

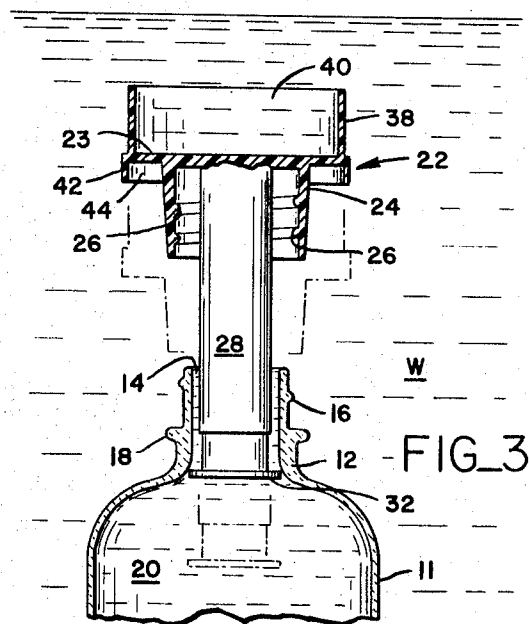
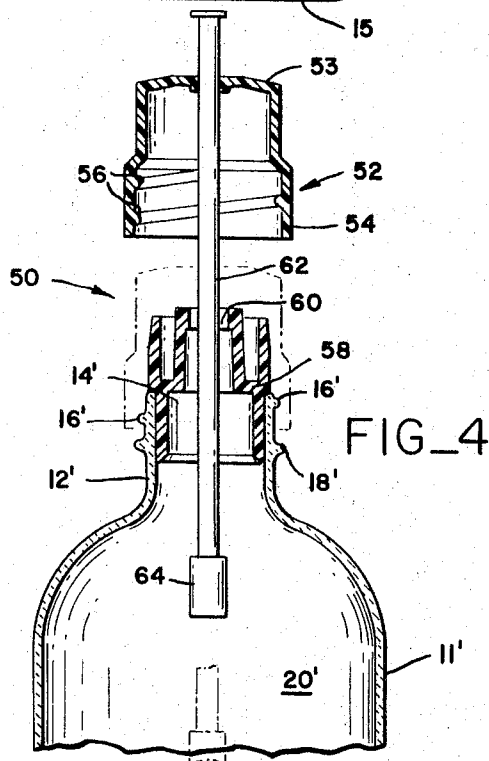
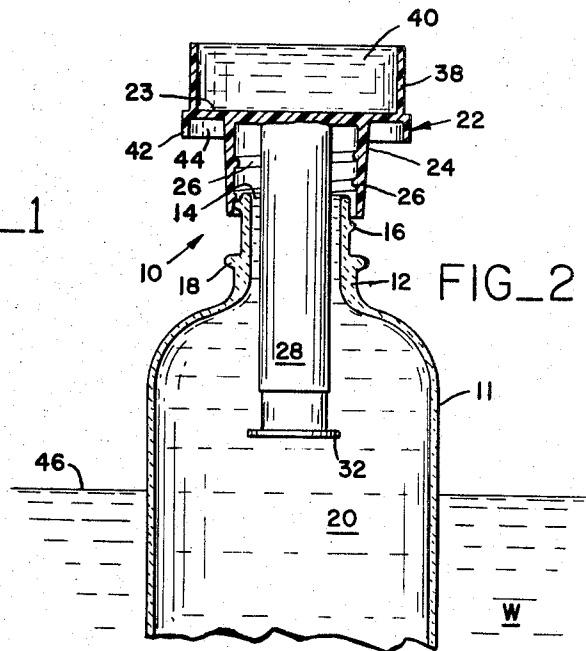
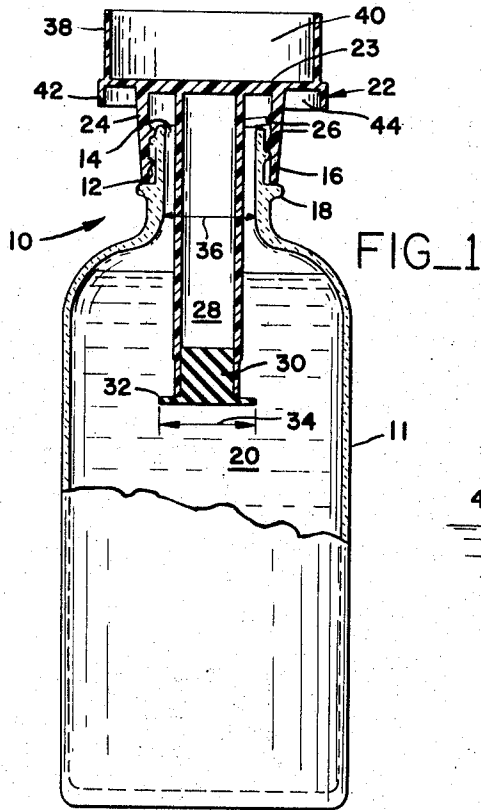
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SOLUTION DISPENSER

