April 17, 1956 M. F. GIBBONS 2,741,774

FLUSH TANK VALVE MECHANISM

Filed June 25, 1953

FIG. 1.

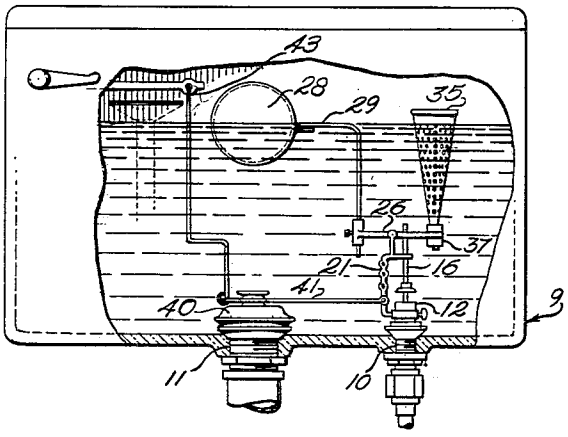
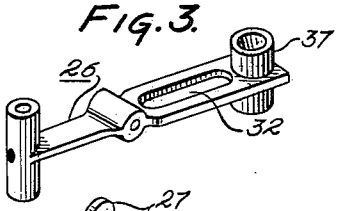


FIG. 3.



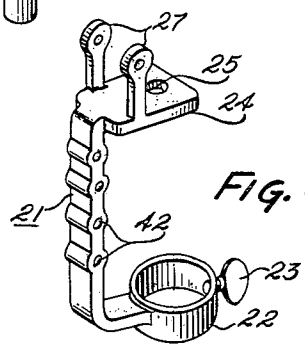


FIG. 4.

FIG. 2.

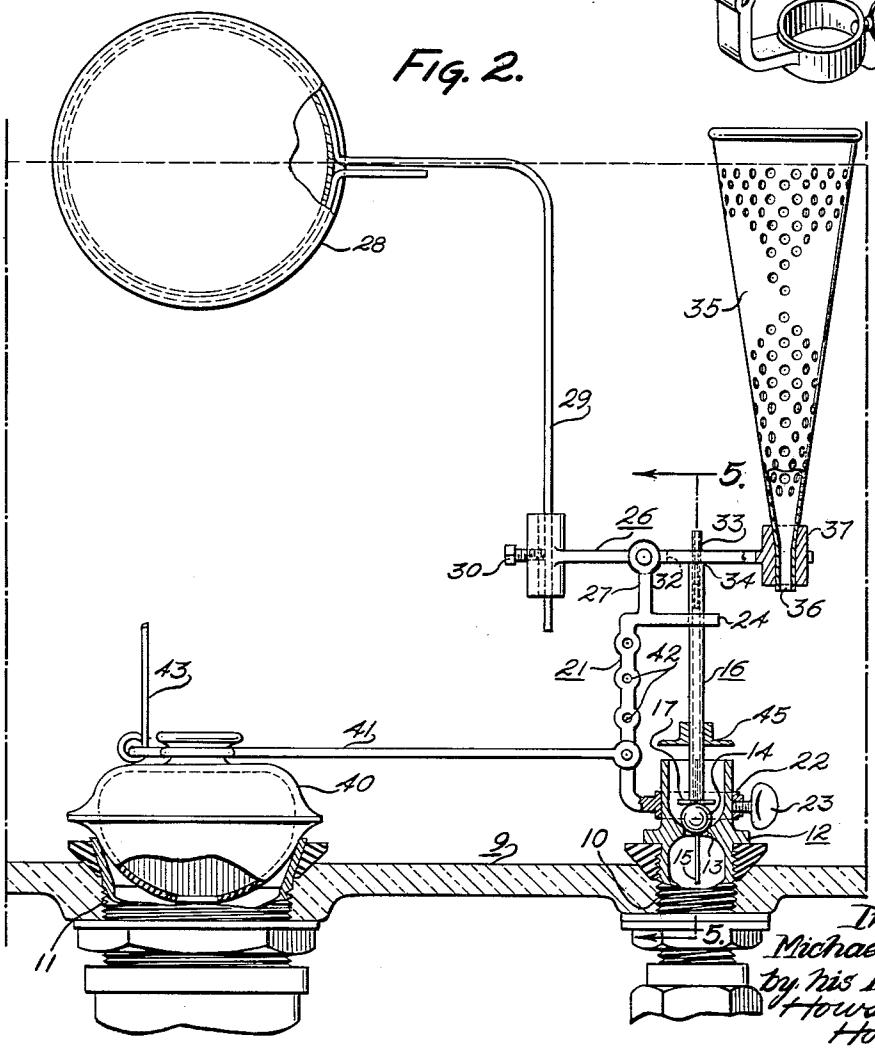
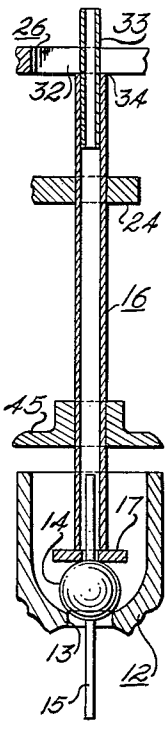


FIG. 5.



