United States Patent [19]

Kachergis

[11] **3,709,246**

[45] **Jan. 9, 1973**

[54] **WATER INLET CONTROL MEANS FOR TOILET TANKS**

[76] Inventor: **Henry J. Kachergis,** 89 Larchmont Avenue, Waterbury, Conn. 06705

[22] Filed: **July 26, 1971**

[21] Appl. No.: **166,103**

[52] **U.S. Cl.**.....**137/216,** 137/436;441;444;449

[51] **Int. Cl.**.....**F16k 45/00**

[58] **Field of Search** 4/41; 137/216, 436, 434, 441, 137/442, 444, 449

[56] **References Cited**

UNITED STATES PATENTS

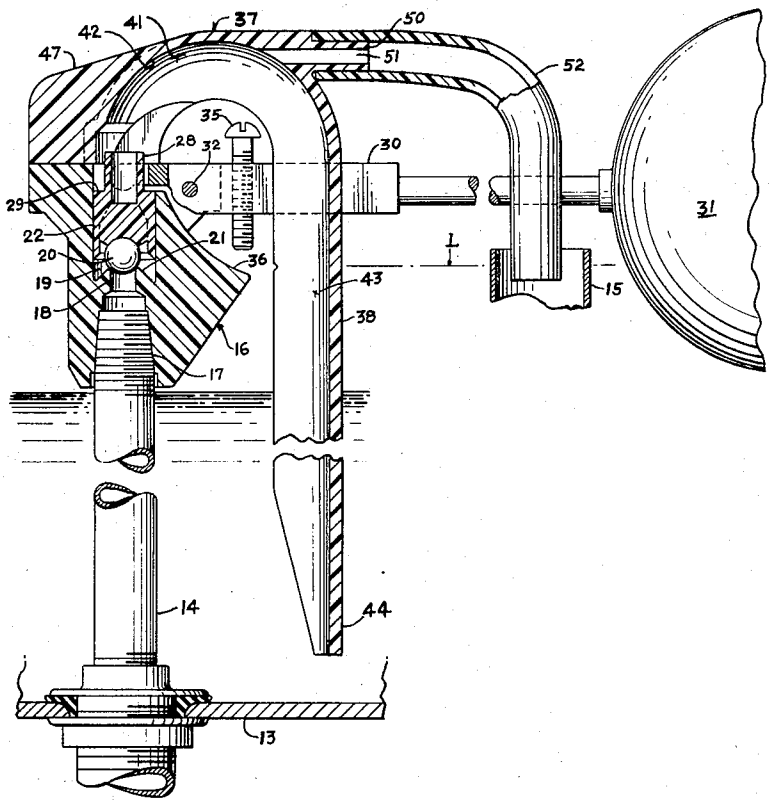
2,146,794	2/1939	Clemmons	137/216
3,605,455	9/1971	Olthuis	137/216 X

Primary Examiner—Henry T. Klinksiek
Attorney—Roland S. Kelley

[57] **ABSTRACT**

An improved water inlet control for toilet tanks of light weight simple construction, has an inverted U-shaped deflector channel for conducting water from an upwardly discharging cutoff valve to a down spout leading into the tank. The water is not forced to change direction abruptly at any point. The open channel itself serves as a true vacuum breaker, without pulling in air during normal operation, and the float controlled valve may function as a check valve when the float is down, thus giving complete assurance against the possibility of back flow if a vacuum should occur in the supply pipe.

