June 24, 1958 W. A. HEIDMAN, JR 2,839,761

FLUSH VALVES FOR WATER CLOSET TANKS

Filed Dec. 6, 1955 2 Sheets-Sheet 1

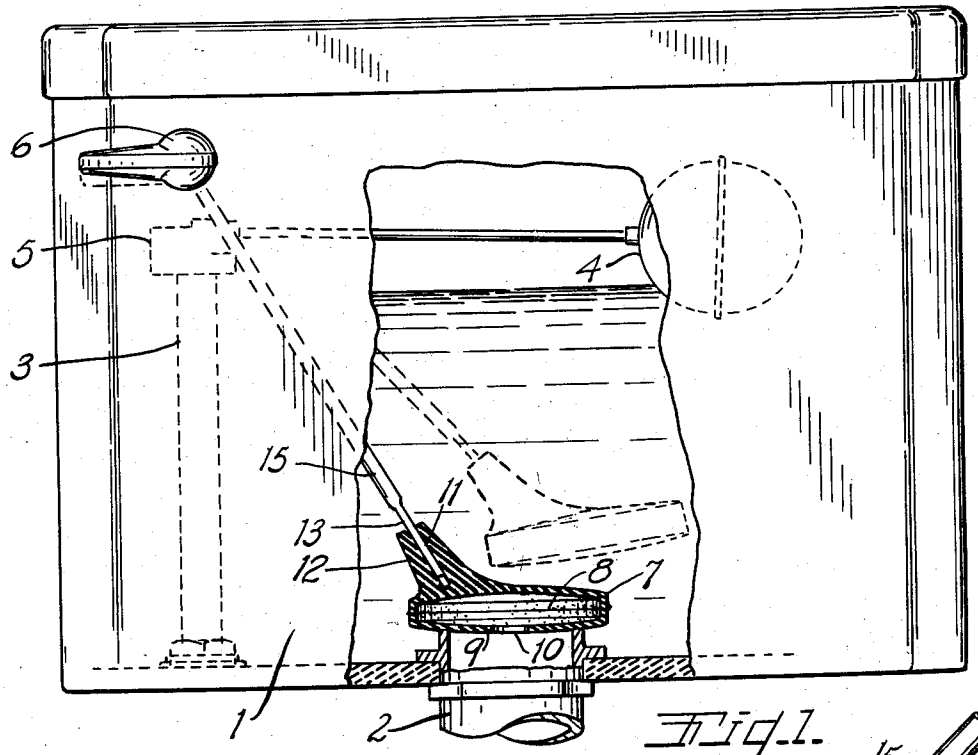


Fig. 1.

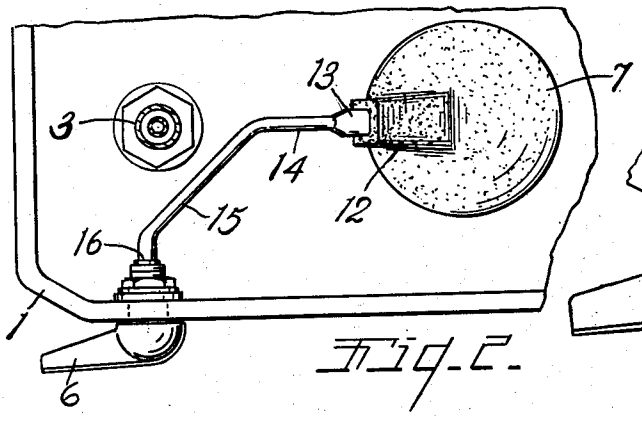


Fig. 2.

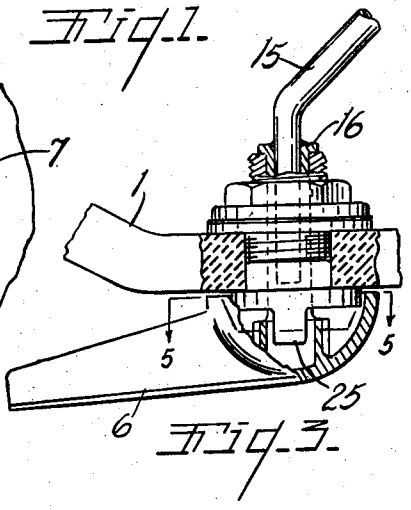


Fig. 3.

