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DISPENSER FOR FLUENT MASSES

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ABSTRACT OF THE DISCLOSURE

A dispenser comprising a cylindrical container having a forward end wall and a follower piston movable forwardly by atmospheric pressure against a fluid mass in the container to force the mass through a valve controlled inlet in the end wall into a pump chamber defined between the end wall and a deformable actuator wall which can be pressed inwardly toward the end wall to dispense the mass from the chamber through a discharge valve controlled outlet, the deformable wall expanding away from the end wall to draw the mass from the container through the valve controlled inlet.

The present invention relates to dispensers, and more particularly to a dispenser for a fluent mass, such as tooth paste or a lotion.

While the art is replete with dispensing devices for discharging a fluent mass, the prior devices have not been fully satisfactory in terms of cost and simplicity of manufacture and assembly, effectiveness and dependability of operation, and ease of operation. Further, a substantial portion of their internal space has been occupied by structure or mechanism, reducing the portion of the space available for the material being dispensed.

Broadly, the present invention contemplates a dispenser for a fluent mass comprising a container for the mass having forward and rearward portions and a piston in the rearward portion of the container movable against the mass. The dispenser also includes a pump at the forward portion of the container having an inlet from the container and a discharge outlet. One-way valve devices are provided at both the pump inlet and outlet to permit flow only in a forward direction from the container into the pump and out through the outlet. The pump has a part movable lengthwise of the container toward its rear to discharge the fluent mass through the pump outlet, while the valve at the pump inlet is thereby closed to prevent back pressure from being imposed on the fluent mass and piston.

It is an object of the present invention to provide an improved dispenser for the discharge of quantities of a fluent mass.

Another object of the invention is to provide such a dispenser having a pump at one end operable by inward movement lengthwise or axially of the container to dispense the fluent mass, without applying a dispensing pressure on the fluent mass in the container portion of the dispenser.

Still another object of the invention is to provide such dispenser having an improved compact pump construction.

A further object of the invention is to provide a dispenser which is simple and economical to manufacture and assemble.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of a form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. It 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

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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 a dispensing apparatus embodying the present invention;

FIG. 2 is a cross-section taken along the line 2—2 on FIG. 1;

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

FIG. 4 is an enlarged sectional view of the discharge portion of the dispensing apparatus;

FIG. 5 is a section taken along the line 5—5 on FIG. 4; and

FIG. 6 is a section taken along the line 6—6 on FIG. 4.

In general, the dispenser includes a container 10 for a fluent mass M operatively associated with a pump 11 at the forward end of the container. The container includes a cylindrical side wall 12 and a bottom or lower end wall 13 integral therewith, the side and end walls being formed of any suitable material, such as polypropylene. The lower end wall 13 may be omitted, but if included, it is provided with one or a plurality of air vents or ports 14 and with a circular rib 15 at its periphery to elevate its bottom surface above a supporting surface (not shown), such as a counter top, to afford entry of ambient air through the ports 14 into the rear or bottom portion 16 of the container. The upper portion of the side wall has external peripheral ribs 17 formed thereon to which the depending skirt portion 18 of the pump mechanism 11 is secured, the skirt portion having companion internal circular ribs 19 thereon interlocking with the external ribs 17 to effect attachment of the parts to one another. The skirt 18 may be snapped over the upper portion of the container wall 12 in view of the fact that both the container wall and the pump skirt are made of a flexible or elastic material.

The forward portion of the container wall 12 is closed by an end wall 20 extending thereacross and bearing against the upper end of the cylindrical wall, being held thereagainst by the outer transverse actuator portion 21 of the pump mechanism, which is integral with the skirt 18 of the pump. The end wall 20 not only serves to close the forward portion of the container 10, but also as one wall of the pump mechanism 11, the other portion of the pump mechanism being provided by the actuator wall 21, which is made of a suitable flexible synthetic resin, such as a polyallomer. The container end wall 20 is concave in a forward direction; whereas, the actuator wall 21 is generally dome shaped or convex in a forward direction, being spaced from one another, as disclosed in FIG. 1, to provide a pump chamber 22 therebetween.

The inner wall 20 has inlet ports 23 through which the fluent mass M in the container can pass into the pump chamber 22, these inlet ports being closed by one-way inlet valves 24 that permit flow of the fluent mass M from the container 10 into the chamber 22, but prevent its reverse flow from the chamber back into the container. The fluent mass M in the chamber 22 can pass outwardly thereof through an outlet 25 that is controlled by a discharge valve 26, the discharge valve preventing return flow of the mass from the outer portion of the outlet into the chamber 22, as well as preventing ambient air from flowing through the outlet into the chamber.

