May 25, 1937. S. HORVATH 2,081,539

FLUSH TANK

Filed Sept. 26, 1935

FIG. 1.

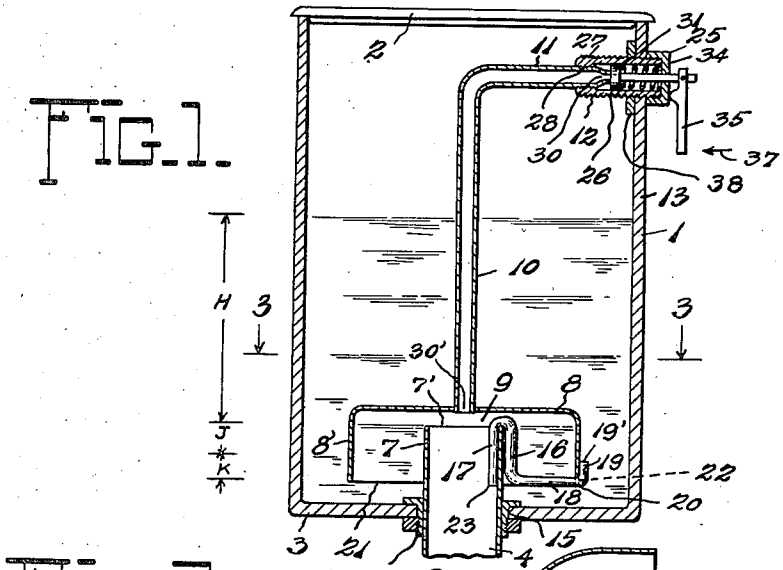


FIG. 2.

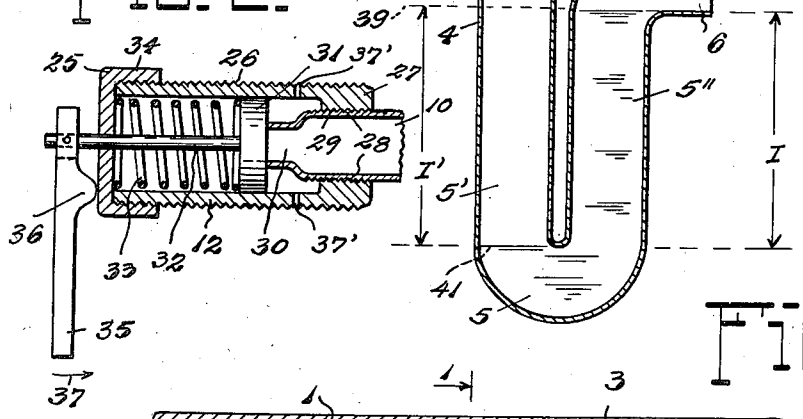
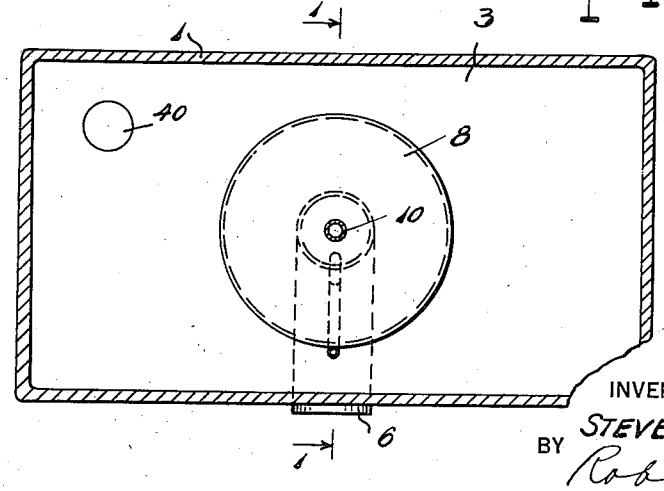


FIG. 3.



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FLUSH TANK

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5 Claims. (Cl. 4—43)

Flush tank constructions for water closets or the like of the type wherein the water is discharged from the tank by a siphon, the action of which is controlled by means of an air chamber and an air control valve, have certain disadvantages which render such devices undesirable for practical installation.

One of the greatest disadvantages in devices as generally mentioned above is that the action of the siphon which discharges the water from the tank breaks off with a considerable surging noise at the end of the discharge period of the water, and for this reason flush tank constructions of this nature have not been adopted for practical installations to any extent.

