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Description

The invention relates to a dispenser for products in paste form with a container containing the product concerned, which container is closed at one end with a piston sliding in seal-tight manner on the inner wall of the container, and at the other end with a partition having at least one opening and which container is provided with a head piece covering the partition and having an applicator possessing a dispensing channel laterally staggered relative to the opening of the partition, which head piece forms together with the partition a pump chamber the volume of which varies through external admission, which pump chamber is separated from the container by a first non-return valve to be opened only in the direction of the pump chamber, and from the orifice of the applicator by a second non-return valve to be opened only in the direction of said orifice.

In the case of such a dispenser, known from US-A-3 361 305, the pump chamber is defined by a separate partition which can be isolated from the container and which extends conically and concavely into the interior of the container, and a conically upwardly bulging diaphragm, whereby at a location between partition and diaphragm, an outlet passage discharges into the pump chamber, which outlet passage comprises as a second non-return valve a ball with an associated valve seat. Provided in the partition are a plurality of apertures which are each masked by flexible flaps located on the partition so that these apertures, together with the flaps associated with them, constitute the first non-return valve. In the case of this prior art dispenser, the pump chamber does indeed have a circular cross-section (in section crosswise

to the main axis), but the height of the pump chamber is at its outer periphery nil and in the non-actuated condition of the outer deformable actuating wall, the height of the pump chamber increases radially from outside inwardly. In the
5 actuated condition of the outside wall, in which this latter has changed its shape, the shape of the pump chamber is generally quite unpredictable. When the container is filled with the product, this latter is introduced into the pump chamber through the apertures in the first non-return valve
10 after the piston which slides in seal-tight fashion on the inner wall of the container has been inserted, so that in its expanded condition, the pump chamber is substantially completely filled with the product in question. When, in order to discharge the product, pressure is exerted from outside
15 onto the diaphragm, e.g. by means of the thumb, then the volume of the pump chamber is decreased, so that the product previously located in the pump chamber is discharged through the then opening second non-return valve and the outlet passage. Upon this decrease in the volume of the pump cham-
20 ber, the product cannot move back into the container since the flexible flaps are pressed firmly against the apertures in the partition, the first non-return valve therefore being closed. If after displacement of the product from the pump chamber, the volume of the pump chamber increases again by
25 the diaphragm being relaxed, then by virtue of the suction effect which takes place, the second non-return valve closes, so that no outside air can pass through the outlet passage and into the pump chamber. By virtue of the negative pressure arising in the pump chamber due to the increase in

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its volume, however, the first non-return valve opens in that the flexible flaps are lifted off the apertures in the partition so that product can flow from the container into the pump chamber so that this latter is once again filled with the product which is to be discharged. However, this known dispenser only functions imprecisely with regard to the quantity of product to be discharged at any given time, since the diaphragm is restored solely by virtue of its inherent elasticity and is subject to fatigue phenomena; also it only permits of a limited maximum volume in the pump chamber.

Known from French Application No. 2 344 469 is a container which in its construction differs fundamentally from the type mentioned at the outset in that it has no separate pump chamber but has, used as a pump chamber, a container space which has at its bottom end and subject to the effect of atmospheric pressure a piston-like end member which slides in seal-tight fashion on the inner wall of the tubular container on which end member there are expanding fingers which are intended to prevent a downwards movement of the end member when the container volume decreases. The interior of the container is isolated from the delivery passage by a valve consisting of valve seat and valve closure member, the valve as a whole being constructed as an insert disposed in the delivery passage.