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3,341,074

**SOLUTION DISPENSER**

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This invention relates to a solution dispenser, and more particularly, to a device for dispensing quantities of solution into a flush tank of a toilet in response to flushing action.

It is desirable to add chemical solution to the flush water of a toilet for disinfecting, deodorizing and cleaning a toilet bowl. Such chemical solution should be added in amounts sufficient to achieve the desired functions, at intervals frequent enough to maintain the toilet bowl in a sanitary, odorless condition and prevent the formation of film and the like upon the interior thereof. To manually add the solution at various intervals, is time consuming and often inconvenient.

An object of the present invention is to provide an improved device for automatically dispensing quantities of solution into the flush tank of a toilet in response to flushing action.

Another object of the invention is to provide a solution dispenser which discharges a predetermined amount of solution upon actuation.

A related object of the invention is to provide a solution dispenser which can be adjusted so as to control the amount of solution discharged upon actuation.

A further object of the invention is to provide an economical solution dispensing container adapted for packaging and sale of quantities of solution.

An additional object of the invention is to provide a solution dispenser which is readily installed for use within the flush tank of a toilet.

Other objects and advantages of the invention will be apparent from the following detailed description, reference being made to the annexed drawing, in which:

FIG. 1 is an elevation view, partially broken away into a sectional view, of a solution dispenser embodying the present invention,

FIG. 2 is a partial sectional elevation view of the solution dispenser shown in FIG. 1 in one operational position,

FIG. 3 is a partial sectional elevation view of the solution dispenser shown in FIGS. 1 and 2 illustrating the structure in another operational position, and

FIG. 4 is a partial sectional elevation view of a modified form of solution dispenser.

With reference to FIG. 1, a solution dispenser 10 is shown which includes a container 11 being a conventional type of bottle with a flat base portion 15 and a neck portion 12 defining a top opening 14. Screw threads 16 are positioned about the exterior of the neck portion 12 adjacent the top opening and a stop ring 18 is located below the screw threads. A storage chamber 20 is enclosed within the container and is adapted for retaining a concentrated chemical solution.

A float cap 22 having a top cover 23 and a tubular coupling portion 24 fits about the neck portion 12 of the container 11. Threads 26 are provided on the interior of the coupling portion and are adapted to engage the screw threads 16 on the neck portion like a bottle cap is secured on a bottle. When the float cap is secured in this manner, in contact with stop ring 18, as shown in FIG. 1, the container is tightly sealed and the float cap is inoperable for solution dispensing. In this condition, the container of solution may be packaged, stored, displayed and sold to consumers.

A hollow displacement rod 28 depends from the top cover 23 loosely within the tubular coupling portion 24

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to leave an annular space therebetween and extends downwardly below the neck portion 12 of the container 11. A stopper plug 30 composed of rubber or other resilient material fits telescopically into the depending end of the hollow displacement rod. A sealing flange 32 projects radially outward from the lowermost end of the stopper plug. The diameter 34 of the sealing flange is greater than the internal diameter 36 of the neck portion and thus, when the float cap 22 is in an upper position, as shown in FIG. 3, the sealing flange contacts the neck portion to effectively seal the container internally.

