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2,898,007

ELASTIC CONTAINER WITH RECIPROCATING PLUNGER

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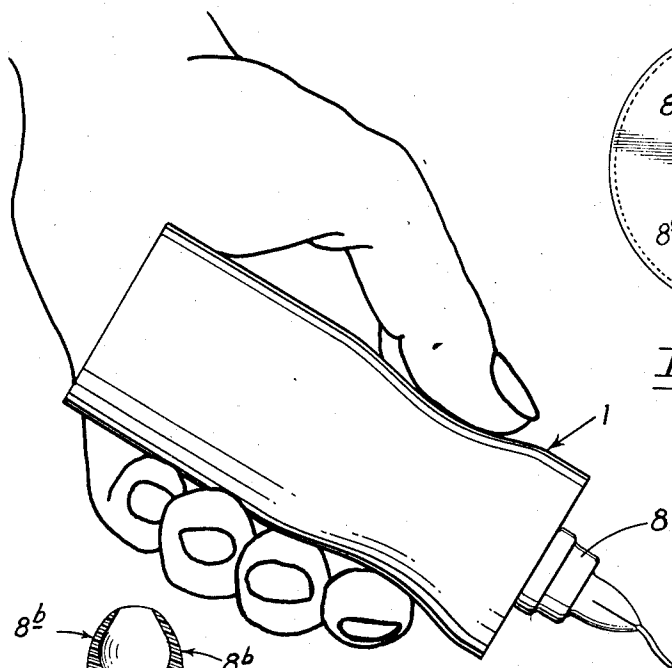


Fig. 1.

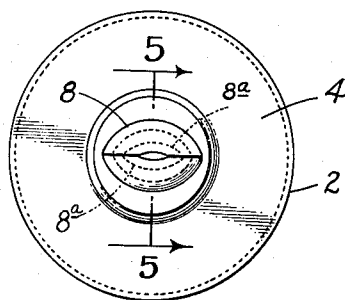


Fig. 4.

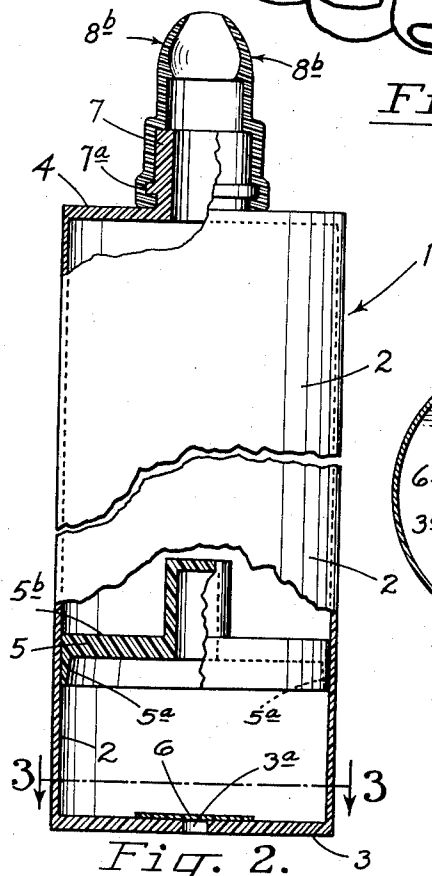


Fig. 2.

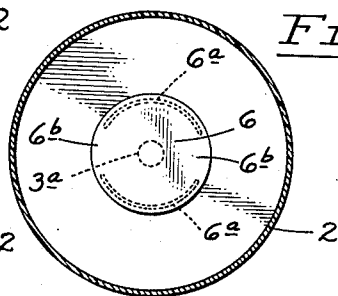


Fig. 3.

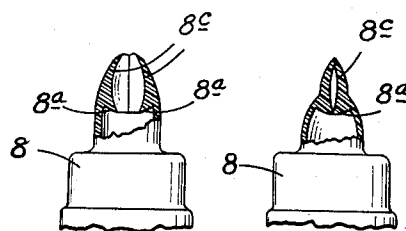


Fig. 5. Fig. 6.