7 Claims, 13 Drawing Figures



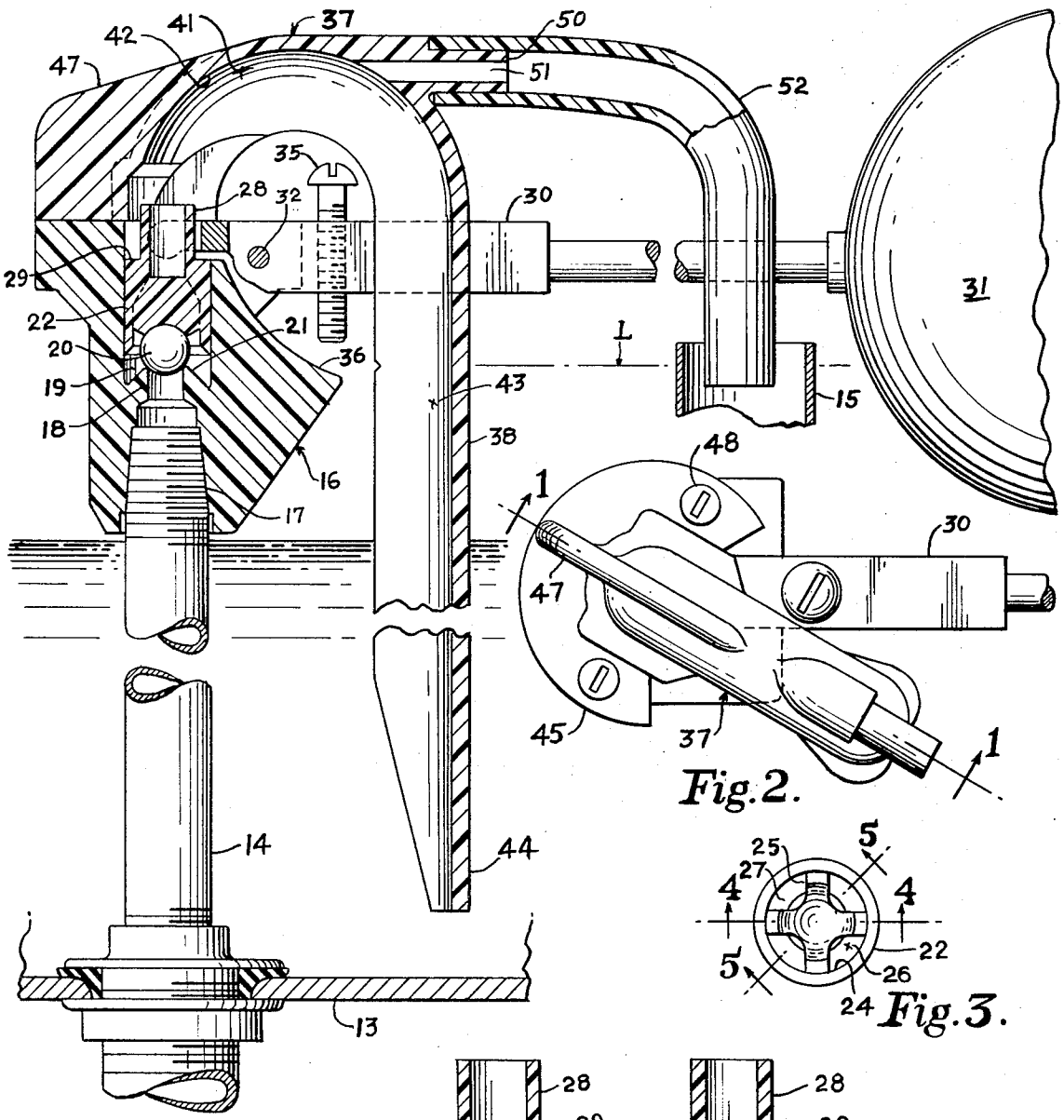


Fig. 1

Fig. 2.

Fig. 3.

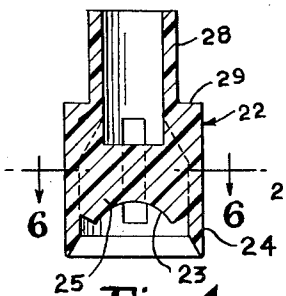


Fig. 4.

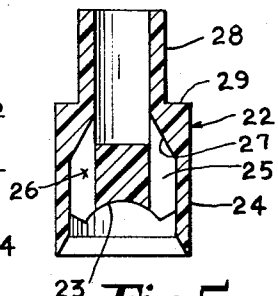


Fig. 5.

