

Nov. 24, 1959

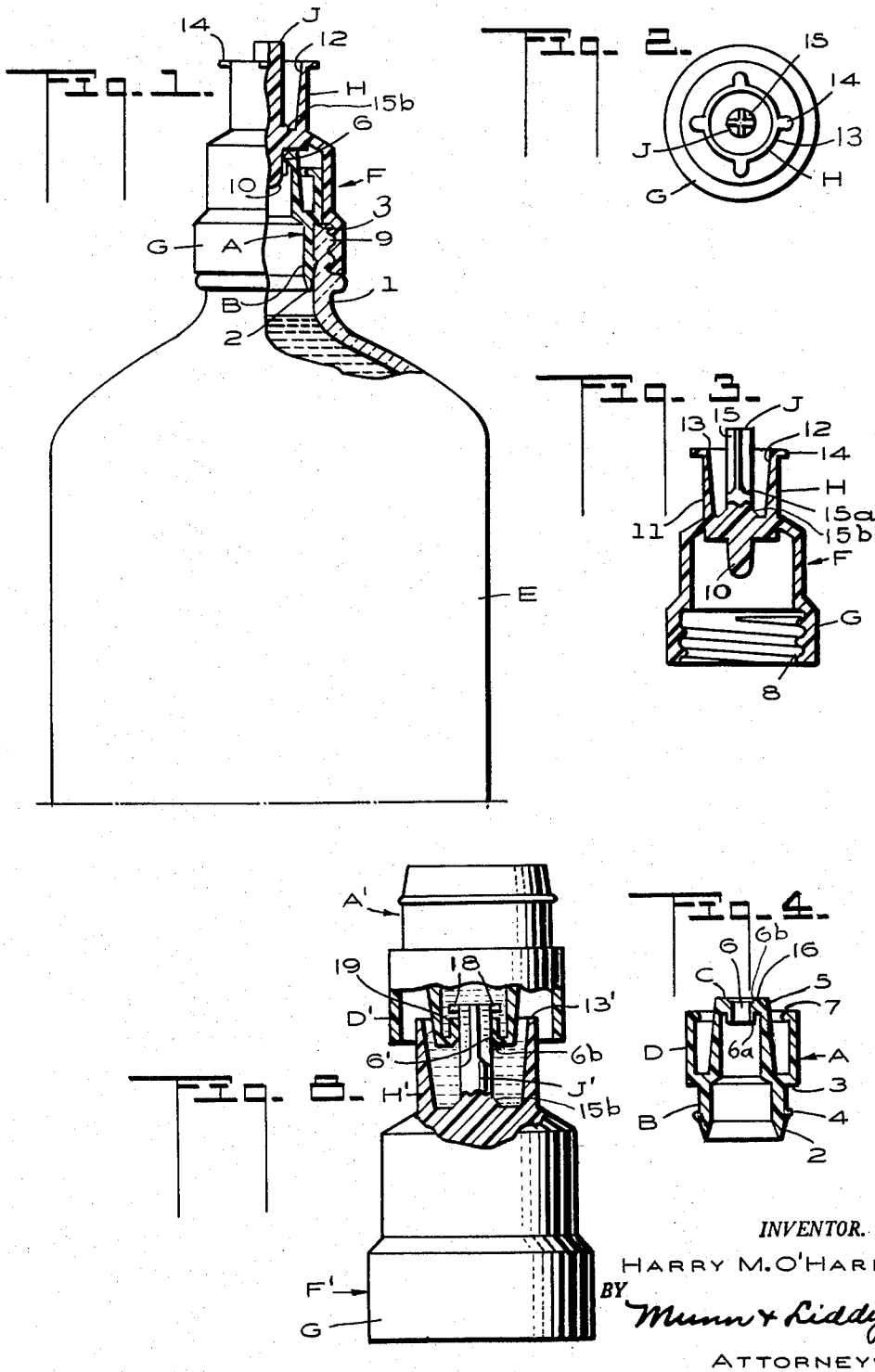
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2,913,734

