

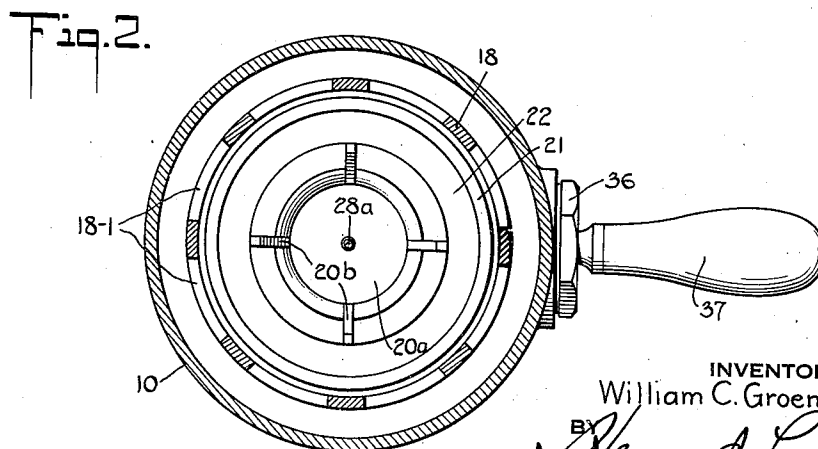
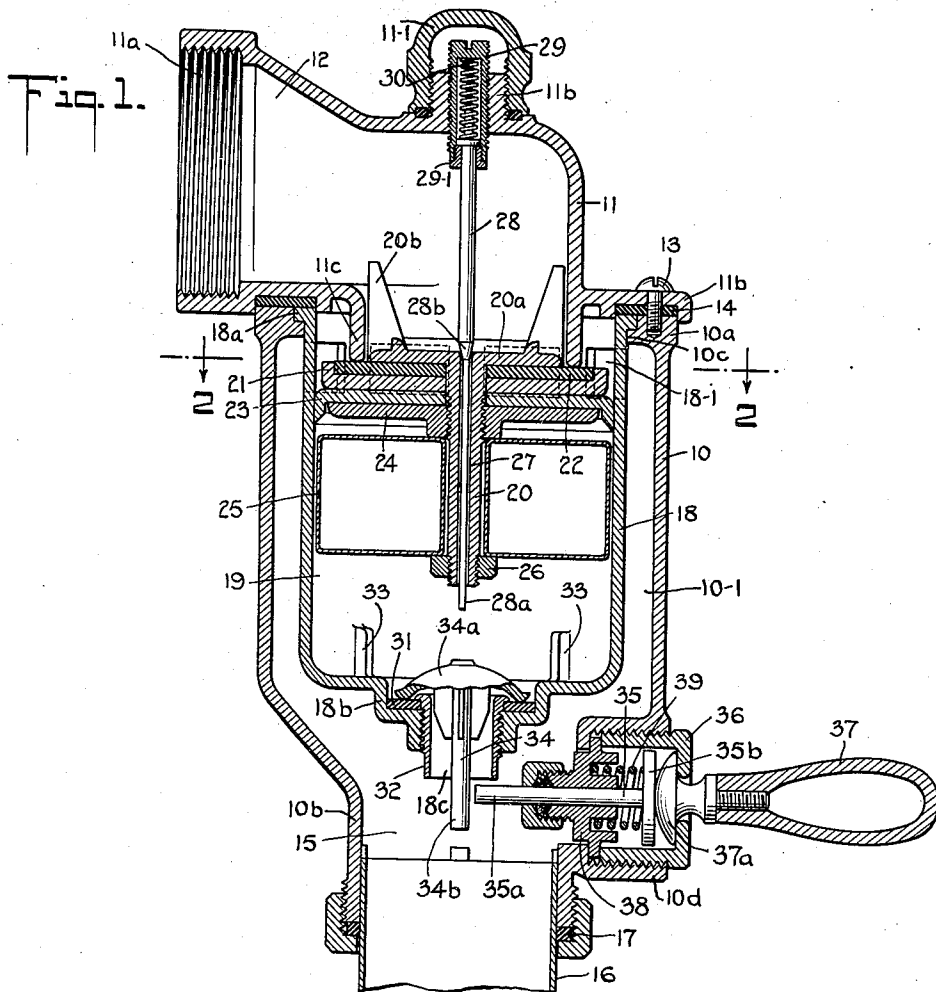
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W. C. GROENIGER

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FLUSH VALVE

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FLUSH VALVE

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

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This invention relates to valves, and more particularly to those types of valves which are known in the sanitary art as flush valves.

