Jan. 10, 1961 H. M. O'HARE 2,967,310

LIQUID DISPENSING APPARATUS

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FIG. 1

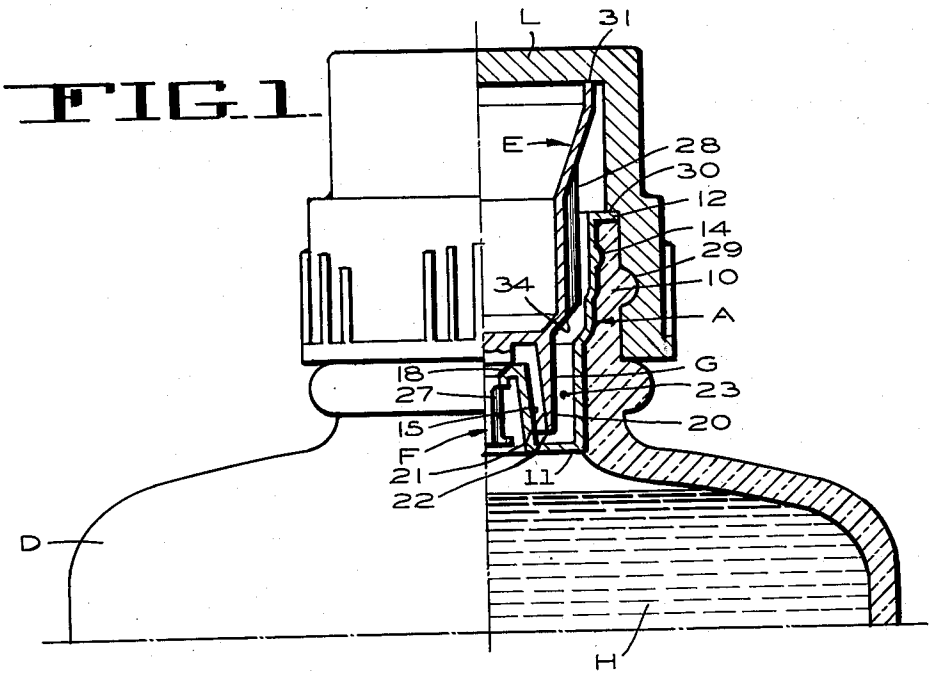


FIG. 2

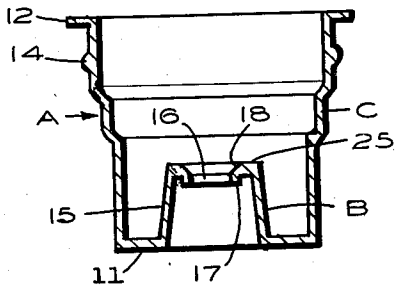


FIG. 3

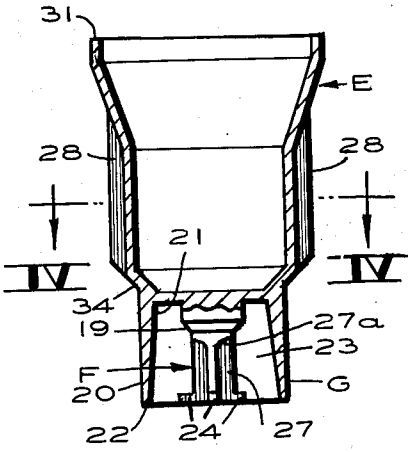
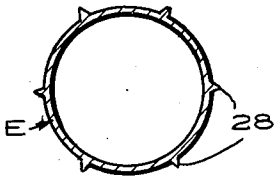


