May 6, 1941. W. C. GROENIGER 2,240,904

TANK REFILL AND AIR GAP

Filed Oct. 27, 1939 2 Sheets-Sheet 1

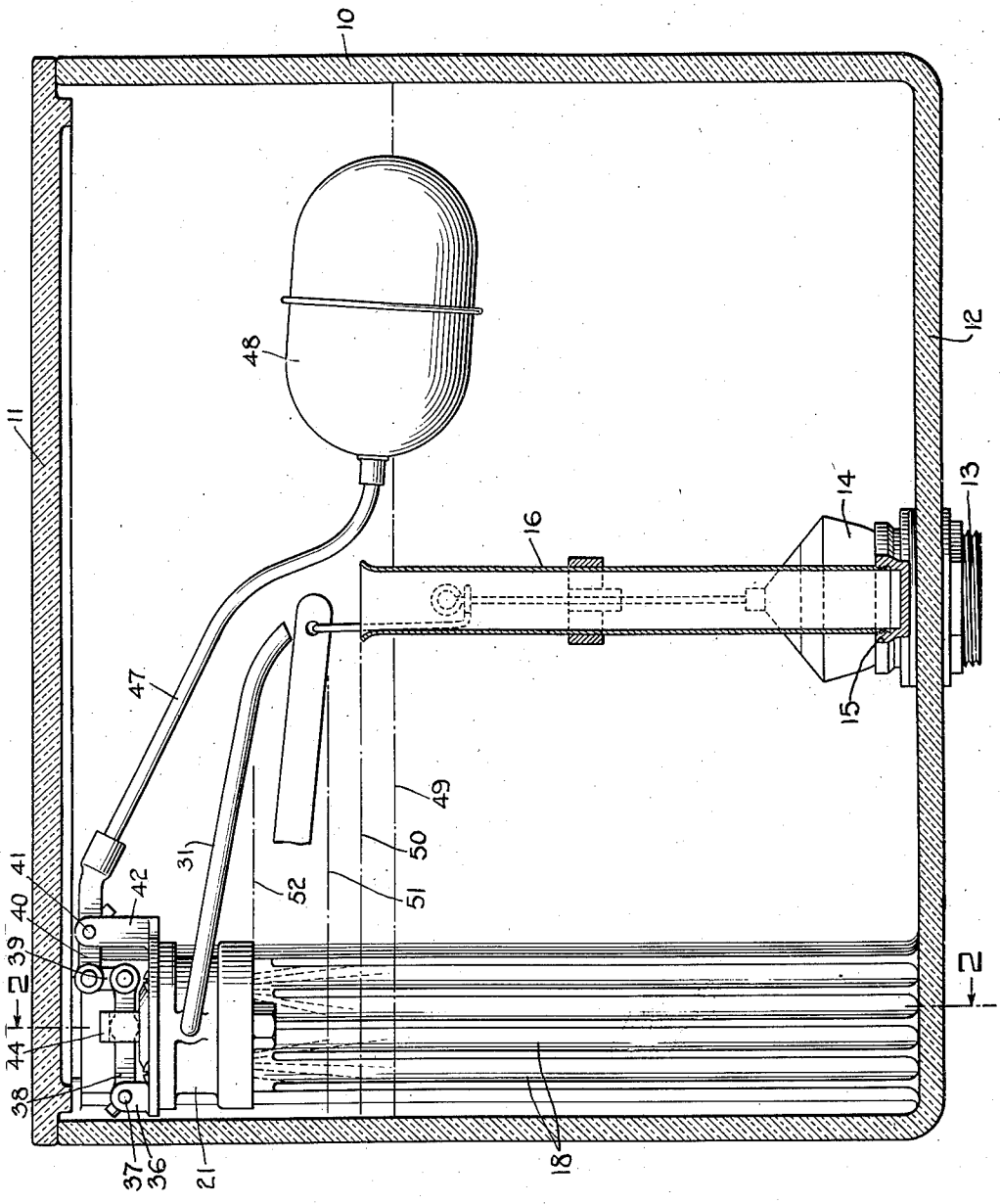


Fig. 1.

INVENTOR
William C. Groeniger
BY Henry J. Lucke
HIS ATTORNEYS

May 6, 1941. W. C. GROENIGER 2,240,904

TANK REFILL AND AIR GAP

Filed Oct. 27, 1939 2 Sheets-Sheet 2

Fig. 3.

