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Gray

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[54] **CHEMICAL DISPENSER FOR TOILET**

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[52] **U.S. Cl.** **4/223;** 4/228

[51] **Int. Cl.** **E03d 9/02**

[58] **Field of Search** 4/222, 223, 227, 228, 109

[56] **References Cited**

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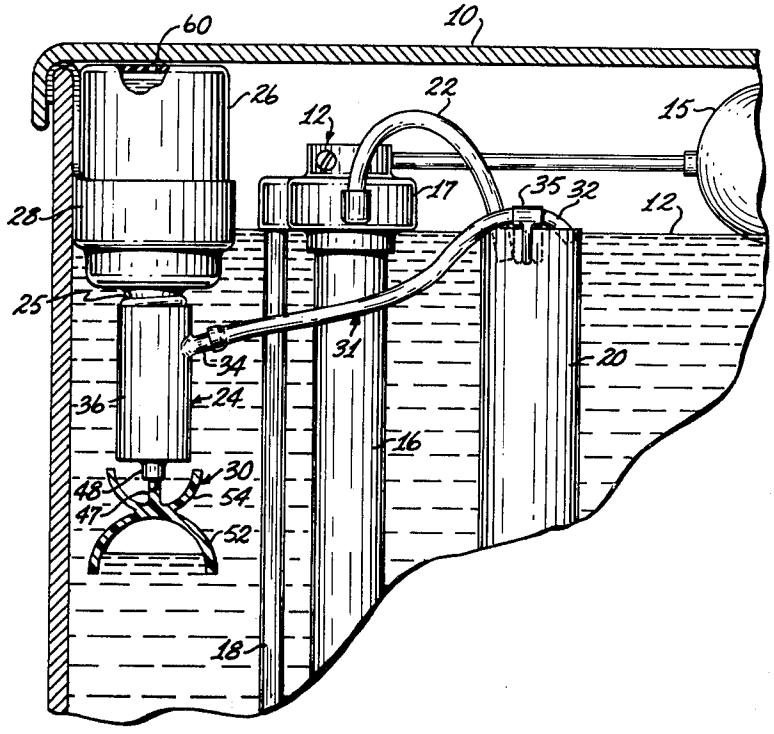
[57] **ABSTRACT**

An automatic dispensing mechanism for supplying a predetermined amount of liquid chemical to the bowl of a toilet tank combination for disinfecting, deodorizing, water conditioning, and the like.