LIQUID DISPENSING APPARATUS

Filed Oct. 24, 1955

2 Sheets-Sheet 1



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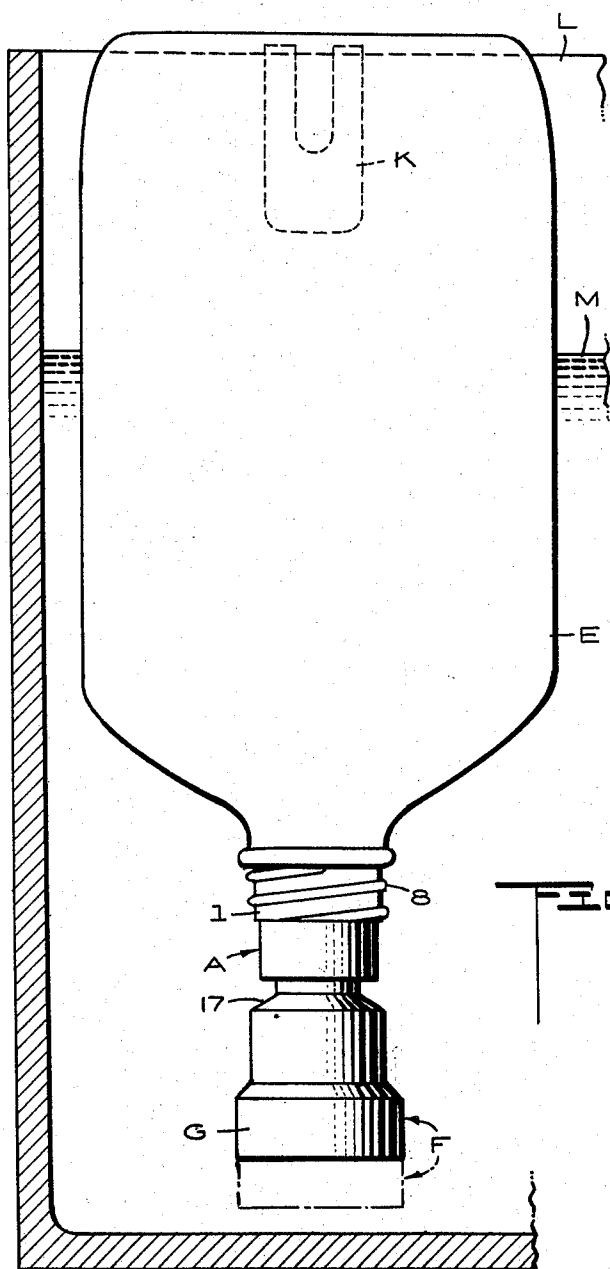


FIG. 5.

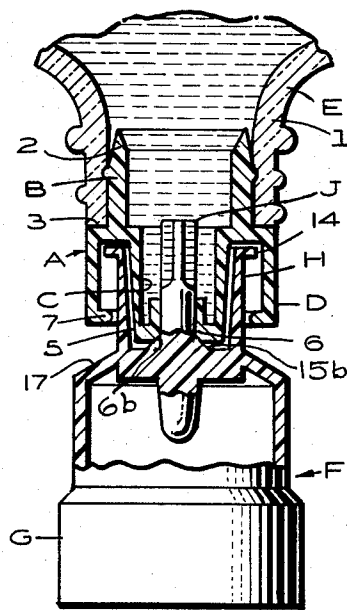
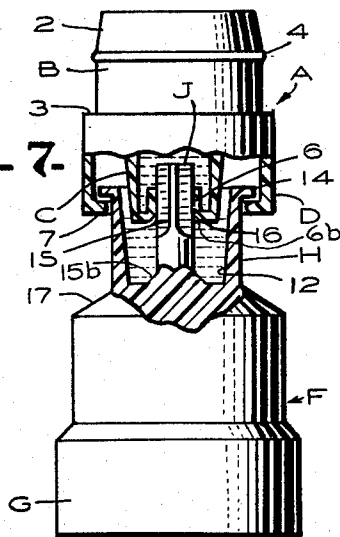


FIG. 6.



