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(54) **DEVICE FOR DISPENSING A LIQUID-TO-PASTY PRODUCT USING A METERING PUMP HAVING A LOW DEAD VOLUME**

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(57) **ABSTRACT**

A device for dispensing a liquid-to-pasty product to be placed at the open end of a rigid container and consisting of a manual metering pump for dispensing a predetermined amount of the product to be dispensed, includes a base member to be placed on the container, a push button provided with a dispensing spout capable of acting, when pumped, against an intermediate bellows comprising an opening/closing device provided at the upper end of the bellows, characterized in that the push button is combined with a cylindrical chamber directed towards the inside of the bellows and extending inside the bellows so as to form a dead volume with a predetermined value inside same and to accordingly reduce the available air volume, thereby improving the compression rate when pumped.

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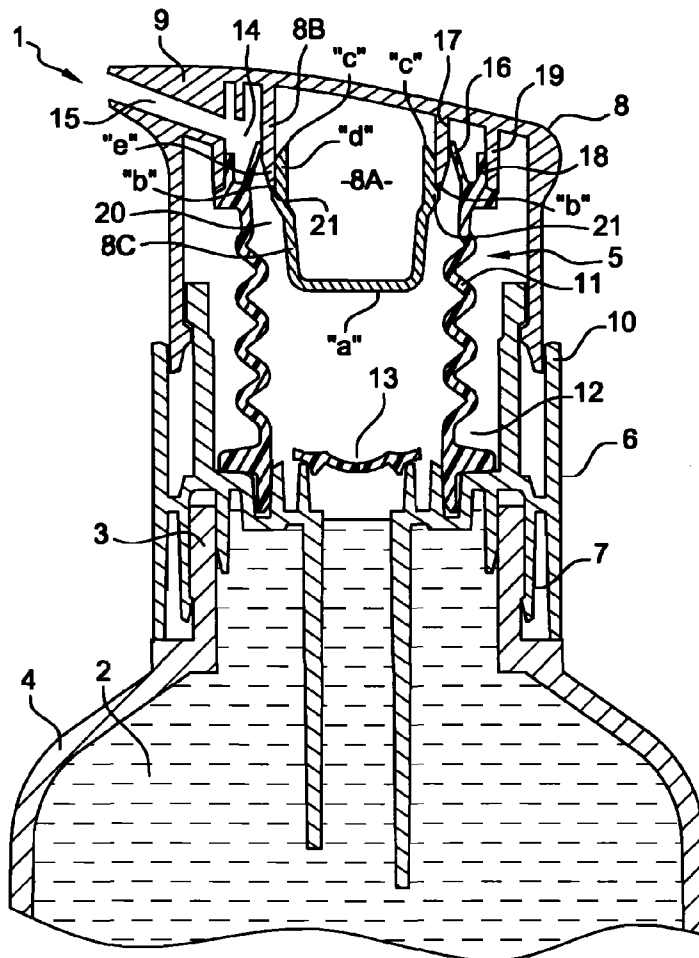
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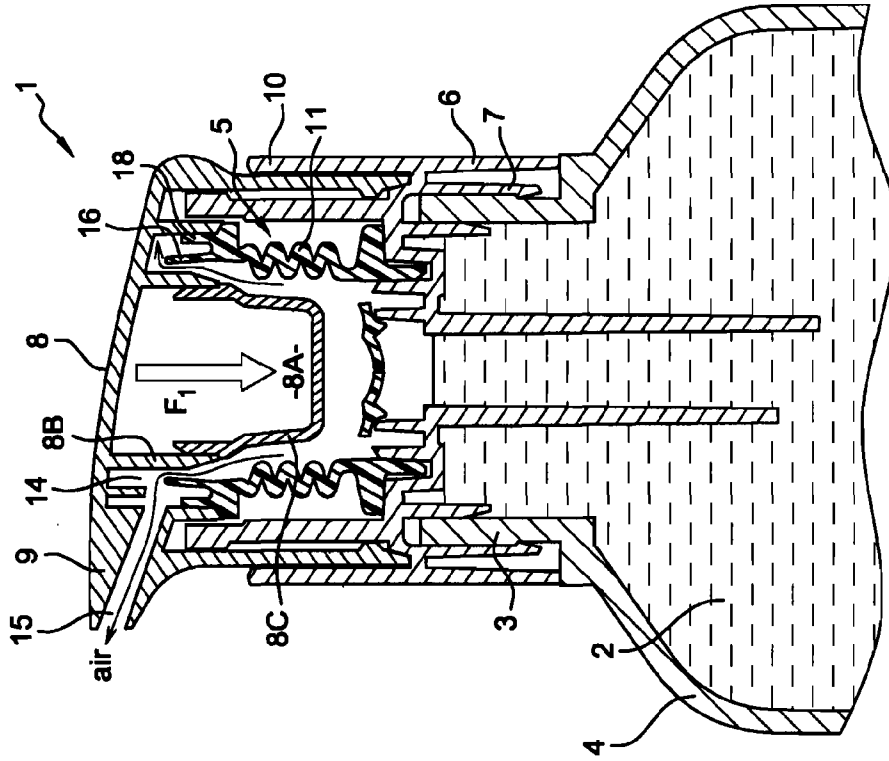


