

- [54] **AUTOMATIC LIQUID DISPENSER FOR AN INVERTED BOTTLE**
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- [73] Assignee: **Northwest Sanitation Products, Inc.**, Fort Bragg, Calif.
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- [52] U.S. Cl. .... **222/57, 222/453, 4/227**
- [51] Int. Cl. .... **E03d 9/03**
- [58] Field of Search ..... **4/227, 228; 222/57, 67, 222/444, 448, 453**

- [56] **References Cited**
- UNITED STATES PATENTS**
- 3,698,021 10/1972 Mack et al. .... 4/227
- FOREIGN PATENTS OR APPLICATIONS**
- 1,278,126 10/1960 France ..... 4/227

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[57] **ABSTRACT**  
 A liquid dispenser for use with an inverted bottle to

dispense a concentrated liquid into a tank containing water or other liquid. It may be used, for example, as a dispenser for a liquid that cleans toilet bowls, the inverted bottle hanging in the tank and the dispensing taking place during flushing. A stationary member has a portion fitting snugly inside the neck of the bottle and connected by an annular diaphragm to a hollow central portion into which the liquid can enter. A movable member fits at least partially within the hollow portion and has a stem with a sealing plug at its upper end and a sealing skirt at its lower end. The buoying force of water in the tank normally holds the dispenser in a position where the skirt seals against the lower end of the hollow portion while liquid enters the upper end and places a charge within it. On the flushing of the tank as the water level drops, the skirt drops, bringing the plug into its sealing position to prevent the exit of further liquid from the bottle, while the charge of liquid within the hollow member is dispensed. The bottle preferably has a recess near its bottom end in a side wall, where a plastic hanger is provided by a portion affixed to the bottle and a free portion hinged thereto. The free portion can be placed in the recess in one position and flexed out at 90° therefrom in another position, for hanging the inverted bottle on a tank wall.