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LIQUID DISPENSING APPARATUS

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Application October 24, 1955, Serial No. 542,293

18 Claims. (Cl. 4-227)

The present invention relates to improvements in a liquid dispensing apparatus for flush tanks. It has particular reference to a dispenser adapted for supplying a predetermined amount of liquid disinfecting, deodorizing and sequestering agents to the water in the tank each time the toilet is flushed, thereby maintaining the tank and its bowl sanitary and free from the usual discoloring incrustations.

As the cardinal object of this invention, it is proposed to provide a dispenser of the character described, which is arranged to discharge only a predetermined metered amount of chemicals to the water in the flush tank, independently of the rate of refilling the tank, after each flushing operation. Thus the proper proportion of the chemical with respect to the water capacity of the tank may be maintained.

More particularly described, the improved chemical dispenser includes two parts, namely: an insert and a float cap and these may be readily attached to each other and to a suitable container in which the chemical agents are disposed. The two units are preferably made of a plastic such as polyethylene and therefore inexpensive to manufacture and are disposable with the bottle when the contents of the latter has been consumed.

The two units when coupled together in a predetermined manner, form a liquid tight closure for the bottle and constitute a bottle cap for the bottle before the latter is used. The float cap is screwed onto the threaded portion of the bottle neck and it carries an integral valve portion for closing the bore of the insert that is received in the neck of the bottle. Just before the device is used, the float cap is unscrewed from the bottle neck and inverted and then reconnected to the insert in a manner hereinafter described. The bottle is then inverted and suspended from the top edge of a wall of a toilet flush tank and the float cap will now function as a float. The float cap is the only movable member for dispensing a measured quantity of chemical from the bottle, each time the toilet is flushed and the flush tank is emptied of its water and is filled again.

The device is simple in construction and is durable and efficient for the purpose intended.

Other objects and advantages will appear as the specification continues. The novel features will be pointed out in the claims hereunto appended.

Drawings

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

Figure 1 is a front elevation of a bottle in an upright position and closed by my dispenser when the two parts forming the dispenser are arranged for constituting a closure for the bottle for shipping purposes, one half of the dispenser being shown in section;

Figure 2 is a top plan view of the float cap;

Figure 3 is a vertical section through the float cap;

Figure 4 is a vertical section through the bottle insert;

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Figure 5 illustrates the bottle inverted and suspended from a flush tank wall, the cap float first being removed from the bottle neck and then inverted and operatively coupled to the insert to act as a fluid measuring and dispensing member;

Figure 6 is an enlarged sectional view of the device with the float cap being in raised position for forcing a measured quantity of fluid into the flush tank;

Figure 7 is a view similar to Figure 6, but shows the float cap lowered and the reservoir in the cap being filled with a predetermined quantity of fluid from the bottle, preparatory for the next lifting of the float cap;

Figure 8 is a modified form of the device and illustrates a different manner for connecting the float cap to the bottle insert.

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

Detailed description

In carrying out my invention, I provide an insert indicated generally at A in Figure 4. The insert is provided with a neck portion B, a stationary plunger portion C, and an umbrella skirt D; all of these parts being integral with each other. The neck portion B has an outer diameter of a size that will snugly fit within the neck 1 of a bottle E, see Figure 1. The neck portion B has a conical end 2, see Figure 4, that permits the end to be readily inserted into the bottle neck 1. The umbrella skirt D has a shoulder 3 at the point where it joins the neck portion B, and the shoulder contacts with the top of the bottle neck as shown in Figure 1 so as to position the insert properly with respect to the bottle. The neck portion B also has an O ring or annular rib 4 for aiding in making a liquid tight seal between the insert and the bottle neck.