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ELASTIC CONTAINER WITH RECIPROCATING PLUNGER

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4 Claims. (Cl. 222-212)

My invention is directed to improvements in flexible walled containers, particularly of the dispensing type. It is particularly designed for storing and dispensing various types of fluids, pastes, creams and medicaments, which are usually quite viscous. That is, my invention is particularly directed to dispensing containers for materials which are not so fluid or comminuted that they can be dispensed by being atomized or discharged by pouring, shaking, tilting, jarring or vibrating, or the like.

In the past, so far as I know, such materials have commonly been packaged in jars, from which this material must be removed digitally or by use of an instrument, or have been contained in a collapsible and deformable container, or one which can be sequentially stripped to uncover the undispensed portion thereof, or housed in sectional, telescopically arranged containers comprising multiple parts which may be moved longitudinally relatively to eject said materials.

I have discovered that a satisfactory container for this purpose may be devised with deformable and elastic walls, enclosing a follower. Apertures and valves therefor are arranged so that when the walls are deformed, and thereafter permitted to spring back to their original shape, subatmospheric pressures may be produced and the elasticity of the walls will cause the follower to move up and displace the material which has theretofore been ejected.

The object of my invention is to provide an elongated container having flexible and elastic walls, in whole or in part, provided with a valved dispensing spout at one end thereof and a bleeder vent at the other. Said container preferably should have its major portion of uniform cross section, and within said container, or within a major portion thereof, a follower is arranged and is proportioned to conform and be guided by the inner wall of the container to maintain the material more or less compact. It is essential that the dispensing spout or aperture have a valve thereon which permits the material to flow outwardly from the container but inhibits reverse air flow therein.

At the other side of said follower, a vent must be provided to the atmosphere so that air at atmospheric pressure may readily flow into the container below said follower. Then when external digital pressure is exerted against the flexible and resilient wall portions of the container, it will cause a portion of the material therein to be expressed from the dispensing spout, and when pressure is relaxed, the walls will regain their normal contour and produce subatmospheric pressures. The follower then moves up until pressures are equalized. Successive deflections of the wall portions will dispense material until said material is completely discharged from the container.

A further object of my invention is to provide a container of this character which, though subject to repeated flexure, is not deformed by use and thus is capable of being refilled and reused.

A further object of my invention is to provide a con-

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tainer of this general character which resembles a piston and cylinder, but in which the piston is advanced not by providing pressures below the piston of such amplitude above atmospheric pressure that the piston is moved thereby but by producing subatmospheric pressures adjacent the material to be dispensed and thereafter permitting the follower to rise in response thereto until atmospheric pressure conditions are attained.

Further and other details of my invention are herein after described with reference to the accompanying drawings, in which:

Fig. 1 is a view of a dispensing container embodying my invention, illustrating the manner in which the walls may be flexed to express material from the dispensing spout;

Fig. 2 is an elevation of said container, with the walls arranged in unflexed condition and with portions of said container shown broken away to disclose, in section, the details thereof;

Fig. 3 is a sectional view taken on the line 3-3 in Fig. 2, showing the details of a valved bleeder vent by which air under atmospheric pressure may flow into the container from below the follower;

Fig. 4 is a plan view of the dispensing end of said container;

Fig. 5 is a sectional view, taken on the line 5-5 in Fig. 4, showing said dispensing spout open; and

Fig. 6 is a view similar to Fig. 5 showing said dispensing spout closed and sealed.

A container embodying my invention preferably is made of a material such as polyethylene plastic, which is capable of distortion without rupture and which has sufficient elasticity to return it to its original shape when external pressures are relaxed. In the drawings, said container 1 is shown to be of cylindrical form, with a flexible wall 2, a base end 3, and a top or dispensing end 4. Said container preferably is elongated and should be of uniform cross section throughout all, or through a substantial portion, of its length. Said container may be of any cross sectional pattern, such as square, rectangular, triangular, elliptical, or other desired pattern.

Within said container is a follower 5. The peripheral outline of said follower conforms closely to the cross section of the container. Said follower must be relatively stiff and fit snugly within the bore of the container. A polyethylene plastic container is capable of stretching within a limited range, and thus I prefer to make the follower slightly oversize with respect to the bore of the container, so that the peripheral skirted portion 5a of the follower bears tightly against the bore of the container in good air sealing relation therewith. The skirted periphery of said follower should be quite broad so that said follower will not tend to cant or wedge within the container when the flexible wall of the container is flexed to discharge material therefrom. Said follower has one face 5b which is complementary to, that is, intaglio with the conformation of the top or dispensing end 4. This permits all of the material within the container lying above the follower to be forced outwardly from the container with no substantial residue.