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United States Patent Office 2,741,774 Patented Apr. 17, 1956

2,741,774

FLUSH TANK VALVE MECHANISM

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Application June 25, 1953, Serial No. 364,100

3 Claims. (Cl. 4—56)

The present invention relates to valve mechanism for the flush tanks of water closets and the like and more particularly to a novel intake valve mechanism for the tank.

In conventional flush tanks, the water intake valve often does not completely close when the water reaches the desired level in the tank. To correct this, it is necessary to disassemble the intake valve mechanism and replace the worn washer or defective mechanism. In addition, the valve normally is mounted at the upper end of a vertical pipe which projects above the water level in the flush tank, and when the tank is flushed, the refilling of the tank is accompanied by the annoying sound of running water.

With the foregoing in mind, a principal object of the present invention is to provide an intake valve mechanism for flush tanks which is located below the normal water level of the tank and which is simple and effective in operation and use.

Another object of the present invention is to provide a valve element for flush tanks which finds its proper seat and compensates for any slight misalignment or wear in the mechanism.

A further object of the present invention is to provide a novel valve for flush tanks which may be readily installed in existing tanks by a relatively unskilled artisan.

The invention also contemplates a flush tank mechanism having a reservoir for soap or other disinfectant which is stirred through the water in the tank by operation of the flushing mechanism.

A more specific object of the present invention is to provide a novel intake valve for flush tanks which comprises a resilient spherical valve element which is forced against a valve seat in the bottom of the flush tank when the water level in the tank reaches the desired level.

In addition, the invention contemplates an easily-installed mechanism wherein the float which determines the water level in the tank is adjustable to provide the proper depth of water in the tank.

These and other objects of the invention and the various features and details of the construction and operation thereof are more fully set forth hereinafter with reference to the accompanying drawing in which:

Fig. 1 is a thumb nail sketch of a flush tank with portions broken away to illustrate the general arrangement of a mechanism made in accordance with the present invention;

Fig. 2 is an enlarged fragmentary sectional view through the tank illustrating the construction and operation of the mechanism illustrated in Fig. 1;

Fig. 3 is an enlarged detached perspective view of one element of the mechanism;

Fig. 4 is an enlarged detached perspective view of another element of the mechanism; and,

Fig. 5 is an enlarged fragmentary sectional view showing the operation of the valve member.

The illustrated embodiment of the present invention comprises a flush tank having standard inlet and outlet

connections. The outlet is closed by the usual rubber float valve and the inlet is provided with a fitting adjacent the tank bottom having a valve seat which is adapted to be closed by a resilient spherical valve element. The valve element is forced into engagement with the valve seat by a vertical tube which is guided for axial movement in a bracket secured to the fitting. The bracket, at its upper extremity, pivotally mounts an arm, one end of which carries the standard float cylinder, and the other end of which supports a foraminous reservoir for soap or other disinfectant. The arm is adapted to engage the upper end of the vertical tubular member so that when the float falls, as when the water leaves the tank, the tubular member is permitted to rise in order to free the spherical valve element from the valve seat and thereby permit entry of water into the tank. When the water fills the tank and causes the float to rise again, pivotal movement of the arm forces the tubular member down against the spherical valve element to cause the latter to seat firmly upon the valve seat and thereby positively shut off the flow of water into the tank. It is noted that when the arm is moved, the reservoir is stirred through the water to cause the water to flow through the reservoir and dissolve a portion of the soap or other disinfectant contained therein.

Referring now to the drawings, the tank 9 is provided with the usual inlet and outlet ports 10 and 11 respectively. The inlet port 10 is provided with a tubular fitting 12 which has a restricted valve seat 13 located centrally in its bore. The bore of the fitting at the upper and lower ends thereof is of a standard pipe diameter and gradually narrows towards the center and terminates in the valve seat 13. The gradually diminishing bore diameter adjacent the valve seat 13 effectively prevents the valve seat from becoming clogged or choked up by foreign matter. The valve seat 13 is adapted to receive a spherical valve element 14 which seats nicely upon the upper surface of the valve seat to shut off the flow of water therethrough.