In each of French Patent Specifications Nos. 1 177 620, 1 415 269 and 581 565 is described a dispenser for liquids and comprising a pump chamber of substantially cylindrical form and a head piece comprising a pump element adapted to

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be actuated from outside against the action of a return spring. In the dispensers according to FR-A-1 177 620 and FR-A-1 415 269, however, the pump chamber is connected to a discharge passage of the applicator by a passage which extends coaxially of the middle axis of the container of the relevant dispenser, being connected to a discharge passage of the applicator which extends transversely of the axis of movement of the pump element to the orifice of the applicator. This transversely extending passage is moved upwardly and downwardly with the pump element as this latter is actuated. Thus, when a dispensing operation is performed, the orifice of the applicator moves upwardly and downwardly and is either aligned transversely of the main axis of the dispenser or is directed towards the container (in the case of FR-A-1 177 620) so that it is impossible precisely to direct the orifice of the applicator at the place at which it is intended to dispense the contents of the container. A transverse orientation of the applicator passage and the orifice is also envisaged in the case of the device according to FR-A-581 565 and has the same disadvantages. None of these devices comprises an insert on which at least one of the closure parts of the two non-return valves would be mounted. The closure parts are constructed as a cone (FR-A-1 415 269) or masking plates (FR-A-1 177 620) or balls which are adapted to be freely upwardly or downwardly movable and which are not mounted, and particularly are not articulated, on any other part. Such a construction of the relevant non-return valves is from the outset not suitable for use in a dispenser for products which take paste form, because the

closure parts would very quickly be uncontrollably freely suspended in an intermediate position between the open and closed positions.

5 The invention is based on the problem of so further developing a dispenser of the type mentioned at the outset that, while being of simple construction, it permits of sensitive measurement of the quantity delivered while at the same time guaranteeing economical manufacture and simple assembly.

10 In the case of a dispenser of the type mentioned at the outset, this problem is according to the invention resolved in that the pump chamber is substantially clindrical, in that the head piece has a pump element actuatable from the outside, displaceable as a whole unit relative to the partition
15 to alter the volume of the pump chamber, on which pump element a return spring engages and effects the return movemeet away from the partition, and in that disposed in the head piece there is provided an injection-moulded part on which the closure portion of at least one of the two non-return
20 valves is mounted, the valve seat of the first non-return valve being disposed in the partition integral with the container, and the valve seat of the second non-return valve being disposed in the channel-shaped part of the head piece.

25 Due to the substantially cylindrical construction of the pump chamber, the volume of which is varied by relative movement of a piston surface in respect of the inner wall of the cylindrical pump chamber, it is possible even if the pump chamber is of relatively large volume, reproducibly to vary or control such volume by the relevant travel of the

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piston face. Even after a plurality of actuations, a reliable return of the dispenser to its inoperative position is assured by the separate return spring which produces relative movement between the piston face and the cylindrical pump chamber in the direction of an increase in volume. The dispenser according to the invention is constructed from a few simple parts and is therefore economical to produce and reliable in use.

A favourable development of the dispenser according to the invention is also achieved in that the closure part of the first non-return valve is integral with the injection-moulded part.

A particularly simple construction of the dispenser according to the invention is achieved if both the closure part of the first non-return valve and the closure part of the second non-return valve are mounted on the injection-moulded part. For manufacture and assembly, it is particularly favourable for the closure parts of the two non-return valves to be integral with the injection-moulded part.

A favourable embodiment of the dispenser according to the invention is achieved in that the head piece is formed as a hood movable in the longitudinal direction of the container relative to the partition of the container, encompassing part of the overall surface of the container and forming the pump element. With this embodiment, when the hood is pushed up onto the container, the volume of the pump chamber is reduced.

Advantageously, this embodiment is so constructed that the injection-moulded part is a resilient cylindrical sleeve

which is disposed parallel with the inner shell of the hood and, acting as a return spring, has one end bearing on the head piece and the other end bearing on the partition or the container.

5 An alternative advantageous embodiment of the dispenser according to the invention is achieved if the pump element is constructed as a piston able to be lowered into the pump chamber and seal-tightly guided in the head piece, and if the applicator is formed as a dispensing channel stationary in
10 relation to the partition of the container. Where this embodiment of the invention is concerned, the cylindrical pump chamber must be regarded as stationary, having a manually displaced piston lowerable in it in order to reduce the volume of the pump chamber.

