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FLUSH VALVE

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Fig. 1

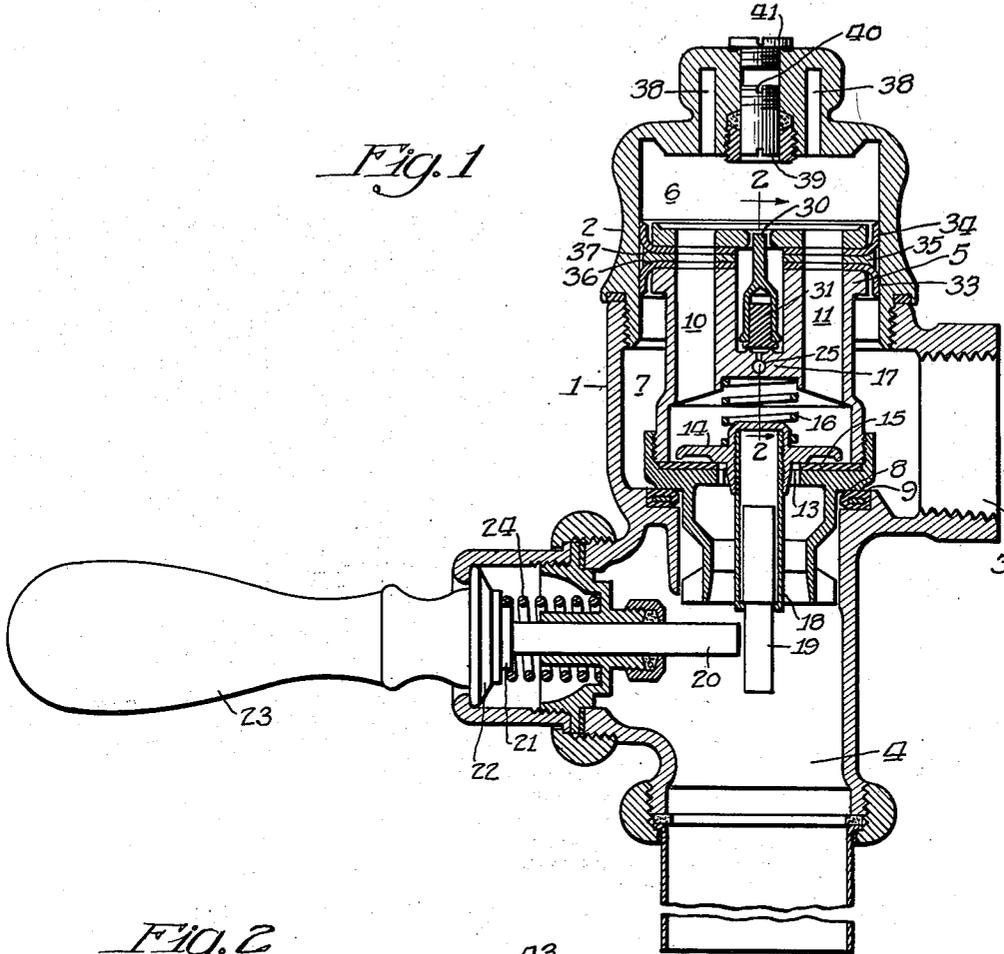
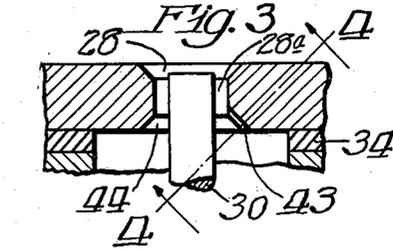
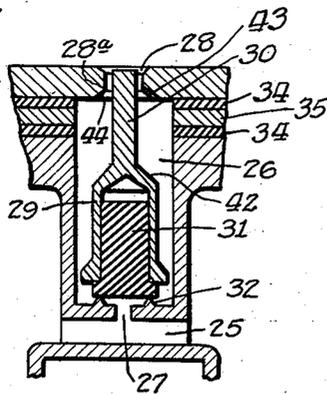


Fig. 2



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FLUSH VALVE

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6 Claims. (Cl. 137-93)

This invention relates to flush valves and has for its object to provide a new and improved device of this description. The invention has as a further object to provide a flush valve arranged to prevent the valve from being operated by a vacuum or partial vacuum in the supply pipe. The invention has as a further object to provide a flush valve which will prevent the contents of the closet bowl, when the flush valve is used with such a bowl, from being drawn back to the supply pipe. The invention has other objects which are more particularly pointed out in the accompanying description.