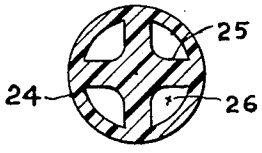


Fig. 6.

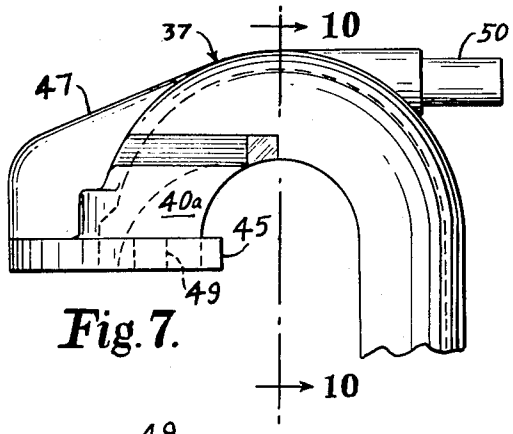


Fig. 7.

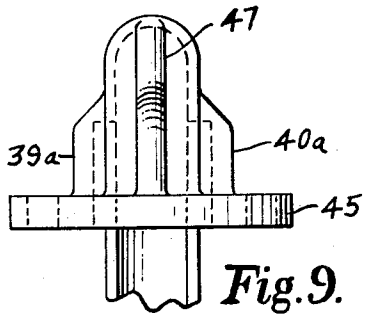


Fig. 9.

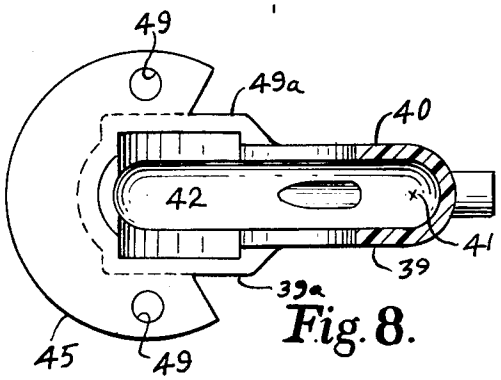


Fig. 8.

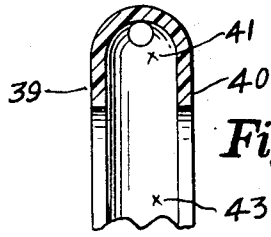


Fig. 10.

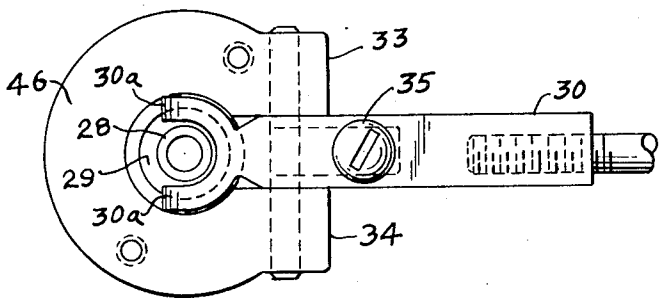


Fig. 11.

