

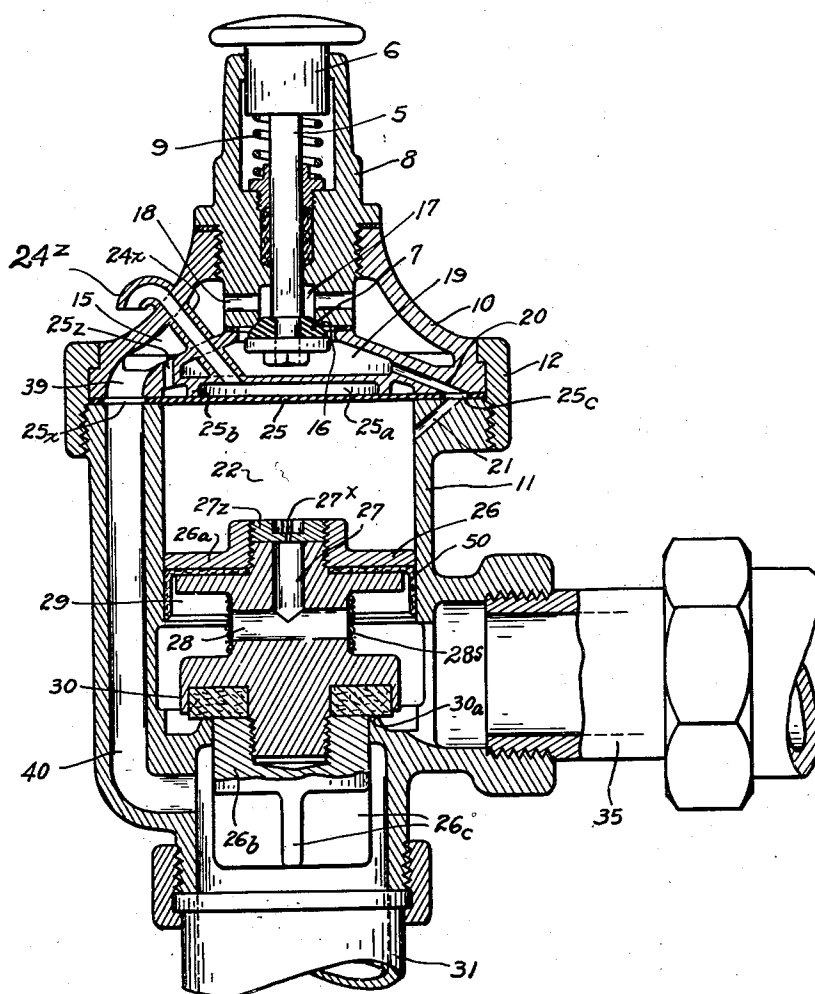
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FLUSH VALVE

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UNITED STATES PATENT OFFICE

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FLUSH VALVE

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This invention relates to a flushing valve which is adapted for use upon water supply systems in which there is a great difference in the water pressure.

5 An object of the invention is to provide a flushing valve which will work efficiently whether the water pressure is high or low, and which will be adapted to use under varying water pressure by an easily accomplished change in the construction thereof.

10 Another object of the invention is to provide a flushing valve which will prevent water from being drawn back through the valve into the main by siphoning action, which
15 has hitherto been an objectionable feature of flushing valves of the present type.

Among other advantages of the invention are to provide a flushing valve of simplified construction, and one which is readily assembled and which is inexpensive to manufacture considering the efficiency of its operation.

20 A still further object of the invention is to provide improved means for preventing any objectionable discharge of water from the fitting on to the floor of the room in which it is installed.

Other objects, advantages and features of the invention may hereinafter appear.

30 Referring to the accompanying drawing which illustrates what is at present deemed to be a preferred embodiment of the invention,

35 The sectional view shown illustrates the valve in the closed position, the valve being shown attached to the discharge end of the water main, and showing the upper portion of the pipe which discharges into the toilet bowl.

40 Referring in detail to the drawing, the valve structure comprises the manually operable push rod 5 which carries at its upper end the head or push button 6 and at its lower end a release valve 7. Said rod 5 operates within the tubular guide 8 against the opposition of the compression spring 9.

