled by a user. The blocking means prevent any substantial movement of the actuator when the actuator is pressed, and consequently the opening of the valve when the nozzle is applied on a pressurized container, when the barrier is located at least partially outside the recess.

## Brief description of the drawings

**[0013]** Figure 1a is a cross sectional view of an embodiment of a pressurized container in its upright position with a nozzle and blocking means according to the present invention. Figures 1b and 1c are cross sectional partial views of the nozzle in its upright position with the blocking means in alternative embodiments of Figure 1a.

**[0014]** Figure 2a is a cross sectional partial view of another embodiment of a nozzle in its upright position with blocking means according to the present invention. Figure 2b is a cross sectional partial view of the nozzle in its upright position with the blocking means in alternative embodiments of Figure 2a.

**[0015]** Figure 3a is a cross sectional partial view of another embodiment of a nozzle in its upright position with blocking means according to the present invention. Figure 3b is a cross sectional partial view of the nozzle in its upright position with the blocking means in alternative embodiments of Figure 3a.

**[0016]** Figure 4a is a cross sectional partial view of another embodiment of a nozzle in its upright position with blocking means according to the present invention. Figure 4b is a cross sectional partial view of the nozzle in its upright position with the blocking means in alternative embodiments of Figure 4a.

**[0017]** Figures 5 to 7 are cross sectional partial views of other embodiments of nozzles in their upright position with blocking means according to the present invention.

**[0018]** Figures 8a, 8b and 8c are cross sectional partial views of different embodiments of nozzle with blocking means according to the present invention.

**[0019]** Figures 9a to 9d are cross sectional partial views of other embodiments of nozzles in its upright position according to the present invention.

**[0020]** Figure 10 is a cross sectional partial view of another embodiment of a nozzle in its upright position with blocking means according to the present invention.

## Detailed Description of the Invention

**[0021]** An embodiment of a nozzle (10) according to the present invention is shown in Figure 1a. The nozzle comprises a discharging tube (11), an actuator (12) and blocking means (20). The nozzle is suitable to be applied on a pressurized container. The nozzle is applied on a pressurized container in such a manner that the discharging tube fits on a valve of a pressurized container as shown in Figure 1a. The discharging tube leads towards the outside of the container when the nozzle is applied to a pressurized container. The valve of a pressurized container has an open position and a closed position. The closed position of the valve prevents any substantial escape of product and/or propellant from a filled pressurized container. The open position of the valve allows the discharge of the product and/or of the propellant from inside the container. The valve is in its closed position when the nozzle is in its rest position, i.e. the nozzle is not substantially moved.

**[0022]** The nozzle (10) can be made of a single piece or made of two parts which are attached to each other. When the nozzle is made of a single piece, the nozzle preferably is made of an upper part and a lower part. The upper part and the lower part are connected at a hinge (Figure 8a, 45). The upper part comprises the discharging tube and the actuator. The lower part comprises the trough. The nozzle made of a single part is moulded in one piece as shown in Figure 8a. Before bringing the upper part onto the lower part together, the barrier (21) is placed in position. The upper part and lower part are clipped together so that the two parts form the finished nozzle. When the nozzle is made of two separate parts, as shown in Figure 8b, the lower part and the upper part are moulded separately, i.e. there is no hinge between these two parts. Nevertheless, the two parts are attached to each other to make the complete nozzle, as shown in Figure 8b, by a snap fit for example.

**[0023]** The discharging opening (14) in the nozzle (10) is directly connected to the upper end of the valve. Indeed, when the nozzle is applied to a filled container, the content of the container exits the container by passing first through the open valve and upper end of the valve and then through the discharging tube (11). The valve may be connected in the housing with a dip tube to the inside of the container.

**[0024]** The actuator (12) is the part of the nozzle where the nozzle is pressed. When the actuator is pressed, the valve of the pressurized container is opened when the nozzle is applied onto a pressurized container. Indeed, by pressing the actuator the nozzle is rigidely moved away from its rest position. This movement of the nozzle is sufficient to open the valve of the pressurized container. The actuator is preferably next to the discharging tube (11). The blocking means (20) of the nozzle according to the present invention prevent that the actuator is substantially moved, if the discharging tube is in an undesired inclination. The "undesired inclination" is any inclination in which the propellant is capable to exit from the inside of the container without expelling at the same time the product. As described above, this may happen whenever the propellant is not obliged to pass through the product when the valve of a pressurized container is opened. This may happen with or without the dip tube as already discussed.

**[0025]** Preferably, the blocking means (20) are located adjacent the actuator (12) next to the discharging tube (11). More preferably, the blocking means are located below the actuator when the nozzle is applied on a pressurized container and the container is in its upright position as shown in Figure 1a. The blocking means are separated from the discharging tube, so that the blocking means is not in contact with the discharging flow of the product and/or of the propellant when the valve is in the open position. Consequently, the blocking means according to the present invention do not have the drawbacks as described above, like limiting the discharging rate from within the pressurized container.

**[0026]** The blocking means (20) according to the present invention comprise a movable, non-compressible barrier (21), like a non-compressible ball, and a recess (22). The recess is such that the recess contains at least partially the barrier. The recess further has a 360° access symmetry for the barrier so that the access of the barrier into the recess is obtained at a desired inclination of the discharging tube independently of the orientation of the nozzle when the nozzle applied on a pressurized container is handled by a user. The recess and the barrier are preferably placed under the actuator (12) as shown in Figure 1a. In a preferred embodiment, the recess is in a stem (23). The stem (23) is located below the actuator (12) on the innermost surface of the actuator as shown in Figure 1a. Opposite the innermost surface of the actuator, the stem comprises the recess. Consequently, the recess is directed towards the barrier so that the barrier can enter into the recess.

**[0027]** Preferably, the movable, non-compressible barrier (21) is placed within a trough (24). Consequently, the movement of the barrier (21) is limited by a surrounding wall (25) and an end wall (26) of the trough (24). In this case, the stem (23) is directed into the trough (24) as shown in Figure 1a. The dimension of the trough is such that the stem is able to enter into the trough. In an alternative embodiment of the nozzle according to the present invention, the recess may be located in the trough as shown in Figure 2a. Also in this case the recess (22) has a corresponding dimension to the barrier (21) such that the barrier can enter at least partially into the recess. The recess may have a cylindrical or conical shape. It has been found that the conical shaped recess allows a quicker entrance of the movable, non-compressible barrier (21) into the recess (22). Furthermore, a conical shaped recess allows to achieve an easy 360° access symmetry for the barrier independently of the orientation of the nozzle.

**[0028]** Preferably, the end wall (26) of the trough (24) is inclined such that the movable, non-compressible barrier (21) tends to be removed from the recess (22) by the action of gravity when the nozzle (10) is in the upright position as shown in Figure 1a. In this position the stem (23) is prevented from moving towards the end wall (26) of the trough, since the barrier remains between the stem and the end wall of the trough. However, when the nozzle is inverted the barrier tends to fall at least partially into the recess. The barrier being at least partially in the recess is sufficient to allow the stem to be moved towards the end wall of the trough thereby allowing to exert a sufficient pressure for opening the valve when the nozzle is applied on a pressurized container.