FIG. 4



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LIQUID DISPENSING APPARATUS

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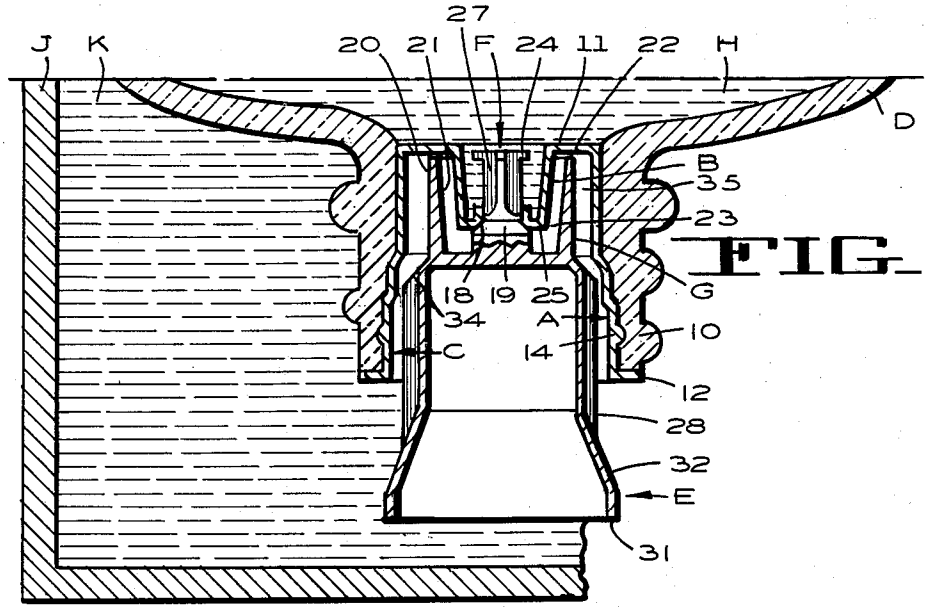

FIG. 5.

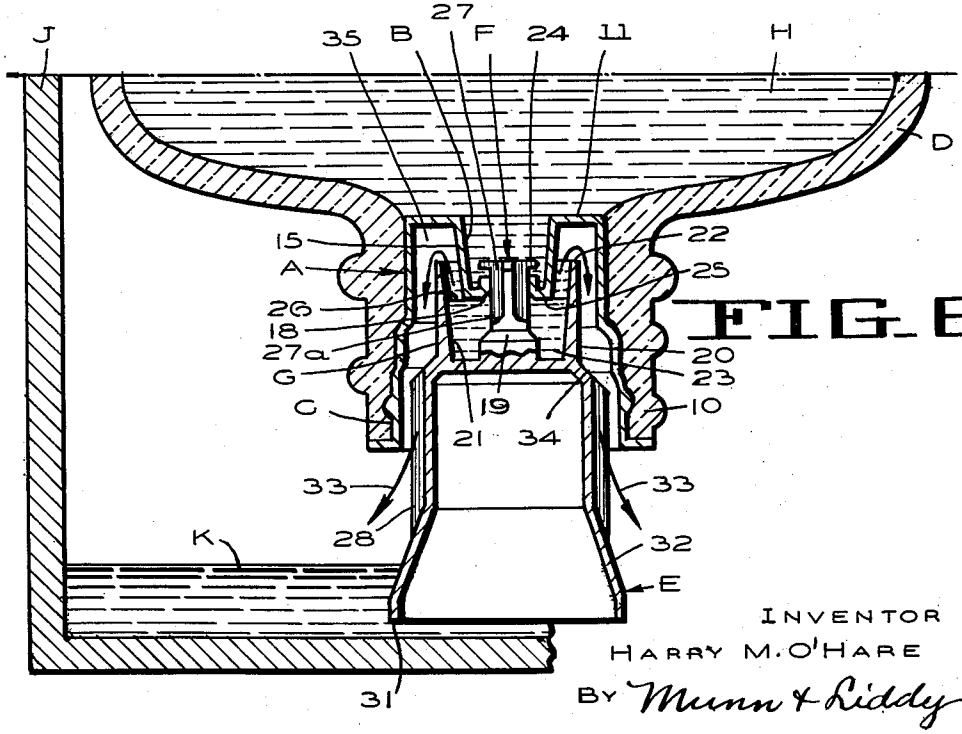

FIG. 6.