Fig. 2

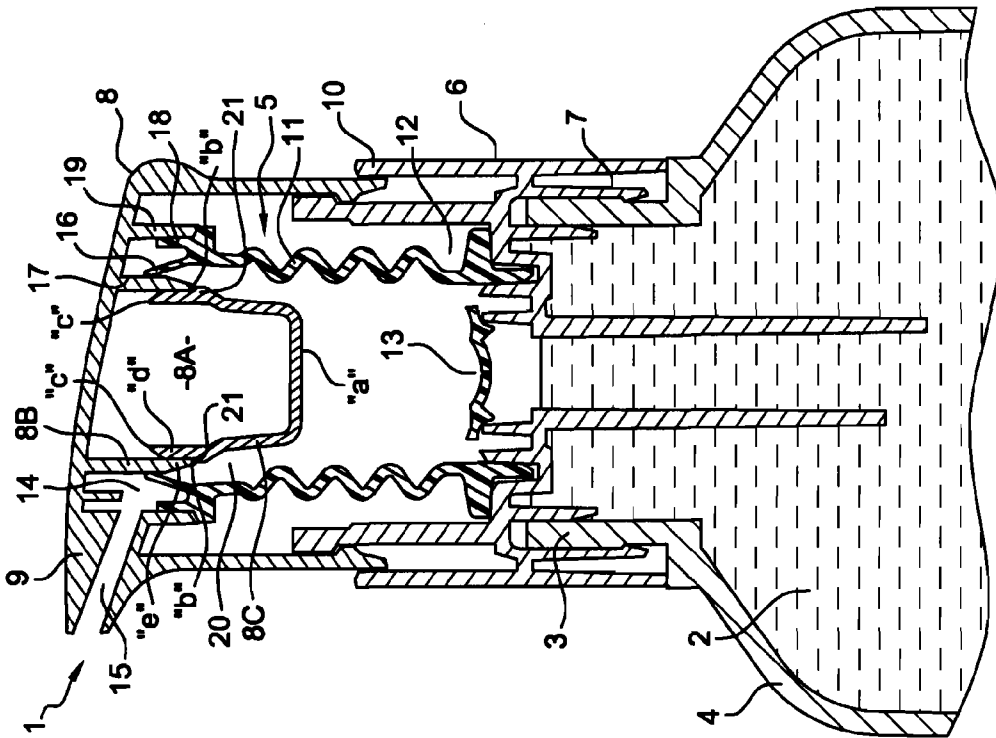


Fig. 1

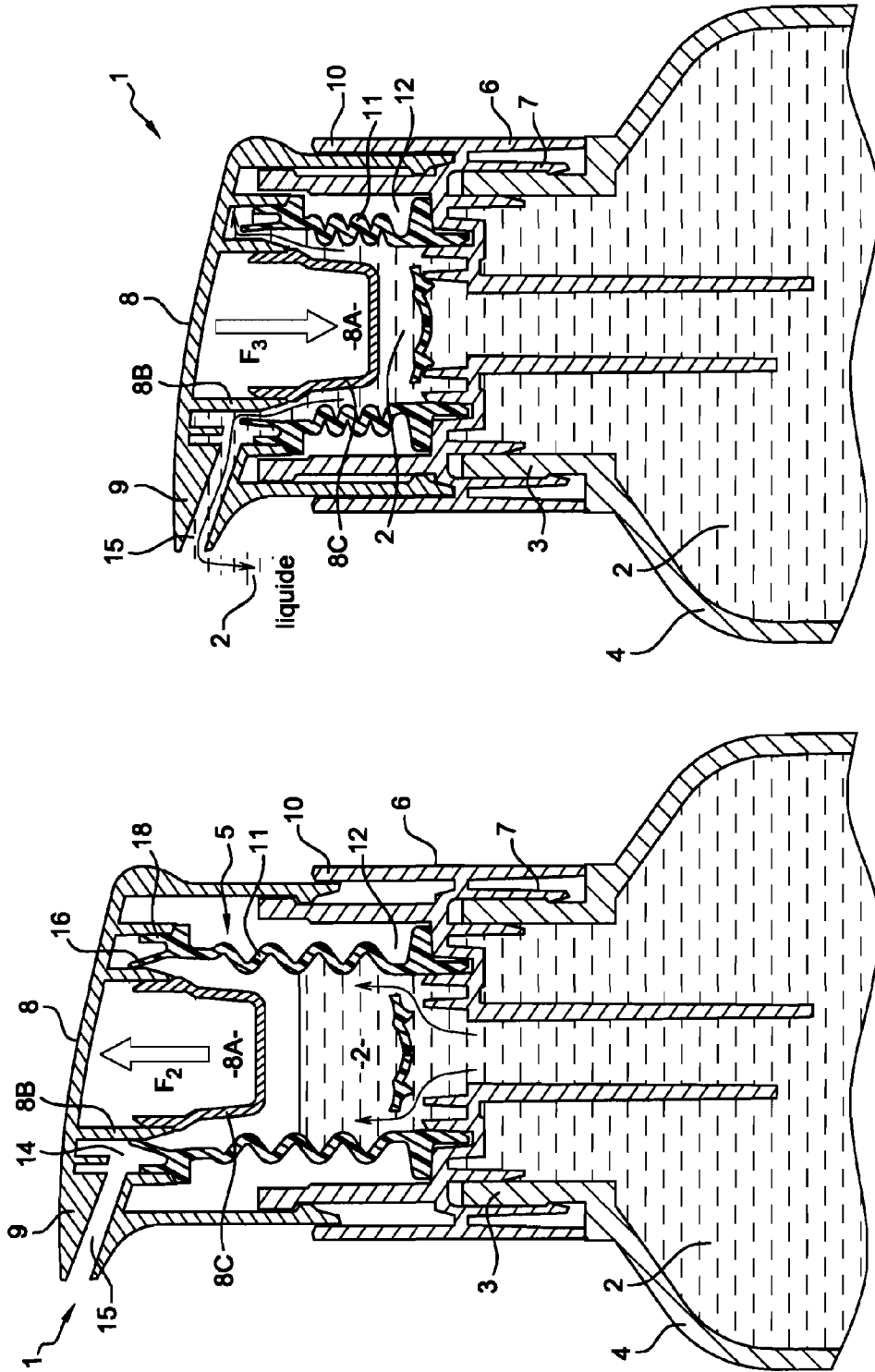


Fig. 4

Fig. 3

**DEVICE FOR DISPENSING A  
LIQUID-TO-PASTY PRODUCT USING A  
METERING PUMP HAVING A LOW DEAD  
VOLUME**

BACKGROUND

**[0001]** This invention relates to a device for dispensing a liquid-to-pasty product intended to be installed at the open end of a rigid container, and constituted by a manual metering pump making it possible to dispense a predetermined quantity of the product to be dispensed.