15 The other Claims indicate further developments of the invention.

The invention is explained in greater detail hereinafter with reference to embodiments shown in the accompanying drawings, in which:

20 Fig. 1 is a longitudinal section through a first example of embodiment of the invention, in the inoperative position;

Fig. 2 shows the embodiment in Fig. 1 in the left-hand half of the section, illustrating a reduction in volume
25 while in the right-hand half of the section it illustrates an increase in the volume of the pump chamber;

Fig. 3 is a longitudinal section through a second embodiment of the invention;

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Fig. 4 is a longitudinal section through the head piece taken on the line IV, V-IV, V in Fig. 3;

Fig. 5 shows the same section illustrating a maximum reduction in pump chamber volume;

5 Fig. 6 is an enlarged view of an injection-moulded part constituting the non-return valves, in section;

Fig. 7 is an enlarged view of the injection-moulded part in Fig. 6, in plan view, and

Fig. 8 shows a section taken on the line VIII-VIII in Fig. 3.

10 Where the first embodiment shown in Figs. 1 and 2 is concerned, the dispenser comprises a substantially cylindrical container 1 consisting of a synthetic plastics material, e.g. polypropylene, into which is filled the product to be dispensed. Closing off its bottom end, the container 1 has a
15 piston 2 which slides in seal-tight fashion on the inner shell of the container 1 so that upon removal of product from the container, the volume is steadily decreased so that for a constant external shape of the container, no negative pressure can build up in the container and no air can accumulate therein. At its upper end, the container 1 has a head
20 piece 3 constructed as a substantially cylindrical sleeve guided to slide on the outer peripheral face of the container 1. In the case of the embodiment illustrated, this is provided for by the outer peripheral surface of the upper part
25 of the container 1 being set back somewhat inwardly so that the outer peripheral face of the head piece 3 is substantially aligned with the outer peripheral face of the rest and main part of the container 1.

The partition 4 between the container and the head piece, in conjunction with the sleeve displaceable in the longitudinal direction of the container 1, serves as a piston surface so that the volume of a pump chamber defined by this piston surface and the interior of the sleeve is varied upon relative movement between sleeve and partition 4. Provided in the partition 4 is an aperture 5 on which is constructed a valve seat which co-operates with a valve cover 6 which is in turn mounted on elastic bands 7. Within the sleeve and bearing substantially parallel on its peripheral surface there is, acting as a return spring, an elastic collar 8, one end of which is fixed on the partition 4 while its other end is fixed on the sleeve. The sleeve of the head piece 3 discharges upwardly into an applicator 9 or into a sleeve part 10 accommodating such applicator.

In the case of the embodiment shown here, there is at the bottom end of the applicator 9 and closing its passage, an elastic flap 11 which with the inner wall of the passageway forms a first marginal zone 12 which, to form a hinge between the flap and the inner wall of the applicator, is elastically but relatively strongly constructed. A second marginal zone 13 substantially opposite this first marginal zone 12 is on the other hand relatively thin but still completely seals the passage in the applicator.

Upon complete insertion of the applicator 9 into the sleeve part 10 of the head piece 3, a blade-like projection 14 provided on the inner peripheral face of the sleeve part 10 parts the relatively thin second marginal zone of the elastic flap, so that this, via its first marginal zone

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which acts as a hinge, is movable in the passage of the applicator 9. This elastic flap 11 then forms a second non-return valve while a first non-return valve is formed by the valve cover 6 and the aperture 5 in the partition 4.

5 As emerges particularly from Fig. 2 of the drawings, upon a downwards displacement of the head part 3 as shown in the left-hand partial section, the volume of the pump chamber is reduced so that the product located in the pump chamber is discharged outwardly through the passage in the applicator 9,
10 and then, under the pressure which builds up, the second non-return valve is opened in that the flap 11 is pivoted about the first marginal zone which acts as a hinge. By reason of the rising pressure upon reduction in pump chamber volume, the valve cover 6 is pressed onto the valve seat which is
15 constructed at the aperture 5 so that no communication exists between the interior of the container 1 and the pump chamber. As can be clearly seen in Fig. 2, upon this movement of the head piece 3, for reducing the volume of the pump chamber, the elastic collar 8 which acts as a return spring
20 is so deformed that it bulges inwardly into the pump chamber.