45 The housing 10 is of a frusto-conical hollow character and is secured to the main casing 11 by means of an internally threaded clamping nut or collar 12. Said housing 10
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contains an annular chamber 15 which extends around the valve seat 16 formed in the lower portion of the guide member 8, there being in the lower end of said tubular guide member, a central recess 17 which communicates with the chamber 15 by means of the radial passages 18.

Diaphragm 25 extends over the main casing 11. Said main casing is of a tubular character and has fitted therewithin a pressure operable plunger 26 which is provided with an axial passage 27 and with a radial or transverse passage 28 with the central portion of which said passage 27 communicates. Said plunger 26 is provided with a relatively deep annular recess 29 which extends therearound and with which the passage 28 communicates at each end, the ends of said passage 28 preferably being covered with screen 28s.

70 The lower end of plunger 26 is provided with an outlet valve 30 which opens and closes the outlet pipe 31 which communicates with the toilet bowl (not shown). The inlet pipe 35 continuously supplies water under pressure to the annular recess 29 which surrounds the plunger 26.

Communication between the recess 17 and the valve chamber 19 is controlled by the valve 7. Said chamber 19 is provided with a relief by-pass which consists of an upper section 20 and a lower section 21, the latter section being formed in the wall of the main casing 11, communication thus being continually afforded between the valve chamber 19 and the main chamber 22 which is located beneath the diaphragm 25. Above the diaphragm 25 is a diaphragm chamber 25a which is surrounded by the seat 25b against which the diaphragm normally seats. Said diaphragm chamber 25a communicates freely with the external atmosphere through the vent tube 24x, the upper end 24z of which is preferably directed downwardly to safeguard it against being accidentally or purposely obstructed. The diaphragm is provided with an aperture 25c to complete the communication between the passages 20 and 21 which have already been described.

Referring to certain preferred details of 100

construction, the restricted opening 27 α is preferably formed in the nut 27 α , the interior of which is adapted to receive a suitable tool whereby said nut is screwed into a larger nut 26 α , the cup washer 50 being clamped by said nut 26 α into place upon the plunger. The lower part of said plunger has screwed thereonto a lower valve extension 26 β having at its lower end the intersecting blades 26 γ thus providing guiding means for the lower end of the plunger even when the plunger is in its most elevated position. The diaphragm 25 has through it an opening 25 α which registers with the main by-pass 40 and the cooperating passage 39.

In the operation of the device, when the operator depresses the push button 6 and thereby opens the relief valve 7 the pressure is released within the valve chamber 19, and by means of passages 20 and 21, the pressure is also released within the auxiliary chamber 22, which in turn releases the pressure beneath diaphragm 25. As a result, if there is the requisite water pressure in the supply pipe 35, upon releasing pressure in chamber 22, plunger 26 is forced upwardly by reason of there being a larger pressure area under the plunger cup washer 50 than upon the area included within the lower valve seat 30 α . As soon as the plunger 26 moves upwardly the required pressure and volume of water is admitted to the outlet pipe 31 to perform the flushing operation.

Normally, during the operation which has just been described, the diaphragm 25 will remain seated. If however, at the time the valve is operated, the supply pipe 35 is open wide at some remote point at a lower level than the discharge end of the pipe 31, then the pressure below the diaphragm will become less than the atmospheric pressure thereabove, and consequently the diaphragm will be unseated, the main by-pass 40 and above described passages and chambers which cooperate therewith will permit air to be entrained through pipe 24 α via diaphragm chamber 25 α to prevent the formation of a siphon which it is intended to avoid, as otherwise water from the outlet pipe 31 might, under these circumstances, be siphoned back into the inlet pipe 35.

While the valve is permitting the proper amount of water to be delivered through the pipe 31, the reserve pressure from inlet passage 35 in the meantime is letting water pass through the restricted opening 27 α which in turn builds up a reserve pressure in chambers 19 and 22 forcing the plunger 26 downward, thus shutting off the flow of water from inlet pipe 35 to outlet pipe 31 at the proper time.

After about one-third of the flushing operation has been performed the light pressure admitted to chamber 22 causes the diaphragm 25 to seat lightly upon its seat 25 β ,

this, in turn, eliminates any back pressure which might occur in outlet pipe 31, thereby eliminating any water which might be forced back through the by-pass 40, aperture 39 into chamber 15 through by-pass 25 α and then over seat 25 β to the external atmosphere through the tube 25 α .