Referring now to the drawing, Fig. 1 is a vertical sectional view to one form of flush valve embodying the invention;

Fig. 2 is an enlarged sectional view taken on line 2-2 of Fig. 1;

Fig. 3 is an enlarged view of the construction shown in the upper end of Fig. 2; and

Fig. 4 is an enlarged sectional view taken on line 4-4 of Fig. 3.

Like numerals refer to like parts throughout the several figures.

The flush valve is provided with a casing consisting of the sections 1 and 2 removably connected together. This casing is provided with the inlet 3 and the outlet 4. Within the casing is a main valve 5 which divides the casing into two chambers, an upper chamber 6 and a lower chamber 7. The main valve is provided with a seat 8 which engages a seat 9 on the casing. The upper chamber 6 has a passageway leading through the main valve which connects it with the outlet 4. This passageway is shown as consisting of the two upper portions 10 and 11 which connect with the enlarged portion 12 and which in turn connects with the contracted portion 13 leading to the outlet 4. This passageway is controlled by an auxiliary valve 14 which normally rests on a seat 15 surrounding the contracted portion 13 of the passageway. A retracting spring 16 is interposed between the auxiliary valve and the central portion 17 of the main valve. The auxiliary valve is provided with a stem which consists of the two telescoping sections 18 and 19 and is operated by pushing the stem laterally by means of an actuating device 20 which has an enlarged end 21 engaged by an enlarged end 22 on the handle 23.

When the handle is moved in any direction, the actuating part 20 is moved inwardly to engage the section 19 of the stem and open the auxiliary valve. A retracting spring 24 is provided which moves the parts back to their initial position when the handle is released. If the handle is

held in its actuating position, the auxiliary valve 14 is automatically closed when the section 19 of the valve stem rises above the actuating part 20. A by-pass is provided connecting the chambers 6 and 7 together. As herein shown, this by-pass consists of the section 25 in the main valve, see Fig. 2, which communicates with the chamber 7. The section 25 communicates with the enlarged section 26 by means of the portion 27, and the enlarged section 26 communicates with the chamber 6 through the port 28.

Located within the enlargement 26 is a by-pass controlling member which consists of the hollow body portion 29, having the projection 30 connected therewith, which projection extends into the port 28. The by-pass controller member could be made entirely of metal and in one piece, but I prefer to make it hollow and insert in this hollow a non-metallic seating section 31, preferably of rubber or other suitable material, which projects from the body portion so as to engage a seat 32 extending around the opening 27. This softer material gives a better seat than if the by-pass controller was entirely of metal. This by-pass controller rests on this seat and closes the by-pass against back flow of the water from the chamber 6 toward the chamber 7 except when the valve is being operated.

The main valve is provided with two cup leathers, a lower cup leather 33 and an upper cup leather 34, the two cup leathers having their ends bent in opposite directions. Located between these cup leathers is a disc 35 which has at its periphery two oppositely curved faces 36 and 37. The curved face 36 insures the edge of the lower cup leather being curved downwardly, and the upper curved face 37 insures the edge of the upper cup leather being moved upwardly. This disc is very important in securing and maintaining the proper and successful operation of the cup leathers. The lower cup leather is the working cup leather and the upper cup leather prevents back flow of the water past the main valve from the upper chamber 6 to the lower chamber 7. Sand, dirt or other foreign material is liable to get into the upper chamber 6, and this upper cup leather 34 prevents this foreign material from passing down between the main valve and the inner face of the casing, and this prevents scratching and scarring of this inner face and prolongs the life of both the casing and the main valve. This construction, where the upper and lower cup leathers are turned up and down on a radius by means of the spacer with the oppositely curved faces, is an

