Aug. 15, 1939. J. L. McBRIDE 2,169,845

DISCHARGING MEANS FOR FLUSH TANKS

Filed Aug. 20, 1937 2 Sheets-Sheet 1

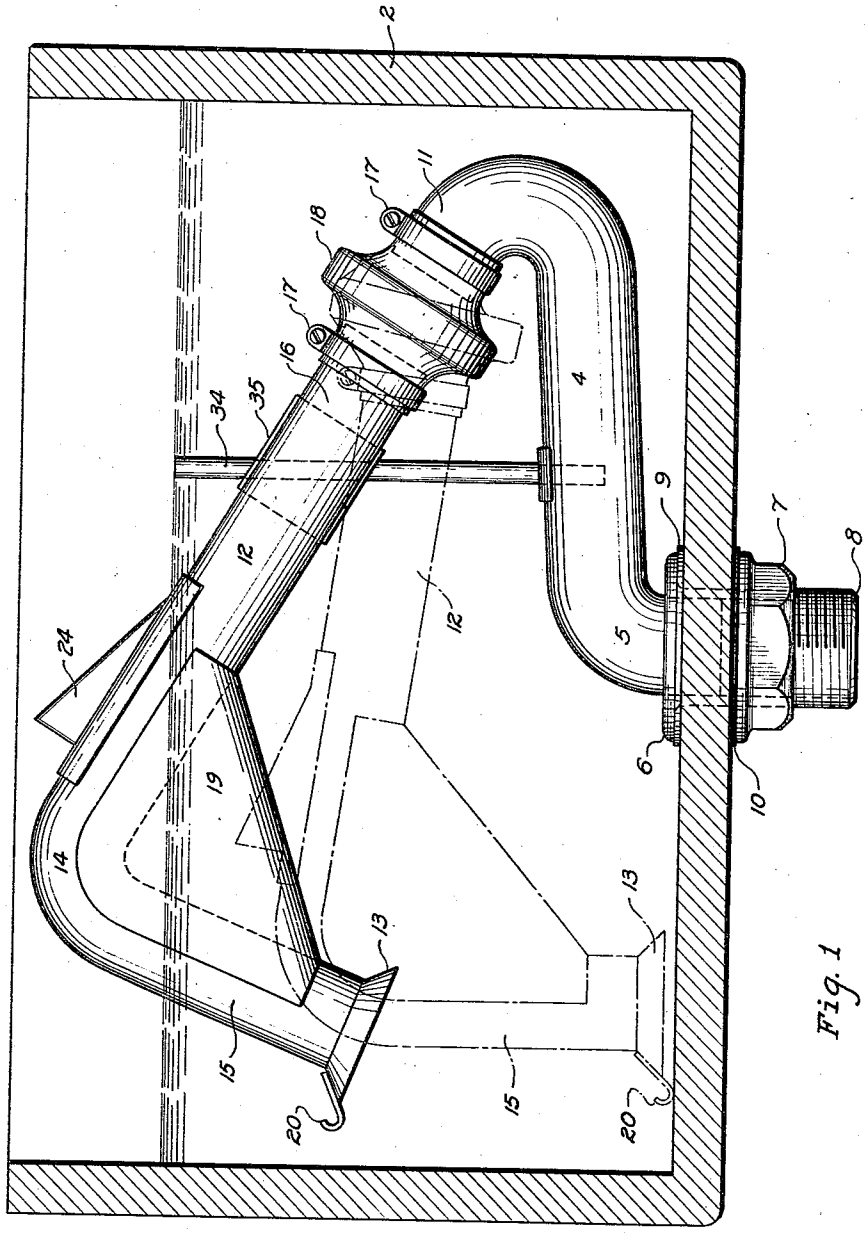


Fig. 1

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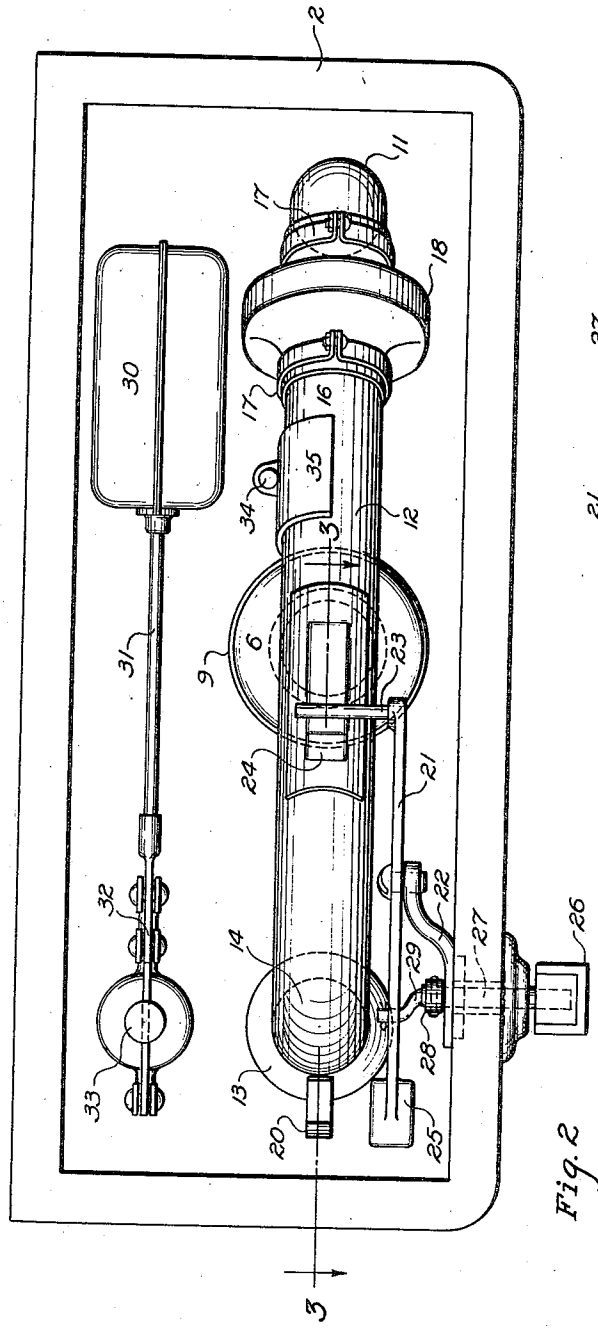


Fig. 2

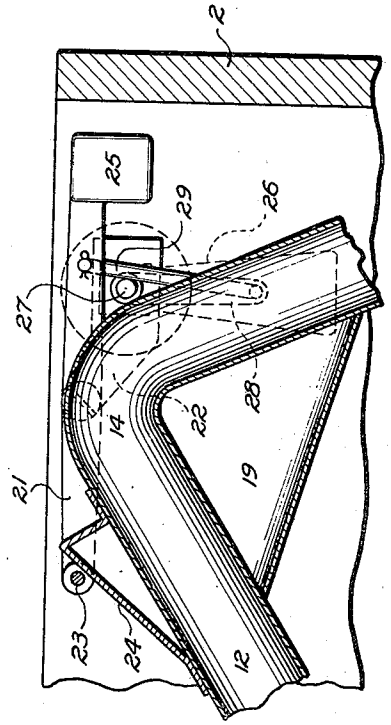


Fig. 3

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DISCHARGING MEANS FOR FLUSH TANKS

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4 Claims. (Cl. 4—50)

My invention relates to an improved means for effecting the discharge of water from toilet flushing tanks and the like.

More specifically my invention relates to flush tanks having a siphon connected to the discharge pipe,—the substitution of a siphon for the customary outlet control valves making it possible to eliminate the difficulties involved in the use of such valves, such as the frequent replacement of the rubber bulbs or inverted rubber cups and the rubber washers and the difficulty of keeping such valves from leaking.

An object of my invention is to provide a simple, practical siphon discharge means which is positive in its action and semi-automatic in operation.

