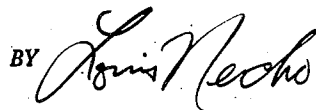


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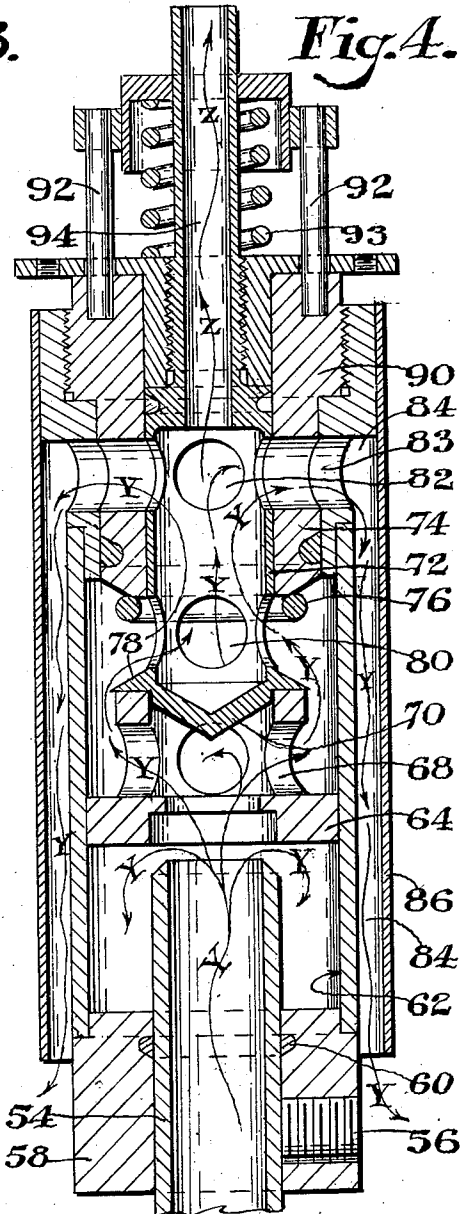
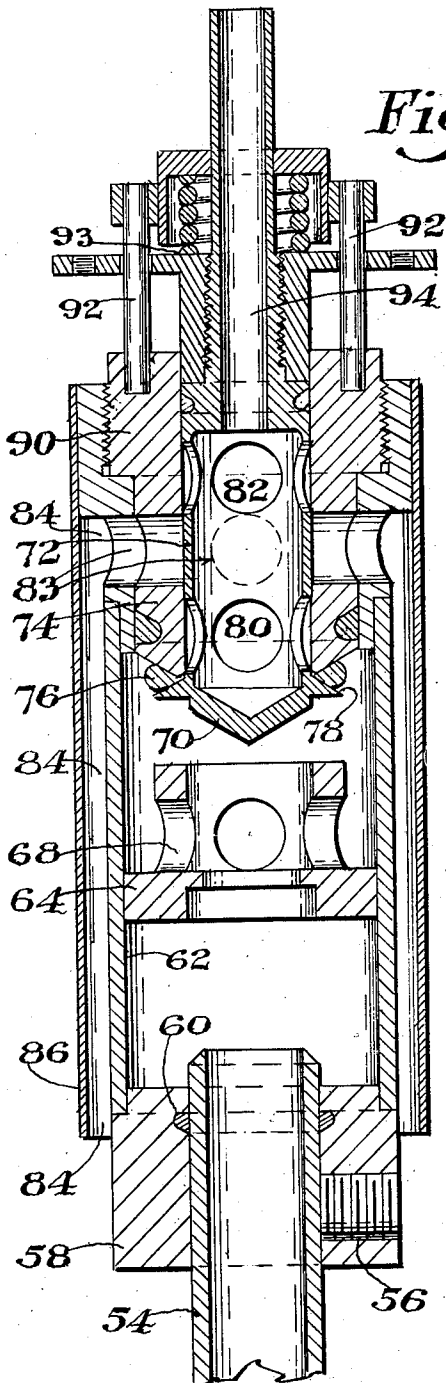
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FLOAT VALVE

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FLOAT VALVE

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2 Claims. (Cl. 137—433)

This invention relates to a toilet flush tank and the main object of the invention is to produce an improved flush tank construction.

In the drawings:

Fig. 1 is a vertical sectional view showing the parts in the position which they occupy during the flushing operation, in which both the inlet and the outlet, through which water is discharged from the tank, are both open.

Fig. 2 is similar to Fig. 1 but showing the position of the parts between flushings in which both the inlet and the outlet are closed.