**[0029]** Consequently, the nozzle (10) with the blocking means (20) described in Figure 1a prevents the opening of the valve when the discharging tube (11) is in its upright position as shown in Figure 1a. The inclined end wall (26) of the trough (24) may preferably have a conical shape with the vertex (27) pointing towards the interior of the recess (22) as shown in Figure 1a. Alternatively, the end part (23a) of the stem (23) may be inclined with the angle $\alpha$. Preferably, both, the end part (23a) of the stem (23) and the end wall (26) of the trough (24), may be inclined with the same angle $\alpha$. The angle $\alpha$ is measured between the horizontal plane (28) and the plane parallel to the end wall (26) of the trough (24) oriented towards the vertex, or between the horizontal plane (28) and the plane parallel to the end part (23a) of the stem (23) oriented towards the recess (22). The angle $\alpha$ determines the angle at which the barrier (21) is more likely to fall into the recess (22). Indeed, by increasing this angle $\alpha$, the barrier falls into the recess when the nozzle is inverted to a lesser extend than if the angle $\alpha$ would be smaller.

**[0030]** Consequently, by choosing the angle $\alpha$ the blocking means (20) can be selected to let the barrier (21) fall into the recess (22) when the nozzle (10) is completely turned upside down (at 180° from the upright position) or already before the complete upside down position at 180°. Preferably, the blocking means of Figure 1a has an angle $\alpha$ such to allow the movement of the actuator between about 90° and about 180° from the upright position, more preferably between about 110° and about 180°, most preferably between about 135° and about 180°.

**[0031]** As a further preferred option, the end wall (26) of the trough (24) may further comprise ledges (29a) or grooves (29b), as shown in Figures 4a and 4b. These ledges or grooves placed on the surface of the end wall directly facing the stem reduce the probability that the incompressible barrier falls into the recess by chance without having properly inverted the nozzle. In practice these ledges or grooves further increase the angle at which the discharging tube of the nozzle has to be inverted before allowing the movement of the actuator.

**[0032]** Figure 1c shows in a partial view another embodiment of the nozzle according to the present invention in which the movement of the actuator (12) is allowed in the upright position. Indeed, in Figure 1c the inclined end wall (26) of the trough (24) is an inverted cone with respect to the end wall of the trough of Figure 1a. Consequently, the barrier (21) rolls always towards the concave part of the vertex (27) by the action of gravity when the nozzle is in the upright position. In this position the stem (23) is able to be moved towards the end wall (26) of the trough, thereby allowing a sufficient movement of the actuator, since the barrier enters into the recess (22). However, if the discharging tube (11) of the nozzle (10) is turned away from the upright position, the barrier, under the action of gravity rolls between the stem and the end wall of the trough away from the recess. Consequently, the stem is prevented to be moved towards the end wall of the trough and the actuator is substantially prevented to move any further.

**[0033]** Figure 1b shows an alternative embodiment of the movable, non-compressible barrier (21) for a blocking means according to the present invention. Instead of a spherical, non-compressible ball, a pin having an oval cross section can also be foreseen as a non-compressible barrier. The recess (22) is shaped and dimensioned to correspond to the shape of the non-compressible barrier.

**[0034]** Figure 2a shows another movable, non-compressible barrier (21) pivotally attached to the end wall (26) of the trough (24). One end of the non-compressible barrier is pivotally attached to the end wall of the trough such that the barrier is directed by the action of the gravity force into a position which prevents the movement of the actuator when the nozzle is in its upright position. In this case, the pivotally attached pin is directed away from the recess (22). Instead, when the nozzle is inverted completely from the upright position, the barrier is directed still by the action of the gravity force towards the interior of the recess. In this position the stem of the valve can be moved towards the end wall (26) of the trough (24), since the barrier enters into the recess without impeding the movement of the stem.

**[0035]** Figure 2b shows a similar blocking means as described before in Figure 2a, however which allows the movement of the actuator (12) only in the upright position. Indeed, the movable, non-compressible barrier or pin is pivotally attached at one end on the end part (23a) of the stem (23 and the recess (22) is located in the end wall (26) of the trough (24). Consequently, the pin enters the recess (22) when the nozzle is in its upright position. Whereas, when the nozzle is inverted the pin is directed away from the recess by the action of the gravity force, as shown in Figure 2b, blocking the movement of the actuator.

**[0036]** Other alternative movable, non-compressible barriers (21) can be achieved also by liquids which are not compressible. In Figure 3a the recess (22) in the end wall (26) of the trough (24) is at least partially filled with a non-compressible liquid, like water. The end part (23a) of the stem (23) comprises a finger (30) having the corresponding dimension of the recess. The dimensions of the finger and of the recess are respectively dimensioned such to achieve a sealing between the finger and the recess. In this manner it is substantially prevented that the liquid in the recess escapes from the recess when the finger is inserted into the recess. Preferably, the finger further comprises a sealing element (31) to improve the sealing between the finger and the recess. Preferably, such a sealing element is an O-ring surrounding the finger.

**[0037]** This finger (30) cannot enter completely into the recess (22), since the liquid inside the recess is incompressible and cannot exit from the recess because of the sealing between the finger and the recess. Only when the nozzle (10) is first inverted can the finger of the stem enter into the recess, allowing the movement of the nozzle. Indeed, the liquid exits at least partially from the recess and the finger has enough space in the recess to allow the movement of the nozzle. As a preferred option, the end wall (26) of the trough may comprise more than one recess. Each recess is filled at least partially with an incompressible liquid and corresponding to each recess a finger (30) on the end part (23a) of the stem has to be moved into the recess to allow the movement of the nozzle, as shown in Figure 3b. The blocking mechanism is identical to that one described for Figure 3a.

**[0038]** A further preferred embodiment of the present invention is a means to control the vertical distance which has to pressed by the actuator before the opening of the valve. This distance may be critical to the functioning of the blocking means (20). This distance needs to be large enough to allow the free movement of the barrier (21) within the blocking means. At the same time, this distance needs to be small enough such that the blocking means blocks before the valve is depressed sufficiently far enough in the vertical direction to allow the escape of product and/or propellant. It is desirable that this distance is controlled precisely when the nozzle is used in conjunction with a standard aerosol valve.

**[0039]** Indeed, standard aerosol valves allow the escape of product and propellant after a small depression of the valve, typically after about 0.3 mm vertical depression of the valve. Therefore, the blocking means needs to block before this vertical depression of e.g. 0.3 mm so that the propellant can not escape from the headspace. However, it has been found that the distance between the entrance to the recess (22) and the outer surface of the barrier (21) nearest to the entrance to the recess needs to be sufficiently great in order for the barrier to have free movement within the blocking means. It has been found that this distance between the entrance to the recess and the outer surface of the barrier has to be greater than 0.2 mm. Therefore, this distance between the entrance to the recess and the outer surface of the barrier is preferably within 0.2 mm to 0.3 mm in this example, with a total variation of only 0.1 mm, in order for the blocking means to function correctly.