**[0002]** Such pumps are in particular intended for the dispensing of all liquid-to-pasty products, whether pertaining for example to food, cosmetic products, hygiene, health, and beauty products or sun products.

**[0003]** But from the moment the pumps were positioned on markets with lower value added, such as food or cosmetics, hygiene, health and beauty, the complexity and the price of the pumps have constituted a hindrance.

**[0004]** Most of these new products that use these pumps are disposable products, with a reduced service life. In addition, their requirements in terms of dose precision and repeatability are more reduced.

**[0005]** This problem with simplification has appeared very recently with the democratization of products, initially high-end, to be adapted for mass distribution.

**[0006]** It is as such that the creation of a pump dispensing system having few parts has already been sought, in any case with the least amount of part possible, in such a way as to make it economical.

**[0007]** A device aiming to achieve this objective was described in French patent application Ser. No. 07/02965 filed by the applicant, which in addition, resolved a safety problem on the dispensing of the product, with the latter no longer able to occur accidentally.

**[0008]** The results obtained, even if they are satisfactory, can be further improved concerning the priming of the pump.

**[0009]** In fact, the main disadvantage of this pump is its substantial dead volume associated with a low compression rate. Indeed, tests have shown that only 37% of its metering chamber is compressed when the push button is pressed. In the priming phase, the air contained in the metering chamber and the dip tube must be evacuated, by compressing the air of the metering chamber and to force it to pass through a high valve.

**[0010]** With such a low compression rate of the air in the metering chamber, the air has difficulty reaching the pressure required to pass through a top valve of the device and the operation is not effective. This results in priming that is too long due to the requirement of having to exert several presses on the push button.

**[0011]** This can be explained by the fact that the volume of air, which corresponds to the volume of the bellows, generates the priming phase of the pump when the air is compressed, during the actuating of the push button.

**[0012]** Recall that the priming is carried out in the following manner:

**[0013]** The push button is pressed in order to compress the air inside the bellows, and this air will escape via the top valve, until a stabilizing pressure is reached.

**[0014]** During the release of the bellows, the push button rises up and creates a vacuum in the metering chamber corresponding to the volume of escaped air.

**[0015]** This vacuum generates a suction of the product via the bottom valve of the same device.

**[0016]** This operation is currently repeated too many times given the substantial volume of air to be actuated in relation to useful volume (dose) of the product dispensed, several times higher than this dose.

**[0017]** For example, for a chamber volume of the bellows equal to 4.07 ml, a compression of 37% of this volume is obtained, allowing for the dispensing of a dose of 1.5 ml.

**[0018]** In this case, the initial compression of the air is 600 mbars, and the vacuum generated is 370 mbars.

**[0019]** All of this results in a dead volume equal to 4.07 ml-1.5 ml≈2.5 ml, therefore 63% of the non-effective initial volume during the priming.

**[0020]** This therefore generates a substantial loss of effectiveness, resulting in a substantial number of pumpings: about twelve priming strokes.

SUMMARY OF THE INVENTION

**[0021]** It is as such that according to a first phase of the inventive approach, it was established that it is required to reduce the dead volume in the bellows.

**[0022]** For this, and according to the invention, a dead volume reducer called solid volume is installed inside the bellows, in an integral manner with the push button, occupying a determined volume inside the bellows, allowing a useful volume of air to subsist corresponding to at least the volume of one dose of the product.