Furthermore, the air conduit which connects the valve and the air chamber in devices of the class mentioned herein is frequently the cause of considerable trouble in the operation of such apparatus, as it permits, in view of the somewhat uncontrolled siphon action, the water to rise therein, so that the valve mechanism will become wet and rendered inoperative or less effective, so that difficulties arise in restoring the air in the air chamber in a perfect manner, which is necessary to render the device operative for subsequent discharge of water from said tank. The apparatus of the present invention has therefore been devised in an attempt to overcome these objectionable features.

It is therefore the object of the present invention to provide a flush tank of a construction wherein the noise of the siphon action is entirely eliminated and wherein the air conduit and air valve have been constructed in such a manner that rising of the water in said conduit from the air chamber into the air valve to thereby interrupt the proper operation of the device, is prevented.

Other and further objects of the present invention will become more apparent as the description proceeds and in reference to the drawing, in which,

Figure 1 is a vertical sectional view of the flush tank construction of the present invention, taken on the line 1—1 of Figure 2, parts being broken away.

Figure 2 illustrates a detail view of the air valve construction as used in connection with the present invention.

Figure 3 is a horizontal sectional view taken on line 3—3 of Figure 1.

Referring now to the drawing, 1 indicates a flush tank of the general construction usually used in connection with water closets or the like, which is provided with a closure member 2. Mounted within the bottom 3 of the tank 1 is a discharge pipe 4, the lower portion of which is of a U-like configuration, as clearly shown at 5, and is provided with a horizontally extending portion 6 which is adapted to be connected to the toilet bowl or the like.

The portions 5 and 6 of the discharge pipe 4 may be integral parts of the toilet bowl itself, and, in such case, the communication between the toilet bowl and the tank 1 may be established by a straight discharge conduit leading from the tank to such toilet bowl structure.

The discharge conduit 4 extends into the flush tank 1 a considerable extent, as clearly shown at 7, for purposes which will be described later on.

A cup-like vessel or air chamber 8 is concentrically arranged above the portion 7 of the discharge conduit 4, and is spaced from the latter as clearly indicated at 9 in Figure 1. The air chamber 8 comprises the downwardly extending portion 8', the lower edge 21 of which is spaced from the bottom 3 of the tank to permit the entrance of water to said inverted cup-like vessel. Connected to said air chamber 8 is an air conduit 10 centrally located with respect to said air chamber and extending upwardly in the flush tank 1. The upper end 11 of the air conduit 10 is bent at a right angle, as seen in Figure 1, and extends into a valve housing 12 which is secured to the side wall 13 of the flush tank 1. In this manner the air conduit 11 and air chamber 8 are supported freely above the portion 7 of the discharge conduit, as will be readily seen from Figure 1.

A packing unit 14 is positioned between the opening 15 and the bottom 3 of the flush tank 1, through which the discharge conduit 4 is inserted. This packing member permits a fluid-tight assembly between the discharge conduit and the flush tank.

It will be noted that the air chamber 8 and the discharge conduit 4 form together a siphon the action of which is utilized for the discharge of water from the flush tank as will be more fully explained later on.

An auxiliary siphon 16, which is formed from a small metal tubing or the like, is provided, the U-like portion 17 of which is attached to the discharge conduit 4, while the portion 18 of the said auxiliary siphon extends horizontally across the air chamber, and the free end thereof is bent upwardly as shown at 19. It must be noted that the lower portion 20 of the auxiliary siphon 16 does not extend below the lower portion 21 of the cup-shaped air chamber, and to arrange the

auxiliary siphon 16 as illustrated in Figure 1 it is therefore necessary to cut out a small portion 22 of the cup-shaped air chamber so as to permit the arrangement of the auxiliary siphon in the position shown in Figure 1. The auxiliary siphon may be welded or soldered to the conduit 4 in the air chamber 8 if this should be desirable, and in such case it would constitute an additional support for the air chamber 8 and the air conduit 10. However, in view of the fact that one end of the auxiliary siphon is bent into U-shape, as indicated at 17, it may be hung over the free end of the conduit 4 extending into the tank 1, and in view of the fact that the auxiliary siphon 16 is introduced into the opening 22 in the side wall of the air chamber, its displacement in a lateral direction is prevented.

Portion 23 of the auxiliary siphon extends downwardly into a discharge conduit 4, and the discharge end of the siphon 16 at the portion 23 should not be below the lower edge 21 of the air chamber more than $\frac{1}{16}$", or it may be in alignment with said lower edge 21. The purpose and operation of the auxiliary siphon member 16 will be more fully described as the description of the invention proceeds.

Referring now to the construction of air control valve generally indicated at 25, it should be noted that the same comprises a valve housing 12 which is of a cylindrical configuration and the outside of which is threaded as clearly seen at 26. The end portion 27 of said housing is provided with inner threads 28 adapted to be screwed upon the threaded portion 29 of the air conduit 10. The air conduit 10 extends into the valve housing 12 and is provided with a reduced opening at its end portion 30.