**[0040]** The distance between the entrance to the recess (22) and the outer surface of the barrier (21) is determined by the relative heights of the top of the valve stem (40) and the top of the valve cup (41). This is because the top half of the nozzle with discharging tube (11) and the actuator is in continual contact with the top of the valve stem. In a similar manner, the bottom half of the nozzle is in continual contact with the top of the valve cup which is crimped onto the aerosol container. Therefore, in order to control the distance between the entrance to the recess and the outer surface of the barrier nearest to the entrance to the recess, the distance between the top of the valve stem and the top of the valve cup has to be controlled.

**[0041]** It has been found that the distance between the top of the valve stem (40) and the top of the valve cup (41) can alter during normal production and use. Indeed, it has been identified three key factors which can affect this distance. Firstly, the height of the valve stem can alter depending on the internal pressure in the can. This is because the internal aerosol container pressure pushes both the valve stem up in the housing, as well as it pushes the valve pedestal (42) upward away from the aerosol container. It has been observed differences between the height of the valve stem and the height of the top of the valve cup of 0.4 mm for aerosol containers filled at a pressure of 8 bar vs. aerosol containers filled at a pressure of 0 bar. Thus, the valve stem height will alter during normal usage of the aerosol container. This is because either the pressure will alter for different ambient usage temperatures or the pressure will drop as the product is used for gas powered aerosols. Secondly, the crimping of the valve onto the aerosol container can alter the distance between the top of the valve stem and the top of the valve cup. Indeed, during normal aerosol container filling production, it has been observed differences of up to 0.3 mm due to variations in the crimping process. Thirdly, the tolerances within individual valves due to the punching out of the metal valve cup, the moulding of the housing and stem, the crimping of the housing into the valve cup and thickness of the gasket can alter the distance between the top of the valve stem and the top of the valve cup. It has been observed differences of 0.3 mm in standard aerosol containers.

**[0042]** Therefore, the total variation in the distance between the top of the valve cup (41) and the top of the valve stem (40) can be expected to be as high as 1.0 mm during normal production. Since the variation required for the blocking means to function correctly is about 0.1 mm, these tolerances from the valve may prevent the blocking means from functioning reliably.

**[0043]** A possible way of removing the effect of these tolerances is to change the action of the valve such that the vertical displacement of the valve stem required to dispense product and/or propellant is greater than the sum of the tolerances within the nozzle. Therefore, this vertical displacement in the above example should be greater than 1.0 mm and preferably greater than 1.5 mm. This can be achieved by moving the location of the stem orifices (43) in the valve stem (44) up the length of the valve stem (44) to increase the vertical displacement required on the actuator for dispensing by a distance of greater than 1.0 mm with respect to usual nozzles. This means that the distance of vertical displacement of the actuator can be increased without compromising the blocking function of the blocking means. This is shown in Figure 5.

**[0044]** Another preferred way of the removing the effect of the tolerances is to place a device within the nozzle which can push the coupling between the nozzle and the valve stem (40) away from the end of the valve stem (40). This has the effect of removing the constraint that the position of the coupling nozzle-valve stem is fixed by the position of the top of the valve stem. Again the distance of vertical displacement of the actuator can be increased without compromising the blocking function of the blocking means. This is shown in Figure 6. Preferably, this device should push the coupling nozzle-valve stem for a distance greater than 1.0 mm away from the end of the valve stem in order to overcome the tolerances. More preferably, this distance should be greater than 1.5 mm.

**[0045]** Preferably, the device to push the coupling nozzle-valve stem away from the valve stem comprises a spring (18). The spring is preferably located between the innermost surface of the actuator (12) and around the trough (24), i.e. inside the nozzle. However, it can also be situated in any position between the base of the valve cup and the inner surface of the upper half of the nozzle (see Figure 6). Preferably, the spring is maintained under a certain compression such that the actuator is pushed away from the trough in the closed position by a distance of greater than 1.0 mm, preferably greater than 1.5 mm. The spring is put under an increased compression when the actuator is pressed. Consequently, the spring automatically pushes the nozzle back into its rest position once the external force on the actuator is released.

**[0046]** The upper half of the nozzle may be clipped to the lower half of the nozzle to prevent the upper half of the nozzle from being pushed away from the lower half by the action of the spring (18). The clipping of the halves may be achieved by ledges (43) as in Figures 5 and 7. Such ledges should also maintain the distance between the upper half of the nozzle and the'top of the valve stem to be greater than 1 mm and preferably greater than 1.5 mm. Such ledges can be placed on the upper and lower halves of the nozzle, or on the upper nozzle and the valve stem.

**[0047]** A further means of pushing the upper half of the nozzle away from the valve stem is to use the hinge connecting the upper half to the lower half of the nozzle. This removes the need for a separate spring (18).

**[0048]** Preferably, the blocking means (20) is a sealed against the product and/or propellant. It has been found that the viscosity of the product may adversely affect the functioning of the blocking means. Indeed, part of the product may remain stuck around the blocking means which facilitates a sticking of the blocking means on part of the actuator. In this case, it may happen that the blocking means blocks the nozzle even if the nozzle is inclined in the correct way. It may also happen that the blocking means is slow to get to the blocking position from the non-blocking position, and vice versa the blocking means may be slow to return from the non-blocking position back to the blocking position. Consequently, the blocking means may still allow discharge through the nozzle when the position of the nozzle is already such that it should already prevent further discharge, and vice versa. Furthermore, the blocking means is also protected from corrosion when a seal is provided. The corrosion may be due to certain product and/or propellant characteristics, like the pH. Therefore, the blocking means being completely isolated by the seal from the product and/or propellant is a preferred execution of the nozzle according to the present invention.

**[0049]** The seal can be achieved with different sealing techniques. A possibility is the friction fit in which the stem (23) elastically presses against the innermost surface of the wall (25) of the trough (24), as shown in Figure 1a. The pressing of the stem against the innermost surface of the wall (25) of the trough ensures that the product and/or the propellant is substantially prevented to enter into the trough (24). Part of the stem (23) may also seal with the outermost surface of the wall (25) of the trough, as shown in Figure 9a. This improves the sealing between the blocking means from the product and/or propellant. Another possibility is given by an O-ring (46) located between the outermost surface of the wall (25) of the trough and part of the stem (23), as shown in Figure 9b. A further possibility is a gasket (47) located between the outermost surface of the wall (25) of the trough and part of the stem (23), as shown in Figure 9c. A further possibility is the use of a wall (48) in form of flexible bellows completely surrounding the blocking means, as shown in Figure 9d.

**[0050]** Instead of completely isolating the blocking means from the product and/or propellant, drain back means can be foreseen in the nozzle. As shown for example in Figure 10, the nozzle may comprise orifices (50) around the blocking means (20) which facilitate the drainage of product into the valve cup.

**[0051]** Preferably, the nozzle according to the present invention is used on a pressurized container. A pressurized container is usually obtained by filling the container with a product and a propellant. The container is hollow body which may be made from any material, preferably metal, plastics including polyethylene terephthalate (= PET), oriented polypropylene (= OPP), polyethylene (= PE) or polyamide and including mixtures, laminates or other combinations of these. The metal can may be made from tin plated steel or other metals such as aluminium. Preferably, the interior surface of the metal container is laminated with a plastic material or coated with a lacquer or with a varnish. The lacquer or varnish are such to protect the interior surface of the container from corrosion. The corrosion may lead to a weakening of the container and may also lead to a discoloration of the container's content. Preferred plastic materials for lamination and lacquers or varnishes for coating are epoxy phenolic, polyamide imide, organosol, PET, PP, PE or a combination thereof.