9 Claims, 5 Drawing Figures



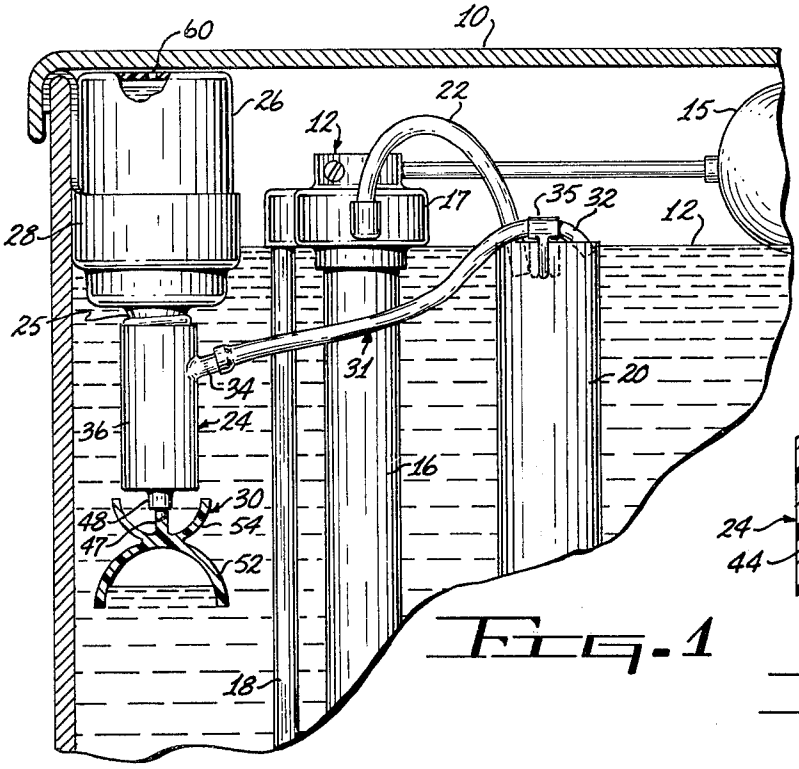


Fig. 1

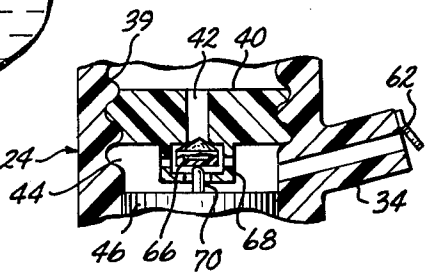


Fig. 5

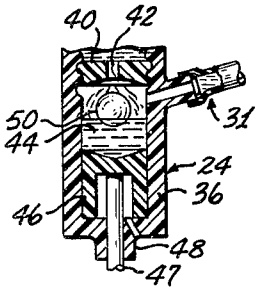


Fig. 3

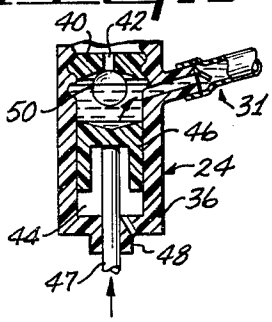


Fig. 4

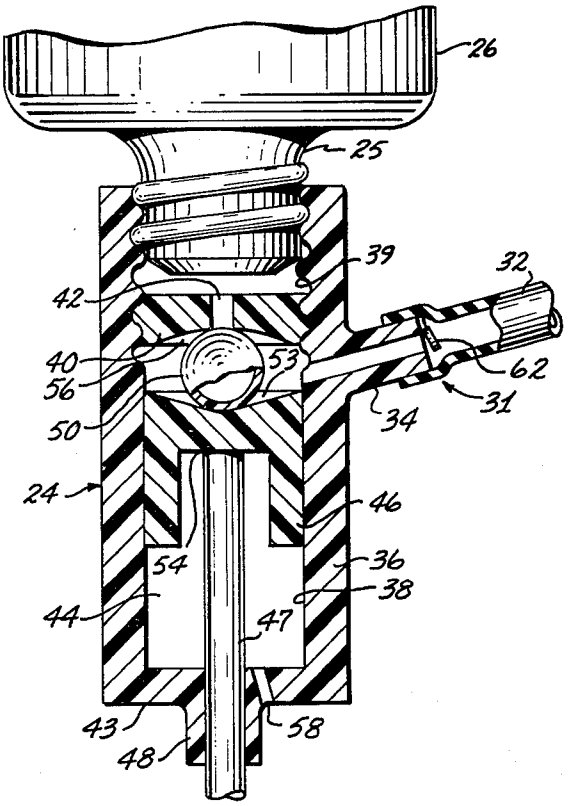


Fig. 2

CHEMICAL DISPENSER FOR TOILET

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to dispensers and more particularly to a liquid dispensing mechanism for use in conjunction with a toilet tank unit.

2. Description of the Prior Art

Several devices and techniques have been devised in an attmept to ease the well known problems and unpleasantries associated with the cleaning, disinfecting and deodorizing of toilet bowls.

The most commonly employed device is a throw away type bottle of liquid chemical which has a metering device attached to the filler neck thereof. The bottle is installed within the flush tank of the toilet tank combination in an inverted position so that the metering mechanism is below the normal water level. When the water level falls during a flushing operation, the metering valve is unseated and the liquid is dispensed from the bottle into the water of the tank. Upon completion of the flushing operation, the water within the tank will rise and reseat the metering valve. This technique has several drawbacks, one of which is that the time interval between the unseating and reseating of the valve mechanism determines the amount of liquid dispensed. Thus, the amount of liquid dispensed will vary from one toilet to the next with the determining factors being such things as the toilet's flushing mechanism, water pressure and the like. This prior art mechanism makes no provisions for limiting the amount of liquid dispensed per flushing operation, and if a flushing mechanism sticks or becomes otherwise inoperative during a flushing operation, the entire contents of the bottle can be dispensed into the flush tank. The amount of water contained within a flush tank is normally three gallons or more and the amount within the toilet bowl is usually less than one half gallon. Therefore, another drawback of this prior art device is that it dispenses the liquid into the flush tank where it becomes highly diluted. This results in very weak cleaning, disinfecting and deodorizing actions taking place in both the flush tank and the toilet bowl rather than the desirable relatively strong actions of this type taking place in the toilet bowl where they are needed. Also, since the dispensing of liquid commences at the beginning of the flush cycle, much of this liquid is wasted by being passed through the bowl.

