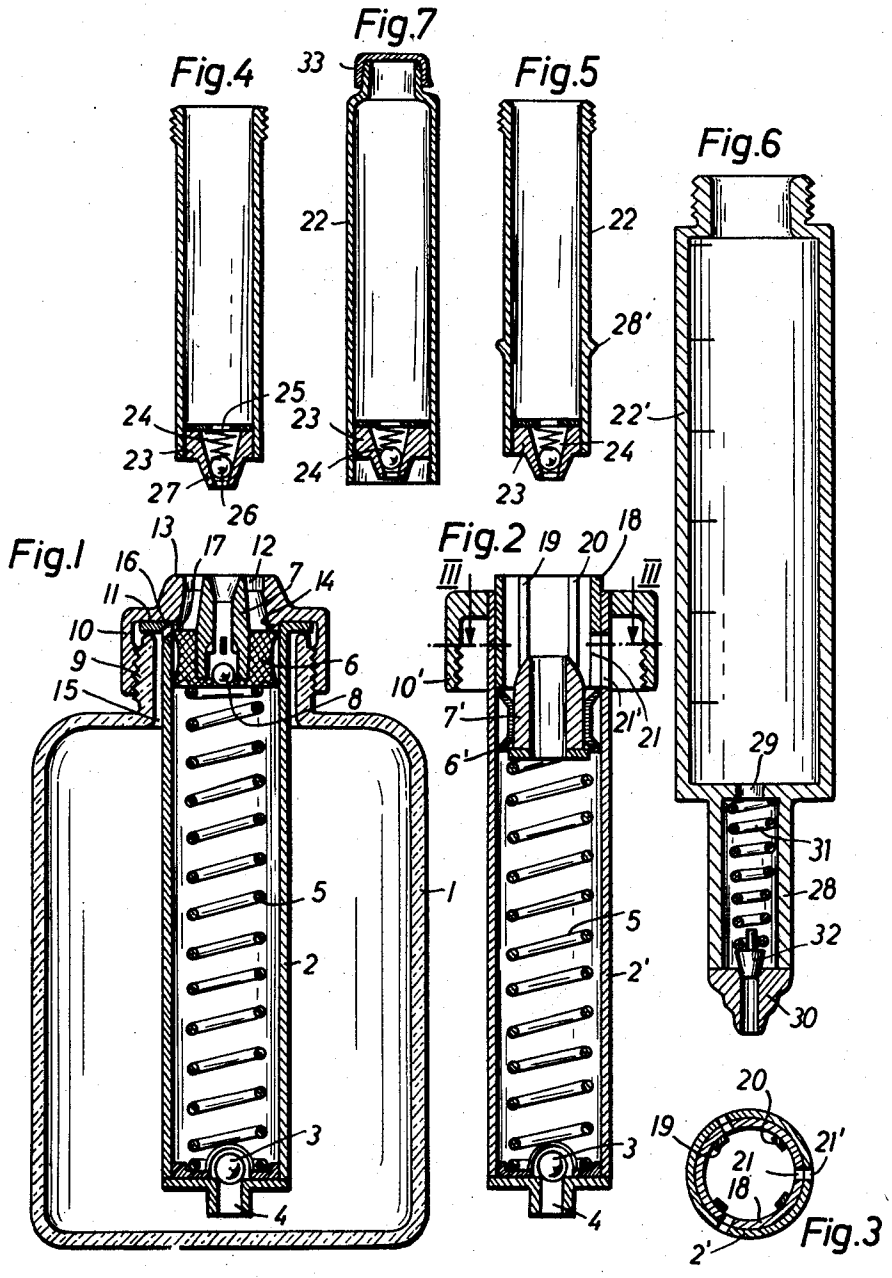
Sept. 29, 1959 H. BECHER 2,906,300

APPARATUS FOR DISPENSING LIQUID OR SEMI-LIQUID SUBSTANCES

Filed March 19, 1957 2 Sheets-Sheet 1



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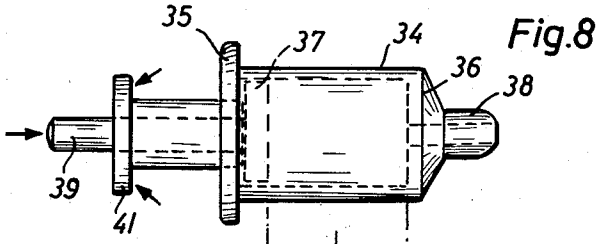