The insert A also has the stationary plunger C made hollow and aligned with the bore of the neck portion B. The outer surface 5 of the stationary plunger is provided with an 8° taper for a purpose hereinafter set forth. The outer end of the stationary plunger C has a reduced bore 6 and the inner end of this bore is formed by a flange 6a that extends inwardly as clearly shown in Figure 4.

The umbrella skirt D is cylindrical and is spaced from the conical wall 5 of the stationary plunger C. The rim of the skirt carries an inwardly extending flange 7. It will be noted that the stationary plunger has its outer end 16 extending beyond the plane of the flange 7.

The insert A is placed in the bottle neck 1 as shown in Figure 1. The shoulder 3 rests on the rim of the neck and the annular rib 4 aids in frictionally holding the insert against accidental removal.

I will now describe the structure of the float cap F that cooperates with the insert in two different ways. It is shown in Figures 2 and 3. The float cap F has a cap or hollow skirt portion G with an internal thread 8 that is designed to be threaded down onto the threaded portion 9 of the bottle neck 1. The cap portion G has a central stationary valve body 10 or plug that is designed to enter the reduced bore 6 of the hollow stationary plunger C, and thus form a liquid-tight seal for the bore of the insert. This is the first function of the float cap F, and that is to seal the bore of the insert A and to cover the portion of the insert projecting above the neck of the bottle. The cap or hollow skirt portion G also encloses the umbrella skirt D and protects it.

Again referring to Figure 3, it will be seen that the float cap F has liquid-receiving receptacle H, facing in the opposite direction to the cap G and integral therewith.

The receptacle has an outer cylindrical wall 11 and a conical inner wall 12 that has the same degree of slant of 8° as the outer conical surface 5 of the stationary plunger C. The receptacle H will therefore have a thin flexible rim 13 and a gradually increasing wall thickness from the rim to the bottom of the receptacle. The flexible rim has a plurality of outwardly extending lugs or ears 14 that are of the shape clearly shown in Figure 2.

A centrally disposed guide J projects upwardly from the base of the reservoir H and has its top projecting above the reservoir rim 13. The guide is axially aligned with the plug valve 10. In fact the cap G, the reservoir H, the plug 10 and the guide J, all have their axes coinciding with one another. The guide J has longitudinally extending grooves 15 that start at the outer end of the guide and terminate at a spaced distance above the reservoir bottom. The inner ends of the grooves have inclined portions 15a so that fluid flowing along the grooves will pass into the reservoir rather than remain in the grooves. I show four grooves 15 in Figure 2 provided in the guide stem J, but I do not wish to be confined to any exact number.

Figure 1 shows how the insert A and the float cap F are assembled on the bottle E, ready for shipping. If desired, the open top of the reservoir or receptacle H may be closed by covering it with a cylindrical member or tape, not shown, and the tape may extend over the exposed end of the guide stem J to protect it. The liquid contents of the bottle will be protected in this way until the bottle is ready to be used.

Referring to Figure 5, I show the bottle E inverted, but before this is done, the float cap F is unscrewed from the bottle neck and inverted. Then the guide stem J is fed down into the bore 6 of the insert, and the rim 13 of the reservoir H will enter the interior of the umbrella skirt D. The diameter of the outer cylindrical wall 11 of the receptacle H will be slightly less than the inner diameter of the inwardly extending flange 7 of the umbrella skirt. This is to provide an annular space between the two for the passage of air and liquid in a manner hereinafter set forth.

It will be noted however, that the outwardly extending ears 14 on the receptacle, will contact with the flange 7 as the rim 13 is moved into the receptacle. The rim 13 and ears 14 are flexible enough to "give" and permit the ears to be flexed backwardly slightly and the rim 13 to move inwardly slightly at the points of projections for permitting the moving of the ears past the flange 7. As soon, however, as this is accomplished, the ears 14 will instantly snap back into normal position and the rim 13 will also return to normal position. The float cap F is now free to move vertically with respect to the insert A for a predetermined distance between the two positions shown in Figures 6 and 7.

