Oct. 25, 1949. V. F. SMITH 2,486,336

FLUSH TANK

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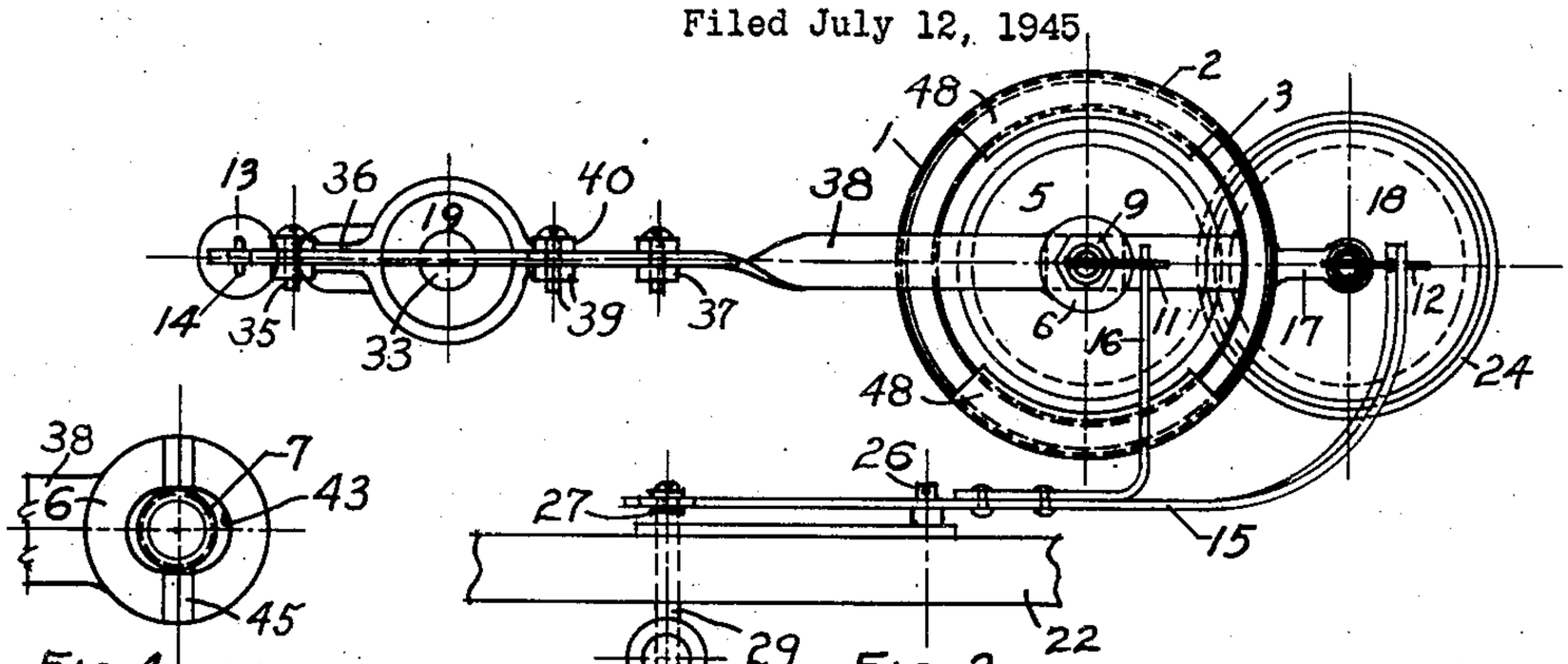

FIG. 2.

FIG. 4.

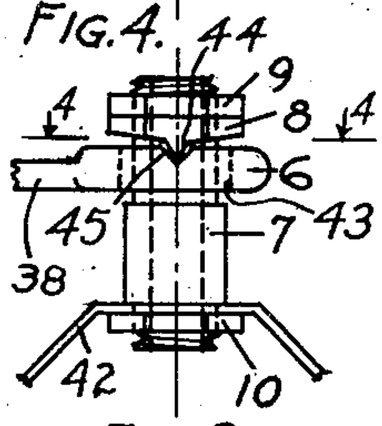

FIG. 3.

FIG. 1.