**[0023]** As such, a gain is made in the effectiveness in the priming phase in order to evacuate the air. The quantity of air that passes through the top valve is higher, and therefore a volume of product that is higher is sucked to replace the air evacuated via the top valve, and therefore have faster priming.

**[0024]** This invention has for purpose to achieve this objective and relates to this effect to a device for dispensing a liquid-to-pasty product intended to be installed at the open end of a rigid container and constituted by a manual metering pump allowing for the dispensing of a predetermined quantity of the product to be dispensed, comprising:

**[0025]** a base member intended to be installed on the container by its lower end via a means of hooking or of adhesion such as clipping or screwing,

**[0026]** a push button provided with a dispensing spout mounted in a telescopic manner at the upper portion of the base member and able to act in pumping in relation to the latter, counter to a retaining member constituted by

**[0027]** an elastically deformable bellows providing the sealed link between on the one hand an internal chamber of the base member, opened towards the container in order to allow for the passage of the product through an opening, and on the other hand, at its upper end, an internal chamber of the push button wherein exits a hole of the dispensing spout, associated with opening/closing means, made at the upper end of said bellows,

**[0028]** characterized in that the push button is associated with a cylindrical chamber, directed towards the interior of the bellows with which cooperates, in a sealed manner, a peripheral wall delimiting said chamber, the latter being hermetically sealed at its lower internal end and extending to the interior of the bellows, in order to constitute a solid volume of predetermined value inside the latter and reduce by as much its useless dead volume, improving as such the compression rate when pumped and the effectiveness of the pump.

[0029] Thanks to the invention, the results obtained, compared to the previous results, are as follows, for the same bellows with a dead volume reducer arranged inside the latter.

[0030] For a new chamber volume of the bellows reduced to 2.56 ml, a new compression of 62% of this volume is obtained, making it possible to dispense an identical dose of 1.5 ml.

[0031] In this case, the initial compression of the air is now 1350 mbars and the vacuum generated is 570 mbars. According to the effect sought, this changes from twelve priming strokes, according to prior art, to six priming strokes, which is half less.

[0032] In addition, the invention allows for the use of products with a higher viscosity due to the fact that the pressure and the suction are also higher.

[0033] The invention also relates to the characteristics that will appear when reading the following description, and which must be considered separately or according to all of their possible technical combinations.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0034] This description provided by way of a non-restricted example, shall allow for a better understanding of how the invention can be carried out in reference to the annexed drawings wherein:

[0035] FIG. 1 shows a longitudinal cross-section view of a dispensing pump according to the invention, arranged on a containing of a product to be dispensed, the push button being in the "before use" position.

[0036] FIG. 2 shows a longitudinal cross-section view of a dispensing pump of FIG. 1, in a first priming phase of the pump, i.e. with the push button being pressed.

[0037] FIG. 3 shows a longitudinal cross-section view of a dispensing pump according to FIG. 2, in a second priming phase of the pump, i.e. during the rising of the push button, having for effect to raise the liquid in the chamber constituted by the bellows.

[0038] FIG. 4 shows a longitudinal cross-section view of a dispensing pump according to FIGS. 1 and 3, during a dispensing of the product, by pressing once again the push button downwards.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0039] The device 1 globally designated in the figures is intended for the dispensing of a liquid-to-pasty product 2, installed at the open end 3 of a rigid container 4, and is constituted by a manual metering pump 5, allowing for the dispensing of a predetermined quantity of the product 2 to be dispensed.

[0040] In a known manner, the device 1 comprises:

[0041] a base member 6 intended to be installed by a means of hooking or of adhesion such as clipping or screwing on the container 4 by its lower end 7,

[0042] a push button 8 provided with a dispensing spout 9 mounted in a telescopic manner at the upper portion 10 of the base member 6 and able to act in pumping in relation to the latter, counter to a retaining member constituted by

[0043] an elastically deformable bellows 11 providing the sealed link between on the one hand an internal chamber 12 of the base member 6, opened towards the container 4 in order to allow for the passage of the product 2 through an opening 13, and on the other hand, at its upper end, an internal chamber 14

of the push button 8 wherein exits a hole 15 of the dispensing spout 9, associated with opening/closing means, made at the upper end of said bellows 11.