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FLUSH VALVES FOR WATER CLOSET TANKS

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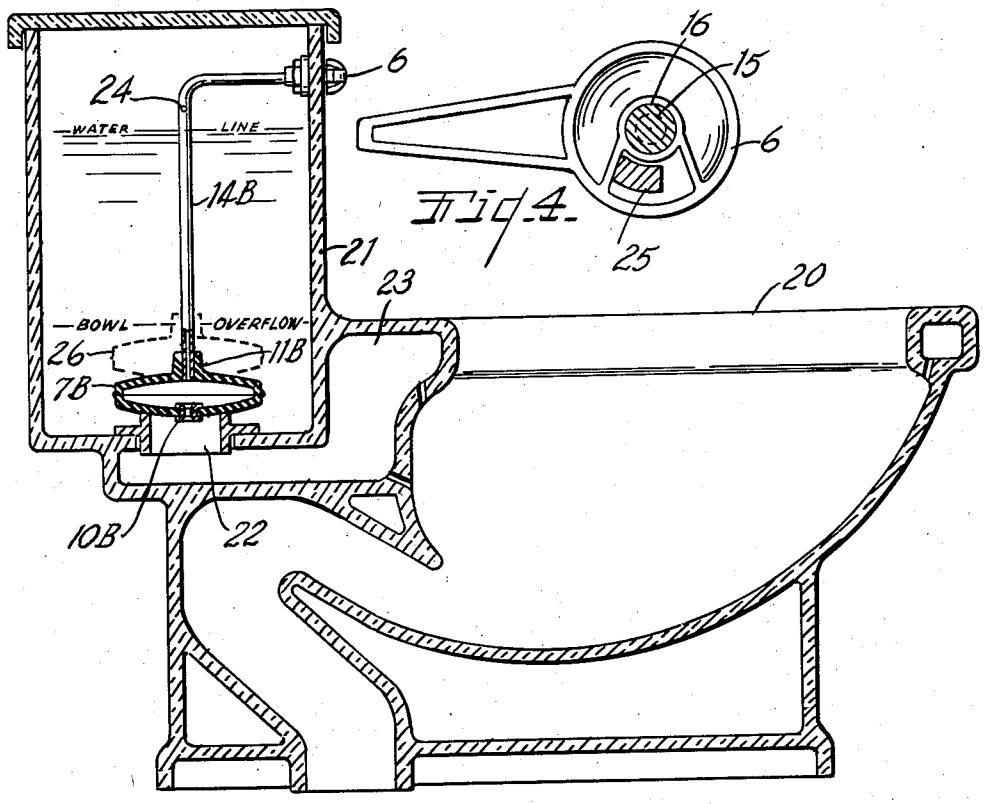


Fig. 4.

Fig. 5.

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FLUSH VALVES FOR WATER CLOSET TANKS

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11 Claims. (Cl. 4—56)

This invention relates to improvements in flush valves for water closet tanks.

The principal objects of this invention are:

First, to provide a flush valve that is extremely simple and inexpensive to manufacture.

Second, to provide a flush valve assembly without any relatively movable joints or parts that are apt to jam or get out of adjustment.

Third, to provide a flush valve assembly particularly adapted for closets having flush tanks positioned below the overflow level of the closet bowl which valves will prevent the overflow of the bowl should the bowl outlet become clogged.

Fourth, to provide a flush valve for low level flush tanks which will close automatically and prevent continued filling of the tank and resultant continued overflow of the closet bowl should the closet bowl become clogged.

Fifth, to provide a flush valve assembly without pivotally or movably connected parts.

Other objects and advantages of the invention will be apparent from a consideration of the following description and claims.

The drawings, of which there are two sheets, illustrate two highly practical forms of flush valve as applied to the two types of closet tanks.

Fig. 1 is a front elevational view of a common form of closet tank with the flush valve of the invention applied thereto, portions of the tank and valve being broken away in vertical section.

Fig. 2 is a fragmentary top plan view of the valve as installed in the tank in Fig. 1.

Fig. 3 is a fragmentary enlarged cross-sectional view through the valve handle mounting on the flush tank wall.

Fig. 4 is a fragmentary cross-sectional view through the flush handle taken along the plane of the line 5—5 in Fig. 3.

Fig. 5 is a vertical cross-sectional view through a water closet having a low level closet tank extending below the level of the closet bowl with a modified form of flush valve operatively mounted in the flush tank.

