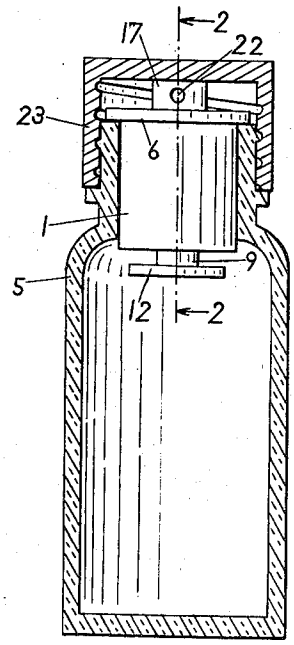
April 8, 1958 P. A. BODKIN 2,829,808

LIQUID DISPENSING DEVICES

Filed June 25, 1956

Fig. 1



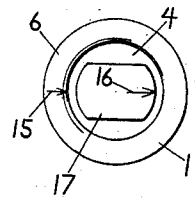


Fig. 3

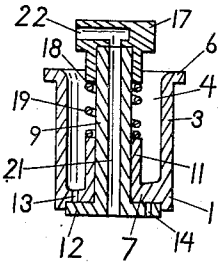


Fig. 2

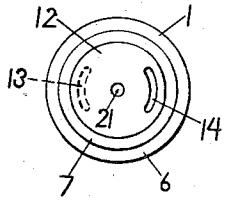
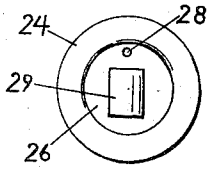


Fig. 4

Fig. 6



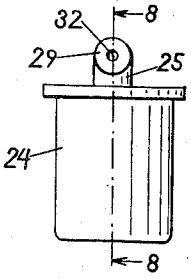


Fig. 5

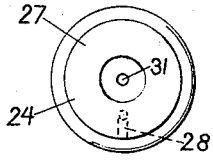


Fig. 7

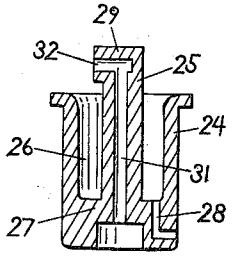


Fig. 8

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LIQUID DISPENSING DEVICES

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4 Claims. (Cl. 222—421)

My invention relates to devices for dispensing liquid from a container, for example from a bottle, and one of its objects is to control the flow or liquid so that the dispensed quantity can be easily and accurately measured.

Other objects are to dispense the liquid in the form of single drops, to prevent the liquid from dripping down the outside of the container or of the bottle neck, and thereby to avoid waste of liquid and to keep container and hand clean.

Further objects are to suck the liquid back from the outlet into the container immediately when the container is turned from its dropping position, thereby to reduce the possibility of unintentional or excessive outflow, and to guide any liquid that still may flow out when the container is turned from its dispensing position back into the container.

Still other objects are to equalize the air pressure inside and outside of the container, thereby to avoid obstruction of the flow by outer air pressure, and to adjust the device to various atmospheric conditions and to any desired dispensing speed or any desired time interval between individual drops.

Still further objects are to attain the mentioned results with simple and reliable means, and with means that can be easily and inexpensively made, and that can easily be attached to a bottle of standard structure.

Still other objects and advantages will appear from the following description of exemplifying embodiments of my invention, from the appended claims and from the accompanying drawing in which:

Fig. 1 shows a side view of an illustrative embodiment of my invention, attached to a bottle, the bottle and its cap being represented sectionally.

Fig. 2 shows a cross-section of the same embodiment without the bottle, this cross-section being taken along the line 2—2 in Fig. 1.

Fig. 3 shows a top view of the same embodiment.

Fig. 4 shows a bottom view of the same embodiment.

Fig. 5 shows a side view of another illustrative embodiment.

Fig. 6 shows a top view of the latter embodiment.

Fig. 7 shows a bottom view of the latter embodiment.

Fig. 8 shows a cross-section taken along the line 8—8 in Fig. 5.