If, then, the head piece 3 is no longer acted upon in the direction of a downwards movement, then under the force of the return spring it will slide upwards again so that the volume of the pump chamber is again increased. By reason
25 of this increase in the volume of the pump chamber, a negative pressure is created in the pump chamber which leads to an immediate closure of the flap 11 which is assisted by that portion of product to be dispensed which is still present in the passage in the applicator 9 and which, upon an increase

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in the pump chamber volume, is partially drawn back again by suction. By reason of the negative pressure in the pump chamber, however, also the valve cover 6 is lifted off the aperture 5 in the partition 4 so that the product can flow
5 out of the interior of the container 1 and into the pump chamber in order once again to fill this latter with product, whereupon, once the pressures have been equalised between the interior of the pump chamber and the interior of the container 1, the valve cover 6 again lowers onto the aperture 5.

10 In Figs. 3 to 8 there is shown a second embodiment of the invention, parts which correspond to those in the first embodiment being identified by the same reference numerals as in Figs. 1 and 2.

The second embodiment differs from the first substantially
15 by the construction of the head piece 3. Guided for movement in this head piece is a piston 15 which, when it is lowered, reduces the volume of the pump chamber 16. As is clearly shown in Figs. 3 and 4, the upper and manually operable part
20 of the piston 15 is constructed as a substantially rectangular button, a return spring 8 taking the form of a conically upwardly extending spring strip extending through an aperture in the piston surface and into a cavity constituted by a substantially button-shaped further rectangular piston
part.

25 Apart from the substantially cylindrical pump chamber 16, the head piece 3 has a channel-shaped part 17 connected via a communicating tunnel 18 to the cylindrical part of the pump chamber 16.

As can be seen particularly in Figs. 6 and 7, this communicating tunnel 18 is constituted by an integral injection-moulded part 19 which at the same time comprises the elastic flaps for the first and second non-return valves. The elastic flap 20 in turn covers a communicating aperture 5 in the partition 4 between the container 1 and the head piece 3. The flap 21, on the other hand, seals off the channel-shaped part 17 from the throughflow passage of the applicator 9. As Figs. 6 and 7 show, the integral injection-moulded part 19 also has, integral with the injection-moulded part, a leaf-spring-like part 22 which biases the elastic flap 20 in the direction of closure. As can be seen from Fig. 7 of the drawings, the hinges between the flap 20 and the rest of the injection moulded part 19 can be constituted by corresponding recesses 23 on the underside of the injection-moulded part.

As Fig. 3 shows, the applicator 9 can be provided with a closure flap 24 for sealing the dispenser.

It goes without saying that applicators of various size, length, shape and other construction may optionally be used with the dispenser in order to facilitate specific applications of the product present in the container. On the other hand, the applicator can also be constructed in one piece with the head piece whereas for special applications involving very long applicators, particularly in the medical field for anal and vaginal administration, for example, a two-part embodiment is recommended on manufacturing grounds.

The mode of operation of the embodiment shown in Figs. 3 to 8 is in principle the same as with the first embodiment

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but now the reduction in the volume of the pump chamber 16 is achieved by pressing down the piston 15, while an increase in volume takes place by a subsequent upwards movement of the piston 15 under the force of the return spring 8. Also in this case, the non-return valves operate in the same way as in the first embodiment. The change in shape of the return spring 8 which occurs upon movement of the piston 15 can be seen immediately from Figs. 4 and 5.

In the diagrammatic view shown in Fig. 8, parts of the return spring 8 and the elastic flap 21 of the second non-return valve are shown.

The return springs can be made from stainless steel or may be injection moulded from macrolene. The synthetic plastics parts of the container 1, head piece 3, piston 15 and applicator may be made, for instance, from polyethylene or polypropylene. These materials ensure that the dispenser offers high product resistance, since it means that almost none of the products likely to be used in the dispenser can be physically or chemically affected by the parts of the dispenser.

Examples of application of the dispenser are, for example, hair and skin cosmetics, oral hygiene, medicine and also foodstuffs areas, paste products of all manner of compositions being capable of being filled into the container 1 and discharged from the dispenser.

Patent claims:

(The Patent Claims are already translated in the original text - Translator)

Two sheets of drawings