A circular wall 38 extends upwardly from the outermost peripheral edge of the top cover 23 to form a basin 40 and a circular wall 42 depends therefrom to form an annular pocket 44. Water retained in the basin 40 tends to force the float cap 22 downward, while air retained in the pocket 42 provides buoyancy for the float cap, as will be explained in detail hereinafter.

FIG. 2 illustrates the float cap 22 after it has been unscrewed so that the lowermost threads 26 thereof rest loosely on the uppermost threads 16 of the container 11. The float cap 22 is thus readied for dispensing solution but the top opening 14 of the container is closed by the tubular coupling portion 24 and top cover 23. FIG. 3 shows the float cap in an upper position but the container is internally sealed by the sealing flange 32. When the float cap moves between the positions of FIGS. 2 and 3, water can enter and solution can be dispensed through the annular space surrounding the displacement rod 28 in the neck portion 12 of the bottle.

In operation, a container 11 full of solution is obtained and the float cap 22 is unscrewed, as shown in FIG. 2. The container 11 is then placed within the flush tank of a toilet, not shown, and stands upright with the flat base portion 15 resting upon the bottom. The float cap 22 is buoyant and rises in the water within the flush tank to a position as shown in FIG. 3. In this position, the container 11 is sealed by the sealing flange 32 so that there is no diffusion of solution into the surrounding water W in the flush tank. Upon flushing, water W within the flush tank drops rapidly causing the float cap 22 to move downward. The displacement rod 28 displaces a quantity of solution which is forced upwardly about the rod and out the top opening 14. The solution dispensed is carried with the flush water into a toilet bowl where it performs the desired functions of cleaning, disinfecting and deodorizing.

When the water W in the flush tank is at a minimum level during the flushing cycle, the float cap 22 is above the water level, as indicated by line 46 in FIG. 2. Since the solution level within the container 11 tends to elevate the displacement rod 18, a counteracting force is necessary to maintain the float cap 22 in a closed position. This is achieved by water which is retained within the basin 40 on top of the float cap.

As the flush tank is refilled, the water level rises about the float cap. A quantity of air is trapped within the pocket 44 and the interior of the cap 22 beneath the top cover 23. This air provides a buoyancy which counteracts the weight of water retained in basin 40 and causes the float cap 22 to rise with the water level in the flush tank as indicated in FIG. 3. Upon the rising of the float cap 22, water from the flush tank enters the top opening 14 of the container in an amount equivalent to the volumetric increase due to elevating the displacement rod 28. This water mixes with the concentrated chemical solution to form a slightly more dilute solution but having sufficient chemical properties for achieving the desired functions. When the float cap 22 reaches the uppermost position shown in FIG. 3, the container 11 is internally sealed and remains so until the next flushing action.

A modified solution dispenser **50** is illustrated in FIG. 4 and similar elements are indicated by like reference numerals with an added prime notation. The container **11'** shown is similar to the container previously described with reference to FIGS. 1, 2, and 3 and includes a neck portion **12'** defining a top opening **14'**. Screw threads **16'** are positioned about the exterior of the neck portion **12'** near the top opening and a stop ring **18'** is located below the screw threads. A storage chamber **20'** is enclosed within the container and is adapted to retain a concentrated chemical solution.

A float cap **52** having a top cover **53** and a tubular coupling portion **54** fits about the neck portion **12'** of the container **11'**. Threads **56** are provided on the lower interior of the coupling portion **54** and are adapted to engage the screw threads **16'** on the neck portion. A plug **58** fits within the opening **14** and is provided with a central bore **60**. A displacement rod **62** is adjustably mounted within a central opening in the top cover **53** so as to depend therefrom and extend loosely through the central bore **60** of the plug **58** below the neck portion of the container. The rod **62** is frictionally held in the opening of the top cover **53** so as to normally retain its adjusted disposition. However, application of manual force will enable the rod to be moved either upwardly or downwardly relative to the cover **53** to ultimately adjust the amount of solution dispensed as will be described in detail hereinafter. A seal plug **64** is fixed to the depending end of the displacement rod **62**. The outside diameter of the seal plug **64** is greater than the central bore diameter and thus when the float cap **52** is in a fully elevated position, the seal plug blocks the central bore to effectively seal the container **11'** from within.