Fig.8

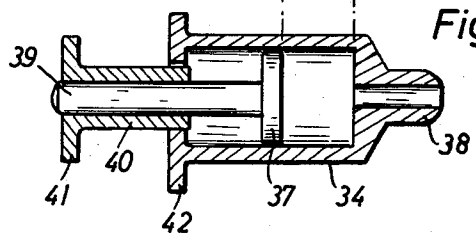


Fig.9

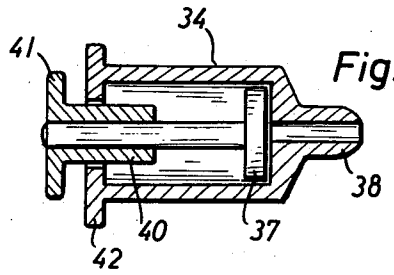


Fig.10

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APPARATUS FOR DISPENSING LIQUID OR SEMI-LIQUID SUBSTANCES

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13 Claims. (Cl. 141—30)

The invention relates to an apparatus for dispensing liquid or semi-liquid substances.

Reservoirs working in conjunction with a plunger pump are known from which definite amounts of liquid can be obtained. Such reservoirs have, however, the disadvantage of not being able to ensure the economical consumption of the liquid or semi-liquid substance which may for example be a cosmetic. Consider for example the employment of liquid shampoo for washing the hair; as is well known, two or even three separate amounts of shampoo are required for several washes one after the other. If the small amounts of shampoo needed for each hair wash are taken from a large reservoir there is a danger that shampoo will be wasted, since the pump can be actuated any number of times by the user. This disadvantage is eliminated by the apparatus according to the invention, which consists of a reservoir and a smaller container into which a liquid or semi-liquid material is drawn off from the larger reservoir, and from which a number of smaller amounts of the liquid or semi-liquid material can again be drawn if required. With the aid of this apparatus it becomes possible to provide a supply of the material in a number of small containers, which for example might be of such a size that the contents of a small container are sufficient for one hair wash. The consumption of shampoo can therefore be kept under close control. Apart from this the apparatus according to the invention makes it also possible to fill a small container with different liquids from several reservoirs in definite proportions, in order to obtain definite mixes for example for dying the hair.

In order to simplify the filling operation, the reservoir is fitted with a plunger piston pump, whose cylinder is provided with a hole, closed by a valve, in its lower end which is close to the bottom of the reservoir, and whose spring-loaded piston is provided with an axial hole allowing the flow of liquid; according to the invention, the axial hole of the piston contains a nozzle whilst the smaller container is provided with a connecting piece intended for filling and emptying and of a shape corresponding to that of the nozzle such that the nozzle is a liquid-tight fit inside the connecting piece or the connecting piece inside the nozzle, and the dimensions of the smaller cylindrical container on the one hand and of the cylinder of the plunger piston pump on the other hand are such that the smaller cylindrical container can slide within the cylinder in the manner of a piston rod, to compress the pump piston against the spring force exerted by its actuating spring, whilst at the same time the liquid or semi-liquid substance is pumped from the reservoir through the nozzle and connecting piece into the smaller container. The liquid so drawn off is taken from the smaller container through the connecting piece or at its upper end which for this purpose can be provided with a wide variety of closing devices.

The actuating spring of the plunger piston pump is placed between the lower end of the cylinder and the under side of the piston.

The nozzle in the axial hole of the piston and/or the connecting piece of the smaller cylindrical container can be closed by a valve.