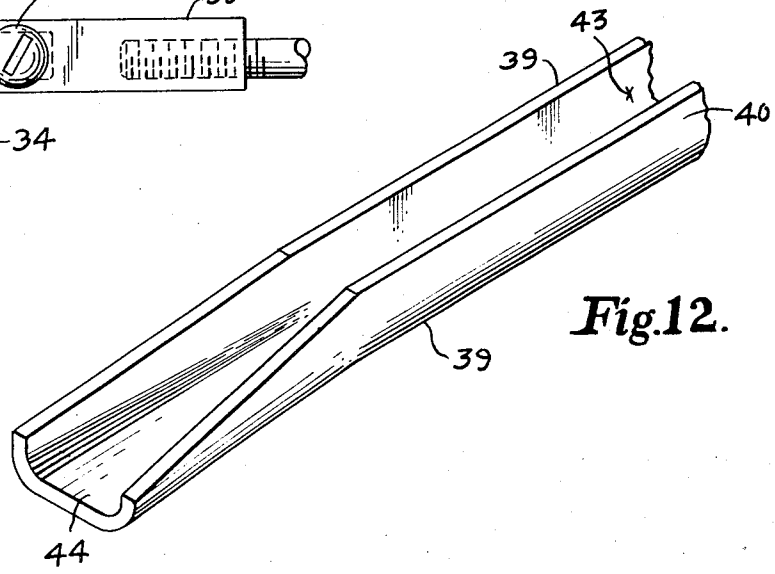


Fig. 12.

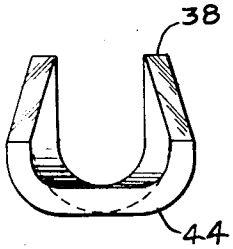


Fig. 13.

WATER INLET CONTROL MEANS FOR TOILET TANKS

My invention relates to water inlet control means for toilet tanks, commonly referred to as ball cock valves.

While certain desirable functional features of ball cock valves as recited in various plumbing codes have long been known, they are difficult of achievement at a competitive cost under present market conditions. A good ball cock valve should be relatively quiet in operation without unduly restricting the rate of flow and there should be no possibility of back flow into the supply pipe even if a high vacuum should suddenly occur in the supply line.

The prior art is replete with devices which attempt to quiet the operation, as by spreading the flow to reduce velocity. There are also examples of antisiphon devices and vacuum breakers, which in themselves are often a source of noise. Such prior valves and control devices have required at one or more places in the system an abrupt change in direction of flow which results in turbulence that may cause noise. While the sheer mass of many such valves tends to reduce the noise to acceptable levels, a low cost ball cock valve must be light in weight and require a minimum of parts. The commonly used antisiphon devices require one or more movable parts and become unreliable after a time. Some of the known vacuum breakers with an opening to the atmosphere above the water line have a separate element which adds to the cost. Others cause excessive noise by drawing air into the stream of water.

My invention therefore has as its general object to provide a water inlet control means for toilet tanks which is capable of being manufactured at low cost, which at the same time is relatively quiet in operation and wherein there is embodied a true vacuum breaker that requires no additional part and which will not suck air into the stream. This is preferably accomplished by the use of an inverted U-shaped deflector channel which is completely open throughout its length. An open sided spout leading from the exit end of such channel further insures against the drawing in of air and spreads or reduces the velocity of flow into the tank. At no point in the entire system is there any abrupt change in direction of flow.

Some of the more specific objects are to make a complete water inlet means with a minimum of parts which are simple in shape and capable of being manufactured without difficulty; to avoid objectionable overall height above the water line; and to provide along with the vacuum breaker function of the U-shaped channel, a float controlled valve which may act as a check valve when the float is down to give further assurance against the possibility of back flow if a vacuum occurs in the supply line.

Other objects and advantages of my invention will hereinafter more fully appear.

In the accompanying drawings I have shown for purposes of illustration one embodiment which my invention may assume in practice. In these drawings:

FIG. 1 is a vertical cross-sectional view on line 1—1 of FIG. 2;

FIG. 2 is a top plan view;

FIGS. 3, 4 and 5 are detail views of the movable valve plunger, FIG. 3 being a bottom plan, while FIGS. 4 and 5 are vertical sections on lines 4—4 and 5—5 respectively of FIG. 3;

FIG. 6 is a cross section on line 6—6 of FIG. 4;

FIG. 7 is a side elevation of the deflector separated from the valve body and showing a portion of the down spout;

FIG. 8 is a bottom plan view of the deflector with the down spout in cross section;

FIG. 9 is an end elevation as seen from the left of FIG. 7;

FIG. 10 is a vertical cross section on line 10—10 of FIG. 7;

FIG. 11 is a top plan view with the deflector removed to show the valve body and float lever connection;

FIG. 12 is a perspective view of the down spout; and

FIG. 13 is a bottom plan view of the down spout.