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FLUSH TANK

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3 Claims. (Cl. 137—68)

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This invention relates to flush tanks and more particularly to valve mechanism for controlling the filling of the tank.

It is the usual practice to control the filling of flush tanks by the use of a float operated valve. As the float rises with the filling of the tank it acts to gradually close the valve and thereby shut off the inflow of the filling liquid until the tank is full, at which time the float controlled valve completely shuts off the inflow of liquid. This arrangement has been considered to be unsatisfactory because there is a gradual shutting off of the inflowing liquid with the consequent result that a relatively long period of time is required to fill the tank and it is, therefore, necessary to wait a long time to reflush the tank. Another disadvantage of this former arrangement is that the gradual shutting off of the inflowing water results in an objectionable noise.

As an important feature of the present invention, an inflow valve mechanism is provided which results in a wide open inflow of liquid until the tank is full, at which time the valve rapidly shuts off the inflow of water. This is of importance because a minimum amount of time is required to fill the flush tank.

A further feature of the invention, resulting from the shortened time required to fill the tank, is that the possible frequency of flush is considerably increased.

Another feature of the invention is the provision of means which eliminates the noise which usually accompanies the gradual closing off of a valve.

A still further feature of the invention involves the arrangement of the mechanism in such manner that it may readily be applied to existing flush tanks so that only a slight change is required.

Other features of the invention will appear from the following description when considered with the accompanying drawings.

In the drawings:

Figure 1 is an elevation of a flush tank to which the mechanism of the invention is applied, the front wall of the flush tank and parts of the inner walls being broken away to more clearly show the construction,

Figure 2 is a plan view of Figure 1,

Figure 3 is a side elevation on an enlarged scale of the auxiliary vessel supporting means, and

Figure 4 is a section on the line 4—4 of Figure 3.

The flush tank 22 has the usual discharge outlet 23 at the bottom thereof providing a valve seat 24 controlled by a ball valve 18. The outlet 23 may be connected in the usual way to a water closet or

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other article to be flushed. The flush tank 22 may be of any conventional construction.

The ball valve 18 is attached to a vertically movable rod 25, the upper portion of which is guided within a bracket 17. A lift rod 12 has a loop at its lower portion to slidably engage the rod 25, and the upper end of the lift rod 12 is connected to one end of a lifting lever 15. Lever 15 is pivoted upon a pin 26 carried by the side wall of the tank 22.

To operate the lifting lever 15, its other end is connected by a link 27 to an arm 28 secured to a shaft 29. Shaft 29 extends through the side wall of the tank 22 and has a handle 20 affixed thereto on the outside of the tank. When the handle 20 is swung to either side, the link 27 pulls downwardly upon the end of lifting lever 15 and thereby lifts the other end to which the lift rod 12 is attached. This lifts ball valve 18 from its seat 24 so that the water in the tank will be emptied.

To supply liquid to the interior of tank 22 an inlet pipe 31 extends into the tank from the outside. At the upper end of the inlet pipe 31 is a valve indicated at 19. When this valve 19 is open, liquid flows inwardly through the pipe 31 and downwardly through pipe 32 to the bottom of the tank 22. The valve head within valve 19 is of the reciprocating type having a valve stem 33 extending upwardly from the body of valve 19. Downward pressure upon this valve stem 33 closes off the valve to prevent inflow of liquid.

In accordance with the invention, the valve stem 33 is not moved to closed position by the usual float and associated lever, but on the contrary is closed by the weight of an auxiliary vessel when it becomes filled with liquid as will be described later.

Acting upon the valve stem 33 is a lever 34 pivoted at pin 35 to the end of a bracket 36 carried by the body of valve 19. The other end of lever 34 is connected by a link 37 to a lever 38 which is pivoted at 39 to a bracket 40 also carried by the body of valve 19. On the other side of the pivot 39 from the link 37 a counterweight 13 is attached to the lever 38 by means of a suspension link 14. This arrangement tends to turn the lever 38 to such position that the link 37 will pull upwardly on the lever 34 and thereby allow the valve stem 33 to rise and open the valve 19. Downward movement of counterweight 13 is limited by the contact of a striker plate 41 on lever 38, against the top of bracket 36.