Flush valves are employed in connection with various types of sanitary apparatus for initiating the flow of flushing liquid, e. g., water, therethrough, and for controlling the duration of flow. Types of flush valves commonly used employ an equalization chamber, into which minor flow of liquid is directed for maintaining the valve closed. Opening of the valve, so as to allow passage of flushing liquid therethrough, is accomplished by emptying the equalization chamber of its contained liquid. The time required for refilling the equalization chamber determines the duration of flow of flushing liquid through the valve into the sanitary apparatus.

It has been necessary in prior flush valves of this type to maintain a minimum liquid pressure, in many cases five pounds or more per square inch, to effect closing of the valve.

In the present invention it is a primary object to provide a flush valve so constructed and arranged as to close at substantially atmospheric pressure, that is, by the negligible pressure of a dribble flow or of a trail discharge.

It is a further object to so construct and arrange the equalization chamber and the valve mechanism that they may be removed, easily and conveniently as a unit, from the outer casing of the valve structure.

An outstanding feature of the invention resides in the fact that the passage, affording minor flow of flushing liquid into the equalization chamber, is disposed below the level of the passage for the inflow of flushing liquid to the valve.

A further feature resides in the employment of a float in the equalization chamber for effecting closure of the valve when the equalization chamber is filled with liquid.

Further features and objects of the invention will be apparent from the following description and the accompanying drawing.

In the drawing, which illustrates one preferred embodiment of the invention:

Fig. 1 represents a vertical section taken centrally through the flush valve.

Fig. 2 represents a horizontal section taken on the line 2—2, Fig. 2.

The illustrated flush valve embodies the novel features of the invention in a preferred form of construction. It comprises a main casing 10 into which the valve mechanism fits. An upper casing 11 encloses the upper portion of the valve mechanism. A lateral portion of the upper cas-

ing 11 defines an inflow passage 12, and has a threaded socket end 11a adapted for connection with water supply piping (not shown). The upper casing 11 is removably secured to the main casing 10, as by means of machine screws, see 13, which pass through an outwardly extending flange portion 11b of the upper casing 11 and through an interposed gasket 14 into the upper rim 10a of the main casing 10. The main casing 10 has a lower portion 10b which defines an outlet passage and opening 15. Piping, indicated at 16, may be connected with the outlet passage 15 by a suitably packed liquid tight joint, such as that indicated generally at 17.

The upper rim 10a of main casing 10 has an internally extending circumferential flange 10c, spaced downwardly from the top thereof, to receive the outwardly extending circumferential flange 18a of the cupped receptacle 18, and thus to suspend such receptacle within the main casing 10. The cupped receptacle 18 is of smaller diameter than the diameter of main casing 10, and, thus, when positioned within the main casing 10, provides passage 10—1 for the down-flow of flushing liquid through the main casing. Cupped receptacle 18 may be conveniently removed, together with its contents, by the simple expedient of removing upper casing 11 from main casing 10. For a purpose hereinafter made clear, the upper portion of the walls of receptacle 18 are ported, see 18—1, Fig. 2, below the circumferential flange 18a.

The cupped receptacle 18 provides the equalization chamber 19, into which a minor flow of water from inflow passage 12 is conducted through movable valve mechanism. The movable valve mechanism comprises a piston mounted on a float which is free to rise and descend within the equalization chamber according to the level of liquid therein. The piston includes a central stem 20 having a plate-like head 20a, from the peripheral margins of which rise spaced guide members 20b. A plate element 21, having an upturned peripheral edge which forms a surface recess into which fits a valve seating washer 22, of any of the types of compressible materials commonly used for the purpose, as, for instance, fiber composition, is strung onto the stem 20, together with a cup leather 23, and is pressed tightly against the undersurface of the platelike head 20a by means of the plate-nut 24 threaded on the stem 20 and bearing against the undersurface of the cup leather 23. The float 25 is strung on the stem 20 below plate-nut 24 and

is secured in place by means of nut 26 threaded on the end of stem 20.