important feature in the successful operation of the valve, as it provides less resistance to the up and down movement of the valve. Without this construction the cup leathers offer so much resistance that they will not slide up and down in the casing easily. With the present construction, where each cup leather works on a curved radius, the flush valve operates successfully, even though the pressure in the supply line is so low that the rate of flow is insufficient for the successful operation of the water closet, whereas with the old form of construction the friction of the cup leathers in the cylinder is so great that the pressure on the supply line, in order to have the valve operate satisfactorily, must be much higher than necessary to give the proper rate of flow for the water closet bowl.

The upper chamber 6 may be provided with one or more air chambers 38, secured for example by drilling one or more holes in the section 2 of the casing. The air chamber or chambers tend to lessen the drop in pressure in case there is a slight leak in the upper chamber 6 at the instant a vacuum comes on the supply pipe connected with the inlet 3. The disc 35 is enlarged at its periphery so as to insure and maintain opposite bends in the two cup leathers. The upper part of the casing has an opening extending therethrough and in this opening is an adjustable member 39 having a screw threaded connection with the casing and being provided with a notch 40 and an adjusting tool. There is also a plug 41 in this opening which covers the adjusting member. The by-pass controller has a beveled face 42. When the by-pass controller has its beveled face in contact with the beveled face 44 of the portion 28 of the by-pass there is a small by-pass opening still left opened, and I prefer to provide this small by-pass opening by making a groove in the face 44. It is of course evident that this groove could be on the beveled face of the by-pass controller, but it is found that when it is in the beveled face 44 a more effective passageway can be secured which does not clog so easily. Under certain conditions the beveled face 42 of the by-pass controller engages a similar beveled face 44 about the portion 28 of the by-pass, and the effective cross section of the by-pass is limited to the groove 43. When the main valve rises the end 30 of the by-pass controller strikes the adjustable member 39 and the by-pass controller is moved downwardly so that any foreign material that may be on the beveled faces or in the section 28a of the opening will be washed away.

The use and operation of my invention are as follows:

When the parts are in the position shown in Figure 1, the valve is closed. To open the valve the handle 23 is moved in any direction. This causes the actuating part 20 to move inwardly and engage the valve stem of the auxiliary valve and move it to one side to open the valve. This opens the passageway leading through the main valve so that the water in the chamber 6 passes out through this passageway to the outlet 4. The pressure in chamber 6 is thus reduced and the pressure in chamber 7 causes the main valve 5 to move upwardly, carrying with it the auxiliary valve 14.

When the main valve is lifted from its seat, the water passes from the inlet 3 between the seats 8 and 9 and out the outlet 4. As the main valve moves upwardly the section 10 of the stem of the auxiliary valve passes above the actual

ing part 20 and the auxiliary valve then moves to its seat, thereby closing the passageway leading from the chamber 6 to the outlet. Water then passes from chamber 7 up to chamber 6 through the by-pass in the main valve 5, lifting the by-pass controller from its seat.

When a sufficient amount of water enters the chamber 6 to sufficiently increase the pressure therein, the main valve starts down and is carried to its seat. When the main valve is seated the by-pass controller is also seated on the seat 32. If, now, a vacuum or partial vacuum is developed in the supply line connecting with chamber 7, the by-pass controller, being properly seated on its seat, will prevent water passing from the chamber 6 down through the by-pass into chamber 7 in response to the vacuum or partial vacuum. The upper cup leather 34 insures against any leakage past the main valve.

It will thus be seen that this vacuum or partial vacuum cannot therefore draw water out of the upper chamber 6 so as to cause the main valve to be opened or partially opened. The device operates properly without the air chamber 38, but if this air chamber is provided the air is compressed in the air chamber when the water enters the chamber 6, and if there should be a small leak past the main valve when the vacuum in the supply line occurs, this air would counteract the small amount of leakage and thereby prevent the pressure in the chamber 6 from being reduced sufficient to cause the main valve to be operated.