Figs. 3 and 4 are enlargements showing details of the valve structures, with the valves in closed and open positions respectively.

In the drawings only the bottom wall 10 and the top wall 12, of a conventional flush tank are shown. The bottom wall 10 has an opening 14 into which is fitted the intermediate portion 16 of a casting having an upper portion 18 which projects above the bottom wall 10 and leads into the tank, and having a lower portion 20 which extends below the bottom wall 10 and is connected to a toilet bowl, not shown. The joint between the intermediate casting portion 16 and the bottom wall of the tank is rendered water tight by any well known packing as at 22. The upper portion 18 of the casting is provided with a seat 23 adapted to be engaged by O-ring packing 24 carried by the lower open end 26 of a float 28. By this means, when the float is in the lower position of Fig. 2, no water can flow from the tank into the toilet bowl.

The float 28 is preferably made of a synthetic material and may be operated by any suitable means. But, according to my invention, the float is provided with a hollow stem 30 the enlarged head 31 of which is adapted to be engaged by the hooked end 32 of an operating arm 34 the handle or knob 36 of which projects above the top wall 12 of the tank. The arm 34 is provided with an enlargement 38 which limits the upward movement of the arm 34 as clearly shown in Fig. 1. The upward movement of the float is limited by a horizontal ledge or wall 40 which has an opening 42 large enough to permit free reciprocation there-through of arm 34. In order to insure proper seating of the float I provide it with a center sleeve 44 which slidably engages a guide rod 46 carried by a lug 47 which is carried by the upper casting portion 18.

The casting is provided with a passage 48 the lower end of which is connected by water tight fittings generally designated by numeral 50 to a pipe 52 leading from a water main, not shown. The upper end of the passage 48 is connected in a water tight manner to pipe 54 which is adjustably secured, by set screw 56, to a block 58 through which the upper end of pipe 54 passes and which supports the inlet valve construction later on described. A water-tight joint is maintained between the pipe 54 and the bore in block 58 by means of suitable packing such as an O ring 60.

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The block 58 supports a cylindrical casing 62 which is joined to it in a water-tight manner. The lower portion of the cylindrical casing is provided with a horizontal partition 64 which has an opening there-through and which supports a spider 68.

The upper end of cylindrical casing 62 is closed, in a water tight manner, by a collar 74 through which valve stem 72 passes. The collar 74 is provided, on its underside, with a packing 76 which is adapted to be engaged by a flange 78 carried by conical head 70 of valve stem 72. The valve stem 72 is provided with openings 80 which are so arranged that, when the valve is in its lower position water flows through spider 68 and through openings 80, to the interior of the valve stem, and through openings 82 and 83, into space 84 between inner cylindrical casing 62 and outer cylindrical casing 86 and into the tank as shown by arrows marked Y. When the valve stem 72 is in the upper position of Fig. 2, openings 80 are closed by collar 74 and flange 78 engages packing 76 to prevent the flow of water into space 84 and hence into the tank.

The cylindrical casing 62 also carries an upper block 90 through which extends a pipe 94. The upper end of pipe 94 leads into one end of a by-pass tube 96 the other end of which leads into the upper end of an overflow pipe 98. The parts just described are carried by a float 100 which slides freely on guide rods 92, from the position of Fig. 1 to that of Fig. 2, and back. The guide rods 92 are carried by block 90 and the assembly is kept under the desired tension by spring 93. The float 100 is preferably made of a light, non-corroding, synthetic material and is large enough to provide the buoyancy needed to operate valve 72. The lower end of overflow tube 98 empties into pocket M which is connected, by a passage, not shown, to the toilet bowl.

The operation is as follows:

Beginning with Fig. 2, it will be seen that float 28 is in its lower position, that gasket 24 engages seat 23 and that no water can flow from the tank to the toilet bowl. Also, it will be noted that float 100 is in its upper position and that flange 78 on the conical head 70 of valve stem 72 engages packing 76 so that no water can flow through opening 80 into space 84 and into the tank. To flush the toilet, handle 36 is pulled up to the position of Fig. 1 and the water in the tank now rushes through the fitting 18 into the toilet bowl. The float 28 is kept in its upper position by the movement of the water therebeneath in the same manner as the ordinary tank ball. When the level of the water falls to a point below the bottom edge of float 28, the float will move down until it reaches the position of Fig. 2. In the meantime float 100, which was retained in the upper position of Fig. 2 by its buoyancy, will move down, as the level of the water falls, until conical valve head 70 comes to rest on spider 68. The downward movement of the valve stem 72 exposes openings 80 so that water can flow through the valve stem into annular space 84. At the same time, some water will flow through the pipe 94 and by-pass tube 96 into overflow pipe 98 from which the water flows through pocket M to fill the trap of the toilet bowl in the usual way. As the water level in the tank rises, float 100 will move upwardly from the position of Fig. 1 to that of Fig. 2 in which the flow of water into the tank is stopped in the manner above set forth.

