May 7, 1963 W. B. SPATZ 3,088,636

DISPENSERS FOR FLUENT MASSES

Filed Dec. 8, 1959

FIG. 1.

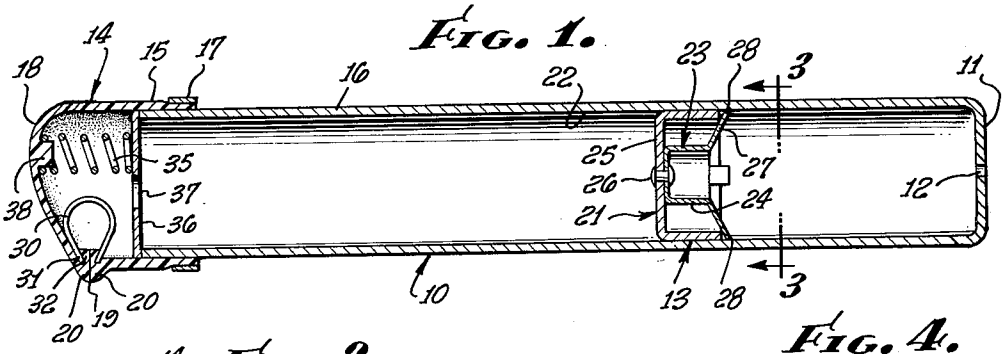


FIG. 2.

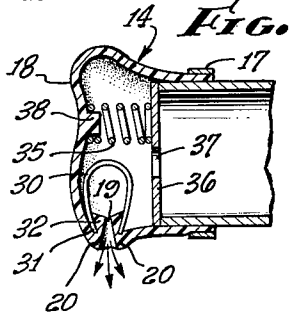


FIG. 3.

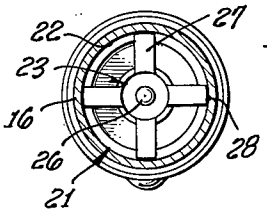


FIG. 4.

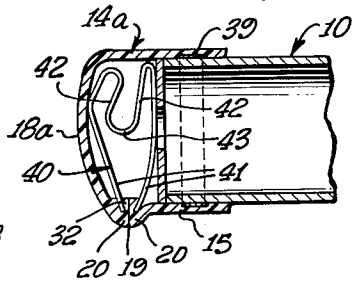


FIG. 5.

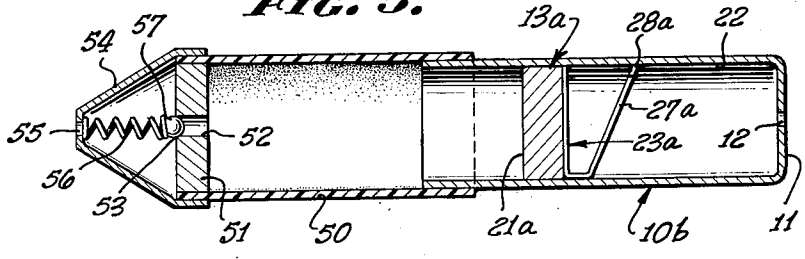


FIG. 7.

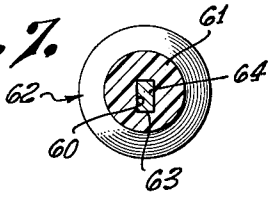
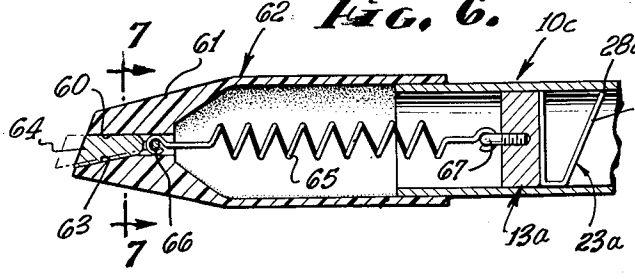


FIG. 6.