[0044] These means are comprised of:

[0045] a first internal peripheral collar 16 made at the upper end of the bellows 11, being housed in an internal annular groove 14 of the push button 8 forming a chamber, and pressing against one of its internal walls 17 that it tightens elastically according to a predetermined force, in such a way as to provide the seal or to be deformed radially under a certain pressure of the product 2 when it is pumped, and as such allow it to be transferred into the annular groove 14, said first flange 16 being associated with

[0046] a second collar 18 of the bellows 11, concentric to the first 16, being housed in the same groove 14 of the push button 8, but pressing against the external wall 19 of the latter wherein groove 14 exits from the orifice 15 of the dispensing spout 9, said second collar 18 being of a height such that it does not obstruct said orifice 15, the opening or the closing of the latter being carried out by the intermediary of a locking tab (not shown), coming from the flange 18, of height and of width at least such as to obstruct the orifice 15 by thrusting against, or to release it during an action in rotation, in one direction or in the other, on said push button 8, in relation to the base member 6, and consequently to the bellows 11, and to its tab, remaining fixed.

[0047] According to the invention, the push button 8 is associated with a cylindrical chamber 8A, directed towards the inside of the bellows 11 with which cooperates, in a sealed manner, a peripheral wall 17 delimiting said chamber 8A, the latter being hermetically sealed at its lower internal end and extending into the interior of the bellows 11, in order to constitute a solid volume of predetermined value inside the latter and reduce by as much its useless dead volume, as such improving the compression rate when pumped and the effectiveness of the pump.

[0048] According to a preferred embodiment, the chamber 8A constituting the solid volume inside the bellows 11 is carried out in two members, of which one is constituted by an internal extension 8B of the push button 8, open at its lower end "b", and the other is constituted by an insert 8C which is globally cylindrical, closed at its lower end portion "a" and open at its upper end portion "c", with the latter being added on the lower open portion "b" of the first member 8B in order to constitute the solid volume 8A.

[0049] This indeed entails a dead volume reducer according to the effect sought by the invention.

[0050] According to a particular embodiment, the insert 8C has an upper portion "d" of which the external shape and dimension correspond, to the nearby assembly clearance, to the internal shape and dimension of the lower portion "e" of the extension 8B of the push button 8 whereon is added the insert 8C.

[0051] The effective connection between the insert 8C and the extension 8B of the push button 8, in their respective end zones, is carried out by gluing, by force fitting or by ultrasonic welding.

[0052] Indeed, the dimensions of the chamber 8A are calculated according to the reduction in volume of the bellows 11 to be obtained, and consequently, of the compression rate sought. For this, action is preferentially taken on the dimensions of the insert 8A which is in fact a removable member.

[0053] As can be understood, the bellows 11 and the insert 8C, both of globally cylindrical shape, delimit between them a concentric crown-shaped volume 20, and the product 2 transits via this crown.

[0054] As can be seen in the figures, the upper end portion "c" of the insert 8C is delimited, on its external wall, by a peripheral shoulder 21 whereon abuts the end edge "b" of the lower portion of the extension 8B.

[0055] Advantageously, the various parts of the system are made from plastic materials.

[0056] Advantageously, the bellows is made of a plastic material, more preferably elastically deformable.

[0057] Advantageously, the material comprising the bellows has a high elasticity and is at the same time able to provide, between the two case members, the retaining forces required for the pumping. It is as such that the choice was directed towards a plastic material that is sufficiently flexible in order to provide a good seal on flanges, sufficiently responsive in order to provide a return to the initial position and provide a vacuum, and sufficiently resistant to creeping in order to make it possible to retain the initial tightening as well as retain a repeatability of compression travel and therefore of the dose.