**[0052]** The pressure inside the container is mainly created by the propellant. The pressure inside the pressurized container is such that the product and the propellant is expelled to the outside of the pressurized container once the valve is in the open position. The pressure inside the container is therefore higher than the external atmospheric pressure outside the container. The pressure inside the container is preferably at least 1 bar at 20°C, more preferably the inside pressure is in the range between 8 bar and 10 bar at 20°C.

**[0053]** The propellant, as said before, helps to discharge the product from inside the container. The quantity of propellant contained in the container is such that substantially all the product can be expelled out of the container throughout the life of the pressurized container at the correct pressure. The quantity also depends from the type of propellant used. Suitable propellants known in the art are liquid and gaseous propellants. Preferred propellants are gaseous propellants for environmental friendliness. As herein referred to, the words "gaseous" and "non-liquifiable" are used interchangeably in regard to the propellant. Indeed, gaseous propellants or non-liquifiable propellants are propellants which are in a gaseous state of matter at room temperature (about 20°C) and at pressures up to 12 bar. Furthermore, it is preferred to use 'ozone-friendly' propellants such as compressed air, carbon dioxide, nitrogen and oxides thereof or mixtures thereof. Carbon dioxide is the more preferred gaseous propellant. Minor amounts of low molecular weight hydrocarbons, such as propane, butane, pentane, hexane, may optionally be included provided that flammability requirements are not exceeded. Various ways to pressurise the propellant gas are known in the art. For example the gas may be pressurised at the time of packing. The product may be physically separated from a compressed gas by a membrane such as rubber under tension. Alternatively a means for pressurising the gas subsequently by mechanical action may be provided (so-called "pump and spray" systems).

**[0054]** Any gaseous, liquid or foaming product can be discharged through the valve according to the present invention. Preferred are foaming products when discharged with gaseous propellant. The propellant expands to form many bubbles within the composition thereby creating the foam. Specific hard surface cleaners are examples of foaming products. Such a foaming product is disclosed, for example, in EP-A-546 828. A preferred foaming product according to the present invention is a foaming laundry cleaning detergent. A foaming laundry cleaning composition is disclosed in EP-A-677 577 and in the co-pending European Patent Application No. 95870084.1.

## Claims

**1.** A nozzle (10) for a pressurized container comprising a discharging tube (11), an actuator (12) and blocking means (20), the discharging tube (11) being coupled to a valve of a pressurized container when the nozzle (10) is applied on a pressurized container, the valve in its open position allowing the discharge of a product contained in the pressurized container through the discharging tube when the actuator (12) is pressed, the blocking means (20) preventing the opening of the valve when the discharging tube (11) is in an undesired inclination, the blocking means (20) comprising a movable, non-compressible barrier (21), and a recess (22), the recess (22) being such that the recess contains at least partially the barrier (21), the recess (22) further having a 360° access symmetry for the barrier (21) so that the access of the barrier (21) into the recess (22) is obtained at a desired inclination of the discharging tube (11) independently of the orientation of the nozzle (10) when the nozzle is handled by a user, **characterized in that** the nozzle (10) comprises a stem (23) and a trough (24), the trough being such to contain the barrier (21), the recess (22) is located in an end part (23a) of the stem (23) or in an end wall (26) of the trough (24), the blocking means (20) prevents any substantial movement of the actuator (12) when the actuator (12) is pressed, and consequently the opening of the valve when the nozzle (10) is applied on a pressurized container, when the barrier (21) is located at least partially outside the recess (22).

**2.** A nozzle according to claim 1 **characterized in that** an end wall (26) of the trough (24) is inclined.

**3.** A nozzle according to either claim 1 or 2 **characterized in that** an end part (23a) of the stem (23) is inclined.

**4.** A nozzle according to any of the preceding claims **characterized in that** the movable, non- compressible barrier (21) is a spherical ball or an oval pin.

**5.** A nozzle according to claims 1 and 3 **characterized in that** the movable, non-compressible barrier (21) is pivotally attached to the end part (23a) of the stem or in the end wall (26) of the trough (24).

**6.** A nozzle according to claims 1 to 3 **characterized in that** the movable, non-compressible barrier (21) is a liquid.

**7.** A nozzle according to any of the preceding claims **characterized in that** the blocking means (20) is sealed against the product and/or propellant during the discharge of product and/or propellant.

**8.** A nozzle according to any of the preceding claims **characterized in that** the nozzle (10) comprises means to control the vertical distance which has to pressed on the nozzle (10) before the opening of the valve.

## Patentansprüche

**1.** Düse (10) für einen mit Druck beaufschlagten Behälter, mit einem Entleerungsrohr (11), einem Aktuator (12) und Sperrmitteln (20), wobei das Entleerungsrohr (11) mit einem Ventil eines mit Druck beaufschlagten Behälters gekoppelt ist, wenn die Düse (10) an einem mit Druck beaufschlagten Behälter angebracht ist, wobei das Ventil in seiner geöffneten Stellung die Entleerung eines in dem mit Druck beaufschlagten Behälter enthaltenen Produkts durch das Entleerungsrohr ermöglicht, wenn der Aktuator (12) gedrückt wird, wobei die Sperrmittel (20) das Öffnen des Ventils verhindern, wenn das Entleerungsrohr (11) eine unerwünschte Neigung hat, wobei die Sperrmittel (20) eine bewegliche, nicht komprimierbare Sperre (21) sowie eine Aussparung (22) umfassen, wobei die Aussparung (22) derart ist, daß sie die Sperre (21) wenigstens teilweise enthält, wobei die Aussparung (22) ferner eine 360°-Zugangssymmetrie für die Sperre (21) besitzt, so daß der Zugang der Sperre (21) in die Aussparung (22) bei einer erwünschten Neigung des Entleerungsrohrs (11) unabhängig von der Orientierung der Düse (10) erhalten wird, wenn die Düse von einem Anwender gehandhabt wird, **dadurch gekennzeichnet, daß** die Düse (10) einen Schaft (23) und einen Aufnahmebehälter (24) umfaßt, wobei der Aufnahmebehälter so beschaffen ist, daß er die Sperre (21) aufnimmt, wobei sich die Aussparung (22) in einem Endabschnitt (23a) des Schafts (23) oder in einer Stirnwand (26) des Aufnahmebehälters (24) befindet, wobei die Sperrmittel (20) jede wesentliche Bewegung des Aktuators (12) verhindern, wenn der Aktuator (12) gedrückt wird, und folglich das Öffnen des Ventils verhindern, wenn die Düse (10) an einem mit Druck beaufschlagten Behälter angebracht ist, wenn sich die Sperre (21) wenigstens teilweise außerhalb der Aussparung (22) befindet.