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DISPENSERS FOR FLUENT MASSES

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The present invention relates to containers adapted to hold semi-solid or fluent masses, and more particularly to containers embodying dispenser features for controlling the discharge from the containers of their contents.

An object of the invention is to provide a dispenser for a fluent mass capable of dispensing a desired quantity of the mass, in which the effective volume of the dispenser automatically decreases after each desired quantity of the mass is discharged from it.

Another object of the invention is to provide a dispenser for a fluent mass, in which the desired quantity of the mass is dispensed in response to finger or hand pressure, and in which the effective volume of the dispenser is automatically decreased to compensate for the dispensed mass upon release of the finger or hand pressure.

A further object of the invention is to provide a dispenser from which a controlled fluent mass can be extruded, the dispenser having a greater volumetric efficiency in that it can contain a greater volume of the mass in proportion to the volume of the container part of the dispenser.

An additional object of the invention is to provide a dispenser for a fluent mass that is comparatively economical to manufacture, and in which the quantity and velocity of discharge of the mass dispensed is easily controlled by a person, as by finger pressure.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of several forms in which it may be embodied. Such forms are shown in the drawings accompanying and forming part of the present specification. These forms will now be described in detail for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

FIGURE 1 is a longitudinal section through one embodiment of the invention, with the discharge valve portion closed;

FIG. 2 is a longitudinal section through the discharge portion of the device shown in FIG. 1 in a discharging condition;

FIG. 3 is a cross-section taken along line 3—3 on FIG. 1;

FIG. 4 is a longitudinal section through the discharge portion of another embodiment of the invention;

FIG. 5 is a longitudinal section through still another embodiment of the invention;

FIG. 6 is a longitudinal section through another form of the invention;

FIG. 7 is a cross-section taken along the line 7—7 on FIG. 6.

In its general aspects, the invention contemplates the provision of a dispenser having a container portion in which a quantity of a fluent mass or semi-solids are contained. The mass is to be discharged in any desired quantity as a result of decreasing the internal volume of the container. Following dispensing of the desired quantity of the fluent mass, the container is allowed to return to its initial volume, thereby producing a partial vacuum therein which will cause atmospheric pressure to force a follower device in the container in a forward direction against the rear portion of the mass, resulting in a decrease in the effective internal volume of the chamber. During the automatic movement of the follower device in a forward direction under the influence of atmospheric pressure, the discharge opening of the container is automatically closed to prevent atmospheric air from entering the container through such opening.

The effective volume of the container has been reduced by the amount of the fluent mass that has been discharged. When another quantity of the fluent mass is to be discharged, the internal volume of the chamber is again decreased, causing the required quantity of the mass to be discharged, and when the chamber volume is allowed to return to its original value, a partial vacuum is again created in the container, accompanied by an automatic follow-up of the follower in the chamber under the influence of atmospheric pressure.

In the form of invention specifically illustrated in FIGS. 1 to 3, inclusive, the dispenser includes a container **10**, that may be of cylindrical shape, and which is adapted to contain a fluent mass (not shown) such as toothpaste, for example. The container has a rear end wall **11** provided with a hole or air vent **12** to permit air at atmospheric pressure to enter the rear portion of the container and act upon a one-way follower device **13** slidable in the container. The follower device **13** is at the rear of the fluent mass in the container, the forward part of the fluent mass being disposed within a hollow head **14** having a generally cylindrical skirt portion **15** clamped around the main cylindrical body **16** of the container, as by use of a retaining band **17**. The head **14** has an end wall **18** which serves as a forward closure for the container, the head also having a discharge opening **19** through which the fluent mass can flow or be extruded as a result of decreasing the effective volume of the container between the follower **13** and the head **14**.