In order to enable the plunger piston pump to be inserted easily into the reservoir and in particular to be located securely, the upper edge of the cylinder can, according to the invention, be flanged such that the flanged edge rests on top of the neck of the reservoir, the top of which is in turn closed by a cap, for example by screwing it on. The screwed cap presses the flanged edge down on the neck of the reservoir; the top of the cap is provided with a hole corresponding to the size of the smaller cylindrical container which can accomodate the connecting piece joined to the piston of the plunger piston pump.

In order to provide the cylindrical container, which performs the function of a piston rod, with a guiding constraint when its connecting piece is inserted into the nozzle, for the purpose of the filling operation and when it is pressed downwards against the force of the spring, the cap has preferably a cylindrical projection at its top, with a conical hole increasing in diameter at its lower end and having a minimum internal diameter equal to the outside diameter of the smaller cylindrical container.

In order to limit the stroke of the piston, which is pressed upwards by the force of the spring, the cap carries a stop at its lower end which extends inwardly of the cylinder of the plunger piston pump.

Since it will be unavoidable that during the filling operation some liquid will trickle down the nozzle or the connecting piece, passages are provided in the cylinder wall above the upper end of the piston travel and level with that also in the upper cylindrical projection of the cap, by means of which the hole inside this projection is in communication with an annular space which is formed between the cylinder and the neck of the reservoir. Any liquid which during the filling process trickles into the hole inside the cylindrical projection of the cap can thus return into the reservoir through these passages.

The cap may have an axial hole into which the pump cylinder is fitted, whilst a bush is provided inside the top of the cylinder which is used as a stop for the piston. The bush has a series of ribs or bars which serve as guides for the smaller cylindrical container. Furthermore, passages may be provided in the bush and the cylinder wall leading into an annular space formed between the cylinder and the neck of the reservoir enabling any liquid trickling down from the nozzle or from the connecting piece to return to the reservoir.

In order to limit the amount of liquid or semi-liquid substance flowing into the smaller cylindrical container at each stroke of the piston, the outside wall of the smaller cylindrical container may be provided with a circumferential bead. The smaller cylindrical container can then be inserted downwards into the hole or similar guide provided for its movement until the bead comes in contact with the cap or the above mentioned bush. Another way of fulfilling the same purpose is to provide the lower end of the smaller cylindrical container with a cylindrical projection of reduced diameter and to dimension the diameter for example of the bush provided at the upper end of the cylinder so as to correspond to the diameter of this cylindrical projection, such that only the latter can be inserted into the bush and can be moved down only until the lower end of the smaller cylindrical container makes contact with the cap, bush or similar part. The lower end of the cylindrical projection is provided with a connecting piece similar in size to the nozzle of the plunger piston pump which is closed by a spring-loaded valve.

The limitation of the length of travel of the smaller

cylindrical container, when the latter is used in the manner of a piston rod for the filling operation, makes it possible to fill the smaller cylindrical container only to a small part of its volume at each stroke of the piston, so that it is possible to fill the smaller cylindrical container with different liquids in definite proportions which depend on the length of the stroke of the piston in each filling operation, so that a mixture of various substances, as for example required for dying the hair, can be prepared in a simple manner.

In order to make it possible to draw off definite quantities of the substance contained in the smaller cylindrical container, the smaller cylindrical container may be provided with a piston which can move between two end positions, and whose movements can be adjusted in steps for the supply of parts of the contents of the container. The limiting positions of the piston are determined by the distance between the top and the bottom of the smaller container. The step-by-step adjustment of the piston is effected preferably by means of a bush which can be moved longitudinally inside the cover or the smaller cylindrical container between the two end positions, and which adjusts the position of the piston rod, and whose length relative to the piston rod determines the proportions.

To enable the invention to be fully understood it will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a sectional view of a liquid dispensing device;

Fig. 2 is a sectional view of a modified form of plunger piston pump;

Fig. 3 is a section on the line III—III of Fig. 2;

Figs. 4, 5, 6 and 7 are sectional views of different forms of containers;

Figs. 8, 9 and 10 show further forms of cylindrical container. Fig. 8 being an outside view and Figs. 9 and 10 sectional views showing different positions of the piston.