This tendency of the counterweight 13 to open the valve 19 is overcome by the weight of an auxiliary vessel 3 after it has been filled or nearly

filled with liquid. The auxiliary vessel 3 is attached by a strap 42 to the lower end of a suspension tube 7 by means of a nut 10 which is threaded onto the lower end of tube 7. This tube 7 extends upwardly through a bore 43 through the enlarged end 6 of lever 38. The bore 43 is larger than the outside of the portion of tube 7 which passes therethrough so that no binding can occur at this place, and this may be accomplished by making bore 43 of oval shape as appears in Figure 4.

Attached to the tube 7 above the enlargement 6 are lock nuts 8 and 9. The lower lock nut 8 is formed with a transverse ridge 44 on its under side which enters a transverse V-shaped groove 45 in the upper face of enlargement 6. The bearing of the ridge 44 upon the bottom of the groove 45 provides a pivot to permit the vessel 3 to remain vertical during its up and down movements without interference from the swinging movement of the lever 38.

The vessel 3 is movable in an up and down direction within a container 1 formed as an enlarged portion of the overflow pipe 46. This overflow pipe 46 may be the usual one which at its lower end empties into the discharge outlet 23 below the valve seat 24 so that any liquid entering the upper end of the overflow pipe 46 can pass into the water closet without interference from the ball valve 18. The invention contemplates that the enlarged portion 1 will be a separate container which is directly attached to the usual overflow 46 after this overflow has been reduced in height. For this purpose, it will ordinarily be sufficient to provide the container 1 with a tubular extension 47 at its lower end which fits tightly over the overflow pipe 46.

It will be observed that the enlarged portion 1 of the overflow 46 serves to hold back the water within the tank 22 away from the vessel 3, so that this vessel 3 may move up and down in a free air space formed within the main body of water. This is not, however, an essential relationship as the container 1 may be formed in any other manner so as to permit the vessel 3 to have up and down movement in a free air space and, in fact, the container 1 may be outside of tank 22.

Attached to the upper end of the container or enlarged portion 1 of the overflow pipe is a cap 2. This cap preferably fits tightly upon the exterior of the container 1 and has inwardly formed lips or spouts 48 which serve to direct the overflow from tank 22 into the vessel 3. That is, when the liquid within tank 22 rises to the height of the upper end of the enlargement 1, the water is conducted past the annular space between the vessel 3 and the enlargement 1, so that it will flow over to and into the vessel 3 instead of downwardly through the enlargement 1 and into the overflow pipe 46.

The weight of the liquid in vessel 3, when it is full, or nearly so, will be sufficient to lift the counterweight 13 and move the lever 38 to such position that the link 37 bears downwardly upon the lever 34 and presses the valve stem 33 downwardly so as to shut off the inflow of water through valve 19. The water inlet will, therefore, remain closed until the vessel 3 is emptied. To empty the vessel 3, it is formed in its lower end with an opening providing a valve seat 4. A ball valve 5 cooperates with the valve seat 4 and has attached thereto a rod 50 which passes upwardly through the suspension tube 7.

To the upper end of lifting rod 50 is slidably attached a lift rod 11, the upper end of which is

hooked onto a bracket 16 which is fixedly attached as by rivets to the lever 15. When the lever 15 is moved upwardly, therefore, under the influence of the handle 20, the valve 5 will be lifted from its seat 4 at the same time that the main flush valve 18 is lifted from its seat 24. As the vessel 3 is small it will empty rapidly when valve 4 is opened.

In the operation of the mechanism, assuming that the tank 22 is full of water and that the vessel 3 has been also filled with water so that the inlet valve 19 is closed off, operation of the handle 20 will simultaneously lift valves 5 and 18 so that the contents of the vessel 3 and the contents of the flush tank 22 will be discharged together into the water closet. The emptying of the vessel 3 will result in its being lifted by the counterweight 13 so that the valve 19 will at once open and permit the inflow of water. It is important to observe that the counterweight 13 will actuate the lever 38 to its full open-valve position so that there will be a maximum inflow of liquid.

It may also be noted that inasmuch as the counterweight, in the arrangement here shown, is within the water in tank 22, the water has a buoyancy effect upon this counterweight 13, so that the weight of vessel 3 is more effective to hold the valve 19 closed. However, when the tank is empty, the buoyancy effect is eliminated and the full weight of counterweight 13 is effective to act on lever 38 so valve 19 will be fully open.