The decrease in effective volume is accomplished, in the form of invention disclosed in FIGS. 1, 2 and 3, by forming the head **14** of a pliant, elastic material, such as polyethylene. The exertion of pressure by one or more of the fingers of a person's hand upon the end wall **18** of the head in an inward direction, such as disclosed in FIG. 2, will result in the inward deformation of the head and a decrease in the volume within the cylindrical container forwardly of the follower **13**, which, as described hereinbelow, is prevented from moving in a rearward direction within the container **10**. Such inward deflection effects an opening of the discharge outlet **19** which, as illustrated, is formed through the side of the head **14** and is actually constituted by a pair of opposed lips **20, 20** defining the sides of the opening, which are normally pressed together to close the opening. However, inward deformation of the end wall **18** of the head will cause the fluent mass to spread the lips **20, 20** apart and effect an opening of the discharge outlet **19**, allowing the fluent material to pass therethrough.

When the pressure on the end wall **18** of the head is released, it will inherently return to its initial shape, such as disclosed in FIG. 1, the lips **20** inherently pressing back against one another to close the discharge outlet **19**. The result is a momentary increase in the volume within the container **10** forwardly of the follower **13**. In view of the dispensing of part of the fluent mass therewithin, a partial vacuum is created, causing the greater atmospheric pressure externally of the container to pass through the rear hole or air vent **12** and act upon the follower **13** to force the latter in a forward direction until the pressure of the fluent mass in the container is again atmospheric.

The one-way follower device **13** may consist of a cup-shaped piston **21** making a slidable fit within the inner wall **22** of the cylindrical container. Secured to the piston is a

one-way gripper or latch 23. As illustrated, the one-way latch includes a central portion 24 secured to the transverse head 25 of the piston in any suitable manner, as by means of a rivet 26. Extending laterally in an outward and rearward direction from the central portion 24 are a plurality of circumferentially spaced latch fingers or arms 27, the outer ends 28 of which are adapted to engage the inner wall 22 of the cylindrical container. These arms are in the nature of leaf springs and can deflect to permit forward motion of the piston device 13 in the container, but which grip the inner wall of the container to prevent rearward motion of the piston and the entire follower device within the container.

It is evident that when the deformable head wall 18 is pressed inwardly, a pressure is exerted on the fluent mass within the container 10, and also a rearward force on the follower device 13. However, the latter cannot move rearwardly of the container because of the gripping action of the flexible fingers 27 with the inner wall of the container. As a result, the fluent mass is forced through the discharge outlet 19 of the dispenser device. When the pressure on the end wall 18 of the head is released, it will return to its initial position, the lips 20 closing the discharge outlet 19, creating the partial vacuum within the container 10 heretofore described, the atmospheric pressure acting on the rear part of the follower device 13 to press it forwardly within the container to the extent corresponding to the volume of the fluent mass that had been dispensed. Decrease in the volume of the cylinder 10 forwardly of the follower device 13 is accompanied by ejection or extrusion of the fluent mass through the discharge outlet 19. Release of the pressure on the head is accompanied by an increase in the volume of the cylinder forwardly of the follower 13 and the creation of a partial vacuum therein, causing the atmospheric pressure to automatically move the follower in a forward direction to compensate for the volume of the fluent mass that had been discharged. The follower device 13 will move forwardly of the container after each ejection of a portion of the fluent mass through the discharge outlet 19, until the follower device has moved completely to the forward end of the container.

In the event that reliance is not placed upon the inherent tendency of the lips 20 to close upon one another following release of the deforming force on the head 14, the lips can be pressed against one another by the use of a suitable spring or clip 30. The outer end portions of the arms 31 of the clip engage opposed flanges 32 at the interior of the lips, pressing the lips together. However, the spring force is insufficient to hold the lips 20 closed against one another upon inward pressure being exerted upon the deformable end wall 18 of the head 14. The lips 20 may be considered to be a one-way valve, allowing discharge of fluent substances through the opening 19, but preventing return flow through the opening.

In the event that the head 14 does not inherently return to its initial position after having been deformed, a supplementary force can be provided, as by use of a helical compression spring 35, the outer end of which bears against the end wall 18 of the head, and the inner end of which bears against a spring seat or plate 36 extending across the cylindrical container and bearing against the end thereof. This spring seat will have a suitable opening 37 to permit the fluent mass to pass therethrough into the head 14. The spring 35 will also be retained in appropriate position within the head by causing its outer end to encompass a suitable centering boss 38 projecting inwardly from the end wall of the head.