The embodiment shown in Figs. 1 to 4 comprises a plug 1 having a cylindric wall 3 surrounding a cavity 4. The wall 3 fits the neck of a bottle 5 which may be, for example, a medicine bottle of standard structure. When the plug 1 is inserted in the bottle 5, the upper side of the plug faces the outer space and the opposite lower side the inside of the bottle. The outer plug side is provided with a flange 6 overlying the bottle neck. The cavity 4 extends from this outer side toward the bottom 7 of the plug which is positioned at the inner plug side.

A pipe 9 passes rotatably and slidably through a corresponding bore of the bottom 7 which may have a tubular projection 11 surrounding the pipe. An annular

disk 12 is permanently connected with the pipe 9 and underlies the bottom 7 which may have a shallow recess into which the disk 12 enters when the pipe is in its most outward position shown in Fig. 2 Preferably, the disk 12 and the pipe 9 are made as one piece.

The bottom 7 has an opening 13 extending from the cavity 4 and preferably forming a narrow slot extending alone along an arc about the rotary axis of the pipe. The disk 12 has a similar opening 14. The openings 13 and 14 have the same radial distance from the pipe axis whereby rotation of the pipe can move these openings into more or less overlapping positions. In order to facilitate the adjustment of the mutual position of these openings, markers may be provided at the visible outer end of the device. For example, an arrow 15 on the flange 6 indicates the position of the opening 13, and an arrow 16 on top of the pipe indicates the position of the opening 14. The openings coincide when the arrows 15 and 16 point toward each other.

The top end 17 of the pipe is broader than the diameter of the other part of the pipe whereby the pipe has a shoulder 18. The pipe end 17 may be made as a separate piece and may be affixed permanently to the main part of the pipe in any known and suitable manner after the latter part has been inserted in the bottom 7.

A spring 19 is positioned between the bottom 7 or its projection 11 and the pipe top 17 or its shoulder 18 and urges the pipe into its most outward position. The spring 19 is preferably coiled about the pipe 9 and positioned before the top 17 is affixed.

The pipe channel 21 extends from the inner side of the disk 12 in axial direction of the pipe through the bottom 7 and farther outward into the top piece 17. Here, the channel is bent rectangularly and terminates in a lateral exit 22 positioned over the cavity 4.

When the bottle 5 is closed by the described device, the narrow channel 21 may not be sufficient for equalizing the inner and outer air pressure, especially if some liquid stays in this channel. In order to obtain perfect adjustment of the pressure in the bottle to the present atmospheric pressure, the pipe 9 is pressed inward against the tension of the spring 19. Thereby, the disk 12 is separated from the bottom 7 and opens the slot 13 so that the inner bottle space communicates with the outer space through opening 13 and cavity 4, whatever the mutual angular position of the openings 13 and 14 may be. The depression of the pipe may be done by hand. But this is not necessary if the bottle is closed during the non-use periods with a bottle cap 23 which is screwed on the bottle neck in usual manner and presses the pipe top 17 inward as shown in Fig. 1.

For dispensing liquid, the cap 23 is removed whereupon the pipe 9 immediately assumes the position shown in Fig. 2 in which the disk 12 contacts the bottom 7. The bottle is tilted to the side of the pipe exit 22 and is turned relatively to the pipe until the openings 13 and 14 overlap sufficiently to let as much air into the bottle as is necessary to secure the desired velocity of liquid outflow. A little overlapping, indicated by a relatively large angle between the arrows 15 and 16, results in a slow sequence of drops emerging from the exit 22. More overlapping results in a quicker sequence or even in a continuous flow of liquid.

The speed of outflow depends also on the nature of the dispensed liquid, a watery liquid flowing more readily then an oily or more viscous liquid. The described adjustment of the openings 13 and 14 makes it possible to adjust the device to various liquids and to various atmospheric conditions.

The embodiment shown in Figs. 5 to 8 is a simplified modification of the first described embodiment and may be used in connection with a container or bottle similar

to the bottle 5. This simplified embodiment comprises a plug 24 and a pipe 25 which may be made as one piece. The plug 24 has a cavity 26 extending from the outer plug side toward the plug bottom 27. This bottom has a narrow opening 28 connecting the cavity 26 with the inner bottle space. The opening 28 may form a rectangularly bent channel.