Other techniques and mechanisms such as those suggested in U.S. Pats. Nos. **3,060,457 l and 3,428,970** have not been too successful for various reasons such as complexity, cost, size and the like. One drawback common to all such mechanisms known to me is the lack of a structure which will limit the amount of liquid dispensed during each flushing operation regardless of the operation of the toilet's flushing mechanism. Also, these mechanisms dispense the liquid during the entire flushing cycle with the resulting waste of fluid by passing through the toilet bowl.

Therefore, in view of the foregoing, a need exists for an improved chemical dispenser mechanism for use with toilet tank combinations which solves some of the problems of the prior art and eases the unpleasantries associated with the cleaning, disinfecting and deodorizing of toilet bowls.

SUMMARY OF THE INVENTION

In accordance with the present invention, a chemical dispenser mechanism is disclosed for dispensing a predetermined amount of liquid chemicals into the toilet bowl of a toilet tank combination. The dispenser mechanism may be adapted for installation on the filler neck of commonly used throw away bottles which contain chemicals suitable for this purpose.

The dispenser mechanism includes a positive double acting float mechanism which unseats a floating valve when the water level within a toilet flush tank drops at the beginning of a flushing operation. Unseating of the floating valve allows liquid chemicals from the bottle to flow into the metering chamber of the dispenser mechanism which upon filling will carry the floating valve back to its seated position. When the water level rises within the flush tank, the double acting float mechanism will drive a piston which pumps the liquid from the metering chamber through a tube into the overflow pipe of the toilet tank combination. Thus, the mechanism of the present invention provides a device which positively limits the amount of liquid dispensed per flushing operation, dispenses the fluid directly into the toilet bowl where it is needed and at a time when the flushing operation is nearing completion so that little or none of the liquid is wasted by passing through the toilet bowl.

Accordingly, it is an object of the present invention to provide a new and useful chemical dispenser for use in conjunction with a toilet tank combination.

Another object of the present invention is to provide a new and useful chemical dispenser for use in a toilet tank combination and which is simple to use and inexpensive to manufacture.

Another object of the present invention is to provide a new and useful chemical dispenser for a toilet tank combination which supplies a predetermined amount of chemicals directly to the toilet bowl.

Another object of the present invention is to provide a new and useful chemical dispenser for a toilet tank combination which positively limits the amount of chemicals dispensed per flushing operation.

Another object of the present invention is to provide a new and useful chemical dispenser for a toilet tank combination which delays dispensing of the chemicals until the flushing cycle is nearing completion.

Still another object of the present invention is to provide a mechanism of the above described character which employs a floating valve to positively limit the amount of liquid dispensed per flushing operation and employs a positive double acting float mechanism to insure proper operation of the dispenser mechanism.

The foregoing and other objects of the present invention as well as the invention itself may be more fully understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary sectional view taken on a vertical plane of a toilet flush tank having the mechanism of the present invention installed therein.

FIG. 2 is an enlarged fragmentary sectional view of the mechanism of the present invention.

FIG. 3 is a view similar to FIG. 2 showing the dispenser mechanism in one stage of its operation.

FIG. 4 is another view similar to FIG. 2 and illustrating that mechanism in another stage of its operating sequence.

FIG. 5 is a fragmentary sectional view illustrating a modification of the mechanism of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, FIG. 1 shows a fragmentary portion of a flush tank **10** of the conventional type used in conjunction with an accompanying toilet bowl (not shown). The flush tank **10** contains a quantity of water with which the bowl is flushed, the water level being indicated at **12.** The principle connection between the flush tank **10** and the toilet bowl is from the bottom of the tank **10,** which, as is well known in the art, is selectively opened and closed by a suitable trip lever operated valve assembly (not shown). Water is supplied to the tank **10** through a float operated ball cock **14** having the usual float **15,** water inlet pipe **16,** shut off valve **17,** and tank fill pipe **18.** The tank **10** is also supplied with the usual overflow pipe **20** which communicates with the toilet bowl so that an outlet is provided for the water should the shut off valve **17** malfunction. The overflow pipe **20** is accordingly fixed at a level somewhat above the normal water lever **12** and below the top of the tank.