2. Düse nach Anspruch 1, **dadurch gekennzeichnet, daß** eine Stirnwand (26) des Aufnahmebehälters (24) geneigt ist.

3. Düse nach einem der Ansprüche 1 oder 2, **dadurch gekennzeichnet, daß** eine Stirnwand (23a) des Schafts (23) geneigt ist.

4. Düse nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** die bewegliche, nicht komprimierbare Sperre (21) eine sphärische Kugel oder ein ovaler Stift ist.

5. Düse nach den Ansprüchen 1 und 3, **dadurch gekennzeichnet, daß** die bewegliche, nicht komprimierbare Sperre (21) am Endabschnitt (23a) des Schafts oder in der Stirnwand (26) des Aufnahmebehälters (24) schwenkbar befestigt ist.

6. Düse nach den Ansprüchen 1 bis 3, **dadurch gekennzeichnet, daß** die bewegliche, nicht komprimierbare Sperre (21) eine Flüssigkeit ist.

7. Düse nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** die Sperrmittel (20) gegenüber dem Produkt und/oder einem Treibmittel während der Entleerung des Produkts und/oder des Treibmittels abgedichtet sind.

8. Düse nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** die Düse (10) Mittel umfaßt, die die vertikale Strecke steuern, um die die Düse (10) gepreßt werden muß, bevor das Ventil geöffnet wird.

## Revendications

1. Buse (10) pour un récipient sous pression comprenant un tube de décharge (11), un actionneur (12) et des moyens de blocage (20), le tube de décharge (11) étant couplé à une soupape d'un récipient sous pression lorsque la buse (10) est appliquée sur un récipient sous pression, la soupape permettant, en position ouverte, l'évacuation d'un produit contenu dans le récipient sous pression par l'intermédiaire du tube de décharge, lorsque l'actionneur (12) est enfoncé, les moyens de blocage (20) empêchant l'ouverture de la soupape lorsque le tube de décharge (11) possède une inclinaison indésirable, les moyens de blocage (20) comprenant une barrière mobile incompressible (21), et un renfoncement (22), le renfoncement (22) étant tel que le renfoncement contient au moins partiellement la barrière (21), le renfoncement (22) possédant en outre une symétrie d'accès à 360° pour la barrière (21) de sorte que l'accès de la barrière (21) du renfoncement (22) est obtenu avec n'importe quelle inclinaison désirée des tubes de décharge (11) indépendamment de l'orientation de la buse (10) lorsque la buse est manipulée par un utilisateur, **caractérisée en ce que** la buse (10) comprend une tige (23) et une auge (24), l'auge étant apte à contenir la barrière (21), le renfoncement (22) est situé dans une partie d'extrémité (23a) de la tige (23) ou dans une paroi d'extrémité (26) de l'auge (24), les moyens de blocage (20) empêchent un déplacement substantiel de l'actionneur (12) lorsque l'actionneur (12) est enfoncé, et par conséquent l'ouverture de la soupape lorsque la buse (10) est appliquée sur un récipient sous pression, lorsque la barrière (21) est située au moins en partie à l'extérieur du renfoncement (22).

2. Buse selon la revendication 1, **caractérisée en ce qu'**une paroi d'extrémité (26) de l'auge (24) est inclinée.

3. Buse selon la revendication 1 ou 2, **caractérisée**

**en ce qu'**une partie d'extrémité (23a) de la tige (23) est inclinée.

4. Buse selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la barrière mobile incompressible (21) est une bille sphérique ou une tige ovale.

5. Buse selon les revendications 1 et 3, **caractérisée en ce que** la barrière mobile incompressible (21) est fixée de manière à pouvoir pivoter à la partie d'extrémité (23a) de la tige ou dans la paroi d'extrémité (26) de l'auge (24).

6. Buse selon les revendications 1 à 3, **caractérisée en ce que** la barrière mobile incompressible (21) est un liquide.

7. Buse selon l'une quelconque des revendications précédentes, **caractérisée en ce que** les moyens de blocage (20) sont appliqués de façon étanche contre le produit et/ou l'agent propulsif pendant l'évacuation du produit et/ou de l'agent propulsif.

8. Buse selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la buse (10) comprend des moyens pour commander la distance verticale sur laquelle il faut appuyer sur la buse (10) avant l'ouverture de la soupape.

Fig. 1a

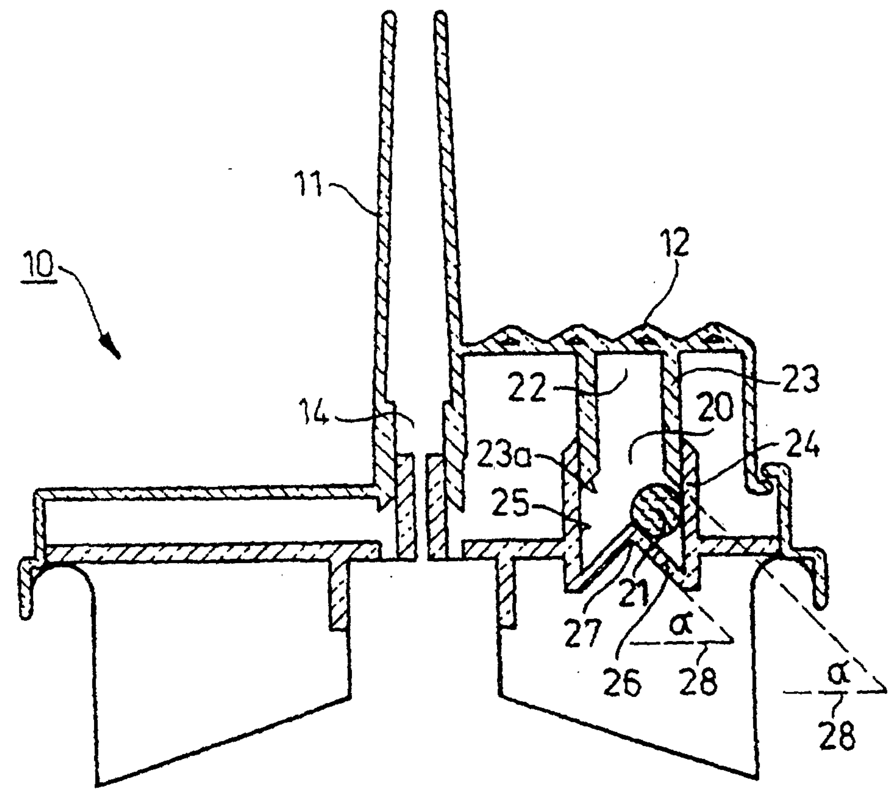
11
10
12
22
23
14
20
23a
24
25
21
27
α
26
28
α
28