To avoid repetition the same reference numbers are used in the accompanying drawings for the same parts.

According to Fig. 1, the device includes a reservoir **1**, in which a plunger piston pump is inserted, the pump consisting of a cylinder **2**, provided with an orifice **4** at its lower end closed by a valve **3** through which liquid or a semi-liquid substance in the reservoir **1** can be drawn into the cylinder **2**. A spring **5** is located in the cylinder which urges the piston **6** of the pump upwards. The pump piston **6** is provided with an axial bore containing a nozzle **7** whose lower end is closed by a valve **8**. The neck **9** of the container is provided with an external thread onto which a cap **10**, which is provided with an internal thread is screwed. The cap **10** presses the upper flanged edge **11** of the cylinder **2** firmly on to the upper edge of the neck **9**. The cap **10** is provided with a cylindrical extension **13** having a bore having a diameter approximately equal to the internal diameter of the cylinder **2**. As shown the bore **12** is of conical shape and the nozzle **7** is disposed centrally therein. The diameter of the conical bore **12** at its smaller end is equal to the outside diameter of the smaller cylindrical container as shown for example in Fig. 4.

The cap **10** is also provided with a shoulder **14** extending inwardly of the cylinder **2**, and serves as a stop to limit the upward travel of the piston **6**, and at the same time makes provision for a return path for any liquid trickling back down the nozzle **7**. For this purpose an annular space **15** is formed between the cylinder **2** and the neck **9** and there is also provided a passage **16** in the cylinder wall above the upper limit of the piston travel communicating with a passage **17** in the projecting shoulder **14** of the cap **10**, so that liquid can return from the bore **12** of the cap into the reservoir **1**.

According to the modified plunger piston pump as shown in Fig. 2, the cylinder **2'** is set in an axial hole in the cap **10'** which can be screwed on to the neck **9** of the reservoir shown in Fig. 1, and a bush **18** is provided inside the upper end of the cylinder **2'** having a number of vertical ribs or bars **19**, **20** etc. which form guides for the smaller cylindrical container. The bush **18** also serves as a stop to limit upward travel of the piston **6'** which is provided with the nozzle **7'**. The bush **18** and the cylinder wall **2'** are provided with a number of openings **21** and **21'**, through which any liquid which trickles down for example from the nozzle **7'** can, return to the reservoir **1**.

The smaller cylindrical containers shown in Figs. 4, 5 and 7 into which a liquid or semi-liquid substance is to be filled from the reservoir **1** shown in Fig. 1, consists essentially of a cylinder **22**, whose lower end is provided with a connecting piece **23**, which is provided with an axial hole **24**, which contains a ball valve **26**, which is acted upon by a spring **25**. The connecting piece is provided with a small projection **27** in the shape of a nipple which can be inserted into the upper end of the nozzle **7** of the plunger piston pump of the reservoir **1**, so as to form a fluid-tight joint.

According to the embodiment as shown in Fig. 6, the cylindrical container **22'** has at its lower end a small cylindrical projection **28**, which on the one hand is in communication with the cylindrical container **22'** by means of a hole **29**, and which on the other hand is provided with a connecting piece **30**, which is closed by a valve **32**, which is under the action of a spring **31**. The size of the connecting piece **30** corresponds to that of the nozzle **7'** of the plunger piston pump shown in Fig. 2, such that the connecting piece **30** can be inserted into the nozzle **7'** so as to form a fluid-tight joint. The outside diameter of the projection **28** is so dimensioned that the projection is guided by the ribs or bars **19**, **20** etc.