Another object of my invention is to provide such a siphon means which will efficiently drain the tank to within a very short distance from the bottom but which will nevertheless retain sufficient water in the tank to keep the end of the siphon sufficiently sealed to prevent any reverse flow of air or other gases through the siphon.

A further object of my invention is to control the position of the siphon, when it is not discharging, by a float means, thus eliminating the use of springs, levers, or similar mechanisms for holding the siphon in proper position.

The means by which I attain the above mentioned and incidental objects will be apparent from the following description with reference to the accompanying drawings.

In the drawings:

Fig. 1 is a sectional elevation of a toilet flushing tank showing the siphon of my invention installed therein, the other mechanisms connected with the tank being omitted in the drawing for the purpose of clarity;

Fig. 2 is a plan view of a toilet flushing tank, with top cover removed, showing the complete mechanism for emptying and filling the tank in place; and

Fig. 3 is a fragmentary sectional elevation on the line 3—3 of Fig. 2 taken in the direction indicated by the arrows.

Referring first to Fig. 1, in the bottom of the toilet flushing tank 2 a flanged fitting 6 is provided which extends through the tank bottom and is clamped thereto by the nut 7 on the threaded downwardly extending shank 8. The shank 8 also is the means by which the discharge pipe (not shown) is connected below the tank 2. Suitable washers 9 and 10 are provided to prevent any leaking about the flanged fitting 6.

Within the tank 2 is an S-shaped pipe 4 whose end 5 is set tightly in the fitting 6, thus holding the pipe 4 stationary. The upper end of the stationary pipe 4 is bent substantially as shown at 11. The bend at the lower end 5 is such that the straight intermediate section of pipe 4 will be inclined slightly from the horizontal.

A second pipe 12, preferably of light weight metal, is bent as at 14 to form an angular pendent section 15 of the pipe 12, the bend at 14 being such that when the pipe 12 is in its lowered position, shown by the broken lines in Fig. 1, the section 15 of the pipe will be approximately perpendicular to the bottom of the tank. The section 15, extends below the bend 14, such distance as to cause the main section of pipe 12 to slope slightly from the horizontal when the pipe is in the lowered position indicated by the broken lines.

The end 16 of pipe 12 is connected with the end 11 of the stationary pipe 4 by a flexible tubular coupling which allows the pipe 12 to swing up and down. I have found it most satisfactory and practical to use for said coupling a piece of rubber tubing of such diameter as to enable the tubing to fit tightly over the ends 11 and 16 of the pipes 4 and 12. Into the middle of the rubber tubing I force a ring of metal or other rigid material of greater diameter thus expanding the tubing radially at its center, as at 18. The ends of the rubber tubing are then secured to the pipes 4 and 12 by the clamps 17. This central expansion of the tubing increases the flexibility of the connection between the expanded portion 18 and the portions secured on the pipes 4 and 12, and, furthermore, maintains the tubular coupling against collapsing and thus insures free passage of water.

The pipe 12, being thus hinged, as it were, to the stationary pipe 4, has its other or free end normally supported in the water in the tank by a float or sealed air chamber 19 formed integral with the pipe 12 by enclosing the acute angle bend of the pipe. The sealed air chamber 19 is made of such size that the inner surface of the pipe 12 at the bend 14 will normally be held above the water level so that when pipe 12 is in its normal position, as shown in Fig. 1, no water will be discharged through the pipes 12 and 4. The walls of the air chamber constitute a brace for the bent section 15 of the pipe 12. When the floating end of pipe 12 is pushed down in the water sufficiently to submerge the bend 14, water immediately fills the pipe 12 and the pipe 4 and starts the siphoning action. This causes a downward suction on the free end of pipe 12 which is increased by

the flared flange 13 with which the end of pipe 12 is finished. The sealed air chamber 19 is not large enough to overcome this downward suction, which occurs as soon as the bend 14 is submerged, and consequently, the free end of pipe 12 continues to descend to the bottom of the tank. On the flange 13 of pipe 12 a stop 20 is attached, the purpose of which is to form a rest for the pipe on the tank bottom, thus preventing the shutting off of the flow of water into the pipe 12 from the tank by keeping the flanged end of the pipe spaced slightly from the tank bottom.