Operation of the modified solution dispenser **50** is similar to that previously described with reference to the solution dispenser **10**. The float cap **52** is backed off from engagement with screw threads **16'** and the container **11'** is placed on the bottom of a toilet flush tank. Buoyancy of the float cap **52** causes it to rise as the water level rises so that the seal plug **64** blocks the central bore **60** to effectively seal the container **11'** and prevent diffusion of the chemical solution within. Upon flushing, the lowering water level allows the float cap **52** to move downward, which in turn forces the displacement rod **62** down and unseats the seal plug **64** from its position blocking the central bore **60**. Further downward movement of the displacement rod **62** and seal plug **64** displaces a quantity of solution which is forced upwardly through the annular space between the central bore and the encompassed displacement rod **62**. This displaced solution is carried by water within the flush tank into the toilet bowl where it performs its desired functions. When water level within the flush tank rises, the float cap **52** is elevated together with the displacement rod **62** and seal plug **64**. This causes an increase in volume within the container **11'** and water from the flush tank flows in through the central bore opening to fill the void. This water mixes with concentrated chemicals in the container **11'** to form more solution. When the float cap **52** reaches its elevated position, the seal plug **64** blocks the central bore **60** and thus seals the container **11'** until the flushing action is repeated.

It will be noted that the displacement rod **62** in FIG. 4 is of smaller diameter than the displacement rod **28** of the solution dispenser **10**, shown in FIGS. 1, 2, and 3. Thus, it is necessary to use the plug **58** having a central bore **60** commensurate with the diameter of displacement rod **62**. The amount of solution dispensed is governed by the length and diameter of the displacement rod that fits into the container **11**, the open area between the displacement rod **28** or **62** and the top opening **14** or central bore **60** and the time interval in which the float cap **22** or **52** moves from an elevated position whereby the container is sealed from within to a lowered position in which the float cap covers the top opening of the container. If a greater or lesser amount of solution is to be dispensed

upon each actuation of the mechanism in the manner described, the disposition of the displacement rod **62** in the top cover **52** is varied by manually shoving the rod upwardly or downwardly through the cover. If less water hardness exists in a particular locale, the displacement rod **62** can be shoved upwardly through the top cover **53** and upon actuation, less solution will be dispensed. If greater water hardness is experienced in another locale, the displacement rod **62** can be pulled downwardly and, in turn, the requisite increased amount of solution will be dispensed upon each actuation.

The solution dispensers **10** and **50** both utilize the following method of maintaining solution for dispensing. A soluble substance in solid or liquid form, being supersaturated concentrated chemicals, is confined within the container **11**. A given amount of solvent, which is water from the flush tank, is brought into contact with the soluble substance as the float cap is elevated. The solvent is maintained within the container until the next flushing action during which time the solvent dissolves an amount of the concentrated chemicals sufficient to form a saturated solution. In view of the fact that for most chemical substances, dissolution thereof in a given solvent occurs only to a predetermined degree where an equilibrium is reached between the substance continuing to dissolve and the amount of solute being redeposited on the substance, such equilibrium condition resulting in a saturated solution, it is clear that if a given amount of a solvent is brought into contact with the soluble substance, only a specific amount of the substance will be dissolved regardless of continued contact between substance and solvent.