**3 Claims, 6 Drawing Figures**

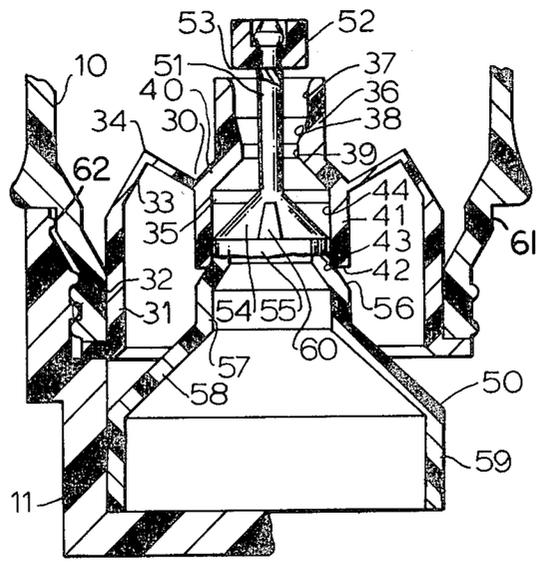


FIG. 1

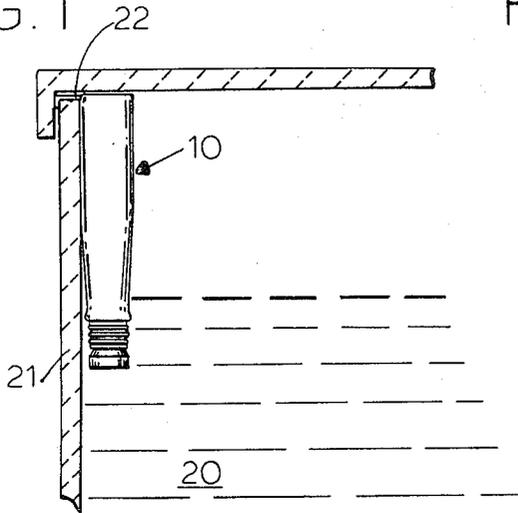


FIG. 2

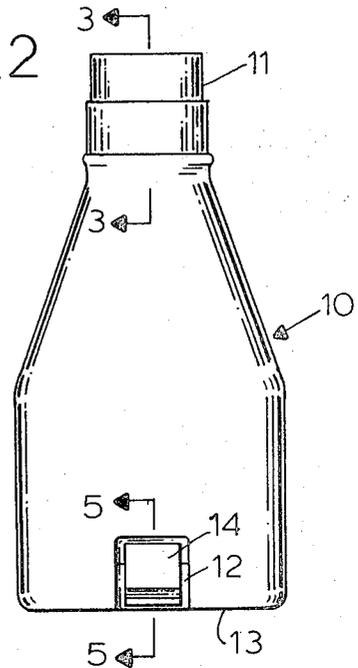


FIG. 3

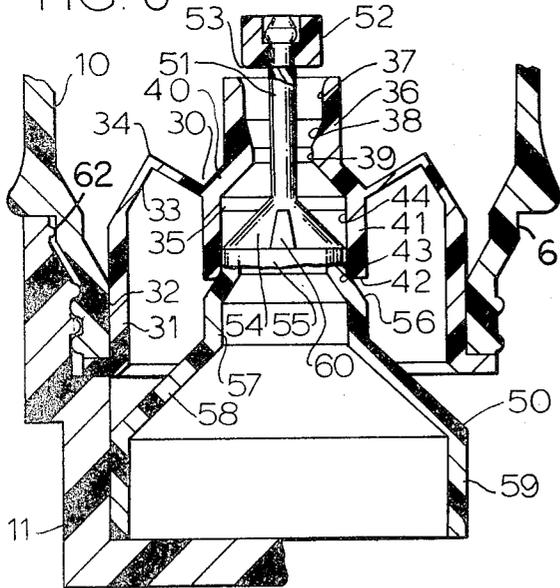


FIG. 4

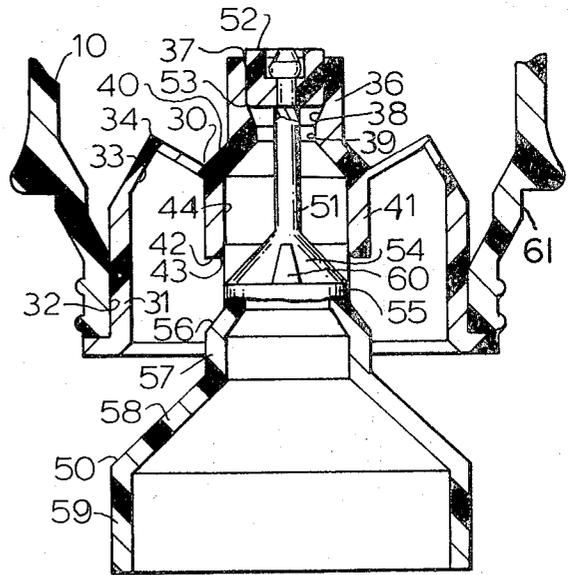


FIG. 5

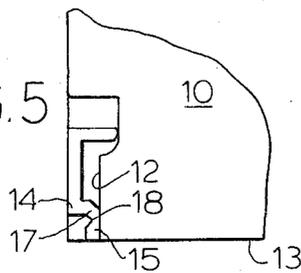
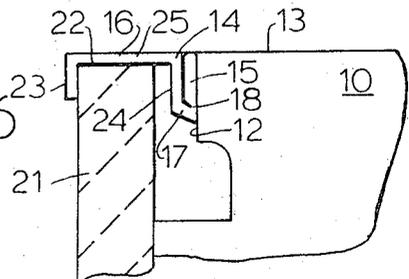


FIG. 6



## AUTOMATIC LIQUID DISPENSER FOR AN INVERTED BOTTLE

### BACKGROUND OF THE INVENTION

This invention relates to a liquid dispenser and is particularly useful as a dispenser for toilet bowl cleaners though it can be used in other installations where liquid is to be dispensed into some water or some other liquid and in which water is present to act as a buoying force for holding the dispenser in a normally closed position and for dispensing the liquid into the water when the water level drops.

