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FLUSH VALVE

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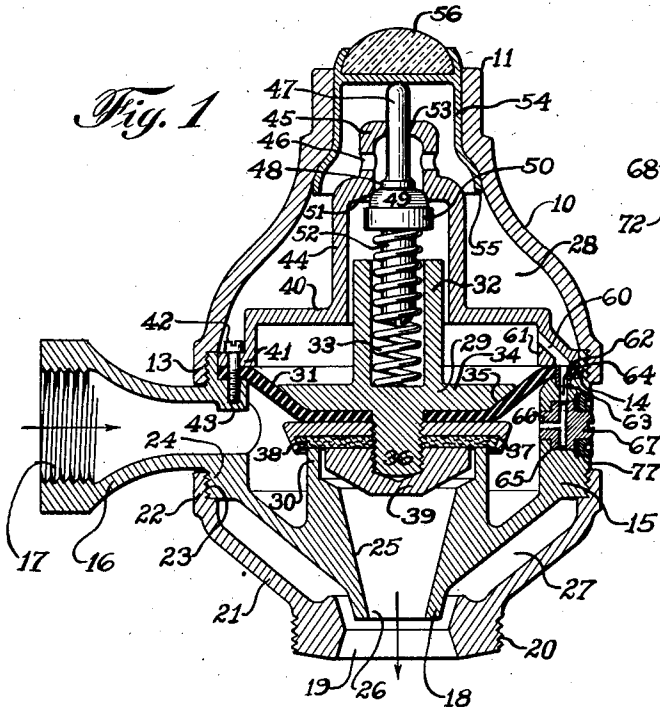


Fig. 1

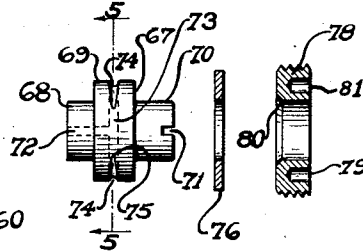


Fig. 3

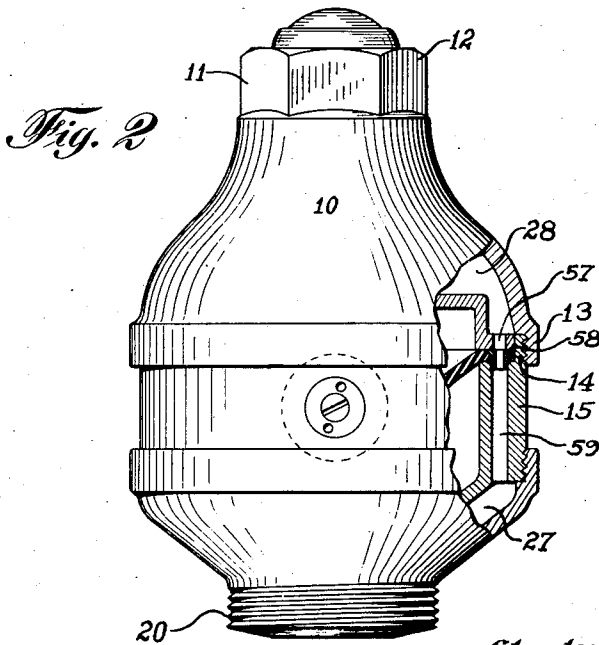


Fig. 2

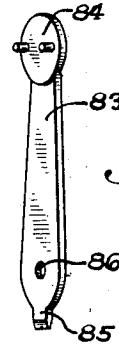


Fig. 4

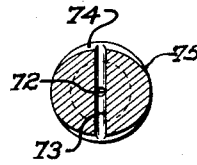


Fig. 5

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FLUSH VALVE.

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This invention relates to flush valves for water-closets and the like, and more particularly to a flush valve having improved means for permitting the period of flow to be accurately adjusted.

One object of this invention is to provide a flush valve of the double-chamber by-pass type in which means are provided for readily cleaning out said by-pass whenever it becomes clogged, without disassembling the device.

A further object is to provide a flush valve of the above nature in which the by-pass can be manipulated from the exterior of the valve for cleaning it out or for adjusting the period of flow without disturbing the interior mechanism.

A further object is to provide a device of the above nature which will be simple in construction, inexpensive to manufacture, not likely to get out of order, easy to install and manipulate, compact in size, ornamental in appearance, and very efficient and durable in use.

With these and other objects in view there has been illustrated on the accompanying drawings one form in which the invention may be conveniently embodied in practice.

Fig. 1 represents a side sectional view in elevation of the preferred embodiment of flush valve.

Fig. 2 is a front view in elevation of the same, with parts broken away.

Fig. 3 is a view on an enlarged scale of the by-pass adjusting device with the parts shown in separated relation.

Fig. 4 is a perspective view of a special form of tool used in manipulating the by-pass adjusting device.