The bottle E can now be inverted and supported by a clip K that is hung over the edge of a flush tank wall L of a toilet, not shown. The clip K is secured to the bottle E in any manner desired. The float cap F will be free to move from the full line position shown in Figure 5, into the dot dash line position, shown in the same figure. The flush tank L has water therein that will be drained from the tank each time the toilet is flushed.

Operation

Figures 6 and 7 illustrate the two positions the float cap occupies during the operation of the device. When the flush tank L is filled with water M to the level indicated in Figure 5, the float cap F will be held in raised position as being hollow and constituting a float because the interior of the cap will be filled with air. The float cap when in raised position, will cause the top of the guide stem J to project into the bore of the insert A and to break any skin friction of the liquid surface in the bot-

tle E. Therefore when the toilet is flushed for the first time after the bottle and dispensing device have been installed, the float cap F will lower as the water M reaches a point where it will no longer support the float cap and the guide stem J will break the surface skin friction of the liquid in the bottle and permit it to flow through the grooves 15 and into the measuring reservoir H.

The lugs or ears 14 come to rest on the flange 7, see Figure 7, and prevent any further downward movement of the float cap F. The lower ends 15a of the grooves 15 are inclined so that the fluid in the grooves will not "hang up," but will flow readily into the receptacle or measuring reservoir H. Before the float cap F will start to raise due to the incoming water into the flush tank L at the completion of the flushing of the toilet, the reservoir H will fill with liquid from the bottle up to a place that coincides with the bottom 16 of the stationary piston or plunger C. The reservoir H will therefore hold a predetermined quantity of liquid.

As the water M starts to fill the flush tank L, the float cap F will be raised and this will raise the reservoir H that has now been filled with liquid. The stationary plunger C will gradually displace the liquid in the reservoir as the latter is raised by the float cap. The liquid will flow from the reservoir and spill over the reservoir rim 13 and then flow downwardly into the interior of the umbrella skirt D and will pass over the flange 7. It will be noted that as the reservoir moves upwardly with respect to the stationary plunger, the guide stem J for the float cap will also move upwardly in the reduced bore 6, see Figure 7. The outer wall 5 of the stationary plunger C has the same 8° taper as the inner wall 12 of the receptacle H. As the wall 12 nears the wall 5 during the upward movement of the float cap F, the grooves 15 on the stem guide J will move into the bore 6 and be closed by the wall of the bore. This prevents any fluid in the receptacle from being forced back into the bottle as the float cap raises and the stationary piston C nears the bottom of the receptacle. Figure 6 shows the float cap in practically fully raised position and the stationary plunger C substantially filling the reservoir so that all of the liquid will be forced out of the receptacle.

The float cap F has a conical outer surface 17 that extends outwardly from the base of the receptacle H. The fluid that is forced out of the reservoir H and passes down along the inner wall of the umbrella skirt D and the other wall 11 of the receptacle, will not "hang up" at the base of the wall 11, but will flow over the inclined surface 17 and pass into the water in the flush tank. The float cap F will remain in raised position until the toilet is again flushed whereupon the operation will be repeated. When all of the chemical has been used, the device can be thrown away with the bottle.

The umbrella skirt D will trap air at its top when the float cap F is raised and this air lock will prevent water M from seeping from the tank L into the bottle E, and will also prevent the chemical in the bottle from leaking into the tank water should the device remain idle and submerged in the water for long periods of time. The umbrella skirt D also sheds any tank water M that might happen to splash or surge against it and this is an additional precaution to prevent water from entering the bottle E and diluting the chemical.