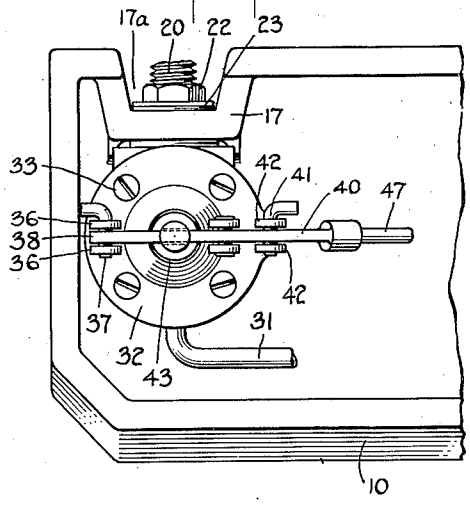


Fig. 2.

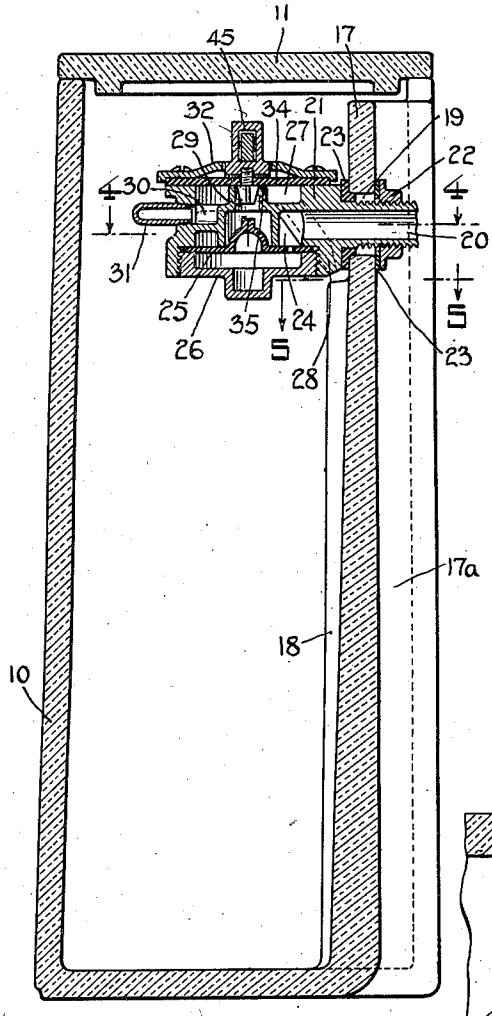


Fig. 4.

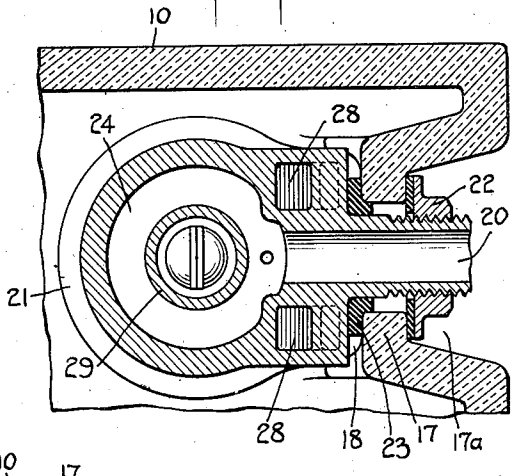
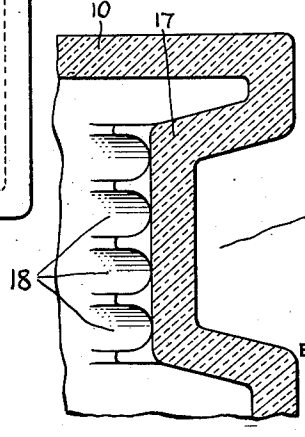


Fig. 5.



INVENTOR
William C. Groeniger
BY Henry J. Lucke
HIS ATTORNEYS

Patented May 6, 1941 2,240,904

UNITED STATES PATENT OFFICE

2,240,904

TANK REFILL AND AIR GAP

William C. Groeniger, Columbus, Ohio, assignor to John B. Pierce Foundation, New York, N. Y., a corporation of New York

Application October 27, 1939, Serial No. 301,570

1 Claim. (Cl. 137—21)

My present invention relates to flush tanks, and more particularly to an improved flush tank filling means.

A primary object of my invention is an improved assembly of elements whereby there is provided a sufficiently large air gap between the means for delivering water to the flush tank, and any possible height which such water shall attain in the tank, to prevent the establishment of a siphon by means of which water once having issued from the delivery means will be drawn back into such means.