Dispensers for toilet bowl cleaners have normally operated on a different principle, namely, the principle of having the buoying force of the water in the tank cause dispensing of a charge, and therefore to mix the toilet bowl cleaner with the contents of the tank during the time that the tank is full. When the tank is emptied by flushing, no further dispensing takes place until the tank is once again nearly full, at which time the dispensing takes place. One of the disadvantages of this type of operation is that the solution is dispensed into the entire toilet tank is and there even though it may not be used for some time. Also, the eventual solution is relatively diluted so that more solution may be required than when the dispensing can be done at the time of flushing after the water level has dropped enough so that a relatively concentrated charge of diluted solution is available for cleaning the toilet bowl during the only time that the material is really acting as a cleaner. So long as the liquid being dispensed is one which diffuses itself very rapidly into the water in the tank, there is nothing to be gained by having it dispensed long before it is used, and the loss in concentration is certainly no benefit. Therefore, the present invention enables one to obtain a better cleaning action with even less fluid by having it come out at a time when it can act in a stronger, more concentrated solution during the same brief interval that it would otherwise be active in any event.

### SUMMARY OF THE INVENTION

A stationary member has a portion fitting snugly inside of the neck of the bottle. This portion is connected by an annular diaphragm to a hollow central portion. The liquid from the bottle enters this central portion through an inlet port. The inlet is succeeded by a narrowing down, or necked-in portion, which serves to provide a seat for the plug of the movable member. The stationary central portion also has a depending cylindrical portion, and the movable member connects the plug by a stem portion to a depending cylindrical member having a frustoconical end portion and serving to engage the end and inside walls of the depending cylindrical portion of the stationary member to seal off there during the first stage of operation, while the plug is up above the neck, so that a fixed charge of liquid is then dispensed into central portion and held there. The sealing portion down below is opened in the second stage of operation when the buoying force of the water in the tank is withdrawn a drop in water level, and the held charge of liquid is dispensed into the water remaining in the tank. The lower cylindrical portion of the movable member is attached to the stem by a frustoconical portion having a plurality of fins engaging the inner cylindrical wall to provide a good guideway and smooth vertical action.

In order to ensure a tight closure when the bottle is on a shelf or in storage or transportation, no matter whether it is right side up or upside down, the bottle has a cap which is threaded around the neck of the bottle and sealed to the bottle and simultaneously covers the movable member and its skirts, preventing any loss of liquid in any position of the bottle.

Another feature of the invention is the mechanism by which the bottle is suspended from the toilet tank. The bottle itself, which may be plastic, is provided with a recessed slot on its outer surface near the bottom of the bottle and in that outer surface is affixed a flexible plastic bracket member having a non-secured portion which is normally folded to be flush with the bottle. However, this flexible non-affixed portion can be swung out to a position about 90° away from its normal position and outside the recess, so that it can hang over the tank of the toilet bowl directly.

### BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a fragmentary view in elevation and in section of a portion of a toilet tank in which an inverted bottle embodying the principles of the invention is suspended in operative position. The bottle is held in its charging and non-dispensing position by the buoying force of the water in the tank acting on the movable member of the dispenser.

FIG. 2 is an enlarged view in elevation and in section of a bottle embodying the principles of the invention and shown in its closed position and upright position with a closure cap on the bottle.

FIG. 3 is a view in elevation and in section taken along the line 3—3 in FIG. 2 but with the bottle inverted and with the right half showing the cap off the bottle, to give an indication of how the sealing action is done during the time the bottle is in the position shown in FIG. 1.