The spherical valve element 14 is provided with means to insure its registry with the valve seat 13. To this end, the element 14 is provided with a pin or rod 15 which passes through the center of the valve element and extends outwardly a substantial distance above and below the valve element. The lower extension of the pin 15 passes downwardly through the valve seat, and the upper extension projects upwardly and is confined within an upstanding tubular member 16. The tubular member 16, as described more fully hereinafter, is adapted to move axially so as to permit the valve element 14 to rise clear of the valve seat 13 and thereby admit water to the tank. The diameter of the bore of the tubular mem- 16 is greater than the diameter of the pin 15 so that the valve is free to find a proper seat on the valve seat 13. To prevent damage to the valve element by the tubular element 16, a washer 17 is fitted loosely over the pin 15 between the lower extremity of the tubular member 16 and the valve element 14. In this manner, the tubular member engages against the washer 17 which in turn effects movement of the valve element 14.

The tubular member 16 moves axially in vertical alignment with the valve seat 13. To this end, a U-shaped bracket 21 is provided, the lower leg of which is formed with a collar 22 that slides over the fitting 12 and is clamped thereon by a thumb screw 23. The upper arm 24 of the bracket 21 is provided with an aperture 25 for receiving and guiding the tubular member 16. When the bracket is clamped to the fitting 12, the aperture 25 is in vertical alignment with the valve seat 13, so that the tubular member 16 may move vertically and maintain registry with the valve seat.

In accordance with the invention, means responsive

to the water level in the tank is provided to actuate the tubular member 16. To this end, an arm 26 is journalled for pivotal movement between upstanding lugs 27, 27 on the bracket 21. The arm 26 at one end mounts a standard float cylinder 28. The cylinder is supported on the arm 26 by a holder element 29 which encircles the cylinder 28 and is adjustably secured to the arm by a set screw 30, as clearly illustrated in Fig. 2. Thus, when the water level rises or falls, the arm 26 is pivoted in its journals in the lugs 27, 27.

Adjacent the opposite extremity of the arm 26, an elongated slot 32 is provided which is in vertical registry with the aperture 25 and the valve seat 13. The slot receives an upward extension 33 of the tubular member 16 so as to provide a further lateral support for the member 16. As seen in Fig. 5, the extension 33 is of smaller diameter than the body portion of the tubular member 16 so as to form adjacent the upper extremity of the member 16, a shoulder 34 which bears against the under surface of the arm 26. In the position illustrated in Fig. 2, therefore, the arm 26 bears down upon the shoulder 34 of the tubular member 16 which in turn forces the valve element 14 into engagement with the valve seat 13. When the water level drops, the float 28 falls, causing counterclockwise pivotal movement of the arm 26 which frees the member 16 for vertical movement within the aperture 25 of the bracket 21. The vertical movement of the tubular member releases the valve member 14 from the valve seat and permits an influx of water through the fitting 12.

In accordance with the invention, means is provided for introducing soap or disinfectant into the tank. To this end, the right hand extremity of the arm 26 is provided with an apertured boss 37 which is adapted to receive and support a foraminous reservoir 35. Cakes or pieces of soap or another disinfectant material are placed within the reservoir 35, and when the arm 26 is actuated, the reservoir will be stirred through the water in the tank so as to partially dissolve the cakes in the reservoir. It is noted that the reservoir 35 is generally conical in form and terminates at its apex in a restricted opening 36. Thus, when the cakes of soap or disinfectant are substantially used up, the small portions remaining pass out of the reservoir into the body of the tank 9 through the opening 36.

The outlet 11 of the tank is fitted with a standard float valve 40. The valve 40 is carried by a rod 41 which is pivotally secured to the bracket 21 by means of one of a plurality of apertures 42 in the vertical arm thereof. By providing a plurality of apertures 42, it is possible to adapt the bracket 21 to a variety of tanks, the proper one of the apertures 42 being chosen in accordance with the height of the seat for the valve 40. The standard trip mechanism for releasing the float valve 40 is provided as indicated at 43 in Figs. 1 and 2.

In the operation of the device, when the valve 40 is tripped by actuation of the mechanism 43, the water in the tank 9 escapes through the outlet 11. The water level in the tank, therefore drops, and the float 28 effects counterclockwise pivotal movement of the arm 26. This movement releases the engagement of the arm 26 with the shoulder 34 of the tubular member 16 and allows the valve element 14 to rise from its seat 13, permitting water to enter the tank through the fitting 12. When the tank is substantially empty, the float valve 40 finds its seat and shuts off the escape of water from the tank. The incoming water raises the float 28, effecting clockwise pivotal movement of the arm 26. The arm engages against the shoulder 34 and forces the tubular member 16 down against the washer 17 to thereby force the valve element 14 against its seat 13. The pivotal movement of the arm stirs the reservoir through the water and partially dissolves the soap or other disinfectant therein.