In the form of invention disclosed in FIG. 4, the polyethylene head 14*a*, or pliant, elastic head of other suitable material, is secured to the cylindrical container portion 10 of the dispenser by interposing a thin band of metal 39 between the cylindrical skirt portion 15 of the head and the container, and then subjecting the parts to induction heating to provide a seal between the head 14*a* and the

cylindrical container 10, which, if desired, can also be made of polyethylene, or similar synthetic resin material.

In addition, a single spring device 40 is provided for closing the lips 20 of the discharge opening 19 and also for insuring the return of the elastic end wall 18*a* of the head to its initial position after it has been pressed inwardly, as by the finger of the user of the fluent mass to be dispensed. The lips 20, in effect, provide a one-way or check valve, which is also true of the form of invention previously described. The leaf spring 40 includes opposed outer arms 41, the outer ends of which tend to move toward each other and engage the flanges 32 at the inner portions of the lips 20 to force the lips, defining the discharge outlet 19, against one another and close the same. These outer arms merge into inner arms 42 that are connected to each other by a web 43 that tend to separate the outer portions of the arms 42, so that one arm is caused to bear against a spring seat or plate 36 that has an opening 37 through which the fluent mass can pass, and which engages the end of the container 10, the other arm bearing against the flexible end wall 18*a* of the head. The inner arms 42 tend inherently to separate, and thereby force the inner portions of the outer arms 41 in directions away from one another so as to force the end wall 18*a* of the head in an outward direction.

The device shown partially in FIG. 4 also includes the same or similar follower arrangement 13 (not shown) as illustrated in FIG. 1. The pliant end wall 18*a* of the head is pressed inwardly, such inward pressure decreasing the volume within the container forwardly of the follower device, which cannot move rearwardly because of the one-way gripping action of the flexible fingers or arms 27. The pressure exerted on the fluent mass forces the lips 20 apart and results in an extrusion or ejection of the fluent mass through the outlet 19. When the pressure on the elastic end wall 18*a* is released, it will inherently return to its original position, or the spring 40 will return it to its original position, the lips 20 closing against one another to prevent ambient air, or other materials, from retrogressing through the opening 19, thereby creating a partial vacuum in the container forwardly of the follower 13 and causing the atmospheric pressure to shift the follower forwardly in the container to take up the volume in the container corresponding to the fluent mass that had just been dispensed.

In the form of invention shown in FIG. 5, the container 10*b* has the rearward end wall 11 provided with a vent hole or opening 12 for the atmospheric air to enter behind a follower device 13*a*, including ap iston 21*a* and a one-way latch or gripper member 23*a* secured to the piston and having a leaf spring arm 27*a* extending in a rearward and laterally outward direction so that its end 28*a* engages the inner wall 22 of the cylindrical container. Snugly embracing the forward portion of the container 10*b* is a pliant or elastic tubing 50 that extends forwardly of the end of the container. This tubing may be made of any suitable material, such as polyethylene, capable of being deformed inwardly. The forward portion of the pliant tubing 50 snugly embraces an end plate or closure 51 having a passage 52 therethrough surrounded by a valve seat 53. A nozzle 54 surrounds the elastic tubing 50 to hold it against the end plate or closure 51 and terminates in a discharge opening or outlet 55. A helical compression spring 56 bears against the forward end of the nozzle 54 and also against a check valve element 57, such as a ball, to urge the latter in a rearward direction against its companion seat 53 in order to prevent return movement of fluent material through the passage or opennig 52 into the chamber within the elastic tubing 50 and the main portion of the container 10*b*.