Fig. 5 is a cross-sectional view of the rotary plug, taken along the line 5-5 of Fig. 3.

Referring now to the drawings in which like reference numerals denote corresponding parts throughout the several views, the numeral 10 indicates an upper outer shell of the flush valve, said shell preferably being substantially frusto-conical in shape. The top of the shell 10 is provided with a reduced neck 11 shaped to form a hexagonal head 12 by means of which the shell may

be manipulated by a suitable wrench, not shown. The lower portion of the shell 10 is provided with a cylindrical rim 13, threaded on its interior surface and adapted to be screwed upon an upstanding threaded flange 14 provided on the top of a body member or casing 15.

The casing 15 is provided on one side with an inlet pipe 16 having a threaded mouth 17 adapted to be screwed upon a water supply pipe, not shown. The bottom of the casing 15 is provided with an outlet member 18 adapted to extend part way through a flared opening 19 in a threaded neck 20 of a bottom shell member 21, said neck 20 being adapted to be connected to a pipe, not shown, leading to a closet bowl or other device to be flushed.

The bottom shell member 21 is provided at its top edge with a vertical cylindrical rim 22, having interior threads 23, said threaded rim 22 being adapted to engage a threaded section 24 on the casing 15.

The outlet member 18 extends upwardly within the casing 15 and has a tapered diverging inner surface 25 terminating in a constricted discharge opening 26. By means of this construction, when a stream of water flows through the valve it will pass through the constricted opening 26 and be caused to emerge at a high velocity. As the stream passes through the flared opening 19 of the bottom shell 21, a suction will be created by injector action, in the compartment 27 between the shell 21 and the lower part of the casing 15, said suction being communicated to the compartment 28 located inside the upper shell 10.

In order to form a seat for a main valve 29, the top of the outlet member 18 terminates in an annular ring 30, as clearly shown in Fig. 1.

In order to permit the main valve 29 to be lifted from its seat to allow the water to flow out through the outlet, said valve 29 is supported upon a flexible diaphragm 31 of rubber or other suitable material, said diaphragm having its edge rigidly secured in position on the shoulder on the inside of the flange 14. As clearly shown in Fig. 1, the main valve 29 has an upwardly extending tubular portion 32 adapted to enclose and

form a seat for a helical spring 33. Immediately below said tubular portion 32, the main valve has a flat disc-shaped portion 34 beveled on its outer periphery 35 and adapted to lie in contact with the top of the diaphragm 31.

The main valve 29 has a depending central threaded shaft 36 below the disc portion 34, said shaft being adapted to carry a threaded inverted cup-shaped disc 37, a washer 38 of rubber or other suitable material, and a tapered nut 39.

The space between the diaphragm 31 and the casing 15 will hereinafter be designated as the "main chamber".

In order to form a "control" chamber for the flush valve, a cover member 40 rests upon the periphery of the rubber diaphragm 31, said cover member having a rim 41 secured to said casing by a plurality of set screws 42 passing through said rim 41 and diaphragm 31, and screwing into suitable sockets 43 in the casing 15.

In order to form a guide-way for the tubular portion 32 of the main valve 29, the cover member has a reduced section 44, terminating at its upper end in a cylindrical section 45 of a still further reduced diameter.

The section 45 has a pair of oppositely disposed apertures 46, leading into the upper shell compartment 28.

When it is desired to open the main valve 29, it will only be necessary to force downwardly a pin 47 on a releasing valve 48. This motion will cause a spherical valve surface 49, preferably of rubber, mounted on an enlarged flange 50, to drop below the shoulder 51 on the cover member 40. This will permit a small quantity of water to escape through the apertures 46, reducing the pressure in the control chamber and allowing the unbalanced pressure in the main chamber to force the main valve 29 upwardly, and flush the closet bowl. The pin 47 will then be released, whereupon the spring 33, which surrounds a depending pin 52, will force the releasing valve up upon its seat 51. In order to operate the releasing valve just described, the pin 47 is adapted to extend up through an aperture 53 in the top of the reduced section 45 into contact with an inverted cup-shaped tube 54 having a flared bottom 55 adapted to fit loosely in the upper portion of the shell 10. The top of said tube 54 carries a push button 56 of porcelain or other suitable material. The water which is thus released from the control chamber passes down into the upper shell compartment 28 and thence through a perforation 57 in the cover member 40 to a short metal tube 58 in the rubber diaphragm 31, from which it goes through a passage 59 in the casing 15 into the lower shell compartment 28.

After the flush valve has been operated, in order to restore the pressure in the control chamber, said chamber is connected to the main chamber by a restricted passage hereinafter termed the "by-pass", and through which a small stream of water is permitted to flow until the pressures in said chambers are equalized.