Fig. 1b

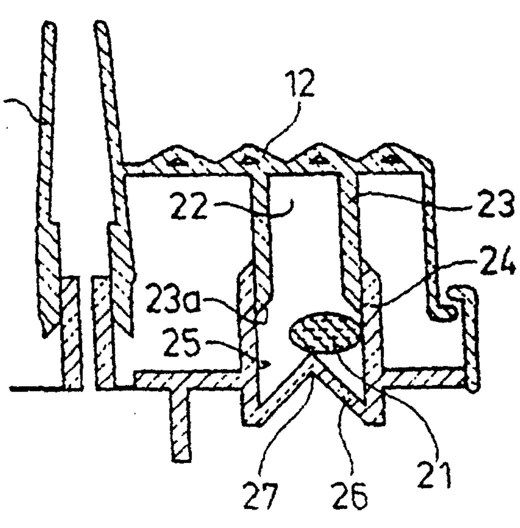
11
12
22
23
23a
24
25
27
26
21

Fig. 1c

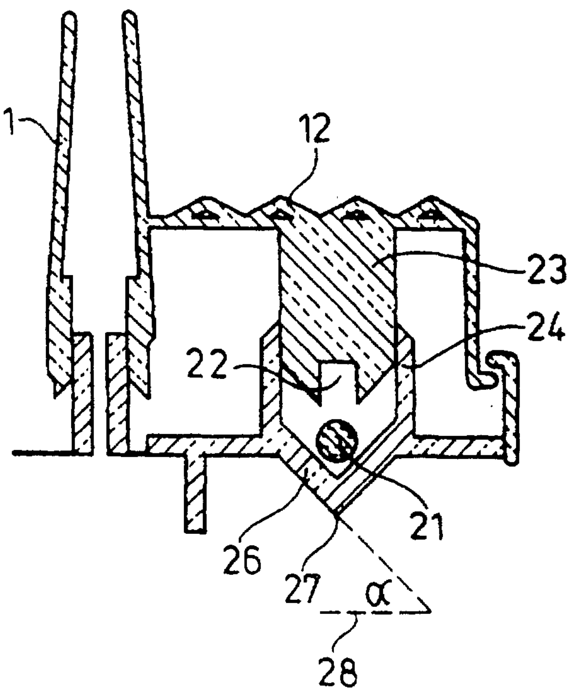


Fig. 2a

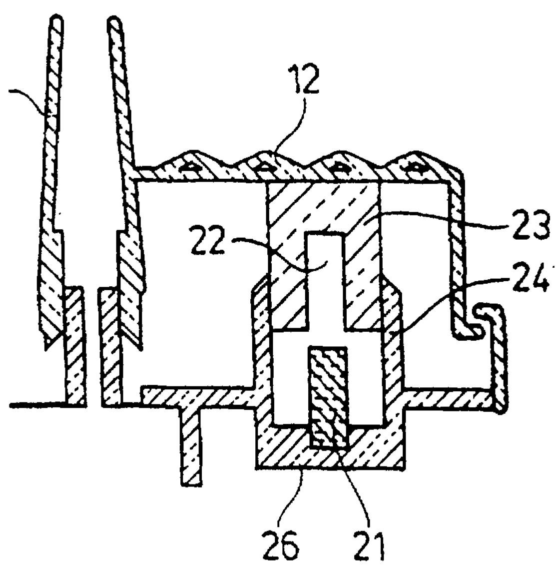

Fig. 2b

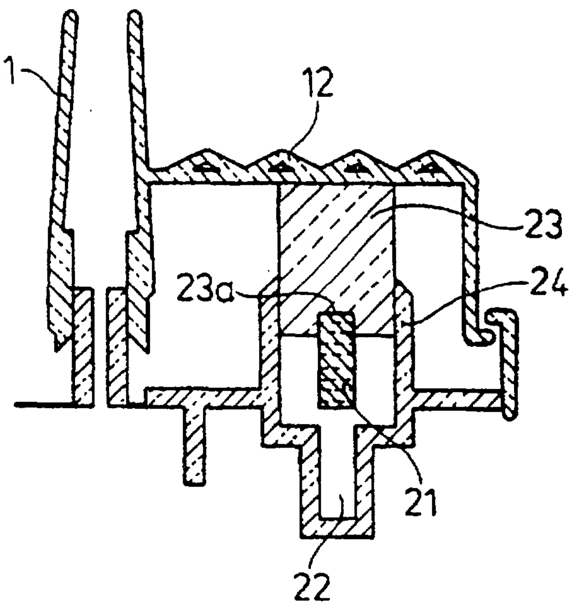


Fig. 3a

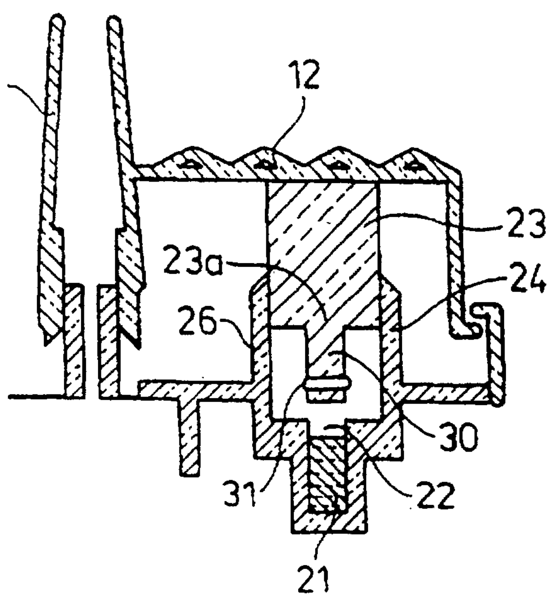

Fig. 3b

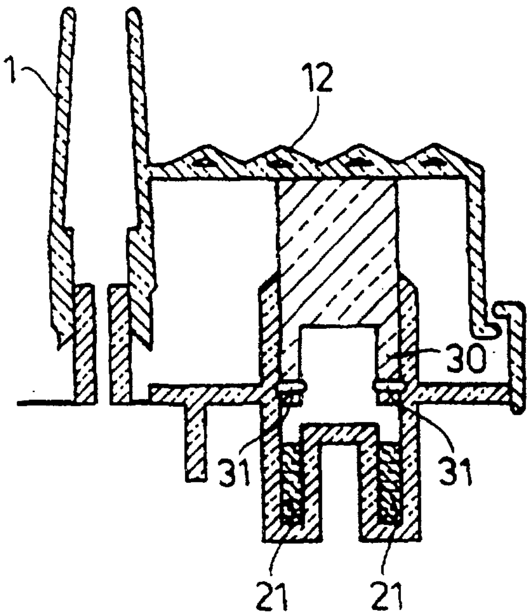