At the outset, the follower device 13*a* is adjacent to the rear end wall 11 of the container 10*b* and the entire container and elastic tubing forwardly of the follower is filled with the fluent mass to be dispensed. When the

mass is to be dispensed, the elastic tubing **50** is grasped by the fingers and is forced inwardly, thereby decreasing the volume within the container **10***b* and tubing **50**. Since the follower **13***a* is prevented from moving rearwardly by the gripping action of the latch arm or finger **27***a* against the inner wall of the container, the fluent mass is forced through the passage **52**, unseating the ball **57** from its valve seat **53** and passing into the nozzle **54** and out through the discharge opening **55** of the nozzle. When the desired quantity of fluent mass has been dispensed, a release of the force or finger pressure on the elastic tubing **50** will allow the latter to inherently return to its original shape, creating a partial vacuum within the tubing **50** and the container **10***b*. The ball **57** automatically will re-engage its seat **53** to prevent any fluent mass in the nozzle **54** or air from passing back into the elastic tubing. As a result of the partial vacuum in the elastic tubing and chamber, the atmospheric air pressure will act upon the follower **13***a* and move it in a forward direction to the extent corresponding to the volume of the fluent mass that had been discharged.

Each time a mass is to be dispensed from the apparatus, a suitable pressure is exerted on the elastic tubing **50** to force the mass out through the check valve **57**, **53** and nozzle **54**. Each time this pressure is released, the check valve closes and the atmospheric pressure shifts the follower **13***a* forwardly to reduce the effective volume in the container and the elastic tubing, whereupon there is a full mass of fluent material between the follower and the check valve. The fluent mass can be intermittently dispensed until the follower **13***a* reaches the forward end of the container **10***b*.

In the form of invention disclosed in FIGS. 6 and 7, the check valve seat **60** is formed integrally with the forward end wall **61** of the pliant, elastic tubing or head portion **62** of the apparatus. This portion snugly embraces the main container portion **10***c* that contains the follower device **13***a*. A central discharge or outlet is provided by the seat **60** in the end wall of the head, this opening being of a rectangular cross section, such as disclosed in FIG. 7, with one side **63** of the opening being tapered. A tapered valve head **64** corresponding to the shape and size of the passage **60** is urged in a rearward direction, so as to wedge within the passage, by a tension spring **65**, one end of which is connected to an eye **66** or other suitable part at the inner end of the valve head **64**, the other end of which is connected by means of an eye **67**, or similar suitable part, to the follower device **13***a*, which can be substantially the same as the one employed in the device shown in FIG. 5. The one-way gripping action of the follower device **13***a* precludes its return movement, such that inward pressure exerted on the elastic part **62** of the dispenser will cause the fluent mass therewithin to urge the tapered valve head or wedge **64** axially in an outward direction to open the outlet passage **60** and cause the fluent material to be dispensed therefrom. Upon release of the pressure on the elastic portion of the device, it will inherently return to its original shape, the valve head **64** being forced inwardly into sealing engagement with its companion seat **60** and the partial vacuum created in the container resulting in the atmospheric pressure moving the follower device **13***a* in a forward direction, the latch portion **23***a* merely sliding along the container during such forward motion. In moving forwardly, the follower device **13***a* is assisted by the tension in the spring **65**.

Repeated pressure exerted on the elastic portion **62** of the dispenser shown in FIG. 7 effects the same general dispensing action as in the other forms of the invention. The follower device **13***a* cannot move rearwardly in the container **10***c*, so that a decrease in the effective volume within the dispenser causes the fluent mass to be extruded or ejected through the discharge outlet **60** thereof. Release of the pressure causes the check valve **64** to close automatically, and also produces the partial vacuum, causing the follower **13***a* to move forwardly in the container to the extent required to compensate for the volume of fluent mass that had been ejected.

From the foregoing description it is apparent that dispensers for semi-solid and fluent masses have been provided in which the fluent mass is automatically fed in a forward direction by the follow-up action of the follower device under the influence of atmospheric pressure each time the finger pressure or the like is released from the dispenser. It is unnecessary to manipulate any devices to cause the follower to move in a forward direction within the dispenser. Substantially the full quantity of fluent mass placed within the dispenser can be dispensed, particularly in the forms of invention illustrated in FIGS. 1 to 4, inclusive, in which the follower device **13** can move from an initial position adjacent to the rear end wall **11** of the container to the spring seat **36** at the forward end of the container. Very little of the fluent mass is wasted. Accordingly, the volume of the fluent mass actually dispensed is relatively great in proportion to the volume of the container itself.