The stem 20 has an open-ended passage 27, extending through its length, through which the lower end portion 28a of pin 28 extends. Pin 28 depends from resilient securement in the top of upper casing 11. Its upper portion has a diameter which is greater than is the diameter of passage 27, and tapers into the lower end portion 28a, see 28b, to form a stopper valve for seating in the coordinatively configured upper end of passage 27. The lower end portion 28a of pin 28 is lesser in diameter than passage 27, and thus permits flow of water through passage 27 when the stopper valve portion 28b is unseated.

Upper casing 11 has an external boss 11b formed in its top wall above passage 27 of stem 20. Threaded through the boss 11b is a hollow screw element 29. The upper portion of pin 28 has an externally threaded ring 29—1 slidably mounted thereon, and has its top end headed to form a limit stop. A coil spring 30 is disposed within the hollow of screw element 29, and ring 29—1 is threaded into the lower end of screw element 29 so that the coil spring is compressible between the headed top end of pin 28 and the closed top of screw element 29. As illustrated, screw element 29 is adapted for vertical adjustment in the boss 11b, whereby the position of pin 28 relative to the movable valve mechanism is also adjustable.

Inflow passage 12 of the upper casing 11 leads into the hollow of the upper casing proper and turns downwardly, opening directly into the movable valve mechanism. Its outlet is defined by the depending annular wall 11c which forms the valve seat for the movable valve mechanism. It should be noted that the valve seat, and thus the movable valve mechanism, is at all times disposed at the bottom of, and preferably below, the inflow passage to insure filling of the equalization chamber under conditions of a dribble flow or trail discharge through the inflow passage.

The bottom of the cupped receptacle 13 is formed, preferably centrally, with a depressed portion 13b, into which an annular valve seat 31 is positioned, and with an outflow passage 13c, lined by a tubular insert 32. Vertically disposed and internally extending ribs, as at 33, may be provided at the bottom of the cupped vessel 13 for limiting the descent of the float and of the movable valve mechanism relative to the outflow passage 13c.

Controlling the flow of water from the equalization chamber through outflow passage 13c, is a mushroom type valve element 34 having the mushroom head 34a whose peripheral rim is normally kept in pressure contact with the annular valve seat 31 by the weight of water within the equalization chamber. The stem 34b depends through outflow passage 13c into adjacency with the stem 35a of actuating plunger 35 for the tipping of mushroom type valve 34 from its seat 31 when it is desired to initiate the flushing operation.

The actuating plunger 35 is preferably manually operated according to customary practice. The main casing 10 may have an internally extending internally threaded boss 10d formed in its lower portion. Threaded in the boss 10d and closing its outer opening is a thimble 36 through which articulatively extends a manually operable handle 37. The stem 35a of plunger 35 extends through a suitable packed washer ele-

ment 38, tightly clamped in place by thimble 36. The head 35b of plunger 35 is normally urged against the rounded head 37a of handle 37 by coil spring 39. As is customary in mechanism of the type, manipulation of handle 37 in any direction pushes plunger 35 inwardly so that its stem 35a displaces stem 34b of mushroom type valve 34 to upwardly tip, and, thus, to open, the valve 34.

Assuming the equalization chamber to be filled with water to such an extent, as is illustrated, that float 25 forces the movable valve mechanism upwardly so that seating washer 22 is pressed into contact with the annular valve seat 11c, no water flows from inflow passage 12 through ports 18—1 into the main casing 10. Under such circumstances, stopper valve element 28b may be fully seated or only approximately seated in the upper end of passage 27, and mushroom type valve element 34 is fully seated, preventing flow of water from the equalization chamber 19.

When it is desired to initiate flow of flushing liquid into the sanitary apparatus to be flushed, handle 37 may be manually manipulated to tip mushroom valve element 34, and, thus, to empty equalization chamber 19 of its contained liquid. Thereupon, float 25, deprived of its supporting liquid, drops to its rest position on ribs 33, and carries with it its associated movable valve mechanism. The valve proper being thus opened, flushing liquid flows from inflow passage 12 into the upper part of the equalization chamber, thence outwardly, through ports 18—1, into and through the main casing 10 to pass through outflow passage 15 into discharge piping 16. Meanwhile, a minor flow of the liquid passes down through passage 27 to gradually refill equalization chamber 19 and to thus gradually raise float 25 and its associated valve mechanism until the valve proper is closed. It should be particularly noted that the minor flow through passage 27 may occur under conditions of mere gravity flow, i. e., in the absence of hydrostatic head on the liquid entering through inflow passage 12. Thus, the equalization chamber refills even though there be merely a dribble flow or trail discharge into inflow passage 12.