When the arm 26 is displaced downwardly, the spherical shape of the valve element 14 insures that it finds a proper seat. If water continues to leak past the valve element 14, the water level in the tank rises accordingly, and causes the float to rise to exert a greater downward pressure on the tubular member 16 and thereby force the valve element 14 more positively against the valve seat 13. It should be noted that a splash plate 45 is fitted onto the tubular member 16 upwardly adjacent the fitting 12 to deflect the incoming water. This prevents the water from spouting against the top of the tank and leaking out between the tank and its cover.

The intake valve mechanism is readily installed or replaced in the tank. To install the device, the collar 22 of the bracket 21 is simply slipped over the fitting 12 and clamped by the thumb screw 23. The valve element 14 is dropped in place in the fitting and the tubular member 16 is slipped over the pin 15. The float 28 and the float valve 40 are properly located on the arm 26 and bracket 21 respectively, and the mechanism is ready for operation. The reverse procedure is used for removing the device for replacement or repair of its parts.

It should be noted that although the valve is located below the water level in the tank, when the pressure in the intake line drops below a safe value, there is no danger of the water from the tank flowing back into the intake line when the float drops. This is because the movement of the float does not, of itself, raise the ball valve but rather the pressure in the intake line effects opening of the valve. In this manner, there is no possibility of the water in the tank flowing back into the intake line when there is a failure of pressure in the line, such for example, as when there is a break in the line, or when the pressure is shut off for making repairs.

While a particular embodiment of the invention has been illustrated and described herein, it is not intended to limit the invention to such disclosure, and changes and modifications may be made therein and thereto within the scope of the following claims.

I claim:

1. For a flush tank having liquid inlet and outlet ports, a valve mechanism for said inlet port comprising a fitting having a central bore in liquid communication with said port, means defining a restricted valve seat in said bore, a resilient spherical valve element loosely confined in said bore and operable to engage upon said valve seat to close said liquid inlet port, said valve element having a pin projecting radially outward therefrom, a hollow tube loosely embracing said pin and mounted for axial movement in axial alignment with said seat, said tube being operable to guide said element into engagement upon said valve seat, a bracket mounted on said fitting and embracing said tube to guide and support the same against lateral displacement, an arm pivoted to said bracket, a float responsive to the liquid level in the tank, mounted at one end of said arm, means adjacent the other end of said arm engaging said tube and operable when the float is at a predetermined level to urge said tube axially against said valve element to thereby forcibly engage the valve element upon the seat, a float valve pivotally mounted on said bracket and cooperable with said outlet port to close the same, and means operable to displace said float valve and afford discharge of the liquid from the tank to cause pivotal displacement of said float and said arm, said pivotal displacement releasing the engagement of said valve element upon said seat to permit entry of liquid through said inlet port.

2. For a flush tank having a liquid inlet port and a float responsive to the liquid level in the tank, a valve mechanism for said port comprising a fitting having a central bore in liquid communication with said port, means defining a restricted valve seat in said bore, a resilient spherical valve element loosely confined in said bore and cooperable with said valve seat to close said liquid inlet port, a pin projecting radially outward from said valve element, a hollow tube projecting out of said bore in

axial alignment with said seat and loosely embracing said pin, said tube being operable to guide said element onto said valve seat, an arm operatively connected to the float and engaging said tube, operable when the float is at a predetermined level to urge said tube axially against said valve element to thereby forcibly engage the valve element upon the seat, and a foraminous reservoir mounted on said arm below the liquid level in said tank and adapted to contain solid disinfectant material, whereby upon movement of said float, the reservoir is displaced in said tank to partially dissolve the material contained in said reservoir.

3. For a flush tank having a liquid inlet port, a valve mechanism for said port comprising a fitting having a central bore in liquid communication with said port, means defining a restricted valve seat in said bore, a resilient generally spherical valve element loosely confined in said bore and operable to engage upon said valve seat to close said liquid inlet port, said element having a pin projecting radially outward therefrom and mounted for axial movement in axial alignment with said seat, guide means embracing said pin to guide said element into engagement upon said valve seat, a bracket mounted on

said fitting and supporting said guide means against lateral displacement, an arm pivoted to said bracket, a float responsive to the liquid level in the tank mounted at one end of said arm, means adjacent the other end of said arm operable when the float is at a predetermined level to urge said valve element toward said fitting and forcibly engage the same upon the seat, a float valve pivotally mounted on said bracket and cooperable with the outlet port of said flush tank to close the same, and means operable to displace said float valve and afford discharge of the liquid from the tank to cause pivotal displacement of said float and said arm, said pivotal displacement releasing the engagement of said valve element upon said seat to permit entry of liquid through said inlet port.

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