The pipe 25 rises from the bottom 27 outward beyond the plug 24, is surrounded by the cavity 26 and terminates in a top piece 29. This top piece may be permanently affixed to the remaining pipe or may form an integral part of the pipe. The pipe channel 31 extends from the inner side of the bottom into the top piece 29 and terminates preferably in a rectangularly bent arm leading to an exit 32 positioned over the cavity 26.

This simplified modification is still less expensive, but has not the advantages of an adjustable bottom opening. Instead, the opening 28 is gauged to fit the requirement of a liquid of definite viscosity. Both embodiments have the advantage that drops will not run down the outside of the bottle neck as it often occurs when liquid is dispensed from ordinary bottles.

When a device according to this invention is used, any drops that may run from the exit of the pipe after the intentional dispension is finished will enter the cavity surrounding the pipe and will eventually return to the interior of the bottle through the bottom opening of the plug. Hence this opening serves for three purposes, for measured entrance of air during the dispension, for equalization of inner and outer air pressure and for the return of excessive outflow.

The interception of drops by the cavity is especially important if the pipe channel is completely straight. In the preferred embodiments shown and described, this channel is bent near the exit. I have found by experiments that such a channel is less apt to let a drop hanging on the exit run down on the outside of the pipe because, in this case, the liquid in the channel exerts a strong suction immediately when the bottle is returned from the tilted dispensing position so that a just emerging drop is sucked back into the interior.

I have further found that this suction and also the dispensing operation is improved if the pipe or the entire device is made of thermo-plastic polyethylene because this material is not adhesive to liquids and, hence, lets the liquid flow freely in either direction. But I do not exclude the use of other transparent or opaque, plastic or otherwise shapable materials.

I desire it understood that my invention is not confined to the particular embodiments shown and described, the same being merely illustrative, and that my invention may be carried out in other ways within the scope of the appended claims without departing from the spirit of my invention as it is obvious that the particular embodiments shown and described are only a few of the many that may be employed to attain the objects of my invention.

Having described the nature of my invention, what I claim and desire to protect by Letters Patent is:

1. For insertion in the outlet of a container, a liquid-dispensing device comprising a plug having a lateral wall adapted for insertion in said outlet and surrounding a cavity, said plug having, in inserted condition, an inner side and an opposite outer side, a bottom at said inner side under said cavity, an open area at said outer side over said cavity and a narrow opening extending from said cavity through said bottom; and a pipe extending from said bottom beyond said outer side and being surrounded by said cavity and by said area, said device having a channel extending through said bottom and said pipe.

2. For insertion in the outlet of a container, a liquid-dispensing device comprising a plug having, in inserted condition, an inner side and an opposite outer side, having a cavity extending from said outer side, a bottom at said inner side and a narrow opening extending from said cavity through said bottom; a pipe passing rotatably through said bottom, extending therefrom beyond said outer side and being surrounded by said cavity; and a disk connected with said pipe, underlying said bottom and said bottom opening and having a similar opening, said two openings having the same radial distance from the rotary axis of said pipe.

3. For insertion in the outlet of a container, a liquid-dispensing device comprising a plug having, in inserted condition, an inner side and an opposite outer side, having a cavity extending from said outer side, a bottom at said inner side and a narrow opening extending from said cavity through said bottom; a pipe passing rotatably through said bottom, extending therefrom beyond said outer side and being surrounded by said cavity; and a disk connected with said pipe, underlying said bottom and said bottom opening and having a similar opening, said two openings forming arc-shaped slots and having the same radial distance from the rotary axis of said pipe.

4. For insertion in the outlet of a container, a liquid-dispensing device comprising a plug having, in inserted condition, an inner side and an opposite outer side, having a cavity extending from said outer side, a bottom at said inner side and a narrow opening extending from said cavity through said bottom; a pipe passing slidably and rotatably through said bottom, extending therefrom beyond said outer side, being surrounded by said cavity and having a broadened outer end; a spring positioned between said broadened end and said bottom and urging said pipe outward; and a disk connected with said pipe, underlying said bottom and said bottom opening and having a similar opening, said two openings having the same radial distance from the rotary axis of said pipe.

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