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LIQUID DISPENSING APPARATUS

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9 Claims. (Cl. 4—227)

The present invention relates to improvements in a liquid-dispensing apparatus for flush tanks. It has particular reference to improvements over the dispensing apparatus shown in my copending application, Serial No. 542,293, which was filed in the United States Patent Office on October 24, 1955, now U.S. Patent No. 2,913,734.

As pointed out in the above-identified patent, such a dispensing apparatus or dispenser is adapted for supplying a predetermined amount of disinfecting, deodorizing and sequestering agents to the water in the tank each time the toilet is flushed. This will maintain the tank and its bowl sanitary and free from the usual discoloring incrustations.

In the patent, the dispenser includes two parts, namely: an insert and a float cap. The insert shown therein has a neck portion which is telescoped into the neck of a bottle containing the chemical liquid; and, moreover, is provided with an umbrella skirt arranged exteriorly of the bottle. Prior to the time that the dispenser is used, the float cap is screwed onto the bottle neck so as to enclose the projecting skirt of the insert. Before installing the dispenser in a flush tank it was necessary to first unscrew the float cap, and then invert the cap, subsequently inserting a guide stem on the cap into the interior of the insert.

As the cardinal object of the present invention, it is proposed to provide a more compact chemical dispenser, in which the insert and its skirt are substantially confined within the neck of the bottle. This will materially reduce the length of the dispenser which projects from the bottle. Moreover, a closure cap is threaded onto the bottle neck and encloses the float cap, providing a leak-proof unit.

When installing my improved chemical dispenser in a flush tank, it is merely necessary to remove the closure cap from the bottle, and then mount the latter in an inverted position in the tank. The dispenser is ready for immediate use, and it does not require the removal and subsequent reattachment of the float, as was necessary in the patent.

As a further object of the invention, it is proposed to provide additional structural features so as to guard against any leakage of the chemical liquid from the bottle during the time that it is being mechandised.

Other objects and advantages will appear as the specification continues. The novel features of the invention will be set forth in the annexed claims.

Drawings

For a better understanding of the invention, reference should be had to the accompanying drawings, forming part of this specification, in which:

Figure 1 is a front elevational view of my chemical dispenser for flush tanks, parts being shown in section, and the bottle being closed and ready for merchandising or shipment;

Figures 2 and 3 are vertical sectional views of the insert and float member, respectively;

Figure 4 is a horizontal sectional view taken along the plane IV—IV of Figure 3;

Figure 5 illustrates the chemical dispenser after being inverted and installed in a flush tank, the float member being held in raised position by the water contained in the tank; and

Figure 6 is a view similar to Figure 5, but disclosing the float member in its lowered position, due to receding of the water level in the tank, and a reservoir of the float member being filled with a predetermined quantity of the chemical liquids, which will be dispensed when the water level rises again.

While I have shown only the preferred form of my invention, it should be understood that various changes, or modifications, may be made within the scope of the appended claims without departing from the spirit thereof.

Detailed description

In carrying out my invention, there is provided an insert indicated generally at A. This insert is provided with a stationary hollow plunger B and a skirt C. The latter has an outer diameter of a size that will fit snugly within the outlet neck 10 of a bottle D.

It will be noted from Figures 1, 5 and 6, that the insert is substantially confined within the bottle neck, and its skirt C is disposed in liquid-tight relation with the interior surface of the bottle neck. The plunger B is connected to the skirt C by a base 11. Moreover, the insert is provided with an outwardly-extending flange 12, which may be seated on the rim of the bottle neck when the insert is telescoped into the neck of the bottle. The skirt C tapers from the base 11 to the flange 12 to thus facilitate the telescoping of the insert A into the bottle neck, and is further provided with an annular rib 14 to aid in making a liquid-tight seal between the insert and the bottle.

It will be noted that the hollow plunger has its outer surface 15 defining a frustum of a cone, which enlarges toward the base 11. The outer end of this plunger has an opening 16, which is surrounded by an annular flange 17 that extends upwardly into the interior of the plunger (see Figure 2). This opening is chambered so as to define a valve seat 18 for the purpose hereinafter described. The insert A is preferably made of resilient plastic, such as polyethelene. Moreover, the skirt C is spaced from the conical surface 15 of the hollow plunger, and is adapted to be frictionally held in the bottle neck 10, when the insert A is telescoped into the neck of the bottle D, as shown in Figures 1, 5 and 6.