FIG. 4 is a view similar to FIG. 3 but with the bottle cap completely removed and showing the bottle in its dispensing position which it assumes when the buoying force of water is withdrawn from the movable member and the movable member drops relative to the stationary member.

FIG. 5 is a further enlarged view of the bottom portion of the bottle of FIG. 2 taken along the line 5—5 in FIG. 2.

FIG. 6 is a view similar to FIG. 5 with the bottle inverted and showing how the hanger is withdrawn from its recessed receptacle and suspended on the wall of the tank at the upper end.

### DESCRIPTION OF A PREFERRED EMBODIMENT

The invention involves the use of a bottle 10 which may be especially made for use with this invention, as the one shown is, or may be a typical bottle in which the dispensing apparatus is installed. The bottle 10 is shown in its upright position in FIG. 2 with its top closed by a cap 11, while in FIG. 1 the bottle 10 is shown in its inverted position with the cap 11 removed.

The suspension of the bottle 10 as shown in FIG. 1, may be obtained by the novel structure shown particularly in FIGS. 5 and 6 and also indicated in FIG. 2. The plastic bottle 10 is provided with a shaped recess 12 near its lower end 13 and in this recess 12 is secured a

flexible hanger member 14 having a base portion 15 which is affixed to the wall of the bottle 10, as by cement. This base portion 15 is connected to a hanger portion 16 by a diaphragm portion 17 that has a V-groove 18. The V-groove 18 has 45° walls preferably, so that the hanger portion 16 can be swung out 90°. In FIG. 6, this has been done, with the bottle 10 inverted, so that it can be hung in a tank 20 at the upper edge 22 of a tank wall 21. The hanger portion 18 comprises a pair of vertical portions 23 and 24 joined by a horizontal portion 25. The horizontal portion overlies the upper edge 22 of the tank 20, and the outer vertical portion 23 provides a securement therefore, while the inner portion 24 engages or lies close to the wall 21.

The liquid dispenser for the bottle 10 comprises an assembly made up of two principal members, both preferably made from a plastic, a stationary member 30 and a movable member 50. The stationary member 30 is molded integrally and preferably comprises a neck-engaging cylindrical portion 31 which fits quite snugly—or even cemented into—the neck 32 of the bottle 10. A diaphragm 33, which is annular in shape and may have a vee shape with a corner 34, to aid in flexure, connects the cylindrical portion 31 to a central hollow portion 35, with which it is integral. The central portion 35 comprises a first tube 36 preferably having a cylindrical outer wall and an inner wall comprising a cylindrical inlet wall 37 which leads to a frustoconical or inwardly tapering or necked-down portion 38 leading to a short cylindrical portion 39, if desired, which is the narrowest part of the passageway. Succeeding the tube 36, and integral with it, the central portion 35 flares outwardly in a frustoconical shell 40 leading to a second cylindrical tube 41 which is larger in diameter than the first tube 36. The tube 41 terminates in a lower edge 42 which may have a rounded inner corner 43, and it is cylindrical throughout its length on both its outer surface and its inner surface 44.

The movable member 50 of the dispensing assembly is axially located with respect to the stationary member 30 and much of it lies inside the stationary member 30. Thus, there is an axial stem 51 which may be cylindrical and which lies inside the central portion 35 at all times. This stem 51 has, at its upper end, a plug 52 which may be a separate member that is locked to it (as shown here) or may be integral with it. This plug 52 has the same outer diameter as the inner surface 37, and its bottom corner 53 serves to engage the inwardly tapering necking or frustoconical portion 38 to seal at that point when the buoying force of the water has been withdrawn and thereby to prevent the passage of liquid from the bottle 10 into the dispensing device at that time.

On the other end of the stem 51 is a frustoconical portion 54 which may be either solid or a shell, and which leads to a cylindrical portion 55, which is preferably a shell; although it could also be solid, because lightness makes it more buoyant. The outer periphery of this cylindrical portion 55 is substantially the same length as that of the inner surface of the second tube 41, and therefore acts in one position to prevent the passage of water between them. Moreover, when they are in the sealing position, the lower edge 42 of the stationary member 30 engages against a second frustoconical portion 56, which lies beyond the cylindrical portion 55 and achieves a tight seal there also. The portions 55 and 56 thus comprise a sealing skirt.