A second function of the overflow pipe **20** is for separately supplying a quantity of water to the toilet bowl which is separate from the water used for flushing. To this end, an auxiliary water supply line **22** is connected from the shutoff valve **17** to supply a relatively small amount of water to the overflow pipe **20,** and subsequently to the toilet bowl, each time the tank is filled. This auxiliary amount of water follows the completion of the flushing operation and assures that a proper quantity of water is in the bowl between flushings.

The dispenser of the present invention is indicated generally by the reference numeral **24** and is shown as being demountably attached to the filler neck **25** of a conventional type throw away bottle **26.** Bottles of this type are currently being marketed under various tradenames and in general contain liquid chemicals suitable for one or more of the actions of disinfecting, cleaning, deodorizing, or otherwise conditioning the toilet tank combination.

It should be understood that although the dispenser **24** is illustrated and described in the preferred combination with the bottle **26,** it is not intended that the dispenser **24** of the present invention be limited for use in combination with the bottle **26** only. It should be readily apparent that the dispenser **24** can be configured or otherwise adapted to attach to any container which is suitable to function as a liquid reservoir.

In any event, the bottle is installed within the flush tank **10** in an inverted position so that the filler neck **25** or liquid outlet thereof is disposed below the normal water level **12** of the tank. The bottle **26** may be mounted in this position in any conventional manner such as with a bracket **28.** Thus, the dispenser **24** is also positioned below the normal water level **12** within the tank and as seen in FIG. **1** is provided with a positive double acting float means **30.** The float **30,** as will hereinafter be described in detail, responds to the lowering and raising of the water level **12** to activate the dispenser mechanism **24** at each flushing of the toilet to deliver a predetermined amount of liquid chemicals to the overflow pipe **20** through a delivery means **31.** The delivery means **31** includes a delivery tube **32** which is suitably coupled on one end thereof to a fluid outlet boss **34** formed on the dispenser **24** and has its other end secured to the overflow pipe **20** such as by clip means **35.**

As best seen in FIG. **2,** the dispenser **24** comprises a housing **36** of generally cylindrical configuration having a perpendicular axial bore **38** formed therein. The upper end of the housing **36** is open and threads **39** are formed in the bore **38** to provide means for attaching the dispenser **24** to the bottle **26.** A valve seat **40** having an orifice **42** therein is threadably or otherwise positioned within the bore **38** of the housing **36** and is located a sufficient distance from the open end of the housing so as not to interfere with the filler neck **25** of the bottle **26.** The bottom of the housing **36** is closed at **43** to form that portion of the axial bore **38** which extends between the valve seat **40** and the closed bottom **43** into a fluid metering chamber **44.** A piston **46** is axially reciprocally mounted within the metering chamber **44** and has a piston rod **47** depending therefrom through a rod guide boss **48** formed on the bottom **43** of the housing **36.** FIG. **1** shows the lowermost end of the piston rod **47** as being suitably attached to the double acting float mechanism **30.**

A floating valve **50** in the form of a hollow ball is positioned within the metering chamber **44** and coacts with the valve seat **40** to provide a means which controls the flow of liquid between the bottle **26** and the metering chamber **44** as hereinafter will be described in detail.

The positive double action float mechanism **30** is formed with an inverted cup shaped portion **52** and an upright cup shaped portion **54.** The portions **52** and **54** may be suitably attached to each other in a vertically axially aligned relationship, or may be integrally formed such as by molding. In operation, the upright cup portion **54** will entrap water therein when the water level **12** falls within the tank **10** and will therefore add the weight of the entrapped water to the weight of the float **30,** thus ensuring a positive downward movement of the float **30,** piston rod **47,** and piston **46.** When the water level **12** begins to rise in the tank **10,** air will be entrapped within the inverted cup shaped portion **52.** When the level **12** passes above the top of the upright portion **54,** the weight of the water entrapped therein will be negated and the buoyancy of the float **30,** provided by the entrapped air, will ensure a positive upward movement of the float **30,** piston rod **47,** and piston **46.**