The manner of operation of the apparatus according to the invention is as follows:

Assuming that one of the smaller cylindrical containers **22** (Figs. 4, 5 or 7) is to be filled with a liquid from the reservoir **1**, the connecting piece **23** of the respective container **22** is inserted into the nozzle **7** of the reservoir **1** and at the same time this nozzle, together with the piston **6** of which it forms a part, is forced downwards against the force of the spring **5** into the cylinder **2** by exerting downward pressure on the container **22**. During this action the container **22** acts like a piston rod, and slides in the axial bore **12**. During this downward movement, the valve **3** remains closed whilst the valves **8** and **26** are open, so that the air contained inside the cylinder **2** can escape through the cylindrical container **22**. If now the downward pressure on the cylindrical container **22** is released, it will be pushed upwardly by the spring **5** and during this movement, the valves **8** and **26** will be closed whilst the valve **3** will open and liquid will be sucked from the reservoir **1** through the orifice **4** into the cylinder **2**. If the container **22** is now again moved downwardly, the liquid in the cylinder **2** will be forced into the container **22**, since during the downward movement of the container **22** the valves **8** and **26** will be open and the valve **3** closed. When the container **22** is again moved upwardly, the cylinder **2** will be immediately refilled with liquid, so that another container can be filled.

The cylindrical containers shown in Figs. 4 and 7 will be filled completely during one operation, since it can be inserted to its entire length into the cylinder **2**.

The container shown in Fig. 5, on the other hand, is provided with a circumferential bead **28'** on the outside of the cylinder, which during the downward movement of the container into the cylinder **2** comes into contact with the extension **13**, of the cap **10**, so that this container can during each downward stroke only be filled

to a depth as determined by the position of this bead 28'. It is thus possible to fill the container 22 with predetermined amounts of different liquids taken from different reservoirs.

The container 22' shown in Fig. 6, is provided with graduation markings and is also intended to be filled with liquids taken from different reservoirs. The lower end of this container will come into contact with the bush 18 of the cylinder shown in Fig. 2, so that during each downward stroke the container 22 will only be filled to a fraction of its volume.

The liquids in the containers 22 or 22' respectively can be used immediately, or they can be kept in store. The containers are closed by means of a cover 33 shown in Fig. 7, which is clipped over or screwed on to the upper end of the container. If the connecting piece 23 is entirely inside the container, as shown in Fig. 7, the lower end of the cylindrical container forms a base so that the container can stand upright.

The cylindrical container shown in Figs. 8, 9 and 10 consists essentially of a cylindrical body 34 whose ends are closed by a cover 35 and a bottom 36. A piston 37 moves inside the body 34, its stroke being limited by the bottom 36 at one end and by the cover 35 at the other end. The bottom 36 is provided with a connecting piece 38 shaped like a nipple which can be inserted into the nozzle 7 or 7' respectively. The piston 37 is provided with a piston rod 39 which slides inside a sleeve 40. The sleeve 40 in turn slides inside a bore in the cover 35 and is provided with a flange 41 in order to facilitate its adjustment. The cover 35 has a similar flange 42 for the same purpose.

The small cylindrical container 34 is filled in the same way as described in connection with the containers 22 or 22' respectively. During the filling operation, the piston 37 slides outwardly towards the cover 35, taking the sleeve 40 with it in the same direction. The container 34 is shown in the filled state in Fig. 8, in which the position of the piston inside the body is indicated by dotted lines.

In this position of the piston, the outer end of the piston rod 39 projects for a certain length from the sleeve 40, and the sleeve in turn projects for nearly its full length from the cover 35. In order to eject the first part of the contents, the cylindrical container is held by means of the index finger and middle finger on either side of the sleeve 40 near the flange 41, as indicated by the arrows in Fig. 8, whilst pressure is exerted by the thumb on the end of the piston rod 39 of the piston 37 in the direction of the arrow. This forces the piston rod 39 into the sleeve 40 until its end is level with the outside of the flange 41, which limits the travel of the piston rod 39. The piston rod in turn has during this movement pushed the piston 37 inside the container 34 by a distance a in the direction of the bottom 36, so that the piston occupies the position indicated in Fig. 9 and has ejected part of the liquid through the connecting piece 38.