The pressure exerted on the deformable portions of the different specific forms of apparatus can be controlled by a person to extrude various quantities of the fluent mass as desired, and also to control the velocity at which the fluent mass is ejected through the discharge opening. The entire apparatus is comparatively economical to manufacture and, as has been pointed out above, is easily operated by the person, with assurance of a controlled discharge of the fluent mass from the dispenser and the ability to utilize substantially all of the fluent mass that has been placed within the dispenser.

The inventor claims:

1. In a dispenser for a fluent mass: a container for the mass having a discharge outlet; piston means in said container movable in a forward direction toward the outlet and against the mass in the container; one-way latch means for preventing substantially all movement of said piston means in said container in a rearward direction away from the outlet while permitting movement of the piston means in the container in the forward direction; means for reducing the volume of the container forwardly of the piston means to dispense a portion of the mass through the discharge outlet; means for then increasing the volume of the container forwardly of the piston means, whereby said one-way latch means releases and said piston means moves forwardly in said container toward said outlet; and means for closing said outlet against flow of fluid therethrough into said container.

2. In a dispenser for a fluent mass: a container for the mass having a discharge outlet; piston means in said container movable in a forward direction toward the outlet and against the mass in the container; one-way latch means for preventing substantially all movement of said piston means in said container in a rearward direction away from the outlet while permitting movement of the piston means in the container in the forward direction; said container having an opening rearwardly of said piston means allowing air at atmospheric pressure to enter said container and act on said piston means; means for reducing the volume of the container forwardly of the piston means to dispense a portion of the mass through the discharge outlet; means for then increasing the volume of the container forwardly of the piston means, whereby said one-way latch means releases and said piston means is moved by air at atmospheric pressure forwardly in said container toward said outlet; and means for closing said outlet against flow of fluid therethrough into said container.

3. In a dispenser for a fluent mass: a container for the mass having a discharge outlet; piston means in said container movable in a forward direction toward the outlet and against the mass in the container; one-way latch means for preventing substantially all movement of

said piston means in said container in a rearward direction away from the outlet while permitting movement of the piston means in the container in the forward direction; at least a portion of said container being made of a pliant, elastic material which is deformable to reduce the volume of said container forwardly of the piston means to dispense a portion of the mass throught the discharge outlet, said portion then returning to its original shape to create a partial vacuum in said container forwardly of said piston means, whereby said one-way latch means releases and said piston means is moved by air at atmospheric pressure forwardly in said container toward said outlet; and means for closing said outlet against flow of fluid therethrough into said container.

4. In a dispenser for a fluent mass: a container for the mass having a discharge outlet; piston means in said container movable in a forward direction toward the outlet and against the mass in the container; one-way latch means for preventing substantially all movement of said piston means in said container in a rearward direction away from the outlet while permitting movement of the piston means in the container in the forward direction; means engageable by one or more fingers of a person for reducing the volume of the container forwardly of the piston means to dispense a portion of the mass through the discharge outlet; means for then increasing the volume of the container forwardly of the piston means upon removal of the one or more fingers of a person, whereby said one-way latch means releases and said piston means moves forwardly in said container toward said outlet; and means for closing said outlet against flow of fluid therethrough into said container.

5. In a dispenser for a fluent mass: a container for the mass having a discharge outlet; piston means in said container movable in a forward direction toward the outlet and against the mass in the container; one-way latch means for preventing substantially all movement of said piston means in said container in a rearward direction away from the outlet while permitting movement of the piston means in the container in the forward direction; the forward terminal head portion of said container being made of a pliant, elastic material deformable by finger pressure to reduce the volume of said container forwardly of the piston means to dispense a portion of the mass through the discharge outlet, said portion returning to its original shape upon relieving of said finger pressure to create a partial vacuum in said container forwardly of said piston means, whereby said one-way latch means releases and said piston means is moved by air at atmospheric pressure forwardly in said container toward said outlet; and means for closing said outlet against flow of fluid therethrough into said container.