A piston or follower device 30 is mounted in the container 10 rearwardly of the mass M. Originally, when the container is filled with the mass M, the piston 30 will be disposed at the lowermost or rearward portion of the container, being adapted to move in a forward direction against the mass. The piston includes a main body portion 31 having a forward lip portion 32 adapted to slidably seal against the inner wall 33 of the container, the piston being movable in a forward direction within the container

by atmospheric air pressure passing through the ports 14 and acting against its rear portion when the pressure of the mass M drops below atmospheric. The piston may be made of a suitable resin, such as polyethylene, and has its forward transverse wall portion 34 dish shaped or concave, corresponding to the extent of concavity of the forward end wall 20 of the container to insure the dispensing of the entire mass from the container as a result of abutting and close fitting of the piston with the forward end wall.

One or more inlet ports 23 may be provided in the end wall 20, each inlet port being controlled by an inlet valve 24. As shown by way of example, there are four ports 23 illustrated in the drawings, and there is a flapper type of inlet valve element 36 for each port, the flapper valve being made of a suitable synthetic resin, such as polyurethane. Each flapper valve element 36 is adapted to overlie its port 23 and to seat against the forward surface of the end wall 20 to close the port against return flow of the fluent mass from the chamber 22 therethrough. The flapper valves 36 may be made from a single sheet or disc of material extending radially inwardly from and integral with a continuous outer circumferential portion 36a. The flapper valve assembly is secured to the end wall by a plurality of projections 37 formed integrally with the portion 36a and received within companion holes in the end wall 20.

The pump 11 has a discharge passage 40 formed at one side of its depressible actuator wall or diaphragm 21, communicating with the discharge outlet 25 through a port 41, the discharge outlet including an outlet nozzle portion 42. Surrounding the discharge outlet port 41 is a valve seat 43 adapted to be engaged by a valve element 44, in the form of a ball, disposed in the nozzle portion 42. When the ball valve 44 moves inwardly into engagement with its seat 43, as shown in broken lines in FIG. 5, fluid cannot flow in a reverse direction through the passages 25, 40 and into the pump chamber 22. However, when fluid is forced from the pump chamber 22 through the discharge outlet 40 and into the nozzle 42, the ball rests against inwardly directed portions 46 of the nozzle, as disclosed most clearly in FIG. 6, with the fluent mass flowing around the ball and out through the nozzle 42 to the exterior of the dispensing apparatus. The ball valve element 44 is made of a suitable material, such as nylon.

The outer end wall 21 of the pump mechanism is shiftable or deflected in an axial longitudinal direction toward the end wall 20 of the container by finger or thumb pressure to impose pressure on the fluent mass M in the pump chamber 22 and effect its discharge through the pump outlet 25. When such finger or thumb pressure is leased, the wall 22 inherently returns to its original position, moving away from the end wall 20 of the container and reducing the pressure in the chamber 22 below atmospheric, drawing the discharge ball valve 44 into engagement with its companion seat 43 to prevent air from flowing into the chamber 22, and then reducing the pressure in the container below atmospheric, causing the atmospheric air acting on the rear of the piston 30 to shift the latter forwardly in the container forwardly in the container 10 and force a portion of the mass M through the inlet ports 23, unseating the inlet flapper valves 36 to refill the pump chamber 22 with a portion of the fluent mass. A subsequent inward axial depression of the pump actuator wall 21 imposes pressure on the mass in the chamber, which will seat the inlet flapper valves 36 across the inlet ports 23, to close the latter, and which will shift the outlet valve ball element 44 away from its seat and allow the fluent mass to flow through the outlet passage 40, port 41 and the nozzle 42 to the exterior of the latter.

Each depression of the end wall 21 will result in the discharge of a fluent mass through and from the nozzle 42, the one-way valves 24 preventing pressure from being imparted on the mass M in the container 10 and on the pis-

ton 30. Release of the finger or thumb force from the actuator wall 21 allows it to inherently return to its initial position, drawing an additional supply of the fluent mass from the container through the ports 23 into the chamber 22 under the action of the piston 30, which will move to the required extent lengthwise along the container 10 and in a forward direction towards the end wall 20. Thus, the intermittent actuation of the end wall 21 will cause the discharge of the fluent mass from the pump chamber 22, followed by a subsequent advance of the piston 30 in the container to replenish the fluent mass in the chamber, the piston advancing in a step-by-step fashion in the container toward the end wall 20 until it contacts the latter, at which time the container will be empty or substantially empty.

