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FLUSHING VALVE.

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This invention relates to flushing valves in general, but more particularly to those designed and intended for toilet flushing purposes where the flushing fluid may be either a gauged charge or a flushing continued at the will of the individual by continued pressure upon the push button of the valve.

The valve shown and described in this application is an improved form of push button valve, designed primarily as an improvement over that shown and described in our co-pending application filed February 24, 1925, Serial No. 10,993. It will be noted that several improvements have been added, such as a leak proof auxiliary valve stem, a non-metallic, non-corrodible element in connection with the guide member and a non-corrodible strainer in the inlet port opening leading to the auxiliary valve chamber.

Primarily, an object of our invention is the provision of a balanced valve of the push button type for use in connection with toilets, urinals and such like lavatory adjuncts that shall be of simple and cheap construction, durable, of highest efficiency, and certain parts of which are constructed of a non-corrodible material, thereby both eliminating wear and reducing to a minimum hammering or pounding of these parts.

Other objects of this invention will appear in the following description thereof, reference being had to the accompanying drawings forming a part of this specification and wherein like reference characters indicate corresponding parts, throughout.

Referring to the drawings:

Figure 1 is a vertical medial section of our valve, showing the main slidable non-corrodible valve member and the auxiliary valve in their closed, or seated positions, also the valve stem housing and leak proof diaphragm, attached to and operable with the stem of the push button mechanism;

Figure 2 is a plan section taken on the line 2—2 of Figure 1, showing the valve stem housing, diaphragm and the integrally formed auxiliary valve chamber housing and the inlet and outlet ports formed in this housing.

Figure 3 is an elevation of the main slidable valve member, showing the several exhaust openings as positioned in the shell wall adjacent the upper edge thereof, and the non-metallic covering, such as hard rub-

ber, forming the contacting outer surface of the valve shell, and

Figure 4 is an enlarged sectional detail of the non-corrodible strainer, as shown in Figure 1, fitted into the inlet port of the main valve shell and leading to the auxiliary valve chamber.

Referring to the drawings:

1 represents the valve shell or housing proper, comprised of an outer cylindrical member having an inlet opening 2, a discharge opening 3, and an integrally formed valve barrel 4, forming a main pressure chamber 5, within the body of the shell or housing of the valve proper—the upper end of the cylindrical member 1 being open and forming an annular seat 6 adapted to seat a pliable diaphragm 7 of ordinary construction; 8 a diaphragm cap member provided with an annular seat 9, corresponding to the seat 6, and adapted to fit over the upper edge of the diaphragm 6, forming therewith an auxiliary pressure chamber 10; 11 the integrally formed valve stem housing extending upwardly from the cap member 8 and having a seat 12 at its upper end adapted to receive a pliable diaphragm 13, held in place by a shouldered screw cap 14; 15 the outside cover or housing cap, interiorly threaded at its lower edge 16 to fit the exteriorly threaded upper end 17 of the cylindrical body 1, and provided with an internal shoulder 18 adapted to fit snugly upon the upper edge of the diaphragm cap member 8, so that the outside cover 15 may be screwed tightly home to clamp the diaphragm 7 between the body seat 6 and the diaphragm cap seat 12.

The main slidable piston valve member 19 is comprised of a cylindrical shell, open at its lower end and closed at its upper end, the whole outer surface being provided with a coating 21 of a non-corrodible material, such as vulcanized hard rubber, or it may be molded in its entirety of vulcanized hard rubber. As shown in Figures 1 and 3 of the drawings, the shell 19 has been enclosed in a coating 21, extending over the top 20 and under the lower edge as at 22 and 23, to securely bind it to the metallic wall of the shell, the whole being finished to form a sliding fit within a cylinder 24 fitted tightly within the bore 24 of the valve barrel 4, the said cylinder being provided with an interior coating 24 of hard rubber as a working surface adapted to contact the

working surface 21 of the main valve 19, thereby providing non-corrodible contacting surfaces for both these members. The upper end 20, of the valve member 19 being provided with a head 25 having a reduced neck 26, forming a diaphragm seat 27, with the neck 26 extending through a centrally positioned opening 28 formed in the diaphragm 7, the head 25 being centrally bored and tapped, as indicated at 29, to receive a clamp nut 30 having an exteriorly threaded boss 31 and a flanged member 32 adapted to clamp the diaphragm 7 tightly against the seat 27 of the valve member 19, the under surface 33 of the diaphragm, immediately adjacent the seat 27, being adapted to seat upon the upper edge 34 of the valve barrel 4.

The main valve member 19 is provided with a plurality of discharge openings 35 formed circumferentially of the valve shell and extending through the wall adjacent the upper end 20, and normally closed by the valve barrel cylinder 24^a.