The base end 3 should be relatively stiff so as to maintain the conformation of the flexible wall. It also provides a base upon which the container may stand. Centrally of said base is a vent or bleeder aperture 3a over which is arranged a flapper valve 6. As is shown in Fig. 3, said valve is tacked or secured to the base only partially about its periphery as at 6a, thus leaving two diametrically disposed passageways 6b through which air at atmospheric pressure may pass from the exterior through said vent or aperture 3a to the space below the follower 5. Reverse flow through said vent or bleeder aperture 3a is inhibited, however, because the flapper valve will

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lie flatwise over the aperture and will hold said valve tightly as a check valve to prevent said reverse flow. Any type of check valve may be used in connection with said vent 3a, but a flapper type, as illustrated, has proved satisfactory in practice.

The top or dispensing end of the container is also shown to be of heavier section than the wall. In some cases, this is desirable, and in others it is desirable that the top be of the same or substantially the same flexibility and elasticity as possessed by the wall. Two heavier ends tend to cause the container better to retain its cylindrical form, but I have found that one stiff end, such as the base 3, is adequate to maintain said rotundity as shown in the drawings, particularly when the follower is similarly made stiff and traverses the length of the container. A snout or neck 7 is preferably formed integral with the top or dispensing end 4, and usually is provided with an outstanding flange or other corrugation 7a so that a dispensing valved cap 8 may be securely held thereon.

The dispensing valve cap illustrated in the drawings is of the type disclosed in my United States Patent No. 2,623,663, issued December 30, 1952 and entitled "Suction Cup Dispensing Spout." Briefly, said dispensing cap is forced into sealing position when pressures within the container are elevated, tending to discharge material therefrom. This flows from the presence of a pair of opposed suction cups which face each other and which are forced towards each other by elevated pressure acting upon the exterior faces of lips 8a. This is shown most clearly in Figs. 5 and 6. When elevated pressures exist within the container, they act upwardly and inwardly against the lips 8a and cause the suction cups to distort and produce a suction seal such as is shown in Fig. 6. This seal may be broken by digitally forcing the margins inwardly to release said partial vacuum or decreased pressure between the two suction cups 8c. When said reduced pressure is relaxed, the parts tend to open up and separate, as is shown in Fig. 5. This permits material readily to flow between said suction cups and outwardly in the manner illustrated in Fig. 1. When sufficient material has been dispensed, said suction cups will be forced together manually and the dispensing valve cap serves as a stopper to prevent further discharge of material. I preferably make said valve cap 8 out of a rubbery material such, for example, as a vinyl plastic, synthetic rubber, or similar materials. I have also found that a vinyl plastic will make an integral container including said dispensing valve cap. When the parts are thus made integral, it is not necessary to have a snout or neck, and the top or dispensing end of the container merges into the valve cap 8.

In use, the valve cap 8 is opened by applying pressure, usually exerted by the forefinger and the thumb, edgewise of the cap. This forces the parts to separate to the position shown in Fig. 5. Viscous material may then be forced from the container by flexing the flexible and elastic walls in the manner shown in Fig. 1.

The cross sectional area of said container is such that sufficient material may be dispensed by a single pressing. If more material is to be dispensed, it is necessary to seal the spout, in the manner shown in Fig. 6, so as to permit the follower to move upwardly to accommodate itself to the material previously dispensed. The follower moves upwardly when the walls resume their original undistorted shape because a region of subatmospheric pressure is provided between the follower 5 and the top or dispensing end 4 of the container, and the follower moves up until pressure equilibrium is reached. The flapper valve permits air to flow into the space below the follower valve until atmospheric pressure is attained below the follower. I have used this dispensing container with various materials such as shaving cream, tooth paste, ointments, salves, and even with materials of such viscosity as Vaseline. Its preferable range of use is with semi-fluid materials having a viscosity somewhat above a state of fluidity at which they will flow readily under normal conditions but

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with insufficient fluidity to flow from an aperture by shaking, vibrating or other manipulation.