The pipe 12 remains in the position shown by the broken lines in Fig. 1 as long as the siphoning action continues, and this continues until the level of water in the tank falls below the rim of the flange 13. The moment the water level drops below the bottom edge of flange 13, air is drawn into the pipe 12 and no further siphoning takes place. As the air is permitted to enter pipe 12 in this manner, it passes to the highest point in the pipe, that is, to the bend 14. The water in the main portion of pipe 12 and that in pipe 4 flows out by gravity into the discharge pipe (not shown) connected to the tank. The water in the vertical section 15 of pipe 12, however, drops back into the bottom of the tank and slightly raises the level of water remaining in the tank, causing the water to reach the bottom edge of flange 13 and thus in effect seals that end of pipe 12 and prevents any tendency, with the flowing of the water out of pipes 12 and 4, for air or gases to pass through pipes 12 and 4 in the reverse direction. Consequently, when the tank is connected with a toilet bowl, with the flushing of the bowl by the water from the tank, no gases will pass up from the bowl into the tank even though the water in the tank is drained to within a very short distance of the tank bottom. This is an important feature of my device.

Any suitable mechanism for depressing the pipe 12 and float chamber 19 and submerging the bend 14, when it is desired to discharge the water from the tank, may be employed. Figs. 2 and 3 illustrate a control mechanism which I have found is convenient, simple, and practical to use for this purpose. This comprises a lever 21, fulcrumed off-center on a bracket 22 which is securely fastened on the inside of the front wall of the tank as shown in Fig. 2. The shorter end of the lever 21 carries a fixed horizontal pin 23 which contacts a wedged-shaped projection 24 on the pipe 12 (see Figs. 1 and 3) when the pipe 12 is in raised position. To the opposite end of the lever 21 is attached a counterweight 25. A shaft 27, extending through the wall of the tank, has an arm 28 keyed to it at its inner end and a handle 26 securely attached to its outer end. A link 29 is pivotally connected at one end to the lever 21 and at the other end to the extremity of the arm 28 as shown in Fig. 3. Thus when the handle 26 is moved pivotally in either direction, the lower end of arm 28 moves in an arc and lifts the link 29 and therewith the weighted end of the lever 21. This causes the other end of the lever 21, and therewith the pin 23 to move downward, pushing the projection 24 and pipe 12 downward with it. As previously explained, it is necessary to push down on projection 24 only sufficiently to submerge bend 14 of pipe 12, whereupon the siphoning action starts and the free end of pipe 12 will be drawn down to the bottom of the tank. Meanwhile, as soon as the handle 26 is released the lever 21, assisted by the counterweight 25, returns to its normal position.

Any of the conventional types of float-actuated water inlet valves may be used to control the filling of the tank. One of the well-known types is shown in plan in Fig. 2. This comprises a float 30 connected by the rod 31 and linkage 32 to the stem 33 of the inlet valve. When the float 30 descends, due to the discharge of the water from the tank, the stem 33 of the inlet valve is raised, thus opening the inlet valve and permitting water to enter into and refill the tank. As the level of water in the tank rises, lifting the float 30, the stem 33 is pushed down, thus closing the inlet valve when the float has risen to a predetermined height.

As the level of water in the tank rises, during the refilling of the tank, the pipe 12 is lifted by its air chamber 19, since the siphoning action has ceased, and the pipe 12 returns to its normal raised position with the projection 24 again contacting pin 23 of lever 21. However, should the water level rise too high in the tank, due to a faulty inlet valve or any defect in the float-actuated mechanism controlling the inlet valve, since further upward travel of pipe 12 is prevented by the pin 23, the water, as soon as the level reaches the bend 14, will start flowing out through pipe 12 and pipe 4 and prevent any overflowing of the tank. Thus with my device a separate overflow pipe, such as is customary with other types of devices, is entirely unnecessary.