The diaphragm cap 8 is provided with a concentrically positioned bore 36 communicating with the valve stem housing 11, to receive the valve stem 37, which is provided with a push button 38, at its upper end adapted to extend through an opening 39 formed in the housing cap 15. The diaphragm 13 is provided with a central opening through which the valve stem 37 extends, said stem being screw threaded from its upper end to about midway to receive a pair of jam nuts 40 and 41, between which the diaphragm 13 is centrally clamped. The lower end of the valve stem 37 is provided with an auxiliary valve member 42, having a recessed gasket 43, adapted to seat against the annular seat 44 formed on the under face of the diaphragm cap 8, the valve being held normally seated by the spring 45, surrounding the stem 37 between the recessed button 38, and the seat 46 formed in the cap 14, the spring urge tending to force the stem upward and the gasket 43 against its seat 44.

The diaphragm cap bore 36 is provided with an annular groove 47, surrounding the stem 37 and adapted to communicate with a plurality of channels 48, formed in the stem adjacent the auxiliary valve member 42, the groove 47 also communicates with a by-pass port 49 formed in the cap, which in turn communicates with a registering opening 50, formed in the outer edge of the diaphragm 7 and a discharge port 51 extending from the seat 6 of the body 1 to the discharge 3, thereof, and 52 the inlet port, formed in the cap 8 opposite the by-pass port 49, and communicating with the auxiliary pressure chamber 10 and the inlet opening 2 through the port 53 and strainer 54.

The strainer 54 is constructed of any suitable non-corrodible material, such as hard

rubber and comprises a tubular member 55, having a flanged upper end adapted to seat in the counter-bore 56 formed in the flange 57 of the housing 1, the lower end of the member 55 being screw-threaded for the reception of a perforated strainer cap 58.

The valve stem 37 is fitted in the bore 36 and forms a reasonably water tight fit between these parts, but if any leakage should occur between said parts into the valve stem housing 11, during the operation of the valve, it will be expelled therefrom through the same channel and into the exhaust port upon return action of the auxiliary valve, due to the expansion of the elastic air cushion within said valve stem housing.

The main valve 19 may be constructed of metal with a hard rubber coating as shown, or it may be molded of solid hard rubber, but the construction shown is preferable as the metallic shell provides a base for the rubber coating and also re-inforces the valve shell. By constructing this valve with a non-metallic coating, wear between the valve shell and inner surface of the cylinder 24^a is greatly reduced, and hammering attendant upon the vibration of the shell is reduced to a minimum.

In operation, our valve, Figure 1, is assumed to be under pressure and closed, with the pressure in the chamber 5, beneath the diaphragm 7, balanced by an equal pressure in the auxiliary chamber 10, above the diaphragm 7, this equalization of pressures being brought about by means of the inlet port 52 being in communication with the main pressure chamber 5, the equilibrium thus established serving to retain seated both main and auxiliary valves 19 and 42. Upon bringing pressure to bear upon the push button 38, the auxiliary valve member is unseated, bringing the channels, or scores, 48 of the stem 37 into communication with the auxiliary pressure chamber, thereby releasing the pressure therein through the groove 47 and by-pass port 49 to the discharge. With the pressure slightly lowered in this chamber, the normal pressure in the main chamber 5 lifts the diaphragm 7, carrying upwardly with it the main piston valve 19, bringing, thereby, the discharge openings 35 of said valve into communication with the main pressure chamber 5, with the attendant exhaust there through of the water from this chamber, through the valve 19, to the discharge 3, the flow continuing until pressure upon the push button 38 is released, upon which, through the action of the spring 45, the valve 42 seats, closing the auxiliary chamber's exhaust port, permitting pressure to be gradually accumulated in this chamber until equal again to that normally carried in chamber 5, with the accompanying result of forcing the valve 19 and diaphragm 7 down upon the seat 34 of the valve barrel

4 and bringing about conditions necessary to a following flushing operation.

A most important feature of this invention resides in the character of the sliding fit of the piston valve 19 in the cylinder 24^a, both piston and cylinder coating being turned to as perfect a fit as is practicable for easy movement, thereby insuring smooth and noiseless action and eliminating entirely the tendency to rattle and pound attendant upon wear of these parts in practically all other well known balanced valve constructions.

The importance of coating both main valve and cylinder with hard rubber is paramount, for the reason that, if either or both of these parts become worn, they may be renewed at slight expense in comparison to a renewal of the entire valve housing, as is the customary practice, in addition to providing non-corrodible contacting surfaces.

Having thus described our invention, we claim, and desire to secure, by Letters Patent:

1. A flushing valve comprising a housing having a main pressure chamber and an auxiliary pressure chamber, a diaphragm between said chambers, a main piston valve in said main pressure chamber borne by said diaphragm, said main piston valve being comprised of a shell having a non-metallic covering, an auxiliary valve in said auxiliary pressure chamber comprised of a spring-controlled, channeled valve stem and valve member, a valve stem housing formed adjacent said auxiliary pressure chamber, a diaphragm in said chamber bearing said auxiliary valve stem, an inlet port communicating with the said auxiliary pressure chamber and said main pressure chamber and having a strainer positioned therein, said strainer consisting of a non-corrodible nipple and perforated cap member and a by-pass port communicating with said auxiliary pressure chamber and main valve discharge and normally closed by said auxiliary valve member and opened by the movement of the valve stem thereof to bring said valve stem channels into register with the by-pass port.