[0058] Preferentially, the bellows is made from an injection molding of low-density polyethylene.

[0059] Also, SANTOPRENE (Polypropylene-modified Ethylene Propylene Diene Rubber), or HYTREL (Thermoplastic Elastomer-Ether-Ester, DRYFLEX (Styrene-Ethylene-Butylene-Styrene Styrenic Thermoplastic) could be used, materials that did not exist about twenty years ago, as well as certain references for polyethylenes that are created or modified in order to guarantee responsiveness and acceptable resistance to creeping.

[0060] These names are commercial names, the chemical names are in parentheses.

[0061] These materials have all of the aforementioned characteristics.

[0062] As can be easily seen in FIGS. 2, 3 and 4, the operation of the device is as follows:

[0063] During the first use, a press is exerted on the push button 8 according to the direction F1, i.e. downwards, having for effect to flush, via the spout 15, the air which is located in the bellows 11.

[0064] By releasing the pressure F1 on the push button 8, that latter rises naturally according to the direction F2, drawing the product 2 upwards, partially filling the internal volume of the bellows 11.

[0065] During a another press in the direction F3, i.e. downwards, exerted on the push button 8, a pressure will be exerted no longer on the air located in the bellows 11, which has already been evacuated, but on the product 2 which will be flushed by the concentric space 20 created between the insert 8A and said bellows 11, for a faster evacuation of the product via the spout 15 of the push button 8, and this with a number of presses on the latter also reduced, for an improved effectiveness in the dispensing of the product.

[0066] More precisely, the evacuation of the product is carried out by transiting in a concentric crown-shaped volume 20 formed by the exterior wall of the cylindrical chamber 8A and the bellows 11.

1-5. (canceled)

6. Device for dispensing a liquid-to-pasty product intended to be installed at an open end of a rigid container and constituted by a manual metering pump allowing for the dispensing of a predetermined quantity of the product comprising:

a base member intended to be installed on the rigid container by a lower end via at least one of hooking, adhesion, clipping, and screwing,

a push button provided with a dispensing spout mounted in a telescopic manner at an upper portion of the base member and able to act in pumping in relation to the base member, counter to a retaining member constituted by an elastically deformable bellows providing a sealed link between an internal chamber of the base member, opened towards the rigid container in order to allow the passage of the product through an opening, and at an upper end, an internal chamber of the push button wherein exits a hole of the dispensing spout, associated with opening/closing means, made at the upper end of said bellows, the push button is associated with a cylindrical chamber, directed towards the interior of the bellows with which cooperates, in a sealed manner, a peripheral wall delimiting said cylindrical chamber, and the cylindrical chamber being hermetically sealed at a lower internal end and extending to the interior of the bellows in order to constitute a solid volume of predetermined value inside the bellows and reduce by as much useless dead volume, improving as such a compression rate when pumped and the effectiveness of the pump.

7. Device according to claim 6, wherein the cylindrical chamber constituting the solid volume inside the bellows is carried out in two members, of which one is constituted by an internal extension of the push button, open at a lower end, and the other is constituted by a globally cylindrical insert, closed at a lower end portion and open at an upper end portion, with the insert being added on the lower open portion of the first member in order to comprise the solid volume.

8. Device according to claim 7, wherein the insert has an upper portion of which an external shape and dimension correspond, to a nearby assembly clearance, to the internal shape and dimension of the lower portion of the extension of the push button whereon is added the insert.

9. Device according to claim 8, wherein the upper end portion of the insert is delimited, on an external wall, by a peripheral shoulder whereon abuts an end edge of the lower portion of the extension.

10. Device according to claim 6, wherein evacuation of the product is carried out by transiting in a concentric crown-shaped volume formed by the exterior wall of the cylindrical chamber and the bellows.

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