In Figs. 1 and 2 there is illustrated the more common type of closet tank 1 having an outlet pipe 2 in the bottom. This type of tank is mounted in a well known manner above the level of the closet bowl to which it is connected. Water is admitted into the tank from an inlet pipe 3 and the level of the water is automatically controlled by a float 4 actuating a valve 5, as will be understood. A flush handle 6 is pivotally mounted on the wall of the tank, also in a well known manner.

The valve 7 which controls the passage of water to the outlet pipe 2 is a generally flat disc shaped hollow body of molded rubber or plastic. The valve is molded in two parts joined along the parting line 8. The lower wall 9 of the valve is desirably convex but its radius of curvature is substantially greater than the radius of the outlet pipe 2 with which it coacts. As illustrated the radius of curvature of the lower wall 9 is about twelve times the radius of the pipe 2 and for the purposes of

defining the scope of the invention, a minimum radius for the bottom of the valve is established as six times the radius of the pipe. The bottom wall may have a small degree of flexibility to conform to the outlet pipe 2 which forms the flush valve seat. However, the wall 9 is sufficiently stiff to prevent collapse of the wall into the end of the pipe. The bottom convex surface of the valve is substantially wider than the pipe. The bottom wall 9 defines a central aperture 10 that opens into the top of the outlet pipe when the valve is seated.

The upper wall of the valve 7 has an integral upwardly inclined neck 12 with an inclined slot or hole therein as at 11. The neck is located off-center of the valve toward the handle 6. The hole 11 adjustably and frictionally receives the flattened end 13 of a valve rod 14 desirably formed of brass or other non-rusting metal. The rod 14 extends obliquely upwardly toward the handle 6 and is bent forwardly as at 15 to clear the inlet pipe 3 and to enter axially into the hub of the handle 6. The upper end of the rod 15 is clamped to the handle for rotation therewith by any suitable means, such as the bushing 16 pressed into the hub of the handle along with the end of the valve rod. Turning motion of the handle thus swings the rod and the valve 7 in an oblique sliding or elevating motion with respect to the seat on the end of the outlet pipe opening the flush valve. The off-center location of the neck 12 and the flexible character of the neck results in a lifting or prying action on the side of the valve nearest the handle that unseats the valve against the pressure of the water. The valve 7 being hollow and buoyant opens and remains open while the tank empties and reseats on the pipe 2 automatically as the level of the water falls to the level of the outlet pipe 2. The neck that connects the valve to the rod is slightly flexible permitting the valve to tilt slightly relative to the rod. A tilt of from 5 to 10 degrees is sufficient and should not be exceeded materially. In seating, the valve will tend to hang down and strike the far edge of the pipe first and then tilt into final seating position.

The closet bowl 20 and the flush tank 21 illustrated in Fig. 5 are a well-known, if somewhat less common, type of structure than the tank 1 in Fig. 1. The outlet pipe 22 of the tank 21 opens directly into a flush passage 23 positioned below the top of the bowl 20. This type of bowl and tank is subject to the disadvantage that when a standard flush valve consisting of a buoyant ball is opened the ball will not sink and reclose the flush valve should the bowl outlet become plugged because there will always be sufficient water above the outlet pipe 22 to float the ball above the pipe. At the same time the low level of the water in the tank will move the inlet float to open position so that the inlet valve will continue to supply water to the tank resulting in continuous over-flow of the closet bowl and resultant damage to the floors, walls and furnishings of the building.

A modified form of flush valve 7B adapted for use in this type of closet tank is similar to the first form of the valve described being a hollow disc-shaped body of molded rubber or plastic. The bottom wall is apertured and a grommet 10B is fitted in the aperture. The grommet is used because there is a regular flow of water through the bottom wall of the valve, as will be described, and the grommet can be made of more rigid and wear-resisting material than the wall of the valve. The size of the opening through the grommet may also be accurately controlled for the reasons to be described. The neck 11B receives the lower end of the valve rod 14B, as in the first form of the valve, but in this case the valve rod 14B is hollow and opens to the interior of the hollow valve 7B. The connection of the valve rod 14B to the valve is desirably off-center as in the first form of the valve although this does not appear

in the angle from which Fig. 5 is taken. The valve rod 14B extends upwardly and is connected to the handle 6, as in the first form of the valve, but a vent hole 24 is formed in the valve rod above the water line of the tank 21.