2. In a valve construction, a housing having a main pressure chamber and an auxiliary pressure chamber, a diaphragm between said chambers, a main piston valve borne by said diaphragm, a valve barrel formed integral with the valve housing and adapted to receive said piston valve, a valve stem housing communicating with said auxiliary pressure chamber, a diaphragm in said valve stem housing, an auxiliary valve in said auxiliary pressure chamber bearing a stem supportable by the said diaphragm and movable therewith, said stem being adjustable relative to said diaphragm and provided with channels therein, an inlet port communicating with said main and auxiliary chambers and a by-pass communicating

with said valve stem channels and leading from said auxiliary chamber to the discharge outlet, and a cushioning means within said valve stem housing, the said valve stem diaphragm acting upon said cushioning means for its compression for the expulsion therefrom of such leakage, as may enter said valve stem housing during the operation of said auxiliary valve.

3. In a flushing valve, a housing having a main pressure chamber and an auxiliary pressure chamber, a diaphragm between said chambers, a main piston-valve borne by said diaphragm, a valve-barrel formed integral with the valve-housing and having a liner therein having an interior coating of vulcanized hard rubber and adapted to receive said piston-valve, said piston-valve consisting of a cylindrical shell having an exterior coating of vulcanized hard rubber formed upon its surface and extending over its upper and lower edges and forming a sliding fit within said liner, a plurality of discharge openings in said piston adapted to communicate with said main pressure chamber, a valve-stem housing communicating with said auxiliary pressure chamber, a diaphragm in said valve-stem housing, an auxiliary valve in said auxiliary pressure chamber bearing a stem supportable by the said diaphragm and movable therewith, said stem being adjustable relative to said diaphragm and provided with channels therein, an inlet port communicating with said main and auxiliary chambers, a by-pass communicating with said valve-stem channels and leading from said auxiliary chamber to the discharge outlet, and a cushioning means within said valve-stem housing.

4. In a flushing valve, a housing having a main pressure chamber and a auxiliary pressure chamber, a diaphragm between said chambers, a main piston-valve borne by said diaphragm and consisting of a head having a reduced neck forming a seat, a tapped opening in said head, an exteriorly threaded clamp-nut adapted to fit in said opening to clamp the diaphragm against the piston-head, a valve-barrel formed in said main pressure-chamber bearing a liner having an interior coating of vulcanized hard rubber, and said main piston valve bearing an exterior coating of like material and adapted to form a sliding fit within said liner.

5. In a flushing valve, a housing having a main pressure-chamber and an auxiliary pressure chamber, a diaphragm between said chambers having a centrally positioned opening, a main piston-valve borne by said diaphragm and consisting of a shell having a head, said head having a reduced neck forming a seat, a tapped opening in said head, discharge openings formed in the wall of said shell, an exteriorly threaded clamp-nut adapted to fit in said tapped opening

- and to receive the diaphragm opening to clamp the same against the piston-head, said piston valve having an exterior coating of vulcanized material, and a valve-barrel 5 formed in said main pressure chamber bearing a tight fitting liner having an interior coating of like vulcanized material adapted to form a smooth working bore for said piston.
- 10 6. In a flushing valve, a main-piston valve therefor consisting of a cylindrical cast shell having a head and reduced neck portion forming a diaphragm seat, a tapped opening in said head, a clamp-nut 15 having a threaded portion adapted to fit in said tapped opening to clamp the diaphragm to the head, a plurality of discharge openings in the wall of said shell positioned adjacent the head thereof, and said shell 20 being provided with a smooth exterior coating of vulcanized hard rubber extending over the upper and lower edges thereof to bind the same thereto.
7. In a flushing valve, a housing having a main pressure chamber and an auxiliary 25 pressure chamber, a diaphragm between said chambers, a main piston-valve borne by said diaphragm; a valve barrel formed integral with the valve-housing and having a tight 30 fitting liner therein provided with an interior coating of vulcanized hard rubber and adapted to receive said piston valve, said piston-valve consisting of a cylindrical cast shell having a head bearing a reduced neck 35 forming a seat, a tapped opening in said head, discharge openings formed in the wall of said shell adjacent the head thereof, an exteriorly threaded clamp-nut adapted to screw into said tapped opening and having a clamp-member adapted to clamp said diaphragm against the head, and said shell 40 having an exterior coating of vulcanized hard rubber extending over its upper and lower edges to bind the same to the shell.
- In testimony whereof we have affixed our signatures.
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