Fig. 4a

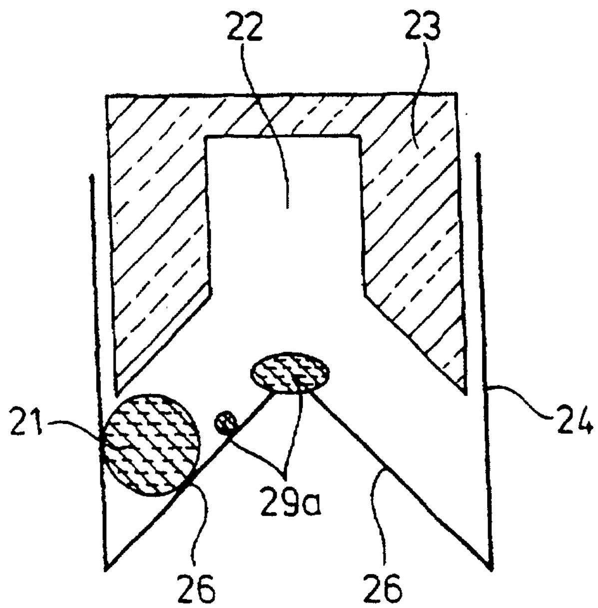

**Fig. 4b**

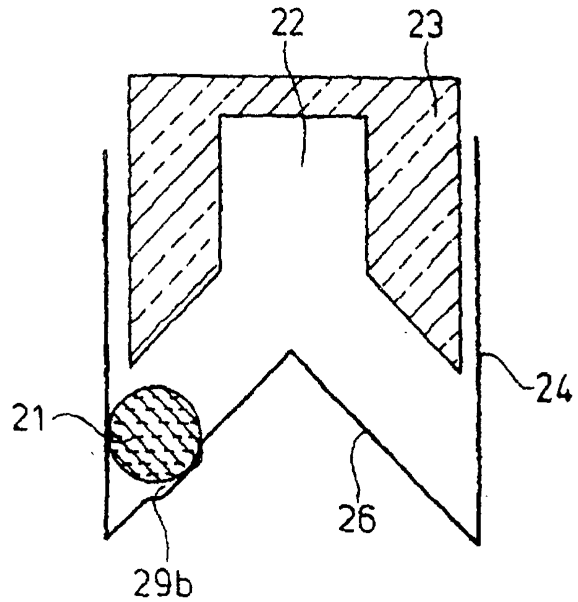


**Fig. 5**

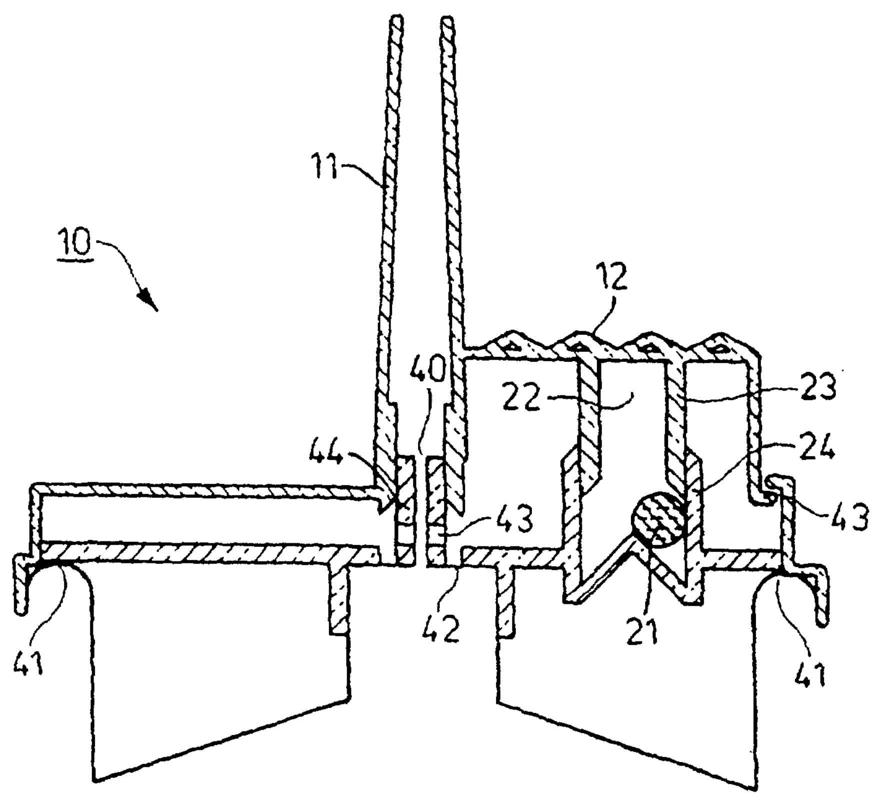

Fig. 6

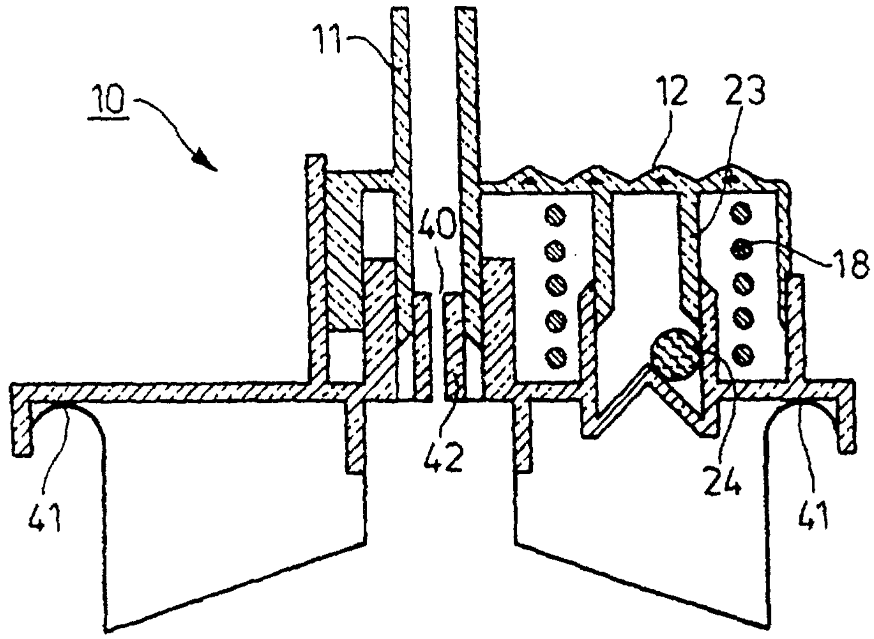


Fig. 7

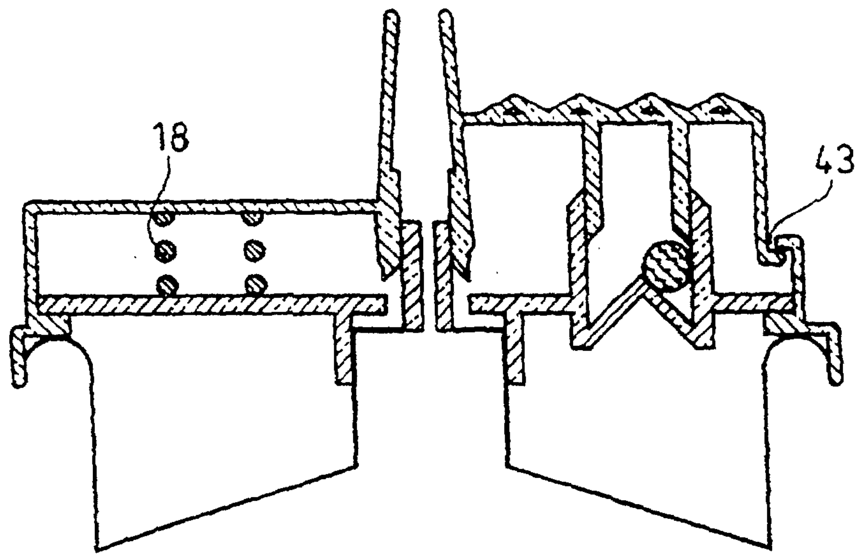

**Fig. 8a**

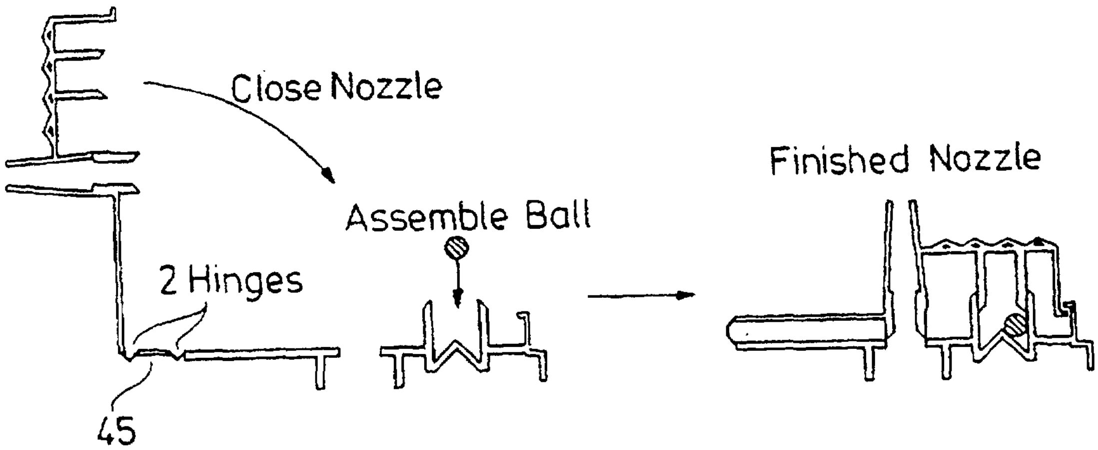