With the foregoing construction, the hollow valve rod 14B and the valve body 7B drain through the outlet pipe 22 as the water drains from the flush passage 23 and the valve is held seated by the pressure of the water in the tank 21. When the handle and valve rod are tilted to unseat the valve 7B the grommet 10B is, of course, immersed in the water in the tank and the space within the hollow valve being open above the water line through the vent 24 water immediately begins to flow into the hollow valve at a rate determined by the size of the orifice in the grommet. This size is desirably calibrated to fill the valve 7B in about the time that it takes to fill the bowl 20 from the tank 21. The float or valve 7B thus losses its buoyancy and sinks to closed position before any over-flow occurs and prevents continued and prolonged over-flow of the bowl.

It is desirable in both the valve assemblies shown that the fixed stop 25 on the valve handle mounting coact with the valve handle 6 to limit upward movement of the valve to a short distance above the valve seat as shown by the dotted lines 26 in Fig. 5. This prevents interference between the valve rod and the ball float arm of the inlet valve. It also holds the valve well below the overflow level of the bowl so that the valve 7B fills at the desired rate due to the head of water over the valve. Closing of the valve before overflow occurs is thus assured. In all forms of the valve, the valve seats externally or over the end of the valve seat as distinguished from seating inside the rim of the seat.

Having thus described the invention, what is claimed as new and is desired to be secured by Letters Patent is:

1. A flush tank valve assembly comprising a closet tank having an outlet pipe in the bottom with a valve seat on the top of the pipe, a handle pivotally mounted in the wall of the tank above the water level of the tank and to one side of the pipe, a valve rod rigidly connected to said handle and swingable therewith within said tank, said rod extending obliquely downwardly to over said pipe, and a hollow circular valve of deformable rubber mounted on the lower end of said rod, said valve having a convex lower surface of substantially greater radius than the radius of the circular outline of the valve and adapted to seat against the seat on said pipe and having an inclined upwardly projecting neck slidably adjustably receiving the lower end of said rod whereby the valve opens and closes in an arcuate swinging motion about the pivot of said handle and obliquely across the top of said pipe onto said seat, the radius of convexity of said convex surface being at least six times the radius of said pipe, the lower wall of said valve having an opening therein positioned within the outline of said pipe when said valve is seated, the connection between said neck and the top of the valve being off-center of the valve toward said handle and being flexible permitting limited tilting of the valve with respect to the rod.

2. A flush tank valve assembly comprising a closet tank having an outlet pipe in the bottom with a valve seat on the top of the pipe, a handle pivotally mounted in the wall of the tank above the water level of the tank and to one side of the pipe, a valve rod rigidly connected to said handle and swingable therewith within said tank, said rod extending obliquely downwardly to over said pipe, and a hollow and flat valve mounted on the lower end of said rod whereby the valve opens and closes in an arcuate swinging motion about the pivot of said handle and obliquely across the top of said pipe onto said seat, said valve having a generally flat lower surface broader than said pipe adapted to seat against the seat over said pipe, the connection between said valve and said rod being flexible permitting limited tilting of the valve on the rod and being located off center of the valve toward the rod.

3. A flush tank valve assembly comprising a closet tank having an outlet pipe in the bottom with a valve seat on the top of the pipe, a handle pivotally mounted in the wall of the tank above the water level of the tank and to one side of the pipe, a valve rod rigidly connected to said handle and swingable therewith within said tank, said rod extending obliquely downwardly to over said pipe, and a hollow flat valve mounted on the lower end of said rod whereby the valve opens and closes in an arcuate swinging motion about the pivot of said handle and obliquely across the top of said pipe onto said seat, said valve having a convex lower surface broader than said pipe adapted to seat against the seat on said pipe, said convex surface having a radius of convexity of at least six times the radius of said pipe, the connection between said valve and said rod being positioned off center of the valve toward the rod.

4. A flush tank valve assembly comprising a closet tank having an outlet pipe in the bottom with a valve seat on the top of the pipe, a handle pivotally mounted in the wall of the tank above the water level of the tank and to one side of the pipe, a valve rod rigidly connected to said handle and swingable therewith within said tank, said rod extending obliquely downwardly toward said pipe, and a hollow flat valve mounted on the lower end of said rod whereby the valve opens and closes in an arcuate swinging motion about the pivot of said handle and obliquely across the top of said pipe onto said seat, said valve having a generally flat lower surface broader than said pipe adapted to seat against the seat on said pipe, the connection between said valve and said rod being off center of the valve.