I claim:

1. A flush valve comprising a casing having an inlet and an outlet, a main valve in said casing dividing it into two chambers, an upper chamber and a lower chamber, a bypass carried by said main valve and extending from the lower chamber to the upper chamber, said bypass having an enlarged portion and a portion of smaller cross sectional area at each end thereof connected therewith at the bottom thereof, an upstanding seat projecting into the enlarged portion of the bypass at the point where the two portions are connected, surrounding the end of the portion of smaller cross sectional area, and a bypass controlling device in said enlarged portion, the lower end of which seats upon said upstanding seat when the main valve is closed to prevent back flow of water through the bypass.

2. A flush valve comprising a casing having an inlet and an outlet, a main valve in said casing dividing it into two chambers, an upper chamber and a lower chamber, a by-pass extending from the lower chamber to the upper chamber and located in said main valve, said main valve having a lower seating portion having an opening therethrough, an intermediate portion removably connected with the lower portion and projecting above the lower portion and provided with a recess, an auxiliary valve in said recess having a stem which projects through the opening in said lower seating portion, a passageway through said main valve connecting said recess with said upper chamber, an upper portion above the intermediate portion of said main valve and separate therefrom, two cup leathers having a disc between them, the two cup leathers and disc being clamped between the upper portion and the intermediate portion of the main valve, said disc being enlarged at its periphery, the cup leathers projecting beyond the periphery of said disc and being curved in opposite directions therefrom.

3. A flush valve comprising a casing having an inlet and an outlet, a main valve in said casing dividing it into two chambers, an upper chamber and a lower chamber, a by-pass extending
 5 from the lower chamber to the upper chamber and located in said main valve, said main valve having a lower seating portion, an intermediate portion removably connected with the lower portion and provided with a recess, an auxiliary
 10 valve in said recess, an upper portion above the intermediate portion and separate therefrom, two cup leathers having a disc between them, the two cup leathers and discs being clamped between the upper portion and the intermediate
 15 portion of the piston, said intermediate portion of the piston having a portion of the bypass extending therethrough, a part of which is enlarged, a bypass controller in said enlarged portion of the bypass, the upper portion of the piston having a contracted portion of the by-pass, said by-pass controller having a contracted portion which projects into the contracted portion of the by-pass in the upper part of the piston.

4. A flush valve comprising a casing having an inlet and an outlet, a main valve in said casing dividing it into two chambers, an upper chamber and a lower chamber, a by-pass carried by said main valve and extending from the lower chamber to the upper chamber, a controlling member
 25 in said by-pass comprising a hollow metal member, a non-metallic seating section extending into said hollow metallic member and projecting therefrom, said bypass having a contracted section above the enlarged section, the bypass controller having a reduced portion which extends into said contracted portion of the bypass,
 30 said piston being provided with two cup shaped leathers which surround said bypass, and means

associated with said cup shaped leathers for maintaining the opposite bends in their free ends.

5. A flush valve comprising a casing having an inlet and an outlet, a main valve in said casing dividing it into two chambers, an upper chamber
 5 and a lower chamber, said main valve being provided with a passageway extending therethrough, an auxiliary valve controlling said passageway, a bypass extending from the lower chamber to the upper chamber and arranged in alignment
 10 with the auxiliary valve, a controlling member in said bypass and a seat for said controlling member upon which it rests when the main and auxiliary valves are closed to prevent water from passing from the upper chamber to the lower
 15 chamber through the bypass when the pressure in the lower chamber is reduced.

6. A flush valve comprising a casing having an inlet and an outlet, a main valve in said casing dividing it into two chambers, a bypass carried by said main valve and located centrally thereof and extending from the lower chamber to the upper chamber, said bypass having an enlargement between its ends, a controlling member in the enlargement of said bypass and confined therein, said controlling member made up of two parts, a hollow metallic part and a non-metallic part extending into the hollow metallic part and surrounded thereby and having a seating portion on the bottom thereof, a seat at the bottom of said enlargement of the bypass upon which the seating portion of the controlling member rests to prevent water from passing from the upper chamber to the lower chamber through the bypass when the pressure in the lower chamber is reduced.

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