The chemical dispenser further includes a float member E, which has a guide stem F that is designed to be projected through the opening 16 of the hollow plunger B. This stem defines a valve 19 at its base which is disposed for bearing against the seat 18 in liquid-tight relation therewith, when the float member E is moved toward the hollow plunger B.

In its structural details, the float member E is provided with a liquid-receiving receptacle G thereon, which is adapted to surround the hollow plunger B in spaced relation therewith. The outer wall 20 of this receptacle is cylindrical, while its inner wall 21 is conical-shaped, conforming to the taper of the outer surface 15 of the plunger B, but spaced therefrom. The receptacle defines a thin flexible rim 22 and an open-top reservoir 23.

The chemical liquid H to be dispensed is contained in the bottle D, and the latter is adapted to be mounted in an inverted relation in a flush tank J, with the outlet neck 10 of the bottle extending downwardly. The float member E is mounted for up and down movement, in response to change of the level of the water K disposed

within the flush tank. When the valve 19 is removed from the seat 18, a measured quantity of the chemical liquid will flow through the opening 16 and this liquid will be received in the reservoir 23.

It will be noted that the guide stem F has outwardly-extending projections 24 thereon, which are positioned to contact with the annular flange 17 of the plunger B to thus limit downward movement of the float member E with respect to the stationary plunger B. These projections are disposed so that the end 25 of the plunger will be retained in the reservoir 23 when the float member descends (see Figure 6). This arrangement will determine the liquid level 26 in the reservoir.

The entire float member E may be made from a resilient plastic, such as polyethylene. This will permit the projections 24 to be inserted through the opening 16, when the float member is assembled on the insert A, as in Figures 1, 5 and 6.

In order to permit the chemical liquid H to flow downwardly through the opening 16, when the float member E descends, the guide stem F has longitudinally-extending grooves 27 fashioned therein. The grooves start at the outer end of the stem F and terminate at a spaced distance from the bottom of the reservoir. As disclosed in Figure 3, the inner ends of these grooves have inclined portions 27*a* so that the liquids will pass into the reservoir 23, rather than remain in the grooves.

For the purpose of guiding the float member E for up and down movement, it has been provided with a plurality of longitudinally-extending ribs 28 on its exterior surface, which are disposed to bear against the skirt C when the float member is moved laterally. These ribs add weight to the float so that it will descend more readily; and, also, the ribs hold the float member in spaced relation with the skirt, thereby assuring space through which the chemical liquid H may flow from the reservoir 23 to the interior of the flush tank J.

Turning now to Figure 1, it will be apparent that the insert A and float member E have been assembled on the bottle D and ready for shipment or merchandising. Moreover, a closure cap L has been secured to the bottle neck 10, such as by interfitting threads 29. This cap defines an annular interior shoulder 30, and the flange 12 of the insert A is clamped between this shoulder and the rim of the bottle neck 10, providing a liquid-tight seal between the cap and bottle neck, during transportation of the chemical dispenser.

Furthermore, the float member E defines a rim 31 at its opposite end from that of the guide stem F. The closure cap L bears against this rim to hold the valve 19 upon its seat 18, until the cap is removed (see Figure 1). This arrangement further contributes to making the chemical dispenser leak-proof.

Summary of operation

Having thus described the various parts of my chemical dispenser for flush tanks, the operation thereof is summarized as follows:

Prior to installing the bottle D in the flush tank J, the closure cap L should be removed. Thereafter, the bottle is mounted in inverted position within the flush tank by any suitable means (not shown). Normally, the water K in the tank extends well up around the bottle, as shown in Figure 5. The water will hold the float member E in raised position, with the valve 19 bearing against its seat 18.

At this time the guide stem F will project into the interior of the hollow plunger B and will break any sking friction of the liquid surface in the bottle. Therefore, when the toilet is flushed for the first time after the chemical dispenser has been installed, the float member E will descend and the stem F will break the skin friction of the liquid H and permit the latter to flow through the grooves 27 into the reservoir 23.