It is to be understood that the embodiment of the invention here illustrated and described merely exemplifies possible constructions pursuant to the generic principles set forth herein and in the claims that follow. Many structural changes may be made without departing from the generic scope of the invention.

I claim:

1. In a valve, passage for the inflow of liquid; an equalization chamber disposed below said inflow passage; restricted passage means communicating with substantially the lowest level of said inflow passage and leading into said equalization chamber; passage for the outflow of liquid communicating with said inflow passage; movable valve mechanism adapted to open and close communication between said inflow passage and said outflow passage; seating means for said movable valve mechanism; means responsive to the level of liquid within said equalization chamber for controlling movement of said movable valve mechanism; and means for lowering the level of liquid within said equalization chamber.

2. Apparatus, as recited in claim 1, wherein valve means is provided for substantially closing

the restricted passage when the movable valve mechanism is seated.

3. Apparatus, as recited in claim 1, wherein the means responsive to the level of liquid within the equalization chamber is a float, and wherein the means for lowering the level of liquid within the equalization chamber is a valved passage which leads downwardly into the outflow passage.

10 4. In a valve, passage for the inflow of liquid; an equalization chamber disposed below said inflow passage; a float operable within said equalization chamber; movable valve mechanism carried by said float; passage for the outflow of
15 liquid communicating with said inflow passage; seating means for said movable valve mechanism so constructed and arranged that, when said float is at a high level in said equalization chamber, said movable valve mechanism seats and
20 closes communication between said inflow passage and said outflow passage; restricted passage means through said movable valve mechanism establishing communication between substantially the lowest level of said inflow passage
25 and said equalization chamber; and means for lowering the level of liquid within said equalization chamber.

5. Apparatus, as recited in claim 4, wherein valve means is provided for substantially closing
30 the restricted passage when the movable valve mechanism is seated.

6. In a flush valve, a main casing having an open upper end; a cupped receptacle disposed upright within said main casing, said receptacle
35 providing an equalization chamber for the valve and being so constructed and arranged as to be removable from said main casing through the said upper end thereof; an upper casing removably secured to the upper part of said main casing,
40 said upper casing embodying a passage for inflow of liquid to the flush valve; a valve seat associated with said inflow passage; valve mechanism movably disposed within said equalization chamber for cooperation with said valve

seat in controlling flow from said inflow passage through the flush valve; means for directing flow into the space between the walls of said receptacle and said main casing when said movable valve mechanism is unseated; means controlling minor flow through said movable valve mechanism directly into said equalization chamber; valve means for controlling flow of liquid from said equalization chamber; and an opening for the outflow of liquid formed in the lower
10 portion of said main casing.

7. A flush valve comprising in combination, a main casing having an open upper end; a cupped receptacle disposed upright within said main casing, said receptacle providing an equalization
15 chamber for the valve and being so constructed and arranged as to be spaced apart from the walls of said main casing and as to be removable from said main casing through the said upper end thereof; an upper casing removably
20 secured to the upper part of said main casing, said upper casing embodying a passage for the inflow of liquid to the said equalization chamber and to the said main casing, and further embodying a substantially annular portion above
25 said equalization chamber forming a seat for movable valve mechanism and providing a downward extension of said inflow passage; ports in the upper portion of said cupped receptacle opening into said main casing; movable valve
30 mechanism slidably mounted in said equalization chamber and adapted to seat against said annular portion of the upper casing for closing communication between said inflow passage and
35 said main casing; a float associated with said movable valve mechanism; restricted passage means establishing communication between said inflow passage and said equalization chamber; means for lowering the level of liquid within
40 said equalization chamber; and an opening for the outflow of liquid disposed in the lower portion of said main casing.

WILLIAM C. GROENIGER.