

April 23, 1963

E. H. BROWN
WATER SILENCING AND SAVING MEANS FOR BALL COCK
VALVE ASSEMBLY IN TOILET FLUSH TANK
Filed March 6, 1959

3,086,546

Fig. 1.

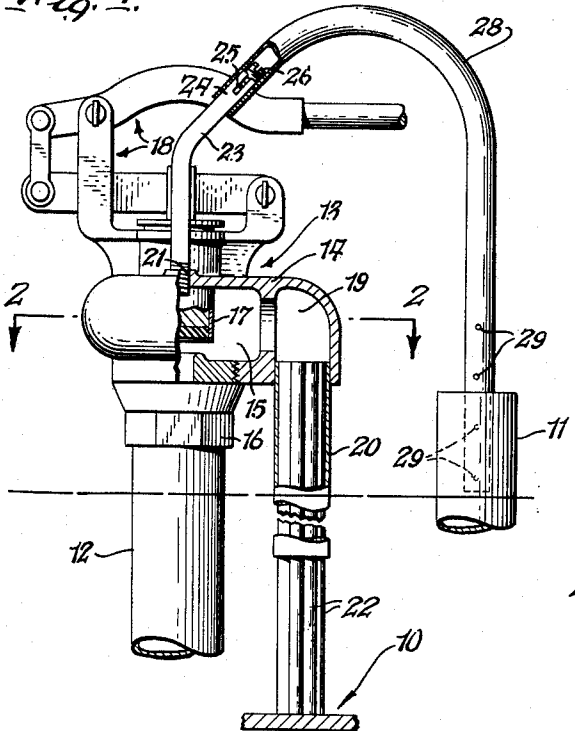


Fig. 2.

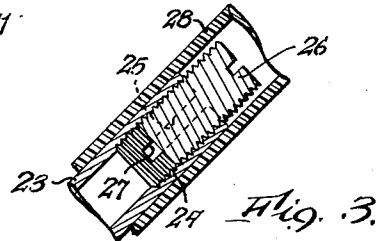
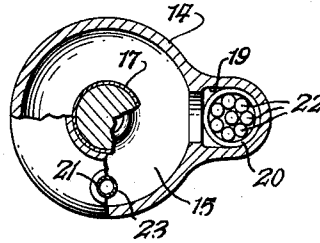


Fig. 5.

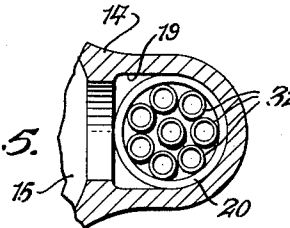


Fig. 4.

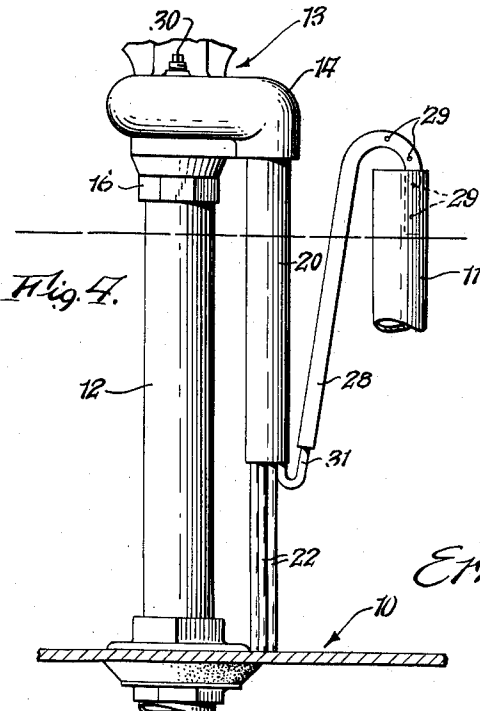
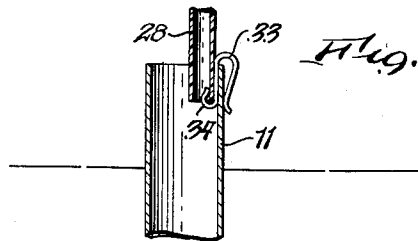


Fig. 6.