The projections 24 come to rest on the annular flange 17 and prevent further downward movement of the float member E. The lower ends 27*a* of these grooves are inclined so that the liquid in the grooves will not "hang up," but will flow readily into the reservoir 23. Before the float member will start to raise, due to the refilling of the flush tank with water, the reservoir 23 will fill with the chemical liquid up to the lower end 25 of the stationary plunger B (see Figure 6). Accordingly, the reservoir will contain a measured quantity of the chemical liquid.

As the water K starts to fill the flush tank J, the float member E will be raised, carrying the liquid-receiving receptacle therewith. The stationary plunger B will gradually displace the chemical liquid from the reservoir 23. This liquid will spill over the rim 22 and then flow downwardly through the skirt C. Finally the liquid will be deflected outwardly by a bell-shaped lower section 32 of the float member into the flush tank, as suggested by the arrows 33 in Figure 6.

It will be noted that as the receptacle G moves upwardly with respect to the stationary plunger B, the guide stem F will move in an upward direction in the opening 16 as the tapered inner wall 21 of this receptacle nears the outer surface 15 of the plunger B, the grooves 27 on the guide stem will move into the opening 16 and will be closed by the wall of the latter. This prevents any liquid in the reservoir 23 from being forced back into the bottle D as the float member continues to move upwardly. Finally, the valve 19 will come to rest upon its seat 18.

The chemical liquid that is forced out of the reservoir 23 will not "hang up" at the base of the outer wall 20 of the receptacle G, but will flow over a downwardly-extending conical portion 34 of the float member E and pass into the water K in the flush tank. The float member will remain in raised position until the toilet is flushed again, whereupon the operation will be repeated again.

The skirt C will trap air at its inner top portion 35 when the float member E is raised (see Figure 6) and this air lock will prevent the water K from seeping from the flush tank J into the bottle D; and, also, will prevent the chemical liquid H in the bottle from leaking into the tank water in the event that the dispenser should remain idle and submerged in the water for a long period of time.

The projections 24 prevent the float member E from becoming disengaged from the insert A. The guide stem F will hold the float member so that the latter will move vertically between its two extreme positions (Figures 5 and 6). Also, the ribs 28 will facilitate the up and down movement of the float member. The projections 24 when resting on the flange 17, cause the float E to hang straight so that its axis will remain vertical. This will prevent the reservoir 23 from tilting and being inclined to a point where some liquid will spill therefrom. In fact, if the reservoir were tilted too much, there might be a continual leakage from the bottle D into the reservoir and from the reservoir, into the flush tank J until the bottle was drained of its chemical.

The guide stem F acts as a liquid agitator as it is moved by the vertically movable float E. During the flushing of the toilet, the float drops and the stem F will move downwardly in the chemical in the bottle and will agitate it and break any surface tension on the liquid. Chemical will therefore flow from the bottle D to fill the reservoir 23, and air will enter the bottle. As the tank J refills with water, the float E will raise and the conical inner wall 21 of the reservoir will cooperate with the conical outer wall 15 of the plunger for forcing the chemical from the reservoir 23, into the tank J, rather than forcing the chemical back into the bottle.

The float E has more of its length received in the insert A when the float is in its raised position than is true in my copending case above mentioned. The entire vertical

wall of the reservoir 23 and the greater portion of the vertical cylindrical wall of the float E, disposed below the reservoir, are received in the insert A, see Figure 5, when the float is raised. This increased vertical wall length prevents water in the tank J from entering the reservoir 23 and the bottle D even when the dispensing device and bottle are submerged in the water K in the tank. The air trapped at the top of the insert in Figure 5, will also prevent water entering the bottle and diffusing with the chemical therein.