6. In a dispenser for a fluent mass: a container for the mass having a pliant, elastic forward terminal head portion, said head portion having a discharge outlet; piston means in said container movable in a forward direction toward the outlet and against the mass in the container; one-way latch means for preventing substantially all movement of said piston means in said container in a rearward direction away from the outlet while permitting movement of the piston means in the container in the forward direction; said head being deformable by finger pressure to reduce the volume of said container forwardly of the piston means to dispense a portion of the mass through the discharge outlet, said head portion returning to its original shape upon relieving of said finger pressure to create a partial vacuum in said container forwardly of said piston means, whereby said one-way latch means releases and said piston means is moved by air at atmospheric pressure forwardly in said container toward said outlet; and means for closing said outlet against flow of fluid therethrough into said container.

7. In a dispenser for a fluent mass: a container for the mass having a pliant, elastic forward terminal head portion, said head portion having a discharge outlet; piston means in said container movable in a forward direction toward the outlet and against the mass in the container; one-way latch means for preventing substantially all movement of said piston means in said container in a rearward direction away from the outlet while permitting movement of the piston means in the container in the forward direction; said head being deformable by finger pressure to reduce the volume of said container forwardly of the piston means to dispense a portion of the mass through the discharge outlet; spring means engaging said head portion to return said head portion to its original shape upon relieving of the finger pressure to create a partial vacuum in said container forwardly of said piston means, whereby said piston means is moved by air at atmospheric pressure forwardly in said container toward said outlet; and means for closing said outlet against flow of fluid therethrough into said container.

8. In a dispenser for a fluent mass: a container for the mass having a pliant, elastic forward terminal head portion, said head portion having a discharge outlet defined by opposed lips normally engaging each other to close said outlet; piston means in said container movable in a forward direction toward the outlet and against the mass in the container; one-way latch means for preventing substantially all movement of said piston means in said container in a rearward direction away from the outlet while permitting movement of the piston means in the container in the forward direction; said head being deformable by finger pressure to reduce the volume of said container forwardly of the piston means to dispense a portion of the mass through the discharge outlet, said head portion returning to its original shape upon relieving of said finger pressure to create a partial vacuum in said container forwardly of said piston means, whereby said piston means is moved by air at atmospheric pressure forwardly in said container toward said outlet.

9. In a dispenser for a fluent mass: a container for the mass having a pliant, elastic forward terminal head portion provided with a discharge outlet defined by opposed lips; spring means engaging said lips to engage said lips with each other to close said outlet; piston means in said container movable in a forward direction toward the outlet and against the mass in the container; one-way latch means for preventing substantially all movement of said piston means in said container in a rearward direction away from the outlet while permitting movement of the piston means in the container in the forward direction; said head being deformable by finger pressure to reduce the volume of said container forwardly of the piston means to dispense a portion of the mass through the discharge outlet; spring means engaging said head portion to return said portion to its original shape to create a partial vacuum in said container forwardly of said piston means, whereby said piston means is moved by air at atmospheric pressure forwardly in said container toward said outlet.

10. In a dispenser for a fluent mass: a container for the mass having a discharge outlet; piston means in said container movable in a forward direction against the outlet and against the mass in the container; one-way latch means on said piston means engageable with said container for preventing substantially all movement of said piston means in said container in a rearward direction away from the outlet while permitting movement of the piston means in the container in the forward direction; means for reducing the volume of the container forwardly of the piston means to dispense a portion of the mass through the discharge outlet; means for then increasing the volume of the container forwardly of the piston means, whereby said one-way latch means releases from said container and said piston means moves forwardly in said container toward said outlet; and means for closing said outlet against flow of fluid therethrough into said container.

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