INVENTOR

Ernest Harold Brown

BY *Gopp and Sommer*

ATTORNEY

1

3,086,546
WATER SILENCING AND SAVING MEANS FOR
BALL COCK VALVE ASSEMBLY IN TOILET
FLUSH TANK

Ernest Harold Brown, 105 Sherwood Ave.,
Hamburg, N.Y.

Filed Mar. 6, 1959, Ser. No. 797,619
7 Claims. (Cl. 137-436)

This invention relates to improved water silencing and saving means adapted to be attached to the conventional ball cock valve assembly found in toilet flush tanks for reducing turbulence and noise of the water flowing through the fill tube into the tank as well as the amount of water flowing through the overflow pipe into the toilet bowl, and thereby eliminate waste of such water.

The vast majority of toilets, whether new or old, have an upstanding float operated ball cock valve assembly for controlling the flow of the incoming water into the flush tank and toilet bowl such valve assembly includes a downwardly extending tube for filling the tank and a refill tube connecting the valve assembly with the overflow pipe for diverting a portion of the water directly to the toilet bowl, while the tank is refilling after each flush. This diversion of a portion of the water is employed to assure a good water seal in the bowl for protection against sewer gases.

Even though the tank fill tube may be long enough to remain below the lowest level of the water in the flush tank in order to somewhat diminish the turbulence and noise of the flow of water into the tank, there still remains a substantial amount of turbulence and noise in the assembly because of the irregularities in its internal surfaces, and the variations in the cross-sectional areas through which the water flows, plus the fact that the direction of flow of the incoming water is reversed in passing from the intake pipe through the valve assembly and then down through the fill tube. Furthermore, almost invariably more water is diverted into the toilet bowl through the refill and overflow pipes than is necessary, tests having shown that as high as 4,000 gallons or more per year may be wasted in this manner.

Accordingly, it is a primary object of this invention to provide improved water silencing and saving means adapted to be attached to the ball cock valve assembly for reducing turbulence and noise of the water flowing through the ball cock valve assembly into the flush tank as well as the amount of water flowing through the overflow pipe into the toilet bowl, and thereby eliminate waste of such water.

Another object of the invention is to provide an improved water silencing means comprising a plurality of elongated members adapted to be inserted into the fill tube throughout a substantial portion of its length for reducing the turbulence and noise of the water flowing through the valve assembly into the flush tank.

Another object of the invention is to provide an improved water silencing means comprising a plurality of flexible and elongated, solid rods and/or hollow tubes adapted to be inserted into the fill tube substantially throughout its length, for reducing turbulence and noise of the water flowing through the valve assembly into the flush tank.

Another object of the invention is to provide an improved water saving means adapted to be connected to the ball cock valve assembly and overflow pipe in place of the conventional, valveless refill tube and including tubular means having a restricted opening therein for reducing the amount of water flowing through the overflow pipe into the toilet bowl and thereby eliminate waste of such water.

Still another object of the invention is to provide an improved water saving means adapted to be connected

2

to the ball cock valve assembly and overflow pipe in place of the conventional, valveless refill tube and including tubular means having an adjustable metering valve providing a restricted opening therein for reducing the amount of water flowing through the overflow pipe into the toilet bowl, and thereby eliminate waste of such water.

A further object of the invention is to provide an improved water saving means adapted to be connected to the ball cock valve assembly and overflow pipe in place of the conventional, valveless refill tube and including tubular means having a restricted opening therein and adapted to be inserted into the fill tube for reducing the amount of water flowing through the overflow tube into the toilet bowl, and thereby eliminate waste of such water.

A still further object of the invention is to provide an improved anti-siphoning means adapted to be incorporated into the aforesaid water saving means for preventing formation of a vacuum therein and back flow of water from the flush tank into the toilet bowl, even though the flush valve is closed.