Another object of my invention is a construction for reducing the noise occasioned by the delivery of water to a flush tank.

A further object of my invention is an improved construction for preventing water which has once issued from a source of supply from ever returning thereto and polluting the source of supply.

Other objects and novel features of the construction and arrangement of parts comprising the device will appear as the description of the invention progresses.

In the accompanying drawings:

Figure 1 is a central sectional elevation through a flush tank illustrating an improved tank supply valve in operative relation to the noise eliminating means for water entering the tank through the valve;

Figure 2 is a sectional elevation taken on the line 2—2 of Fig. 1, looking in the direction of the arrows on said line;

Figure 3 is a plan view of the upper left-hand corner of the construction shown in Figure 1, with the cover of the tank removed for clearness of illustration;

Figure 4 is a sectional plan view on the line 4—4 of Figure 2, and

Figure 5 is a sectional plan view on the line 5—5 of Figure 2.

Referring to the drawings, 10 designates a flush tank provided with a cover 11. Such flush tank may be made of any suitable material, ordinarily ceramic material. The flush tank is provided on the bottom with an opening in which is fitted a discharge nipple 13 having on its top open end a seat for a rubber valve 14 and with an offset 15, in which is screwed the lower end of an overflow pipe 16. The passage from the extension 15 communicates with the passage in the outlet nipple 13, so that upon excess rise of the water within the tank 10, such water will overflow and pass downwardly through the overflow pipe 16 into the nipple 13.

At one side of the rear portion of the tank 10 is provided a raised vertical rib 17 formed integral with the material of the tank 10. On the front face of the rib 17 there is provided a plurality of integral vertically arranged flutes 18, which extend to the bottom of the tank 10. The depth of the flutes 18 decreases as the bottom of the tank 10 is approached, as clearly shown in Figure 2, and thus water flowing downwardly along the flutes 18 is directed across the bottom of the tank into engagement with the front wall thereof and exerts a scouring action on the bottom of the tank. Also, the construction of rib 17 is such as to provide a vertical groove 17*a* in the outer face of the rear wall of the tank. The groove 17*a* is to provide means for housing the vertical supply pipe furnishing water to the valve 21 and thereby eliminates the necessity of such supply pipe passing through water in the tank where it would be subject to the corrosive action of the water as well as furnishing possibly a means for having the water supply polluted.

At the upper end of the rib 17, and above any possible water level in the tank 10, is a perforation 19, through which extends the externally threaded hollow tubular member 20 of a valve body 21. The end of the member 20 extends into and is housed in the groove 17*a*. Associated with the tubular threaded end 20 is a nut 22 and washers 23 which aid in establishing a fluid tight joint between the valve body 21 and the rear wall of the tank 10.

The valve body 21 is provided with a chamber 24 which communicates directly with the hollow tubular member 20. Fitted within the chamber 24 is a split cupped diaphragm valve 25, which is retained in position in the chamber 24 by the cover member 26. The valve body 21 is also provided with a chamber 27 which communicates directly with discharge orifices 28 and indirectly with the chamber 24 by means of a passage 29. Also, the chamber 27 is provided with an outlet 30 to which is connected an afterfill pipe 31, the free end of which communicates with the upper open end of the overflow pipe 16.

The lip member 25 is employed to insure easy and positive operation of the valve structure. It will be noted that the disk portion of the lip member 25 is provided with a relatively small perforation communicating with the inlet 20. Therefore, water filling the inlet pipe 20 seeps through the small perforation in through the space in the cover 26 below the lipped member 25. Also, at this time it may be assumed that the valve diaphragm 34 is in engagement with its valve and, therefore, there is an equalization of pressure on either side of the lipped valve 25. If the lever 47 is operated to move the valve 34 off its seat, there is a sudden lowering of pressure on the upper side of the lipped valve 25 with the result that the split lip of such lipped valve 25 opens allowing the major portion of the water on the underside thereof to flow outward past valve 34. This permits the pressure of the

water passing through the pipe 20 onto the top surface of the lip member 25 to be moved downward with great ease and great suddenness and allow the water to flow through the inlet pipe 20 in a manner usual in such apparatus.

The discharge orifices are so located that when the valve body is in position in the tank 10 as to discharge the water directly onto the flutes 18, the discharge orifices direct the water downwardly onto the flutes and inwardly against the flutes, and such flutes break up the continuity of flow of the water and this breaking up of the continuity of flow, together with the fact that the distance of the discharge orifices from the flutes 18 is relatively small, tends to reduce the noise which has heretofore been occasioned by the discharge of water into the tank 10.

