Nov. 26, 1957 E. LIPMAN 2,814,419

LIQUID DISPENSER

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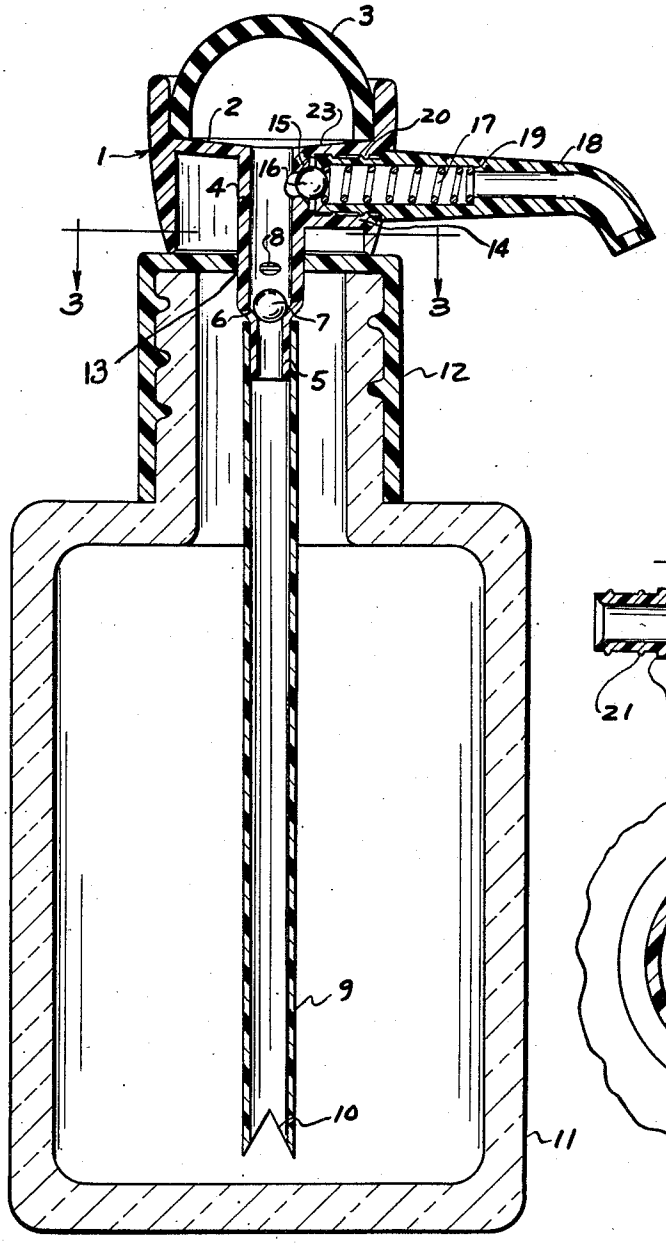


Fig. 1

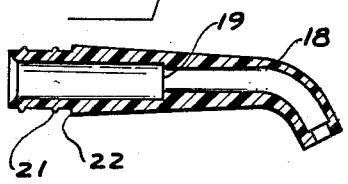


Fig. 2

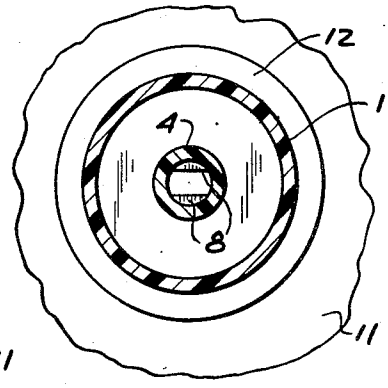


Fig. 3

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LIQUID DISPENSER

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2 Claims. (Cl. 222—207)

The present invention pertains to a novel dispenser for liquids such as lotion, liquid cosmetics, medicinal liquids, condiments and the like. The device is disclosed herein for the dispensing of liquid in a forced flowing stream as distinguished from atomizing, although an atomized discharge may be obtained by restricting the outlet of the discharge nozzle to a small port.

One of the objects of the invention, in connection with a stream discharge as stated above, is to avoid the spitting or sputtering that results from the mixing of air with the discharging liquid in the pumping operation. The device of the invention is constructed in such a manner that the air admitted during the pumping operation is for the most part held away from the discharge stream.

Another object of the invention is to provide a dispensing pump that attaches frictionally to a bottle cap of any commercial size. Previously, the dispenser has been made a permanent part of the cap, or permanently attached thereto. The many sizes of commercial caps have been causing a serious problem in the industry. According to the invention, it is only necessary to drill a hole in the top of the cap, and insert the intake tube of the pump therein. In practice, the bottler of the commodity purchases the pump and need only drill a standard size hole in the caps.