The flange 7 on the umbrella skirt and the ears 14 on the float cap F prevent the latter from becoming disengaged from the insert when the float cap ceases to be supported by the water. The guide stem J will hold the float cap H so that it will move in a vertical line between its two extreme positions. The inner edge of the flange 7 is spaced from the outer wall 11 of the reservoir H to permit air to enter the umbrella skirt when the fluid has been emptied from the reservoir and the float cap is ready to be lifted again by the water M. The lowermost level of the water in the tank L must be low

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enough to permit the float cap to lower to the dot dash line position F, shown in Figure 5.

A modified form of the device is shown in Figure 8. The umbrella skirt D' has no flange 7. The rim 13' has no lugs or ears 14. Instead, the guide stem J' has outwardly extending projections 18 that overlie the rim 19 forming the top of the reduced bore 6'.

The operation of this form of the device is identical to the preferred form. The projections 18 rest on the rim 19 when the float cap F' is down and will hold the float cap against accidental disengagement from the insert A'.

It will be noted from Figure 3, that the guide stem J has a conical portion 15b at its base. Figure 4 shows the reduced bore 6 of the stationary plunger C, provided with a chamfered entrance end 6b. The purpose of this is illustrated in the enlarged view of Figure 6. When the float cap F is in raised position, the conical base portion 15b of the guide stem J, will seat against the chamfered portion 6b of the bore 6 and form a liquid-tight seal for the bore 6. Water M from the flush tank L will be prevented from entering the bore 6 and finding its way into the interior of the bottle E. Also the liquid-tight seal will prevent any leakage of liquid from the bottle into the reservoir H when the float cap F is in raised position.

I claim:

1. A liquid dispensing apparatus comprising a hollow stationary member adapted to be secured to a bottle neck; a float cap having a portion for removably gripping the outer surface of the bottle neck and having an integral plug for entering the hollow member and sealing it; said hollow member having a stationary plunger providing a discharge opening and an umbrella skirt enclosed by the float cap when the latter is secured to the bottle neck; said float cap having an integral reservoir facing outwardly when the float cap is secured to the bottle neck; said float cap being removable from the bottle neck and inverted in its position with respect to the hollow stationary member so that the reservoir will receive the liquid from the bottle through the discharge opening when the latter is inverted; and means for removably connecting the float cap in its inverted position to the hollow stationary member and permitting the float cap to move between two positions when the bottle is in an inverted position; the float cap when in a lowered position permitting the reservoir to be filled with liquid from the bottle.

2. The combination as set forth in claim 1; and in which the float cap has an integral guide stem adapted to enter the hollow stationary member when the reservoir is received in the umbrella skirt; said guide stem projecting beyond the top of the reservoir a predetermined distance and having longitudinal grooves extending from the outer end of the guide stem to a spaced distance from the bottom of the reservoir; said grooves acting as channels for conveying liquid from the bottle when inverted, into the reservoir.

3. The combination as set forth in claim 1; and in which the means for connecting the inverted float cap to the hollow stationary member comprises an inwardly extending flange that is integral with the rim of the umbrella skirt; and outwardly extending flexible lugs integral with the rim of the reservoir and adapted to be flexed rearwardly when the reservoir is inserted into the umbrella skirt and thereafter to rest upon said flange when the float cap is in its lowermost position.

4. The combination as set forth in claim 1; and in which the outer surface of the stationary plunger is conical in shape; and the inner wall of the reservoir has the same conical shape; whereby the raising of the reservoir into the umbrella skirt will cause the conical wall of the reservoir to move toward the outer conical wall of the plunger and empty the reservoir of its liquid contents; the grooves in the guide stem being received in the in-

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terior of the hollow insert after the reservoir moves a predetermined distance into the umbrella skirt; whereby the grooves will be closed to the reservoir for the remaining movement of the reservoir and the remaining fluid in the reservoir will be forced out into the interior of the umbrella skirt and will pass from the umbrella skirt due to gravity.