The chamber 27 is provided with a cover 32 secured in position by a plurality of screws 33. Clamped between the upper face of the body 21 and cover 32 is a diaphragm valve 34 and which valve engages with a valve seat 35 formed at the upper end of the passage 29.

Formed integral with the cover 32 at one side thereof, are spaced lugs or ears 36, in which is pivotally mounted, on a shaft 37, one end of a lever 38. The other end of this lever 38 is pivotally attached to the lower end of a link 39, such link extending upwardly, as viewed in Figure 1, and is pivotally connected at its upper end to an operating lever 40. The operating lever 40 is pivotally mounted on a shaft 41 secured in lugs or ears 42 that are formed integral with the cover 32.

The cover 32 of the valve is provided with a centrally arranged opening 43 in which is slidably mounted a member 44. This member is secured at its lower end to the diaphragm valve 34, and having that portion thereof exterior of the cover 32 provided with a substantially rectangular passage 45 through which passes the lever 38. The lever 38, on that portion thereof which is in association with the member 44, is provided with rounded portions, as clearly shown in Figure 1, and which engage with the upper and lower surfaces of the rectangular slot 45 with a sliding or rolling motion. The operating lever 40 has attached thereto in any convenient manner a rod 47, which extends outwardly along the length of the tank 10 and has secured at its free end a hollow buoyant float 48, usually and ordinarily made of light gauge metal.

The normal level of water within the tank 10 is designated by the reference numeral 49. When the water reaches this height in the tank 10, the buoyancy of the float 48 will swing the lever 40 on its pivot shaft 41, thus depressing the link 39, with a consequent rotation in a clockwise direction of the lever 39 about its pivot shaft 37. There is thereby caused a downward movement of the diaphragm valve 34 into engagement with the valve seat 35 to shut off the flow of water passing therethrough.

Under some circumstances, because of sluggishness of operation of the mechanism above described, or the sticking of some part thereof, the water will rise above the normal water level, as indicated by the reference numeral 49, and will rise to the spill level, as indicated by the reference numeral 50. Excess of water delivered to the tank 10 and under these conditions will be expected to flow into the overflow pipe 16 and out of the tank 10. It is, however, possible that even under these conditions the flow of water into the tank 10 is greater than can be taken care of by the overflow pipe 16, and the water may rise to the level indicated by the reference numeral 51. This is the overflow spill level and is the top level to which the water can rise in the tank 10, even though the float 48 has broken away from its supporting member 47. At the level 51 there will be a head of water sufficiently great to drive the water through the overflow pipe 16 as fast as such water is delivered to the tank 10 through the discharge orifice 28 of the valve.

The valve discharge level is indicated by the reference numeral 52, and upon inspection of Figure 1, it will be apparent that the distance between the levels 51 and 52 provides an ample air gap to preclude the possibility of the water rising to a level within the tank sufficiently great to permit back flow of water to the source of supply under any possible circumstances.

In actual commercial construction the distance between the top of the overflow pipe 16 and the overflow spill level indicated by the reference numeral 51 is the factor of safety or minimum distance provided for the height of the water or the possible height the water in the tank would reach in the event of flooding by reason of the float 48 being disconnected or broken off. The distance between the tank overflow level 50 and the valve discharge level 52 is the air gap or air space which is provided and to prevent any water in the tank from returning to the water supply system by back flow such as back siphonage.

Whereas I have described my invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

I claim:

In an improved flush tank filling means the combination of a tank, an overflow waste pipe mounted therein and determining the normal height of water within the tank, an inwardly extending rib formed on the rear wall of the tank and extending into the tank and defining a groove on the rear wall of the tank, a plurality of flutes formed on the front face of the rib, a source of water supply including a pipe positioned in the groove and a lateral pipe connected to and extending through a perforation in the rib and adjacent the upper open end of the tank, and a water supply valve secured to the lateral, said water supply valve being positioned adjacent the top of the tank and with the outlet leading water into the tank located well above the possible height that water within the tank may attain under any condition of service, such construction establishing a fixed air gap between the supply valve and any possible height to which water may rise within the tank to prevent back siphonage of water to the source of supply, and said construction also preventing pollution of pure water from the supply by maintaining the supply pipe out of contact at all times with water within the tank.

WILLIAM C. GROENIGER.