The dispenser illustrated and described is economical to manufacture because of its simplicity. The piston or follower device 30 moves only in a forward direction, and without the need for any gripping devices, or the like, to prevent its rearward motion in the container, since the pump or dispensing pressure is not applied to the mass in the container 10 and, therefore, against the piston 30 itself. The only force tending to move the piston is the atmospheric air pressure, which advances the piston in the container to move the fluent mass M through the inlet ports 23 into the pump chamber 22 upon the creation of a vacuum therein as the actuator wall 21 returns to its initial position. The opposed concave and convex configurations of the container end wall 20 and of the actuator wall 21 define the pump chamber 22 in a simple manner, enabling the entire pump 11 to occupy relatively little space, leaving a maximum portion of the volume of the dispenser available for storage of the fluent mass M between the end wall 20 of the container and the follower or piston device 30.

I claim:

1. A dispenser for a fluent mass comprising a container adapted to contain the mass and having a cylindrical side wall communicating at its rear with the surrounding atmosphere, said container further having a forward end wall at the forward end of said cylindrical wall and extending across substantially the full cross-sectional area of said container, piston means in said container slidably engaging said side wall and movable in a forward direction against the mass and toward said end wall, a pump comprising said end wall and a deformable wall disposed forwardly thereof and secured to said side wall to clamp said end wall between said deformable wall and the forward portion of said cylindrical side wall, said end wall and deformable wall defining a pump chamber therebetween, said end wall having an inlet therein opening into said chamber, an inlet valve adapted to extend across said inlet in engagement with said end wall to close said inlet, means communicating with said chamber and providing an outlet, and a one-way discharge valve member adapted to seat across said outlet to close the same, whereby inward deflection of said deformable wall toward said end wall forces at least part of the mass in said chamber through said outlet, outward deflection of said deformable wall away from said end wall drawing the mass from said container through said inlet into said chamber.

2. A dispenser as defined in claim 1, wherein said inlet comprises a flapper valve adapted to extend across said inlet in engagement with said end wall to close said inlet.

3. A dispenser as defined in claim 1, wherein said end wall has a plurality of inlets therethrough, there being an inlet valve element for each inlet comprising a flapper valve adapted to extend across each inlet in engagement with said end wall to close said inlet.

4. A dispenser for a fluent mass comprising a container adapted to contain the mass, piston means in said container movable in a forward direction against the mass, means providing a pump chamber at the forward end of said container, said pump chamber means having an inlet

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for the passage of the mass from said container into said chamber, said pump chamber means having an outlet for the discharge of the mass from the chamber to the exterior thereof, a one-way intake valve controlling said inlet and allowing flow of the mass from said container into said chamber but preventing reverse flow from said chamber into said container, a one-way discharge valve controlling said outlet and allowing flow of the mass from said chamber through said outlet to the exterior thereof but preventing reverse flow from the exterior into said chamber, and an actuator movable axially of said container in a rearward direction to reduce the volume of said chamber and discharge the mass from the pump chamber without exerting a back pressure on the mass in said container in advance of said piston means, said actuator then being movable axially of said container in a forward direction to increase the volume of said chamber and cause said piston means to move forwardly in said container toward said pump chamber, wherein said container comprises a cylindrical side wall communicating at its rear with the surrounding atmosphere, said container further comprising a forward end wall at the forward end of said cylindrical wall which also constitutes an end wall of said pump chamber, said end wall being concave in a forward direction, said piston means slidably engaging said side wall and being movable therein toward said end wall, said actuator comprising a deformable wall of said pump chamber convex in a forward direction and secured to said side wall, said deformable wall being depressible axially toward said end wall and being flexible and resilient so as to return inherently

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to its original condition after the depressing force thereon has been released, means for securing said deformable wall to said cylindrical wall to clamp said forward end wall between said deformable wall and the forward portion of said cylindrical wall, said inlet being provided in said end wall, said one-way intake valve comprising a flapper valve adapted to extend across said inlet in engagement with said end wall to close said inlet, said outlet being provided by means integral with said deformable wall, said one-way discharge valve comprising a ball adapted to seat across said outlet to close the same.

5. A dispenser as defined in claim 4, wherein the rearward portion of said end wall is convex, the forward portion of said piston means being concave to conform to the convexity of said end wall whereby said piston means can move forwardly into snug contact with said end wall.

References Cited

UNITED STATES PATENTS

20	2,016,400	10/1935	Tear	222—283
	2,125,572	8/1938	Johnston	222—383 X
	2,314,676	3/1943	Wilson.	
	2,942,762	6/1960	Fahr	222—207
	3,162,333	12/1964	Davidson	222—207
25	3,298,573	1/1967	Smalley	222—207

FOREIGN PATENTS

385,159 11/1923 Germany.

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