It will be noted that float 28 is positively guided and that, short of being torn up, gasket 24 which operates under compression should last indefinitely. In other words, this part of the construction should require no servicing. The same is true of gasket 76 which is compressed by flange 78 on the valve head 70 which, too, is positively guided by collar 74. The float 100 is guided

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on rods 92 and hence can not bind. Therefore, the water inlet parts should also be service free.

All of the parts enclosed within the tank are preferably made of some well known synthetic material possessing the required rigidity. This produces a lighter and less expensive structure and since synthetic materials do not rust and are not affected by electrolysis, the structure of my improved mechanism is more durable than a similar mechanism the parts of which are metallic.

It will also appear that by my construction a longer and more forceful flushing will take place. Thus, after some water has flowed out of the tank but before float 28 drops, and after float 100 has begun to move down, water from the pipe 54, under city pressure, which is usually 60 p. s. i., will rush into the tank and out through the fitting 18 into the toilet bowl. This gives a short but violent burst of water just before the end of the flushing cycle and will insure thorough emptying of the toilet bowl.

It will also be seen that by adjusting spring 93 so as to neutralize the pressure of water in pipe 54, the valve 70 and float 100 will be moved upwardly by buoyancy and that they will be moved downwardly by the pressure of spring 93 and by gravity.

In ordinary constructions, a little wear of, or a little dirt settling on, the valve plug or the valve seat, will cause a leak so that water will continue to flow into the flush tank and out through the overflow pipe with consequent loss of water and with an accompanying hissing noise. In my construction water is shut off by O-ring packing 76 which is compressed by flange 78. Since water under high pressure flows through the valve every time the toilet is flushed no dirt can settle on the O-ring or on flange 78. Also, the pressure of flange 78 being exerted over the entire area O-ring 76 produces no distortion and no measurable wear and thus prolongs the life of the valve almost indefinitely.

Furthermore, flange 78 closes against O-ring 76 in the direction of the water pressure from the main and is also urged in the same direction by concentric float 100. Therefore, if the strength of spring 93 is made substantially equal to the pressure of the water pressure in pipe 54, the accumulation of water in the tank will move float 100 up and will press flange 78 against O-ring 76. The relatively large size of the float 100, acting as it does in the direction of the water pressure, rather than against it, as in conventional valves, insures positive closing of the inlet valve. On the other hand, when the tank is empty, the weight of float 100 and the action of spring 93 push the valve assembly 72 down to move flange 78 away from O-ring 76. Thus the O-ring 76 forms a valve seat and flange 78 serves as the valve core or plug.

From the foregoing it will be seen that the inlet and outlet valves are always centered and aligned to prevent

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uneven wear that both valves close in the direction of the prevailing water pressure, that the seats of both valves are washed with water under high pressure so that no dirt can settle on the seats, or on the valve plugs, and that, in both valves, the pressure is distributed over a large area so as to minimize wear and distortion.

What I claim is:

1. A valve for controlling the flow of water into, and for maintaining it at a given level, in a tank, said valve including a fixed outer casing, a fixed inner casing disposed within, and in spaced relation to, said outer casing, the space between said casings communicating with said tank, a pipe for constantly delivering water to the lower end of said inner casing, there being openings in the upper portion of said inner casing leading to said space, a hollow, cylindrical block fixed in said inner casing and having holes in the wall thereof which register with said openings, a valve stem disposed within said block and having passages therethrough, said valve stem being movable to a lower position in which said passages register with said holes in said block and establish communication between said pipe and said space and to an upper position in which said passages are out of registration with said holes and communication between said pipe and said space is interrupted, a valve carried by said valve stem and adapted to close the lower end of said block when said valve stem is in its upper position, and a float carried by said valve stem and operable to move said valve stem to said second position when the water in said tank reaches said given level and to said lower position when the level of the water falls below said given level.

2. The structure recited in claim 1 and a spring normally biasing said valve stem to said lower position, the downward force exerted by said spring being less than the buoyancy of said float.

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