The dispenser has been designed so that it can be attached to a bottle filled with the chemical, and the package shipped while the bottle remains in its filled state. In many liquid dispensers, the liquid cannot be added before the device is shipped. The triple liquid seal in my device permits the bottle to be shipped, filled with the chemical. The cap L when screwed onto the threaded neck of the bottle, acts as the first liquid seal. The second liquid seal is the flange 12 of the insert A, that is held down by the shoulder 30 in the cap. The third liquid seal is the cap L, pressing on the rim 31, of the float E for forcing the valve 19 on the stem F, against the valve seat 18.

I claim:

1. In a liquid dispensing apparatus, a container having a neck defining an outlet opening, a stationary member secured in the neck of the container and having means defining a discharge opening communicating with the outlet opening in the container, said stationary member including a skirt-like portion disposed within the neck of the container and which extends a substantial distance below the discharge opening, a movable member, said movable member being formed to provide a reservoir with an open top, said means defining a discharge opening extending into said reservoir, and cooperating means on said stationary and movable members serving to limit the lowermost position of said movable member so that the top of the reservoir is never below said discharge opening.

2. A liquid dispensing apparatus as in claim 1 wherein a substantial portion of said movable member is disposed within the skirt-like portion of the stationary member and has a configuration which loosely interfits with said skirt-like portion to generally guide movement of said movable member.

3. A liquid dispensing apparatus as in claim 2 wherein said movable member is provided with longitudinally extending ribs which are adapted to engage the skirt-like portion of the stationary member and serve to guide the movement of the movable member.

4. In a liquid dispensing apparatus, a container having an outlet opening, a stationary member secured to the container and having means defining a discharge opening communicating with the outlet opening of the container, said stationary member having a skirt-like portion which extends a substantial distance below the discharge opening, a movable member, said movable member being formed to provide a reservoir with an open top and a centrally disposed guide stem located in the reservoir, said guide stem extending into said discharge opening and said means defining the discharge opening extending into said reservoir, and cooperative means on said guide stem and on said means defining the discharge opening serving to limit the lowermost position of the movable member so that the top of the reservoir is never below said discharge opening.

5. A liquid dispensing apparatus as in claim 4 wherein a substantial portion of said movable member is disposed within the skirt-like portion and has a configuration which loosely interfits with said skirt-like portion to generally guide the movement of said movable member.

6. A liquid dispensing apparatus as in claim 5 in which the container is provided with a neck which defines the outlet opening and in which the stationary member is disposed within the neck.

7. In a liquid dispensing apparatus of the type adapted for use with a container having a neck defining an outlet opening and a closure cap removably secured thereto, a stationary member adapted to be mounted in the neck and having means defining a discharge opening communicating with the outlet opening in the neck, a movable member, said movable member being formed to provide a reservoir, said means defining the discharge opening extending into said reservoir, cooperative means carried by the stationary member and the movable member to limit the movement of the movable member with respect to the stationary member, and sealing means carried by the stationary and movable members, the removable closure cap secured to the neck of the container being adapted to enclose said stationary and movable members and being adapted to urge said movable member into engagement with said stationary member so that said sealing means is made operative to establish a substantially liquid-tight seal between the stationary and movable members.

8. In a liquid dispensing apparatus of the type adapted for use with a container having a neck defining an outlet opening and removable closure cap secured thereto, a stationary member adapted to be mounted within the neck and having means defining a discharge opening communicating with the outlet opening in the neck, said means being formed to provide an annular valve seat on the outer surface thereof adjacent the discharge opening, and a movable member, said movable member being formed to provide a reservoir and a centrally disposed guide stem located in the reservoir, said guide stem extending into the discharge opening and said means defining the discharge opening extending into said reservoir, said movable member also being formed to provide an annular valve surface adjacent the base of said stem, the removable closure cap secured to the neck of the container being adapted to enclose said stationary and movable members, the movable member being adapted to be engaged by the closure cap and being urged so that the valve surface on the movable member engages the valve seat on the stationary member to provide a liquid-tight seal therebetween.

9. A liquid dispensing apparatus as in claim 8 wherein said stationary member is formed with a flange which rests upon the rim of the neck of the container and wherein the cap is adapted to engage the flange to provide an additional liquid-tight seal.

References Cited in the file of this patent

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