The movable member 50 preferably also comprises a second cylindrical portion 57 following the second frustoconical portion 56 and succeeded by a third frustoconical portion 58 and a third cylindrical portion 59. Furthermore, the first frustoconical portion 54 may have guiding fins 60, which are segments ending with an arcuate surface the same diameter as the first cylindrical portion 55.

When the bottle cap 11 is in place, a seal is accomplished by means of a cylindrical portion 61 of the bottle 10 and an annular rib 62 on the cap 11, so that there can be no leakage from the cap 11.

In the position shown in FIG. 4, the plug 52 is sealed against the wall 38, and liquid is dispensed so that the annular space around the stem 51 is empty of liquid.

When the water in the tank again rises it forces the first cylindrical portion 55 and second frustoconical portion 56 into sealing engagement with the lower edge 42 of the second tube 41, as shown in FIG. 3, and at the same time raises and thereby opens the plug 52, so that liquid from the bottle can enter the inlet 37 and fill the annular space inside the central portion 35 and around the stem 51. This provides a charge, and then when the buoyant force is withdrawn again by a pull in the water level in the tank 20, as because of flushing, the movable member 50 drops again into the position shown in FIG. 4 and dispenses its charge into the water while that water is lower than the tank level. Thereby, a more concentrated charge of the diluted liquid is obtained for cleaning the toilet bowl. This is, of course, all actuated by the action of the flushing in the tank; the operation is swift and there is, of course, sufficient agitation at this time to achieve a very good mixing and dilution of the cleaning solution.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. A liquid dispenser for use to dispense liquid from an inverted bottle having a neck into a tank at times when buoying water in the tank drops in level, including in combination:

a hollow annular stationary member having a neck-engaging portion joined by an annular diaphragm to a central hollow portion having a first cylindrical tube and a second cylindrical tube of greater diameter than said first cylindrical tube connected thereto, said second cylindrical tube having a cylindrical inner surface and terminating in a sealing edge, said first cylindrical tube having an entrance end with an inlet passage provided by a cylindrical inner surface followed by a frustoconical passage leading in toward the axis to an inner surface that is cylindrical and is smaller in diameter than said inlet passage, and

a movable member comprising, successively, an axial stem portion that is cylindrical and lies in and extends beyond both ends of said first cylindrical tube, a first frustoconical portion lying within said second cylindrical tube, a cylindrical portion having an outer periphery substantially identical to the inner periphery of said second cylindrical tube and engaging it in sealing relationship in a first position

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of said movable member, and a second frustoconical portion flaring outwardly from said cylindrical portion and engaged in said first portion by said sealing edge of said second tube in sealing position,

said axial stem having at its distal end a cylindrical plug which lies beyond said stationary member in said first position and engages said inlet passage and said frustoconical passage in sealing relation in a second position of said movable member, said cylindrical position and said second frustoconical portion then being moved away from said second cylindrical tube,

whereby in said first position of said movable member liquid from said bottle enters said inlet passage and fills the space between said movable member and said stationary member above the seal made by

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said second cylindrical tube on said cylindrical portion and said second frustoconical portion, and liquid is dispensed when said movable member drops to its second position, at which time said cylindrical plug seals against said stationary member to prevent further dispensing,

said movable member normally being held in said first position by the buoying force of water in a said tank and moving to said second position when the water level in said tank drops and the buoying force is withdrawn.

2. The dispenser of claim 1 wherein said first frustoconical portion has a plurality of radially-extending fins engaging said cylindrical portion for guiding action.

3. The dispenser of claim 2 wherein said plug is separable from said stem but is locked thereto in assembly.

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