The intake check valve is mounted in this tube, and another object of the invention is to avoid distortion of the valve seat when the tube is frictionally fitted in the cap. For this purpose the ball valve is mounted well downward in the tube so that it lies substantially below the top of the cap and is therefore not affected by the surrounding pressure.

A further object of the invention is to provide a pump body molded in one piece, not only for the economy of an unassembled structure, but also to eliminate the many disadvantages resulting from the adhesives used for securing plastic parts together. Another object in this connection is to realize the advantages of polyethylene for which there is no known solvent and which therefore is unattacked by the ingredients of various liquids handled by the device.

Further objects and advantages of the invention will appear as the description is developed.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings in which:

Figure 1 is a vertical section of the device;

Figure 2 is a vertical section of the nozzle, and

Figure 3 is a section on the line 3—3 of Figure 1.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

Figure 1 is shown a somewhat cylindrical housing or body 1 formed with a floor 2 at a substantial distance below its upper end. Over the floor a resilient dome or bulb 3 is fitted in the body without adhesive. On successive compression and release of the bulb 3, a pumping action is effected as will presently be described.

From the center of the floor 2 depends an intake tube 4 extending beyond the lower end of the body 1 and formed at its lower end with a restriction 5 providing a valve 6 which also lies below the lower end of the body 1. A metal ball 7 closes on the seat and is limited in its upward movement, on the pumping action, by lugs or stops 8 formed inward from the wall of the tube 4 at a suitable distance over the seat 6. A flexible liquid tube 9 is fitted on the reduced end 5 and is formed at its lower end with one or more notches 10 to receive liquid in any position within a bottle 11 as will be more fully described.

The bottle is fitted with a conventional cap 12 in the top of which is drilled a hole 13. The tube 4 is inserted in the hole until the bottom of the housing 1 engages the top of the cap 12. The valve seat 6 is brought considerably below the top of the cap. The entire pump body assembly, including the tube 4, is made of a pliant plastic material, but the valve seat 6 is not liable to distortion by the pressure at the hole 13 because of its distance below the top of the cap.

The body wall 1 forms substantially a hollow cylinder except for the parts 2 and 4. In addition, there is formed a tubular portion 14 directly below the floor 2 and extending from the wall 1 to the tube 4. At this juncture, the wall of the tube 4 is formed with a valve seat 15 engaged by an inwardly closing ball valve 16 backed by a coil spring 17. A nozzle 18 is inserted in the portion 14, and the outer end of the spring seats against a shoulder 19 formed in the nozzle.

The inner wall of the portion 14 is formed with inwardly extending rings 20, and the outer wall of the nozzle 18 is formed on its inner end with outwardly extending rings 21. When the nozzle is inserted, the rings 21 are forced past the rings 20 until an outward shoulder 22 on the nozzle bears against the body. Since the body and nozzle material is resilient, the rings 20 spring back in place in front of the rings 21. Also, there is a tight fit between the inner wall of the portion 14 and the outer wall of the nozzle 18. The nozzle 10, however, may be pulled out for cleaning if desired.

In the pumping action previously mentioned, a small quantity of air accumulates in the dome 3. The initial pressure on the dome 3 expels the air therefrom through the valve 16 and nozzle 18. Usually only one push is sufficient to expel the air which may accumulate within the dome due to leakage where the device stands for a long period without being used. Release of the dome causes liquid to be sucked up through the valve 7 and the next downward push on the dome expels the liquid through the valve 16 and nozzle 18. Ordinarily this air is delivered regularly to the discharged stream and causes spitting or sputtering. This effect is avoided, however, by positioning the outlet tube 14 below the floor 2. The air does not readily reach the outlet in any substantial degree and consequently it has no effect on the nature of the stream. When the device stands idle, the trapped air above atmospheric pressure eventually leaks out to the atmosphere to restore atmospheric pressure throughout the device. In like manner, there is sufficient air leakage under the body 1 and around the tube 4 for venting the receptacle 11, and it will be seen that no other vent is provided. Because of the absence of a full vent, filled receptacles fitted with dispensers can be shipped without leakage.

It has heretofore been common to assemble the dispenser permanently to the bottle cap. If a cap cracks, the entire assembly must be discarded. In the instant device, if a cap cracks, the dispenser assembly is merely pulled out and fitted into a new cap, either in the hands of the assembler or the consumer.

The body wall 1, tube 4 and tube 14 are molded in one

piece, thereby eliminating the use of adhesive where several parts are secured together. The adhesives are often attacked and broken down by the contents of the receptacle, and leaks are thereby formed. Moreover the contents become contaminated with the adhesives and this is very detrimental in the case of skin lotions and medicinal lotions. Ingredients of the adhesives are strongly acid and very irritable to the skin. Further, the adhesives are highly inflammable and a source of danger in handling, and the elimination of adhesives is another advantage in this respect. These considerations apply also to the securing of the nozzle **18** without adhesives.