After vessel 3 and main tank 22 have been emptied, the valves 5 and 18 will fall upon their seats in the usual manner to close the discharge outlets. The liquid flowing inwardly through valve 19 will then fill the main flush tank 22 and since no liquid can enter the vessel 3 while this filling is taking place, the valve 19 will remain wide open so that the tank 22 will fill in the shortest possible time. Also, as the valve 19 remains wide open during this time and there will be no gradual restriction in the flow of liquid therethrough, no noise due to throttling will occur in the valve 19.

When the liquid within the tank 22 reaches the top of the overflow constituted by the upper edge of the container 1, this level being indicated at 21, the liquid will be conducted by the lips or spouts 48 into the vessel 3 so that this vessel will fill with liquid. As soon as the vessel 3 is full or nearly full of this overflow liquid, it will cause the valve 19 to close in the manner which has been described. Because of the small size of the vessel 3, it will fill with liquid rapidly and consequently will shut off the valve 19 in a very short interval of time.

It is to be noted that but slight change need be made in existing flush tanks to apply the present invention thereto. The valve 19 may replace the usual inflow valve, but it is possible to adapt the ordinary valve to the present use by the provision of brackets 36 and 40 thereto. Likewise, the enlarged overflow portion or container 1 may be directly applied, as has been stated, to the usual overflow 46 by reducing its height. It is also necessary to attach the bracket 16 to the conventional lifting lever 15. The usual manner of operating the flush tank is not interfered with since it requires merely the actuation of the handle 20. Also, it will be noted that the enlargement 1 of the overflow 46 does not interfere with the usual function of this overflow to carry off water in the event that the valve 19 does not fully close.

What I claim is:

1. An inlet valve mechanism for flush tanks comprising a liquid inlet, a valve controlling said inlet, a lever having an operative connection to the valve, a force impelling means acting on the lever to tend to relieve the valve of the closing action of the lever, a vessel positioned to receive overflow from the flush tank, said vessel being suspended from said lever by a tubular element to move the lever to close the valve when the vessel is weighted with water, said vessel having an outlet at its bottom, and a valve controlling said outlet to empty the vessel and thereby relieve the valve of its closing force, said valve being operable by means of a lifting rod passing through said tubular element as a guide.

2. An inlet valve mechanism for flush tanks, comprising a water inlet, a valve controlling said inlet, a pivoted lever, means connecting the lever to the inlet valve to effect opening and closing movements of said valve when the lever is pivoted in opposite directions, a counterweight suspended from the lever and acting to pivot the lever in the direction to open the inlet valve, a vessel positioned to receive overflow water from the flush tank, means including a tubular element for suspending the vessel from the lever so as to pivot the lever in the direction to close the inlet valve when the vessel has received sufficient overflow water to over-balance the action of said counterweight, and manually operable means including a rod passing freely through said tubular element for emptying the vessel of overflow water to bring about inlet valve opening pivotal movement of said lever as soon as the said counterweight over-balances the weight of the vessel and its remaining overflow water.

3. An inlet valve mechanism for flush tanks, comprising a water inlet, a valve controlling said inlet, a pivoted lever, means connecting the lever to the inlet valve to effect opening and closing movements of said valve when the lever is pivoted

in opposite directions, a counterweight suspended from the lever and acting to pivot the lever in the direction to open the inlet valve, a vessel positioned to receive overflow water from the flush tank, means including a tubular element for suspending the vessel from the lever so as to pivot the lever in the direction to close the inlet valve when the vessel has received sufficient overflow water to over-balance the action of said counterweight, said vessel having an outlet opening in its bottom through which it is emptied of overflow water, an outlet valve for said vessel opening, a manually operable lever, and means including a rod passing freely through said tubular elements for connecting the manual lever to the outlet valve so that the manual lever can be operated independently of the aforesaid pivoted lever to effect emptying of the vessel of overflow water to bring about movement of the pivoted lever in the direction to open the inlet valve as soon as the counterweight over-balances the weight of the vessel and its remaining overflow water.

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