The operation of the dispensing mechanism **24** can best be understood by sequentially considering FIGS. **2, 3,** and **4.** FIG. **2** illustrates the dispenser **24** in the position that it would assume between flushes of the toilet. In this position the water lever **12** is in the position shown in FIG. **1** and the float **30** will hold the piston **46** in the up position. The piston **46** is formed with an inverted conical recess **53** in the head **54** thereof so as to center the floating ball valve **50** and hold that valve in seated engagement with the valve seat **40** to prevent liquid chemicals from entering into the metering chamber **44.**

When the water level **12** falls, as occurs upon commencement of a flushing operation, the float **30** will pull the piston **46** down to the position seen in FIG. **2.**

When the piston **46** moves down, the ball valve **50** also moves down under the influence of gravity and allows liquid chemicals from the bottle **26** to pass through the orifice **42** of the valve seat **40** into the metering chamber **44.** As the metering chamber **44** fills, the floating ball valve **50** will be carried upwardly on the rising liquid. The underside of the valve seat **40** is formed into a dome shaped cavity **56,** so as to center the valve **50** as it is floatingly carried upwardly by the rising liquid chemicals. Thus, the ball valve **50** will be seated on the valve seat **40** upon entry of sufficient liquid chemical into the metering chamber **44.**

As the flush tank begins to refill, as occurs when the flushing operation is nearing completion, the float **30** will cause the piston **46** to move upwardly within the metering chamber **44** as shown in FIG. **4.** When the piston **46** is moving upwardly it will move the liquid chemical within the metering chamber **44** with it and this action will firmly hold the ball valve in sealing engagement with the valve seat to prevent liquid from returning to the bottle **26** and the liquid chemical will be pumped out of the metering chamber **44** through the outlet boss **34** to the delivery tube **32** and ultimately, into the toilet bowl through the overflow pipe **20.**

The bottom **43** of the housing **36** is provided with a vent opening **58** therein to prevent the movements of the piston from being hampered by a dashpot action. Also, the bottle **26** may be provided with a knockout in the bottom thereof to provide a vent **60** therein so that a partial vacuum will not be drawn in the bottle upon withdrawal of a portion of the liquid chemicals therefrom.

It may now be seen that the liquid chemicals supplied to the metering chamber **44** are forced into the delivery tube **32** upon upward movement of the piston **46.** Most of the liquid thus moved will pass through the delivery tube into the overflow pipe **20** and an amount of this liquid sufficient to substantially fill the tube will remain therein until the next flushing cycle occurs. This remaining liquid may be allowed to drain back into the metering chamber **44** when the piston **46** is moved downwardly. In this manner, the liquid which comes from the delivery tube will partially supply the amount of liquid needed to fill the metering chamber with the balance being supplied from the bottle **26** as previously described. Thus, the amount of liquid dispensed at each cycle of the dispenser mechanism **24** will be equal to the amount of liquid supplied from the bottle and will be at some valve less than the total capacity of the metering chamber.

An alternate method of handling the liquid which remains in the delivery tube **32** would be to provide a check valve means **62** proximate the fluid outlet boss **34.** The check valve means may take the form of a simple flapper mechanism and would prevent any reverse flow of liquid from occuring. The amount of liquid dispensed at each cycle of the dispensing mechanism **24** when equipped with the check valve means **62** may be seen to be substantially equal to the capacity of the metering chamber **44.**

A modified form of the dispenser mechanism **24** is illustrated in FIG. **5** and may be seen therein to include a disc shaped floating valve **66.** The valve **66** is captively held proximate the orifice **42** of the valve seat **40** by an open cage member **68** dependingly formed in axial alignment with the valve seat **40.** The floating valve **66** is axially movable within the cage **68** into sealing engagement with the valve seat and out of engagement therewith so as to function in substantially in the same manner as the previously discribed floating ball valve **50.** In this embodiment, the piston **46** is formed with an upstanding projection **70** which engagingly contacts the disc valve **66** to ensure a firm sealing contact between the valve **66** and the seat **40** between flushing cycles.

While the principles of the invention have now been made clear in an illustrated embodiment, there will be immediately obvious to those skilled in the art, many modifications of structure, arrangements, proportions, the elements, materials, and components used in the practice of the invention, and otherwise, which are particularly adpated for specific environments and operation requirements without departing from those principles. The appended claims are therefore intended to cover and embrace any such modifications within the limits only of the true spirit and scope of the invention.