The main valve will thus be caused to gradually return to its seat and shut off the flushing stream. The preferred form of by-pass herein disclosed, comprises an inclined passage 60 located within an enlarged boss 61 on the inside of the base of the cover member 40.

The passage 60 communicates with a short metallic tube 62 passing through the rubber diaphragm 31 and resting on a seat 63 in the casing 15. The tube 62 in turn communicates with a short passage 64 in the casing, said passage 64 leading to a horizontal circular stepped recess 65. The recess 65 passes entirely through the wall of the casing 15, and communicates at its inner end 66 with the main chamber.

An adjustable rotary plug 67 is adapted to fit snugly within said recess 65, and said plug comprises a hollow inner stem section 68, an enlarged intermediate section 69, and an outer head section 70, said head section having a slot 71 in its outer face and adapted to lie approximately flush with the outer surface of the casing 15.

The hollow stem section 68 has a longitudinal passage 72 extending to the midpoint of the enlarged section 69 where it communicates with a transverse passage 73 passing entirely through said intermediate enlarged section 69. The enlarged section 69 is provided on its outer face, in alignment with the outer extremities of said transverse passage 73, with a pair of tapered grooves 74 diminishing in depth away from said extremities to the tip portions 75 thereof, as most clearly shown in Fig. 5. The use of said tapered grooves permits the by-pass to be continuously adjusted over a very wide range, producing a corresponding wide range in the resulting period of flow.

In order to lock the adjusting plug 67 in any desired angular position in the recess 65, and also to prevent possibility of leakage around said plug, a packing washer 76 of asbestos or the like, and a threaded bushing 78 may be employed. The washer 76 and bushing 78 are fitted around said slotted head 70 and within an enlarged threaded recess 77 communicating with the recess 65.

The bushing 78 is preferably provided at its base with an interior beveled edge 80 so as to permit the packing washer to be spread out over a greater area on the plug head and thereby produce a tighter joint at this point. The outer face of the bushing is also provided with a pair of sockets 79 and 81 adapt-

ed to be engaged by the prongs of a suitable wrench.

In the operation of the flush valve, the user will first press down, momentarily, on the push button to reduce the pressure in the control chamber, thereby opening the main valve to permit the flushing stream to emerge through the outlet. When the push button is released, the main valve will remain open until sufficient water has passed through the by-pass to restore the original pressure in the control chamber.

When it is desired to adjust the flush valve to give a longer or shorter period of flow, the tool illustrated in Fig. 4 will preferably be employed. This tool comprises a handle 83 having a spanner wrench 84 at one end and a screw driver 85 on its other end, said handle being apertured at 86 to permit the tool to be hung up on a nail or other convenient support.

In operation, the lock bushing 78 will first be rotated, by the spanner wrench 84 in a counter-clockwise direction, and then the plug 70 will be rotated to the desired adjusted position by means of the screw driver 85. The lock bushing will then be turned back in a clockwise direction as far as it will go, thereby preventing the plug from getting out of adjustment and avoiding the possibility of leakage.

One advantage of this invention is that the by-pass adjusting means for changing the time of flush may be operated from the outside of the flush valve without removing the outer shells or in any way disturbing the interior mechanism.

Another advantage is that the by-pass adjusting means cannot be tampered with by unauthorized persons, as it can only be operated by the use of a screw driver and a special form of spanner wrench.

Another advantage is that the adjusting plug simply rotates in its recess without any sliding or longitudinal movement whatever.

Another advantage is that the bearing sur-

faces of the adjusting plug are cylindrical, and hence cannot become wedged or stuck in the casing body, as was the case with the former adjusting devices having conical bearing surfaces.

While there has been disclosed in this specification one form in which the invention may be embodied, it is to be understood that this form is shown for the purpose of illustration only, and that the invention is not to be limited to the specific disclosure but may be modified and embodied in various other forms without departing from its spirit. In short, the invention includes all the modifications and embodiments coming within the scope of the following claims.

Having thus fully described the invention, what is claimed as new, and for which it is desired to secure Letters Patent, is:

1. In a flush valve of the two-chamber, by-pass type, a tubular plug adapted to be located in the by-pass between the two chambers, said plug having oppositely disposed openings in its periphery, the surface of said plug adjoining each of said openings having a pair of tapered grooves of gradually diminishing depth whereby the flow of water through said by-pass may be minutely adjusted by turning said plug about its axis.

2. In a flush valve of the two-chamber by-pass type, a tubular plug located in the by-pass between the two chambers, said plug having oppositely disposed openings in its periphery, the surface of said plug adjoining each of said openings having a pair of oppositely extending grooves, whereby the flow of water through said by-pass may be adjusted by turning said plug about its axis.

In testimony whereof, I have affixed my signature to this specification.

WILLIAM H. CADWELL.

In testimony whereof, we have affixed our signatures to this specification.

CHARLES D. CROCKER.
JOHN OTT.