5. A flush valve assembly comprising a closet tank having an outlet in the bottom thereof with a valve seat around the outlet, a valve of hollow construction having a generally flat lower wall broader than said seat adapted to seat on said seat and having a hole formed in the middle of said lower wall, a valve handle pivoted in the wall of said tank above the water level of the tank, a valve rod connected directly to said handle and swingable therewith and extending in an incline downwardly within said tank and connected to said valve.

6. In combination with a closet bowl having a flush tank with an outlet pipe positioned below the level of the top of the bowl, a flush valve assembly comprising a flattened hollow circular valve of deformable rubber material adapted to seat on said pipe and having a hole in its bottom wall opening to said pipe, a handle pivoted on the wall of said tank, a valve rod connected to said handle and swingable therewith and extending obliquely downwardly to said valve, said rod having a hollow portion connected to said valve and communicating with the inside of the valve and having a vent hole opening from said hollow portion above the water line of said tank, and a grommet fitted within the hole in the bottom of said valve and having a calibrated orifice to meter the flow of water into said hollow valve, said handle and tank having coacting stop portions limiting upward motion of the said rod to retain said valve below the bowl overflow line of the tank, the connection between said rod and said valve being off-center of the valve.

7. In combination with a closet bowl having a flush tank with an outlet pipe positioned below the level of the top of the bowl, a flush valve assembly comprising a flat hollow circular valve having a convex bottom wall of substantially greater radius than the radius of the circular outline of the valve and adapted to seat on said pipe and having a hole in its bottom wall opening to said pipe, a handle pivoted on the wall of said tank, a valve rod directly connected to said handle and swingable therewith and extending obliquely downwardly to said valve, said rod having a hollow portion connected to said valve and communicating with the inside of the

valve and having a vent hole opening from said hollow portion above the water line of said tank, and a grommet fitted within the hole in the bottom of said valve and having a calibrated orifice to meter the flow of water into said hollow valve, said handle and tank having coacting stop portions limiting upward motion of the said rod to retain said valve below the bowl overflow line of the tank.

8. In combination with a closet bowl having a flush tank with an outlet pipe positioned below the level of the top of the bowl, a flush valve assembly comprising a flat hollow circular valve adapted to seat on said pipe and having a hole in its bottom wall opening to said pipe, a handle pivoted on the wall of said tank, and a valve rod directly connected to said handle and swingable therewith and extending obliquely downwardly to said valve, said rod having a hollow portion connected to said valve and communicating with the inside of the valve and having a vent hole opening from said hollow portion above the water line of said tank, said handle and tank having coacting stop portions limiting upward motion of the said rod to retain said valve below the bowl overflow line of the tank.

9. In combination with a closet bowl having a flush tank with an outlet with a valve seat therearound positioned below the level of the top of the bowl, a flush valve assembly comprising a flat hollow circular valve adapted to seat on said seat and having a hole in its bottom wall opening to said outlet, a handle pivoted on the wall of said tank, and a valve rod connected to said handle and swingable therewith and extending obliquely downwardly to said valve, means movable with said rod communicating with the inside of the valve and forming a vent opening above the water line of said tank, said hole acting to meter the flow of water into said hollow valve, the connection between the rod and valve having limited flexibility and being located off-center of the valve.

10. In combination with a closet bowl having a flush tank with an outlet with a valve seat therearound positioned below the level of the top of the bowl, a flush

valve assembly comprising a hollow valve having a generally flat lower surface broader than said seat adapted to seat on said seat and having a hole in its bottom wall opening to said outlet, a handle pivoted on the wall of said tank above the water level of the tank, and a valve rod connected directly to said handle and swingable therewith and extending obliquely downwardly and connected to said valve whereby the valve opens and closes in an arcuate swinging motion about the pivot of said handle and obliquely onto said seat, and means movable with said rod communicating with the inside of the valve and forming a vent opening above the water line of said tank, said hole acting to meter the flow of water into said hollow valve.

11. A flush tank valve assembly comprising a handle adapted to be pivotally mounted in the wall of a tank, a valve rod connected directly to said handle and swingable therewith, and a flat hollow valve mounted on the lower end of said rod whereby the valve opens and closes in an arcuate swinging motion about the pivot of said handle and obliquely across the top of said pipe onto said seat, said valve having a generally flat lower surface adapted to seat over a seat on a pipe and having a neck on its upper side connected to the lower end of said rod, the connection between said neck and the valve being off-center of the valve toward said handle and being flexible permitting limited tilting of the valve with respect to the rod.

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