5. The combination as set forth in claim 1; and in which the means for connecting the inverted float cap to the hollow stationary member comprises a shoulder formed in the hollow stationary member; and outwardly extending flexible lugs carried by the free end of the guide and adapted to rest on the shoulder when the float cap is in its lowest position.

6. A chemical dispenser for flush tanks comprising a hollow stationary member secured to the neck of an inverted receptacle that has a liquid therein; said member having an integral umbrella skirt extending downwardly from the receptacle neck, and having an integral and downwardly extending stationary hollow plunger that is centrally disposed with respect to the umbrella skirt; a float member having a reservoir open at its top and receivable in the umbrella skirt, the outer reservoir wall being spaced from the inner wall of the umbrella skirt; said float member having an integral guide stem that is centrally mounted in the reservoir and extends upwardly so as to be slidably received in the hollow stationary plunger; said guide stem having longitudinal grooves therein; said float member being movable in a vertical line between two positions; the float member when in its lowered position placing the reservoir in communication with the receptacle interior to receive liquid therefrom for filling the reservoir up to the lower end of the stationary plunger; said float member when raised into its uppermost position, causing the plunger to eject the fluid from the reservoir and to force it through the passage provided between the reservoir outer wall and the umbrella skirt inner wall; the top inner portion of the umbrella skirt normally retaining air that acts as a barrier for the receptacle liquid from leaking past the reservoir top and for any water, in the tank in which the device is mounted, from leaking into the receptacle interior.

7. In a liquid dispenser for flush tanks; a receptacle having a downwardly extending neck formed with a discharge opening; a stationary member secured to said neck; said stationary member having an umbrella skirt extending downwardly and a downwardly extending stationary hollow plunger disposed within the umbrella skirt and communicating with the discharge opening in said neck; a movable member having a reservoir open at its top and receivable in the umbrella skirt; said movable member having an upwardly extending guide stem disposed within said reservoir and receivable in the hollow plunger; and means mounted on said stationary member limiting the lowermost position of the movable member with respect to the stationary member and providing the sole support for the movable member.

8. A liquid dispenser of the combination as set forth in claim 7; wherein said guide stem is formed with grooves longitudinally of the stem.

9. A liquid dispenser of the combination as set forth in claim 7; wherein said last named means comprises inwardly extending portions formed on said plunger and outwardly extending portions formed on said guide stem, said last named portions engaging said first named portions when said movable member is in its lowermost position.

10. In a liquid dispenser for flush tanks; a receptacle having a downwardly extending neck formed with a discharge opening; a stationary member secured to said neck, said stationary member having an umbrella skirt extending downwardly and a downwardly extending stationary plunger disposed within the umbrella skirt and communicating with the discharge opening in said neck;

said plunger having an outer tapered surface sloping inwardly and downwardly; the lower portions of said plunger being formed with an inwardly extending annular rim; a movable member having a reservoir open at its top and receivable in the umbrella skirt; said reservoir having an inner tapered surface sloping outwardly and upwardly; said plunger being adapted to cooperatively seat in said reservoir; said movable member having an upwardly extending guide stem positioned in said reservoir and receivable in the hollow plunger; said guide stem having outwardly extending deformable ears formed on the upper portion thereof and adapted to engage with the annular rim on said plunger to limit the lowermost position of the movable member with respect to the stationary member, said ears providing the sole support for the movable member in its lowermost position.

11. A liquid dispenser of the combination as set forth in claim 10; wherein the inner margin of the annular rim on the plunger is chamfered and wherein the lower portion of the guide stem is cone-shaped and adapted to seat in the chamfered portion of said rim to provide a fluid tight seal when the movable member is in its uppermost position with respect to said stationary member.