In FIG. 1 there is indicated a portion of the bottom wall 13 of a toilet tank to which is attached, in the usual manner, a riser or supply pipe 14. There is also indicated the upper portion of the usual overflow pipe 15 which of course leads into the toilet bowl. The upper end of the overflow pipe defines the maximum possible water level in the tank which is hereinafter referred to as the high water level L, although in practice the float would be adjusted so that the water will shut off before reaching that level.

The valve body generally designated 16, is preferably a one piece molding of suitable plastic material for economy of manufacture, although it could be made of a metal casting with appropriate machining operations. The lower portion of the body 16 is internally threaded for secure attachment to the threaded end 17 of supply pipe 14. Water flows upwardly through a supply port 18 into a valve chamber 19 under the control of a ball valve 20, which is adapted to shut off the water flow when held against conical valve seat 21. As shown, the valve chamber is an upwardly opening cylindrical bore into which is slidably fitted a valve operating plunger 22.

The plunger 22 is generally hollow to allow free upward flow of water without abrupt change of direction. It does, however, have a centrally located cage with a spherically concave bottom surface 23, which confines the ball 20 during the small up and down movement in opening and closing of the valve. As seen in FIGS. 3, 4 and 5 the ball control cage is integrally joined to cylindrical wall 24 by four webs 25, with amply sized passages 26 between the webs 25. Water flows through passages 26 and along the inside conical surface 27 to the upwardly directed discharge tube or nozzle 28. Discharge tube 28 is substantially smaller in diameter than the cylindrical wall 24, thus providing an upwardly facing annular ledge or shoulder 29.

A float control arm 30 carrying a float 31, pivots on a pin 32 mounted in two parallel ears 33 and 34 formed on the valve body 16, as best seen in FIG. 11. The operating end of the float control arm is bifurcated to straddle the discharge tube 28 and provides two rounded bearing ends 30*a* acting against the shoulder 29 of the valve operating plunger 22, as best seen in FIG. 11. An adjustable screw 35 fitted in the control arm 30 strikes a boss 36 formed on the valve body 16 to limit the downward movement of the float in the tank. The general mode of operation follows the usual pattern. When the tank drains as the toilet is flushed, the float drops allowing valve 20 and plunger 22 to lift under the pressure of water in supply pipe 14. As the tank refills the float rises and acts on the valve plunger to force the ball valve into sealing relation with the seat

21, thus shutting off the flow of water. Since the ball 20 is free to move when the float is down it may serve as a check valve if there should be a vacuum in supply pipe 14.

The U-shaped vertically arranged deflector, generally designated 37 and the down spout 38 are preferably molded together as one piece from a suitable plastic material, but if desired the down spout may be made made as a separate part and assembled with the deflector. The deflector is generally U-shaped in cross section with side walls 39 and 40 to provide a channel 41 which opens to the atmosphere inwardly and downwardly throughout the entire length of the deflector and also across the entire width of channel 41. The entrance end of channel 41 is alined with the discharge tube 28 so that a stream of water is directed tangentially against the smooth curved inside surface 42 of the channel. The water flows along this surface 42, being held in the channel by centrifugal force so that it gradually and smoothly changes direction to emerge downwardly from the exit end of the channel. While the down spout is shown as an integral continuation of the deflector I have chosen for convenience of description to refer to the U-shaped section as a deflector and the straight section which extends downwardly from the leg of the U, as a down spout. The upper portion of the spout is shaped to form a channel 43 which is a smooth continuation of channel 41 in the deflector. It is open laterally preferably across its entire width to preclude the possibility of drawing air into the stream, which would be a source of noise. Channel 43 gradually widens and flattens as it approaches the spill end 44 as seen in FIG. 12 so as to reduce the velocity of flow as the water falls into the tank.