As, under normal conditions, there is always a considerably greater pressure against the lower face of the diaphragm 25 than against the upper face thereof, consequently the diaphragm will ordinarily remain seated, whether it be constructed of limp material or of resilient material tending, with a moderate force, to spring away from its seat. It is deemed preferable, however, to make the diaphragm of a composition rubber which will be of a moderate thickness and of sufficient firmness to remain seated except when suction is applied to the lower face thereof. The only time it would not be held in contact with its seat is when, due to an opening in the supply line below the valve, the inlet pressure is reduced to less than atmospheric.

I claim:

1. In a flushing valve, a casing, a housing juxtaposed to said casing, a diaphragm between said housing and casing, said casing having within it a main chamber of which said diaphragm forms a wall, a pressure operable plunger having a working fit within said main chamber, a supply pipe and an outlet pipe communicating with said main chamber, communication between said pipes being controlled by said plunger, said plunger having through it a restricted passage which at all times affords a limited communication between said supply pipe and main chamber, said housing containing two chambers one of them a diaphragm chamber overlying said diaphragm and the other a valve chamber more remote from said diaphragm, there being relatively small passages affording communication between said main chamber and said valve chamber and there being a vent passage from said diaphragm chamber to the external atmosphere, a by-pass affording communication between said valve chamber and said outlet pipe, and a valve constructed and arranged to open and close communication between said by-pass and said valve chamber for the purpose of starting the flushing operation, there being a passage to afford communication between said diaphragm chamber and said valve chamber and by-pass when the diaphragm recedes from the side of said diaphragm chamber.

2. In a flushing valve, a casing construction, a diaphragm therewithin which separates the casing construction into two chambers one a main chamber and the other a diaphragm chamber, a pressure operable plunger having a working fit within said main chamber, a supply pipe and outlet pipe communicating with said main chamber, com-

munication between said pipes being controlled by said plunger, there being a restricted passage through said plunger affording communication between said supply pipe and said main chamber, and there being a vent passage from said diaphragm chamber to the external atmosphere, there being passages to afford communication between said main chamber and the outlet pipe, and an externally operable relief valve to open such communication to cause the flushing operation, the opening of said relief valve causing the diaphragm to recede from said diaphragm chamber, there being passages which afford communication between said diaphragm chamber and the outlet pipe when the diaphragm is so relaxed.

chamber, there being a vent passage from said diaphragm chamber to the external atmosphere which communicates with said annular chamber when the diaphragm is unseated, there being passages affording communication between said annular chamber and the outlet pipe, and means to relieve the pressure in said main chamber to cause the valve to operate.

In testimony whereof I hereunto affix my signature.

MARVIN A. HAGEY.

3. In a flushing valve, a casing construction, a diaphragm therewithin which separates the casing construction into two chambers one a main chamber and the other a diaphragm chamber, said diaphragm chamber being surrounded by a wall with which said diaphragm contacts, there being an annular chamber around said wall, a pressure operable plunger having a working fit within said main chamber, a supply pipe and an outlet pipe communicating with said main chamber, communication between said pipes being controlled by said plunger, there being a restricted passage through said plunger affording communication between said supply pipe and said main chamber, and there being a vent passage from said diaphragm chamber to the external atmosphere, there being passages to afford communication between said main chamber and the outlet pipe, and an externally operable relief valve to open such communication to cause the flushing operation, the opening of said relief valve causing the diaphragm to recede from said diaphragm chamber, there being passages which afford communication between said annular chamber and the outlet pipe.

4. In a flushing valve, a casing construction, a diaphragm which separates said casing construction into two chambers one a main chamber and the other a diaphragm chamber, said diaphragm chamber being surrounded by a wall forming a lip which is normally engaged by one face of the diaphragm, said main chamber being opposed by the other face of the diaphragm and subjecting that face of the diaphragm to pressure throughout an area which extends radially beyond said lip, there being an annular chamber around said lip at the same side of the diaphragm, a pressure operable valve member within said main chamber, a supply pipe and an outlet pipe communicating with said main chamber, communication between said pipes being controlled by said valve member, there being a restricted passage affording communication between said supply pipe and main

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