What I claim is:

1. A dispenser for delivering a predetermined amount of liquid to the toilet bowl of a toilet tank combination each time the toilet is flushed, said dispenser comprising:

a. a liquid reservoir mountable within the flush tank of the toilet;

b. a housing attached to said liquid reservoir and having a liquid metering chamber formed therein which is in liquid receiving communication with said liquid reservoir; eservoir;

c. delivery means on said housing through which liquid from the metering chamber thereof is delivered to the toilet bowl;

d. valve means within said housing for controlling the flow of liquid between said liquid reservoir and the metering chamber of said housing, said valve means when open allows liquid to enter into the metering chamber and will close when the metering chamber is substantially filled;

e. a piston reciprocally movable within the metering chamber of said housing for holding said valve means closed between flushing operations of the toilet and for allowing said valve means to open upon commencement of a flushing operation, said piston adapted to pump the liquid from the metering chamber of said housing to said delivery means as a flushing operation nears completion; and

f. float means within the flush tank of the toilet and coupled to said piston for reciprocally moving said piston in response to the emptying and filling of the flush tank during a flushing operation of the toilet.

2. A dispenser as claimed in claim **1** wherein said valve means comprises:

a. a valve seat having an orifice formed therethrough; and

b. a floating ball valve within the metering chamber of said housing.

3. A dispenser as claimed in claim **1** wherein said valve means comprises:

a. a valve seat having an orifice formed therein;

b. an open cage depending from said valve seat into the metering chamber of said housing, said open cage disposed in axial alignment with the orifice formed in said valve seat; and

c. a floating valve within said open cage and axially movable therein to open and close the orifice formed in said valve seat.

4. A dispenser as claimed in claim 1 wherein said delivery means comprises:
   a. a liquid outlet boss formed on said housing and having a passage therethrough which communicates with the liquid metering chamber of said housing;
   b. a delivery tube attached on one end thereof to said outlet boss; and
   c. means on the other end of said delivery tube for attachment thereof to the overflow pipe of the toilet.

5. A dispenser as claimed in claim 1 wherein said float means comprises an inverted cup shaped structure and an upright cup shaped structure in vertically disposed axial alignment with each other.

6. A dispenser as claimed in claim 1 further comprising a check valve means within said delivery means for allowing the liquid to flow therethrough from the metering chamber of said housing and for checking reverse flow of that liquid.

7. A dispenser for delivering a predetermined amount of liquid to the toilet bowl of a toilet tank combination each time the toilet is flushed, said dispenser comprising:
   a. a liquid reservoir mountable within the flush tank of the toilet and having a depending liquid outlet thereon;
   b. a housing having a perpendicular bore therein which is open at the top and closed at the bottom, said housing attached to the outlet of said liquid reservoir to place the bore of said housing in liquid receiving communication with said reservoir;
   c. a valve seat within the bore of said housing to provide a liquid metering chamber between said valve seat and the bottom of said housing, said valve seat having an orifice through which liquid from said reservoir is admitted to the metering chamber of said housing;
   d. floating valve means within the metering chamber of said housing for controlling the flow of liquid through said valve seat, said floating valve means adapted to sealingly engage said valve seat when the metering chamber becomes substantially filled with liquid from said reservoir;
   e. outlet means on said housing through which liquid from the metering chamber is delivered to the toilet bowl of the toilet;
   f. a piston axially reciprocally movable between up and down positions within the metering chamber of said housing, said piston adapted to holdingly engage said floating valve means in sealing engagement with said valve seat when said piston is in the up position; and
   g. float means within the flush tank of the toilet and coupled to said piston for moving said piston in response to the emptying and filling of the flush tank, said float means adapted to hold said piston in the up position when the flush tank is full whereby said floating valve means sealingly engages said valve seat, said float means adapted to move said piston downwardly during emptying of the flush tank to disengage said floating valve means from said valve seat, and said float means adapted to move said piston upwardly during refilling of the flush tank to pump the liquid from the metering chamber of said housing into said outlet means.

8. A dispenser as claimed in claim 7 wherein said floating valve means comprises a hollow ball.

9. A dispenser as claimed in claim 7 wherein said float means comprises:
   a. a piston rod depending from said piston through the bottom of said housing;
   b. an upright cup shaped structure on the lowermost end of said piston rod; and
   c. an inverted cup shaped structure integral with said upright cup shaped structure and depending in vertical axial alignment therefrom.

* * * * *