12. In a liquid dispenser for flush tanks comprising: a hollow member secured to the neck of an inverted receptacle that has a liquid therein; said hollow member having an integral skirt extending downwardly, and having an integral and downwardly extending stationary hollow plunger surrounded by the skirt; a float member mounted for up and down movement and having a reservoir with an annular rim at its top, said float member being provided with a guide stem disposed in said reservoir and slidably received in the hollow plunger, said stem having a conical portion at its base, followed by a cylindrical portion above the base, the remaining upper portion of the stem being grooved longitudinally; said hollow plunger having a discharge opening with a bevelled portion adapted to seat on the conical stem portion when the float is in its raised position for sealing the discharge opening in the plunger; the reservoir being movably receivable in the umbrella skirt; the length of the hollow plunger being slightly longer than the height of the reservoir wall; the outer surface of the reservoir wall being spaced from the inner wall of the umbrella skirt; said hollow plunger permitting fluid to flow from the inverted receptacle, through the discharge opening in the hollow plunger and into the upwardly facing reservoir when the float member is lowered to move the conical portion of the stem out of engagement with the bevelled portion of the plunger; and means limiting the downward movement of the float member with respect to the plunger so that the rim of the reservoir is always above the lower end of the plunger, the plunger having an outwardly extending base adjacent its top cooperating with an adjacent portion of the umbrella skirt for forming an air pocket that will receive the reservoir rim when the float member is in a raised position, and will prevent water in a flush tank in which the receptacle is disposed, from passing into the reservoir and finding its way into the receptacle.

13. In a liquid dispensing apparatus, a container having an outlet opening, a stationary member secured to the container, said stationary member having an umbrella skirt extending downwardly and a centrally disposed plunger formed within the umbrella skirt, said plunger being formed to provide a discharge opening in communication with the outlet opening in said container, a movable member, said movable member being formed with a skirt portion on one end and a substantially cylindrical portion on the other end, said cylindrical por-

tion defining a reservoir open at one end, said movable member being formed with a centrally disposed guide stem located in said reservoir, said guide stem extending into the opening in said plunger and said plunger extending into said reservoir, the cooperation of the guide stem with the opening in said plunger serving to guide the path of travel of said movable member and cooperating means on the stationary and movable members serving to limit the lowermost position of the movable member.

14. A liquid dispensing apparatus as in claim 13 wherein said receptacle is provided with a neck and wherein the stationary member is disposed within the neck.

15. A liquid dispensing apparatus as in claim 14 wherein the movable member is detachable and may be secured to the neck of the container so that the skirt portion of the movable member engages the neck of the container and seals the container to prevent the discharge of liquid therefrom.

16. A liquid dispensing apparatus as in claim 13 wherein said cooperating means is located on said plunger and said guide stem.

17. In a liquid dispensing apparatus, a container having a neck forming an outlet opening, a stationary member secured within the neck of said container, said stationary member being formed with a discharge opening communicating with the outlet opening in said container, a movable member, said movable member having a substantially cylindrical hollow skirt portion on one end and a reservoir on the other end, the reservoir being positioned so that the discharge opening in the stationary member is disposed in said reservoir so that the liquid discharged therefrom empties into the reservoir, means on said stationary and movable members connecting the same to limit the lowermost position of said movable member with respect to said stationary member, said movable member being detachable from said stationary member and being adapted to be secured to the neck of said container so that the skirt portion is in engagement with the neck of the container to seal the container to prevent the discharge of liquid therefrom, said movable member being provided with a plug centrally disposed within the skirt portion of the movable member, said plug serving to close the discharge opening in the stationary member when said movable member is secured to the neck of said container.

18. In a liquid dispensing apparatus, a container having a neck defining an outlet opening, a stationary member secured within the neck of the container, the stationary member including a neck portion engaging the inner surface of the neck of the container and means centrally disposed with respect to the neck portion and defining a discharge opening communicating with the outlet opening in the container, a movable member, said movable member being formed with a hollow skirt portion on one end and a reservoir on the other end, the means defining the discharge opening extending into the reservoir so that liquid discharged therefrom empties into the reservoir, means carried by the stationary and movable members for limiting the lowermost position of the movable member so that the top of the reservoir is always above the lower end of the means defining the discharge opening.

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