Additional objects and advantages of the invention will become apparent upon consideration of the following detailed description and the accompanying drawing, wherein:

FIG. 1 is a partial elevational view, partly in section, and illustrating a portion of a toilet flush tank having an upstanding overflow pipe, an upstanding intake pipe and a ball cock valve assembly mounted on the intake pipe, and to which assembly is attached one embodiment of the water silencing and saving means comprising the present invention;

FIG. 2 is a sectional view taken on line 2-2 of FIG. 1;

FIG. 3 is an enlarged, partial sectional view through the inventive water saving means of FIG. 1, illustrating the detailed construction of the metering valve incorporated therein;

FIG. 4 is a partial elevational view similar to FIG. 1, but illustrating another embodiment of the water silencing and saving means comprising the invention, wherein the metering valve is eliminated and the water saving means is inserted into the fill tube rather than attached to the valve casing of the ball cock valve assembly;

FIG. 5 is a partial sectional view through the ball cock valve assembly and illustrates a modification of the water silencing means shown in FIGS. 1 and 4, the solid rods therein being replaced by hollow tubes; and

FIG. 6 is a partial sectional view illustrating a modification of the anti-siphoning means which is incorporated in the water saving means of FIGS. 1 and 4, and which may be employed in addition to, or in place thereof.

Referring to the drawing, and in particular, FIG. 1, the toilet flush tank 10, only the bottom portion of which is shown, is provided with an upstanding overflow pipe 11, an upstanding intake pipe 12, and a ball cock valve assembly mounted on pipe 12, the assembly being generally indicated at 13. The assembly is composed of a valve casing 14 having a main chamber 15, an opening 16 communicating with pipe 12, which opening is opened and closed by the usual reciprocating valve 17 in chamber 15, the valve being actuated by the float operated linkage generally indicated at 18. Casing 14 is also provided with an auxiliary chamber 19 for receiving the downwardly extending fill tube 20, and main chamber 15 has a threaded opening 21 for receiving the usual refill tube (not shown), which is in turn connected to the overflow pipe 11.

As will be apparent, whenever the toilet is flushed, the flush valve (not shown) opens, dropping the water level and lowering the float, whereby linkage 18 opens valve 17 to permit supply water to flow from pipe 12 into main

chamber 15 and to divide into two paths. The major portion of the water flows into the auxiliary chamber 19, reversing direction and flowing downwardly into tank 10 through fill tube 20. The remainder of the water within chamber 15 flows through opening 21 therein and eventually reaches overflow pipe 11. As the water flows through assembly 13, a substantial amount of turbulence and noise is created because of the irregular internal surfaces of the assembly, the variations in cross-sectional area through which the water flows, and the required reversal of direction of flow from pipe 12 to fill tube 20. In addition, the conventional refill tube (not shown) permits an excess portion of the water to flow into overflow pipe 11, and thence into the toilet bowl (not shown) for preventing sewer gases from escaping back out of the toilet bowl. This diversion of excess water is wasteful, tests having shown that for an average household of four persons, as much as 4,000 gallons or more per year may be wasted in this manner.

In order to overcome these problems created by the conventional construction described above, the present invention comprising improved water silencing and saving means was developed. As seen in FIG. 1, one embodiment of the water silencing means comprises a plurality of flexible and elongated, round solid rods 22 which are preferably made of a plastic material such as nylon. The rods are preferably about $\frac{3}{16}$ " in diameter, and are of such a length that when packed side by side into fill tube 20, they preferably extend substantially throughout its length and rest on the bottom of the tank. Because of their flexibility, the rods 22 may be readily bent to facilitate their insertion into tube 20, without disturbing this tube or any other part of the valve assembly 13, and in a typical installation using a $\frac{5}{16}$ " inside diameter fill tube, approximately 8 rods are required. When so installed, rods 22 effectively reduce the turbulence and noise of the water flowing through the assembly, as they reduce the rate of flow therethrough, spread the pressure drop gradually over substantially the entire length of relatively long tube 20, and convert the type of flow from turbulent to substantially laminar, the water being restricted to the straight line passages or interstices formed between the various rods 22, as well as between the rods and the interior of tube 20.

As also illustrated in FIG. 1, one embodiment of the improved water saving means comprises tubular means including an externally threaded and relatively short adapter tube 23 engaged within opening 21 at one end and provided at its other end with an internally threaded portion 24 having a pair of diametrically opposed slots 25, for threadedly receiving a set screw 26 or the like. The slotted portion 24 of adapter tube 23 and the set screw 26 form an adjustable metering valve for confining the flow of water through the restricted opening 27 formed between the slots 25 of portion 24 and the end of set screw 26. The tubular means also includes a relatively long flexible tube 28 which is preferably made of a plastic material such as clear polyvinyl chloride, and one end of this tube is adapted to slide snugly over the slotted portion 24 of adapter tube 23, but fit freely over screw 26 to permit passage of the water flowing through opening 27 and slots 25, while the other end of tube 28 is adapted to fit within the upper end of overflow pipe 11. By properly adjusting screw 26 in slotted portion 24, the amount of water flowing into the toilet bowl (not shown) through overflow pipe 11 can be reduced to the necessary minimum for preventing sewer gases from escaping back out of the toilet bowl, and at the same time eliminate waste of such water normally experienced with the conventional valveless refill tube (not shown).