In order to eject the remainder of the contents, the container 34 is held as before close to the flange 42, as indicated by means of arrows in Fig. 9, and a pressure is exerted on the end of the piston rod 39 and on the flange 41, as indicated in Fig. 9. This will push the piston through a distance b until it comes into contact with the bottom 36 and the parts assume the relative positions as indicated in Fig. 10.

As will be seen from Figs. 8 to 10, the proportion in which the contents is dispensed can be varied by adjusting the ratio of the length a to the length $a+b$; this can be done in a simple manner by altering the ratio of the length of the sleeve 40 to the length of the piston rod 39, for example by using a sleeve having a different length.

What I claim is:

1. Apparatus for dispensing liquid or semi-liquid substance comprising a reservoir having an opening in its top, a cylinder fixedly mounted in said reservoir having its upper end in said opening and its lower end near the bottom of the reservoir, said lower end having an opening therein, a first check valve means in said cylinder opening for preventing flow from the cylinder into said reservoir, a piston slidable inside the cylinder, spring means in the cylinder below the piston normally urging the piston upward, said piston having an axial hole therethrough, a second check valve means in said hole for preventing flow through the piston in a downward direction, said piston having an upwardly directed nozzle communicating with said reservoir opening and having an internal seat therein, means limiting the upward movement of said piston to maintain the nozzle in its uppermost position at least substantially as low as the top of the reservoir, and a container having an opening thereinto and having a portion around said container opening engageable in said seat, said container having outer dimensions at least as small as the inner dimensions of said cylinder so as to be slidable thereinto to force the piston downwardly in the cylinder against the action of said spring means.

2. In a device as claimed in claim 1, a third check valve means in said container opening to prevent flow from within the container through said container opening.

3. Apparatus according to claim 1 wherein the upper edge of the pump cylinder has a flange which rests on the neck of the reservoir, a cap on top of the flange having a bore whose diameter equals that of the container.

4. Apparatus as claimed in claim 3 in which the bore is of conical shape.

5. Apparatus according to claim 3 wherein said limiting means comprises a projection on said cap extending inwardly of the cylinder to form a stop to limit the upward travel of the piston.

6. In apparatus according to claim 5, an annular space formed between the pump cylinder and the neck of the reservoir, said pump cylinder having a wall, the wall of the pump cylinder and shoulder having passages therethrough above the upper limit of travel of the piston to permit the return flow of liquid from the axial bore of the cap into the reservoir through said annular space.

7. Apparatus according to claim 3 wherein the cap has an axial bore into which the pump cylinder is inserted, and a bushing inside the upper end of the cylinder, said bushing having ribs serving as guides for the container, said pump cylinder having a wall, and passages in the bushing and the adjacent part of the wall of the pump cylinder to permit liquid to flow back into the reservoir.

8. Apparatus according to claim 1 wherein the outside of the container is provided with a circumferential bead adapted to serve as a stop.

9. Apparatus according to claim 1 wherein the container is provided with a plunger which slides between two extreme positions and whose stroke can be adjusted in steps to dispense parts of the total contents of the container.

10. Apparatus according to claim 9, wherein the container has a cover and the extreme positions of the plunger are determined by the distance between the bottom and the cover of the container.

11. Apparatus according to claim 9, wherein the container has a cover, a sleeve which can slide between two extreme positions in a longitudinal direction inside the cover of the container, the plunger having a rod connected thereto, the sleeve having a bore in which the plunger rod is slidably mounted, the length of the sleeve being so related to the length of the plunger rod as to permit the contents of the container to be discharged in regulated steps.

12. Apparatus according to claim 9, wherein the cover and the sleeve are both provided with outwardly projecting flanges.

13. In apparatus as claimed in claim 1, said cylinder having openings therein located above the upper limit of travel of the piston communicating with the interior of the cylinder above the piston and with the interior of the reservoir to permit flow from above the piston back to the reservoir.

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