Polyethylene is a highly desirable material for the molded member because of its light weight and durability. It is resistant to boiling water without distortion and therefore can be sterilized when used for medicinal purposes. It is also resistant to the ingredients of cosmetic liquids such as ketones, thioglycolic acid used in hair waving solutions, other acids and alcohols. For the same reason, there is no acceptible solvent for polyethylene and no adhesive for it. Consequently polyethylene cannot be used for an assembled dispenser and could not be used at all until the instant one-piece body was developed.

It will be noted that no apertures, ports or holes are drilled in the instant device. When a piece of plastic is drilled, the surface glazing and curing are removed. The raw, powdery surface thus exposed reacts with the contacting liquid. The reaction forms a gas that will corrode a nickel plated metal ball valve overnight. When a hole is drilled, it has been found that a stainless steel ball valve must be used, costing about seven and a half times as much as a plated ball. The elimination of drilled holes herein enables the use of a cheaper plated ball.

With reference now to some of the details of construction, the illustrated construction involving dome **3** enables the device to be pumped with a short pump stroke. Thus, the device can be operated with the same hand that holds the receptacle. The upper surface of the floor is dished or sloped downward at **23** to drain the floor after use.

No bushings are used to hold the tube **4** in the bottle cap but only the friction of the resilient material. The tube **4** may be assembled on caps of various materials such as metal, ceramic and glass. The device is adaptable to a convex as well as a flat bottle cap top.

Since the device is often used with thick, gummy liquids and condiments, occasional cleaning is desired. The easy removal of the dispenser from the receptacle and its resistance to boiling water encourages frequent cleaning.

The usefulness of the notched end **10** of the liquid tube **9** will be realized in connection with straight-ended tubes. The assembler often uses a fixed length of flexible tube for various bottle depths. If the flat end engages the bottom of the receptacle it is obviously blocked. Likewise, if it becomes locked in a corner of the receptacle it is also obstructed. The notches **10** when used provide an adequate inlet under any of these conditions.

In the operation of the device, the first few strokes of the bulb **3** lift liquid in the tube **9** to lift the valve **7**, and on the pressure stroke, closes the valve to build up a volume in the tube **4**. When the liquid level reaches the valve **15**, the pressure strokes expel liquid from the nozzle **18**. At other times the spring **17** closes the valve **16** to close off the nozzle from the dispenser body.

Although a specific embodiment of the invention has been illustrated and described, it will be understood that various alterations in the details of construction will be made without departing from the scope of the invention as indicated by the appended claims.

What I claim is:

1. A liquid pump for attachment to conventional bottle caps for use in pumping liquids from a bottle, through the top of the bottle cap and out through the pump, said pump comprising a one-piece member of a resilient plastic material in the form of a substantially cylindrical open ended body arranged axially upright and divided into an upper and a lower chamber by a substantially horizontal floor extending across the inside of the body and spaced from each of its open ends with a hollow tubular part axially aligned with the body, depending from the floor and extending a considerable distance beneath the open lower end of the body and opening into the upper chamber through the floor, and with a hollow tubular discharge part formed in the lower chamber and communicating at one end into the depending tubular part slightly beneath the floor through a constricted opening and opening at the other end through the body cylindrical wall; the open upper chamber being closed off by a squeezable, dome-like, resilient bulb; an upwardly facing ball valve seat formed within the depending tubular part at a considerable distance beneath the lower end of the body and a ball positioned within the depending tubular part to close downwardly against its seat; a ball valve positioned within the discharge part and spring means pressing the ball valve towards the constricted opening to normally close off said opening; wherein said one-piece member may be removably attached to a conventional bottle cap by forcing the depending tubular part through a hole formed in the top of the cap until the point where the body bottom edge contacts the top of the bottle cap wherein the tubular part is frictionally held within the cap, but with its ball and seat considerably beneath the cap top where the tubular depending part is frictionally grasped.

2. A liquid pump for frictional attachment to a conventional bottle cap and comprising a one-piece member in the form of a substantially cylindrical body arranged axially upright and divided into an open upper and an open lower chamber by a substantially horizontal floor, with a hollow tubular part, opening into the upper chamber and depending from the floor and extending a considerable distance beneath the bottom edge of the body, and with a hollow discharge tube arranged in the lower chamber and communicating into the depending tubular part and opening to the outside of the body cylindrical wall; a resilient squeeze bulb covering the upper chamber; a valve means formed within the depending tubular part at a considerable distance beneath the bottom edge of the body; said one-piece member being formed of a resilient plastic material whereby the depending tubular part may be force fitted into a hole formed in the top of a bottle cap to the point where the bottom edge of the body contacts the cap, thereby causing said tubular part to be frictionally gripped at the bottle cap top, but with its valve means positioned beneath the bottle cap top.

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