The improved water saving means is also provided with an anti-siphoning means in order to prevent a vacuum from forming therein and back flow of water from the

tank 10 through the ball cock valve assembly 13, tubular means, overflow pipe 11 and into the toilet bowl, in order to prevent further waste of water. As will be apparent, if the end of tube 28 inserted into pipe 11 lies below the water level in tank 10, the water in the tank will siphon back up fill tube 20, through assembly 13, tube 28 and overflow pipe 11 into the toilet bowl. Thus, even when the toilet is not being flushed, the continual dropping of the water in the tank would cause ball cock valve 17 to open in order to replenish the water wasted by the aforesaid siphoning action. In order to prevent this, an anti-siphoning means is provided, and as shown in FIG. 1, it preferably takes the form of a plurality of longitudinally spaced openings 29 located adjacent the end of flexible tube 28 connected to overflow pipe 11. Thus, even though the open end of tube 28 might lie below the tank water level, one or more of these openings will be above the water level and effectively break any vacuum in tube 28.

Referring now to FIG. 4, another embodiment of the water silencing and saving means comprising the invention is illustrated therein. In this embodiment, the opening 21 in main chamber 15 is closed by a plug 30, and the improved water saving means is inserted into the fill tube 20 together with the water silencing rods 21. The preferred form of this water saving means differs from that illustrated in FIG. 1 in that adapter tube 23, and the slotted portion 24 and set screw 26 forming the metering valve are completely eliminated, and replaced by a smaller tube 31 forming the desired restricted opening. This relatively short tube 31 is bent into a substantially U-shape, and one end is inserted into fill tube 20, being held securely in place therein by the water silencing rods 21. The other end of U-shaped tube 31 is inserted into the relatively long flexible tube 28 which is connected to the overflow pipe 11, as in FIG. 1.

As will be apparent, the U-shaped tube 31 provides a restricted opening for the water saving means, which opening is much smaller than that found in the conventional valveless refill tube (not shown), in order to accomplish substantially the same results as the adapter tube 23 and the metering valve formed by slotted portion 24 and set screw 26 of FIG. 1, albeit lacking their feature of adjustability.

Referring to FIG. 5, there is illustrated therein a modification of the water silencing means shown in FIGS. 1 and 4. Instead of using solid rods 21, hollow tubes 32 may be used, or a combination of such rods and tubes may be used, if so desired. Preferably, tubes 32 are of substantially the same size and shape as rods 21 and are preferably made of the same plastic material. The tubes 32 are particularly adapted for low pressure water systems, whereas the solid rods 21 are especially adapted for use in systems of high pressure. Thus, in a low pressure system, the rods 21 might so restrict the rate of flow of the water into tank 10 as to require an unduly long period for filling the tank. Thus, their complete or partial replacement by the hollow tubes 32 will substantially reduce the turbulence and noise created by the flow of water through fill tube 20, without unduly restricting the flow, as the water can also flow through the holes in the tubes as well as through the interstices formed therebetween.

Referring now to FIG. 6, there is illustrated therein a modification of the anti-siphoning means shown in FIGS. 1 and 4. This modification preferably takes the form of a U-shaped clip 33 adapted to fit snugly over the upper end of overflow pipe 11 and which clip is provided with a small hook 34 at one end for snugly receiving the adjacent end of flexible tube 28. It will be noted that the overflow pipe 11 is designed so as to always extend above the highest level of the water in the tank. Thus, some anti-siphoning means must be provided above this water level to prevent the formation of a vacuum in the flexible

5

tube 28 and undesirable back flow of water from the tank through the valve assembly 13, water saving means and overflow pipe 11 into the toilet bowl. This is most economically accomplished by providing the plurality of holes 29 near the end of tube 28 inserted into overflow pipe 11, as illustrated in FIGS. 1 and 4. The anti-siphoning clip 33 of FIG. 6 however, which may be used in conjunction with or in place of holes 29, provides a positive means for keeping the open end of tube 28 above this high water level, whereas the uppermost hole 29 of FIGS. 1 and 4 might possibly slip below the high water level in the event tube 28 was not cut short enough to prevent this occurrence.