It will be understood that modifications and variations of the embodiments of the solution dispenser disclosed herein may be resorted to without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A solution dispenser comprising a container filled with solution and having a neck portion defining a top opening, a float cap adapted to cover the top opening and defining a chamber open in a downward direction, a displacement rod depending from the float cap and loosely extending through the top opening and, a seal fixed to the displacement rod at the end opposite the float cap within the container, said seal being adapted to engage the neck portion of said container whereupon the container is sealed from within when said float cap is in a fully elevated position and upon lowering the float cap, solution is displaced from the container.
2. A solution dispenser according to claim 1 wherein said displacement rod is adjustably connected to said float cap for axial motion relative thereto.
3. A solution dispenser comprising a container filled with solution and having a neck portion defining a top opening, a float cap adapted to cover the top opening, a displacement rod depending from the float cap and loosely extending through the top opening and a seal fixed to the displacement rod at the end opposite the float cap within the container, said seal being adapted to engage the neck portion of said container, said container neck portion being threaded externally and said float cap being threaded internally to engage the threads of said neck portion, whereby said container is effectively sealed to prevent dispensation of solution therefrom.
4. A solution dispenser comprising a container filled with solution and having an externally threaded neck portion defining a top opening,

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- a float cap adapted to cover the top opening and having internal threads for engagement with the threaded neck portion of said container,
- a displacement rod depending from the float cap and loosely extending through the top opening of said container and 5
- a seal fixed to the displacement rod at the end opposite the float cap within the container, 10
- said seal being adapted to block said top opening when in a position of engagement with the neck portion of said container
- whereby said container can be effectively sealed to prevent dispensation of solution upon engagement of the internal threads of said float cap with said externally threaded container neck portion, and upon disengagement thereof, said solution dispenser is operable to dispense solution in response to movement of said float cap and displacement rod. 15
5. A solution dispenser adapted for placement within a toilet flush tank, said dispenser comprising 20
- a container filled with solution and having a neck portion defining a top opening,
- a float cap adapted to cover the top opening,
- a displacement rod depending from the float cap and loosely extending through the top opening, 25
- a seal fixed to the displacement rod at the end opposite the float cap within the container, said seal being adapted to engage the neck portion of said container for blocking the top opening thereof and
- a circular wall defining a basin above said float cap in which a quantity of water is retained to hold said float cap in a depressed position when water within said flush tank recedes to a level below said float cap. 30
6. A solution dispenser adapted for placement within a toilet flush tank, said dispenser comprising 35
- a container filled with solution and having a neck portion defining a top opening,
- a float cap adapted to cover the top opening,
- a displacement rod depending from the float cap and loosely extending through the top opening, 40
- a seal fixed to the displacement rod at the end opposite the float cap within the container, said seal being adapted to block the top opening thereof and
- a circular wall defining an inverted pocket beneath said float cap for entrapment of air when water level within the flush tank rises about said float cap thus creating additional buoyancy for elevating said float cap. 45
7. A solution dispenser adapted for placement within a toilet flush tank having a flat interior bottom, said dispenser comprising 50
- a container filled with solution and having an externally threaded neck portion defining a top opening and a

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- flat base portion adapted for bearing on the flat interior bottom of said toilet flush tank
- a float cap adapted to cover the top opening of said container and having internal threads for engagement with the externally threaded neck portion,
- a displacement rod depending from the float cap and loosely extending through the top opening of said container and
- a seal fixed to the displacement rod at the end opposite the float cap within the container, said seal being of a size sufficient to block said top opening when in a position of engagement with the neck portion of said container,
- whereby said solution dispenser is effectively sealed by engagement of the internal threads of said float cap with said externally threaded container neck portion and upon disengagement thereof, said solution dispenser is operable to dispense solution in response to movement of said float cap and displacement rod when said container is placed within the flush tank of a toilet with the flat base portion resting on said flat interior bottom.
8. A solution dispenser adapted for placement within a toilet flush tank, said solution dispenser comprising
- a container adapted to be filled with solution and having a neck portion defining a top opening,
- a plug fitted within said top opening and having a central bore therein,
- a float cap adapted to cover the top opening and central bore and defining a chamber open in a downward direction,
- a displacement rod depending from the float cap and loosely extending through said central bore of said plug into said container, and
- a seal plug fixed to the displacement rod at the end opposite the float cap within the container, said seal plug being adapted to block said central bore, 5
- whereupon the container is sealed from within when said float cap is in a fully elevated position and upon lowering the float cap, solution is displaced from the container.

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