As seen in FIG. 2 the deflector 37 extends from the valve body at an angle to the float control arm 30 so that the down spout 38 and deflector 37 will not interfere with the up and down movement of the float control arm. The deflector is secured to the valve body 16 by a horizontal flange 45 which is seen in FIG. 8 as having a somewhat more than half circle extent around the center line of valve chamber 19. Flange 45 fits against a corresponding flange 46 formed on the valve body as seen in FIG. 11. A strengthening rib 47 extends from the central portion of flange 45 over at least a part of the exterior surface of deflector 37. Flanges 45 and 46 may be attached together by any suitable means such as screws 48 extending through holes 49 in the flanges. Portions 39*a* and 40*a* of deflector walls 39 and 40, on opposite sides of discharge tube 28, are offset outwardly to provide space to accommodate bearing ends 30*a* of the float control arm.

The U-shaped flow channel of the deflector allows for a very convenient means to take off a small stream of water to refill the bowl after flushing. For this purpose it is only required to form a tubular boss 50 on the deflector with a small passage 51 leading tangentially away from the curved inner surface 42. A piece of flexible tubing 52 may then be employed to conduct the refill water to the overflow tube 15.

While the deflector is mounted above the high water level it leads directly from the valve discharge means and the radius of its channel can be ample to allow a smooth nonturbulent flow while keeping the overall height within acceptable limits. In practice I have found that good results are obtained with a flow channel radius of about seven-eighths of an inch.

It will now be apparent that, as a result of my invention, a ball cock valve having all the desirable functional features may be produced at a minimal cost. It consists of a relatively small number of easily manufactured parts. The assembly is light in weight, yet the operation is comparatively quiet. It functions as a true vacuum breaker without additional parts and without pulling air into the stream as it flows to the tank.

I Claim:

1. Water inlet control means for toilet tanks comprising

a. a float controlled valve adapted for connection to a supply pipe and having an upwardly directed discharge means located above the high water level of the tank;

b. a deflector of inverted U-shape mounted above said valve and having an inwardly and downwardly opening channel extending throughout its length, the entrance end of said channel being located in line with said discharge means whereby, when said valve is open, a stream is directed tangentially against the inside surface of said channel, the outlet end of said channel being located to one side of said valve, the open sides of said U-shaped deflector being positioned above the high water level; and

c. a downwardly extending spout in line with the outlet end of said deflector and adapted to control the flow of water to the lower portion of the tank, the upper portion of said spout being channel shaped and opening laterally inwardly with its inside surface constituting a smooth continuation of the inside surface of the channel of said deflector.

2. Water control means as defined in claim 1, wherein said deflector is mounted so that its U-shaped channel extends vertically and wherein said discharge means is a vertically directed nozzle adapted to direct a stream tangentially against the downwardly facing inside surface of the deflector channel near its entrance end.

3. Water inlet control means as defined in claim 1, wherein said valve includes a body having a plurality of concentric vertical bores, a vertically movable plunger fitted in the upper bore and having vertical passages leading directly to said nozzle which is at the upper end of said plunger, whereby the combination of valve, deflector and spout allows flow through the entire inlet control means without any abrupt change of direction.

4. Water inlet control means as defined in claim 1, wherein said float controlled valve is a ball type valve which may act as a check valve to prevent backflow into the supply pipe.

5. Water inlet control means as defined in claim 4, wherein said float controlled valve has a valve body with an upwardly opening cylindrical bore, a plunger slidably fitted in said bore, said plunger being generally hollow to provide flow passage without abrupt change of direction, said plunger also having a centrally located ball control cage.

6. In combination with water inlet control means as defined in claim 1, a refill tube connection including a boss formed on said deflector, said boss having a passage which leads tangentially in a downstream direction from the deflector channel.

7. Water inlet control means as defined in claim 1, wherein said float controlled valve has a float carrying arm extending to one side of said valve, said deflector extending from said valve at an angle to said float carrying arm.

* * * * *