Arranged within the valve housing 12 is a piston or valve member 31 provided with a shaft 32 and held against the reduced end portion of the air conduit 10 by means of a spring 33. A retaining member 34 is availed of to close the open end of the housing 12 and to form a bearing for the shaft 32. Pivotally connected to the free end of valve shaft 32 is a valve lever 35 provided with a cam portion 36. If pressure is exerted against the valve lever or valve operating arm 35 in the direction indicated by the arrow 37, the piston member 31 will be withdrawn from the end of the air conduit 11 and the valve is thereby opened and air may be admitted to air conduit 19 through a plurality of holes 37' in the valve housing 12. A retaining member 38 is provided for securing valve 25 to one of the side walls 13 of the tank 1.

The operation of the device is as follows:

It is assumed that the U-like portion 5 of the discharge conduit 4 is filled with water up to the level 39, the flush tank 1 is emptied and valve 25 is closed. Water is now admitted through water intake valve generally indicated at 40 in Figure 3. The tank 1 will be filled with water to a certain height until the valve 40 is closed. The valve 40 is of usual commercial construction and its specific arrangement has not been disclosed in the drawing of the present invention as the construction of such valve will be obvious to those skilled in the art.

The water will enter into the inverted cup-like air chamber and displace the air from the air chamber into the discharge conduit 4 so that the water in the leg 5' of the U-shaped portion of the discharge conduit 4 will be forced downwardly until it reaches the position shown at 41. Obviously, a certain amount of water will overflow from the leg 5'' of the discharge conduit 4 through portion 6 into the toilet bowl or the like. The inverted cup-like vessel or air chamber 8 is now filled with water to the upper edge 7' of the discharge conduit 4 and the fluid in the system may be stated now to be in balance. In other words, the water column H is in balance with the water column I. Obviously, the column of water I' which has been displaced by the water entering the air chamber 8 will be equal in volume to the water column J in the air chamber 8.

As previously stated, the system is now balanced and ready for discharge of the fluid, which is effected by pressing against valve operating arm 35 in the direction of the arrow 37. Operation of the valve lever 35 as mentioned before will withdraw the valve member 31 from its seat on a reduced portion 30 of the air conduit 10 and the latter member now will be open to atmospheric pressure.

The air entrapped within the system and in said air conduit, which is slightly compressed, is now permitted to escape and obviously the water from the tank 1 will flow through the air chamber 8 into the discharge conduit 4 from where it is discharged into the bowl of a toilet, or the like, for flushing purposes.

The reduced portion 30 of the air conduit 10 permits a fast discharge of air at this point while at the opposite end 30' of the air conduit 10 the flow of air is considerably slower. In view of the above slow release of the air the squirting of the water is eliminated and there is no likelihood of the escaping air mixing with the water and carrying the same upwardly in the air conduit 10. Of course valve 25 is opened only for a moment and a release of the pressure on valve lever 35 will close the valve 25 again. This opening and closing action of the valve is adequate for releasing a certain quantity of air sufficient for bringing the siphon into operation to effect the discharge of the water from the tank. In this way a silent starting of the siphon action is effected. Sufficient air is released from the system as described above, and then the discharge conduit 4 and the air chamber 8 will operate together in the manner of a siphon, as previously mentioned, and the water will be siphoned from the tank 1 for purposes referred to hereinbefore.

When the siphon action is completed and no precautions are taken, the siphon action will cut off with a surging noise, which is very undesirable. To eliminate the noisy cut-off of the siphon action, the auxiliary siphon 16 has been provided and it will be noted that while the water is discharging from the tank through the siphon 8—4, it will also be discharged through the auxiliary siphon 16 until the water level falls below the opening 19' of the auxiliary siphon 16, at which time air is admitted to the discharge conduit 4 through said auxiliary siphon. In view of the fact that the portion 19 of the auxiliary siphon extends only a small distance above the lower edge 21 of the air chamber 8 and on account of the position of the discharge opening 23 of the auxiliary siphon in alignment with the lower edge 21 of the air chamber 8 or slightly below said edge, admission of air over the auxiliary siphon 16 will be effected slightly ahead of the time when the water level in the tank 1 reaches the lower edge 21 of the air chamber 8. Therefore, the admission of the air over the auxiliary siphon 16 is effected at the time the breaking off action of the siphon 8 and 4 takes place, so that no surging noise at the edge 21 of the air chamber will take place, because the air is admitted

through the auxiliary siphon 16. In this way an absolutely noiseless operation of the siphon action of the device of the present invention is accomplished.