With the flexible rubber coupling connecting pipes 4 and 12 in the manner described, I have found it advisable, as a means of preventing lateral movement of the pipe 12 towards the rear wall of the tank, to provide a vertical guide post 34 which I secure at its base to the stationary pipe 4 at the side facing the rear wall of the tank (see Fig. 1). The pipe 12 is free to slide against the vertical post 34, and to prevent wear on the outer surface of pipe 12, a reinforcing plate 35 is mounted on pipe 12 as shown in Fig. 2. As a matter of convenience, I make the post 34 extend to the desired high water level in the tank in order that it may serve also as a gage for determining the correct water level when adjusting the stem 33 and other float mechanism operating the inlet valve.

When my device is to be used in a toilet flushing tank, the tank should be of such capacity and arranged to be filled to such a level as to cause one or more complete flushings of the toilet bowl during the siphoning discharge from the tank. Then, when the siphoning from the tank ceases, the remaining water in pipes 12 and 4, which then flows by gravity into the toilet bowl, will insure the proper amount of water remaining in the bowl to seal the discharge outlet from the toilet bowl to avoid any escape of gas from the sewer pipe into the bowl.

The flare or flange 13 at the bottom of the section 15 of pipe 12, by affording a considerably increased circumferential edge under which the water is drawn up into the pipe during the siphoning operation, enables such bottom end of the siphon to be positioned closer to the bottom of the tank without interfering too much with the intake of the water into the siphon. It is desirable to drain the tank as completely as possible during each siphoning operation, but at the same time, the passage of the water into and through the siphon must take place in sufficient volume and with sufficient speed to cause the proper flush-

ing of the toilet bow. One of the objections common to other toilet flushing tanks is that the water in the bottom of the tank is not sufficiently drained out in the ordinary flushing operation and this induces the accumulation of dirt and sediment in the bottom of the tank. Thus, the greater the flare or flange at the intake end of my siphon and the greater the area of the intake end, within reasonable limits, the more completely can the tank be empied by my device without decreasing its efficiency in other respects.

It would, of course, be possible to make the bottom edge of the flare or flange toothed or notched and thereby dispense with the stop 20. I have found it most practical, however, to use the particular construction illustrated.

Variations in the mechanical construction of my device may be made provided the principle of my invention be not departed from.

I claim:

1. In a flushing tank a siphon element comprising an S-shaped stationary pipe section arranged at a slight angle above the horizontal and whose lower end extends thru the tank bottom, a movable pipe extension connected to the upper end of said stationary pipe section by a rubber tube including an expanding ring, the upper end of said pipe extension bent to form an angular pendent section, the bent section of said pipe extension inclosed by a housing constituting an air chamber floating said bent section in the water in the tank, the walls of said air chamber constituting a brace for said bent section, a manually operable lever including a stop contacting with said bent section, and in the normal position of said lever limiting the rise of said bent section, said lever operable to depress the bent end of said movable pipe section.

2. In a flushing tank, a syphon element comprising an S-shaped stationary pipe section whose lower end extends thru the tank bottom, a movable pipe extension connected to the upper end of said stationary pipe section by a flexible tubular coupling of resilient material including an expanding ring of greater diameter than said tube, the upper end of said pipe bent to form a pendent section and provided with an air chamber floating said bent section in the water of the tank, a manually operable lever including a stop contacting with said bent section and in the normal position of said lever limiting the rise of said bent section, said lever operable to depress the bent end of said movable pipe extension.

3. In a flushing tank, a syphon element comprising an S-shaped stationary pipe section whose lower end extends thru the tank bottom, a movable pipe extension connected to the upper end of said stationary pipe section by a rubber tube including an expanding ring, the upper end of said pipe bent to form a pendent section and provided with an air chamber floating said bent section in the water of the tank.

4. In a flushing tank, a syphon element comprising an S-shaped stationary pipe section whose lower end extends thru the tank bottom, a movable pipe extension connected to the upper end of said stationary pipe section by a flexible tubular coupling of resilient material including an expanding ring of greater diameter than said tube, the upper end of said pipe extension bent to form a pendent section and provided with an air chamber floating said bent section in the water of the tank.

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