While at first, it might be considered feasible to employ either the water silencing or saving means separately, as a practical matter it is necessary to employ both of these means in order to obtain the desired result. For example, if the rods 22 or tubes 32 were employed alone in order to reduce water turbulence and noise, they obviously would create a back pressure in valve casing 14 as a result of which the rate of flow through the conventional refill tube (not shown) would be substantially increased, thereby causing further waste of such water, as well as additional noise offsetting the silencing action in the assembly. On the other hand, if the water saving means were used alone, this would also create an undesirable back pressure, especially in the embodiment shown in FIG. 1, thereby increasing the rate of flow through the assembly and causing more turbulence and noise than normal. While the embodiment of the water saving means illustrated in FIG. 4 would not, in itself, create an undesirable amount of back pressure, because of its location in fill tube 20, the plugging up of opening 21 would nevertheless increase the rate of flow through the assembly and hence create more undesirable water turbulence and noise than normal.

It will now be seen how the above described embodiments accomplish the various objects of the invention, and the numerous advantages obtained thereby are now apparent. While only several embodiments of the invention have been described, it is to be understood that various modifications and changes may be made therein by those skilled in the art without departing from the spirit of the invention, the scope of which is to be determined by the appended claims.

I claim:

1. In a toilet flush tank having a water intake pipe and a ball cock valve assembly mounted on said pipe, said assembly including a downwardly extending tube for filling said tank, the combination therewith of improved water silencing means comprising a plurality of flexible elongated members inserted side by side into said tube substantially throughout its length and having their lower ends resting on the bottom of said tank, for reducing turbulence and noise of the water flowing through said assembly into said tank.

2. The combination of claim 1 wherein said members are in the form of solid rods.

6

3. The combination of claim 1 wherein said members are in the form of hollow tubes.

4. In a toilet flush tank having an upstanding water overflow pipe connected to the toilet bowl, a water intake pipe and a ball cock valve assembly mounted on said intake pipe, said assembly including an opening for connection to said overflow pipe and a downwardly extending tube for filling said tank, the combination therewith of improved water silencing means comprising a plurality of flexible elongated members inserted side by side into said tube substantially throughout its length and having their lower ends resting upon the bottom of said tank, for reducing turbulence and noise of the water flowing through said assembly into said tank, and improved water saving means comprising tubular means having a restricted opening therein and being connected at one end to said opening in said assembly and at its other end to said overflow pipe, for reducing the amount of water flowing through said overflow pipe and thereby eliminate waste of such water.

5. The combination of claim 4 wherein said tubular means includes a relatively short tubular member having said restricted opening therein and removably connected at one end to said opening in said assembly, and a relatively long and flexible tubular member removably connected at one end to the other end of said short tubular member and at its other end to said overflow pipe.

6. The combination of claim 5 wherein said valve assembly also includes a valve casing providing said opening therein, and said short tubular member has an adjustable metering valve providing said restricted opening therein.

7. The combination of claim 5 wherein said downwardly extending tank filling tube provides said opening in said valve assembly, said short tubular member is substantially U-shaped, and said one end thereof is inserted into said downwardly extending tube alongside said flexible members.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 22,727	Svirsky	Feb. 26, 1946
1,078,584	Jones	Nov. 11, 1913
1,671,361	Frankenberger	May 29, 1928
1,901,633	Clemmons	Mar. 14, 1933
2,044,816	Schmiedeknecht	June 23, 1936
2,195,797	Groeniger	Apr. 2, 1940
2,277,878	Morris	Mar. 31, 1942
2,722,229	Wentz	Nov. 1, 1955
2,722,944	Langdon	Nov. 8, 1955
2,743,459	Schmidt	May 1, 1956

FOREIGN PATENTS

101,245	Sweden	Apr. 1, 1941
542,826	Germany	Jan. 28, 1932