Close Nozzle
Finished Nozzle
Assemble Ball
2 Hinges
45

**Fig. 8b**

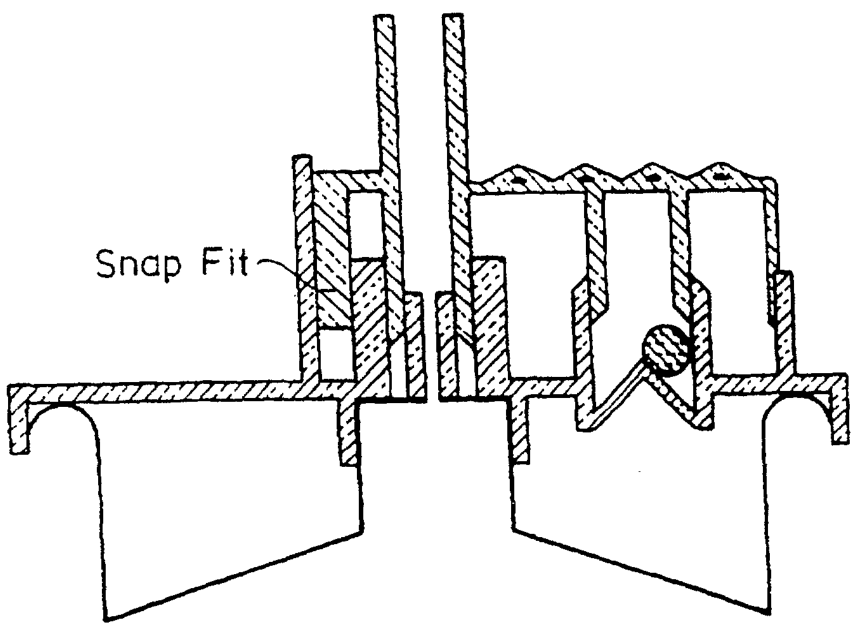
Snap Fit

Fig. 9a

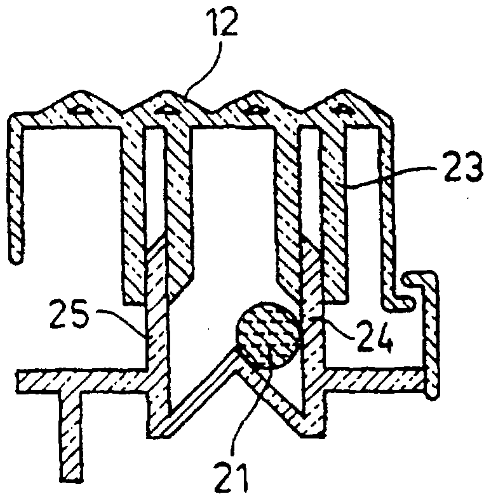


Fig. 9b

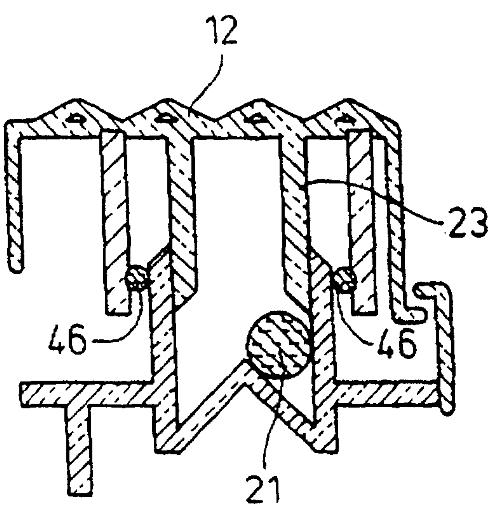

Fig. 9c

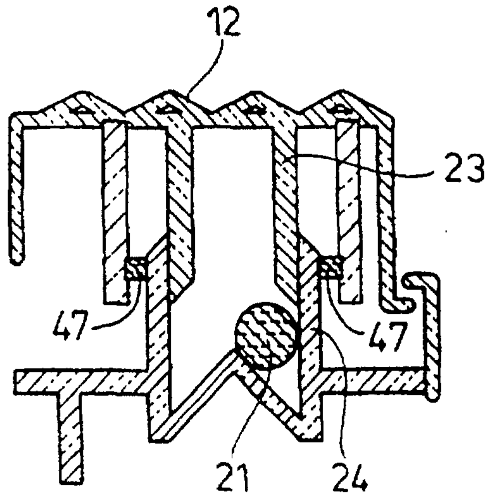


Fig. 9d

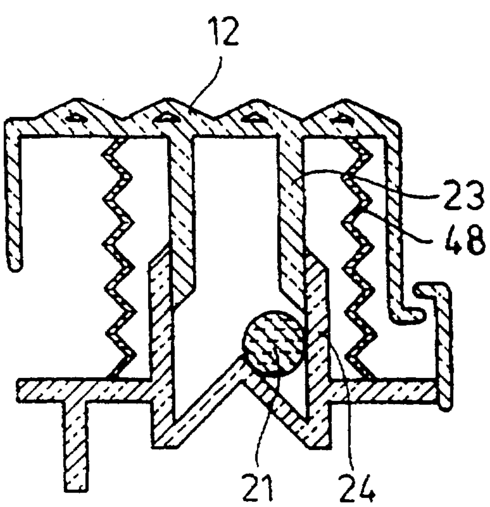

Fig. 10