The auxiliary siphon 16 serves the further purpose of restoring the device for subsequent operation, even though the valve lever 35 has been accidentally tripped a second time during the operation of the main siphon. It will be noted that in such case when air is admitted to the cup-like member 8, after the siphoning action of the main siphon has been initiated by depressing the valve lever 35, it is impossible to automatically restore the device to its original balanced position, and the auxiliary siphon 16 functions, therefore, to properly restore and render the device ready for a subsequent discharge even though the valve lever 35 has been accidentally tripped during the siphoning operation of the main siphon. In other words, the action of the auxiliary siphon continues until all water above the level of the inlet 19' of the auxiliary siphon is discharged from the tank, whereupon air is admitted into the cup-like member 8 and the action of the device restored for a subsequent discharging operation.

It is notable under the conditions above referred to that the auxiliary siphon 16 is a siphon entirely independent of the main siphon and, by virtue of this fact, when the air valve is tripped, the water level in the tank will drop, the water passing out the drain pipe 4 until the opening 19' of the auxiliary siphon is uncovered. In this normal operation, the auxiliary siphon acts as a siphon breaker. If the siphoning action of the main siphon is inadvertently broken by operation of the air valve before the level reaches the mouth 19' of the auxiliary siphon, said auxiliary siphon will continue to siphon out the water, although the main siphoning action has been broken, until the level of the water withdrawn by the auxiliary siphon reaches the mouth 19', at which time air will be admitted and will break the auxiliary siphon normalizing the device. Since the outflow of the water from the tank in this siphoning action is greater than the inflow through the water valve, the water level in the tank is bound to drop below the entrance of the auxiliary siphon, and once the auxiliary siphoning action has been broken in this manner, the tank will be filled and the air compressed in the tube 10 and the top of the bell, as hereinbefore described.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is—

1. A device of the character described, comprising, in combination, a tank, a discharge conduit operatively associated with said tank and extending into the latter, an air chamber adjacent said discharge conduit, an air control valve, an air conduit interconnecting said air chamber and air control valve, the air chamber and discharge conduit forming a main siphon for discharging water from the said tank upon operation of the air control valve, and an auxiliary siphon member between the discharge conduit and said tank for controlling the operation of the main siphon and for restoring the same into operative condition subsequent to the water discharging operation, irrespective of an interruption of the operation of the main siphon.

2. A device of the character described, comprising, in combination, a flush tank, an inverted cup-like air chamber, a discharge conduit extending into said flush tank and inverted cup-like chamber, an air control valve, an air conduit interconnecting said inverted cup-like air chamber and air control valve, said discharge conduit and inverted cup-like air chamber forming a siphon for discharging water from said tank, and an auxiliary siphon separate from said first mentioned siphon between said flush tank and discharge conduit for controlling the cut-off operation of said first mentioned siphon and for restoring the operation of the device irrespective of an interruption of operation of said first mentioned siphon.

3. A device of the character described, comprising, in combination, a flush tank, an air chamber within said tank, a discharge conduit extending into said tank and air chamber, an air conduit, one end of which is provided with a large opening and connected with said air chamber, while the other end is provided with a reduced opening, and an air control valve at the reduced opening of said air conduit for releasing air entrapped within said air chamber and discharge conduit when said tank is filled with a fluid to effect the discharge of said fluid from the tank, the reduced opening of the air conduit causing a flow of air at a slow speed at the large opening of said air conduit during the operation of the latter to thereby prevent the mixing of air and fluid at the large opening of said air conduit.

4. A device of the character described, comprising, in combination, a tank, a discharge conduit operatively associated with said tank and extending into the latter, an air chamber adjacent said discharge conduit, an air control valve, an air conduit interconnecting said air chamber and air control valve, the air chamber and discharge conduit forming a main siphon for discharging water from the said tank upon operation of the air control valve, and an auxiliary siphon member between the discharge conduit and said tank and separate from said main siphon for causing noiseless breaking of the main siphon action and for discharging water from the tank to restore the operation of the device upon interruption of the operation of the main siphon.

5. In a device of the character described, comprising in combination, a tank, a discharge conduit operatively associated with said tank and extending into the latter, an air chamber adjacent said discharge conduit, an air control valve, an air conduit interconnecting said air chamber and air control valve, the air chamber and discharge conduit forming a main siphon for discharging water from the said tank upon operation of the air control valve, and an auxiliary siphon member supported by said discharge conduit and extending through the air chamber into said tank for admitting air into the air chamber and discharge conduit upon discontinuance of the operation of the main siphon.

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