When the contents of said container have been entirely dispensed, it may be refilled by merely holding the flapper valve 6 open and by removing the dispensing valve cap 8. Materials filling the space above the follower 5 will fill the container, and thereafter the dispensing valve cap may be replaced.

I claim:

1. A dispensing device for viscous liquid materials comprising an elongated container of uniform cross-section throughout a substantial portion of its length having flexible and resilient side walls along its longitudinal dimension, a floating stiff plunger element free to traverse the longitudinal dimension of said container, said plunger element dividing the interior of said container into two compartments, each of said compartments being unobstructed across its entire transverse dimension, one adjacent each end of the container and each substantially sealed from the other, a valve controlled air inlet at one end of said container for introducing air into the compartment adjacent said one end, and a liquid dispensing spout at the other end of said container for discharging liquid from the other compartment, said liquid dispensing spout having an aperture extending therethrough communicating at its inner end with said other compartment and a valve structure having flexible and elastic wall elements for closing said aperture by constriction of a portion of said aperture, said valve structure accommodating unidirectional flow of liquid from the interior of said other compartment to the atmosphere, said aperture being the only passage leading from the interior of said other compartment to the atmosphere.

2. A dispensing device for viscous liquid materials comprising an elongated container of cylindrical cross-section throughout a substantial portion of its length having flexible and resilient side walls along its longitudinal dimension, a floating stiff plunger element of cylindrical shape free to traverse the longitudinal dimension of said container, said plunger element dividing the interior of said container into two compartments, each of said compartments being unobstructed across its entire transverse dimension, one adjacent each end of the container, said plunger element having a relatively broad peripheral rim portion snugly sliding within the interior of said container and substantially sealing each of said compartments from the other, a valve-controlled air inlet at one end of said container for introducing air into the compartment adjacent said one end, and a liquid dispensing spout at the other end of said container for discharging liquid from the other compartment, said liquid dispensing spout having an aperture extending therethrough communicating at its inner end with said other compartment and a valve structure having flexible and resilient wall elements for closing said aperture by constriction of a portion of said aperture, said valve structure accommodating unidirectional flow of liquid from the interior of said other compartment to the atmosphere, said aperture being the only passage leading from the interior of said other compartment to the atmosphere.

3. A dispensing device for viscous liquid materials comprising an elongated container of uniform cross-section throughout a substantial portion of its length having flexible and resilient side walls along its longitudinal dimension, said container having a stiff end wall at one end thereof, a floating stiff plunger element free to traverse the longitudinal dimension of said container, said plunger element dividing the interior of said container into two compartments, each of said compartments being unobstructed across its entire transverse dimension, one adjacent each end of the container and each substantially sealed from the other, a valve controlled air inlet at said one end of said container extending through said end wall for introducing air into the compartment adjacent said one end, and a liquid dispensing spout at

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the other end of said container for discharging liquid from the other compartment, said liquid dispensing spout having an aperture extending therethrough communicating at its inner end with said other compartment and a valve structure having flexible and elastic wall elements for closing said aperture by constriction of a portion of said aperture, said valve structure accommodating unidirectional flow of liquid from the interior of said other compartment to the atmosphere, said aperture being the only passage leading from the interior of said other compartment to the atmosphere.

4. A dispensing device for viscous liquid materials comprising an elongated container of uniform cross-section throughout a substantial portion of its length having flexible and resilient side walls along its longitudinal dimension, a floating stiff plunger element free to traverse the longitudinal dimension of said container, said plunger element dividing the interior of said container into two compartments, each of said compartments being unobstructed across its entire transverse dimension, one adjacent each end of the container and each substantially sealed from the other, said container having a stiff circular end wall at one end thereof, a valve controlled air inlet at said one end of said container extending through said end wall for introducing air into the compartment adjacent said one end, and a liquid dispensing spout at the other

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end of said container for discharging liquid from the other compartment, said liquid dispensing spout having an aperture extending therethrough communicating at its inner end with said other compartment and a valve structure having flexible and elastic wall elements for closing said aperture by constriction of a portion of said aperture, said valve structure accommodating unidirectional flow of liquid from the interior of said other compartment to the atmosphere, said aperture being the only passage leading from the interior of said other compartment to the atmosphere, the face of said plunger element facing said dispensing spout conforming to the inner face of said other end of said container.

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