# United States Patent

**Billeter et al.**

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[54] **REMOTELY ACTUATED FLUSH VALVES**


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[73] Assignee: **Sloan Valve Company**



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[52] **U.S. Cl.** .....**137/360**, 251/29, 251/41

[51] **Int. Cl.**.....**F16k 31/143**

[58] **Field of Search**.....251/41, 28, 29, 295, 33, 38, 251/40, 57; 137/360



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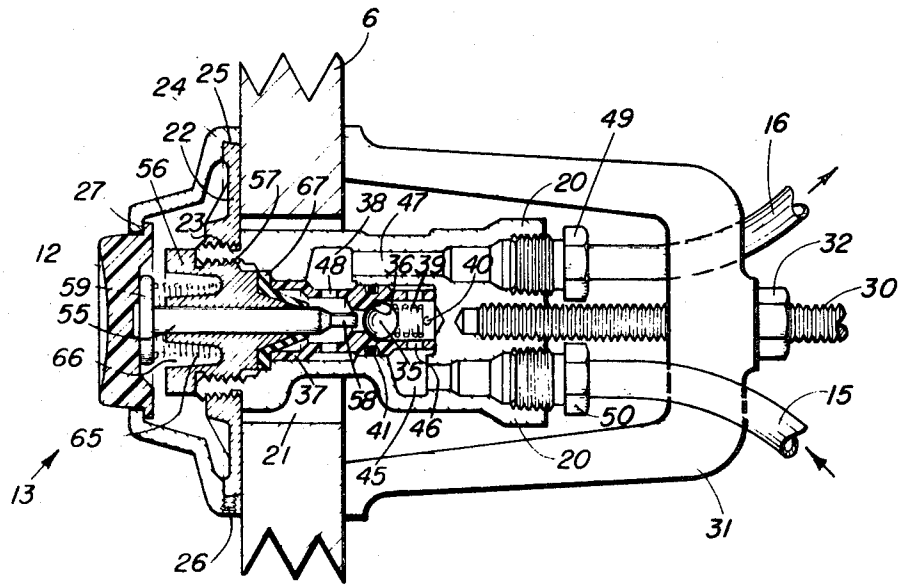
[57] **ABSTRACT**

The flush valve is located behind a wall and is hydraulically actuated by a push button on the front wall. The operating button is connected to the inlet supply line and to a piston in the flush valve handle coupling, over a pair of small copper tubes. The tubes allow for variations in roughing-in measurement and wall thickness, and can be of any length.


**7 Claims, 4 Drawing Figures**



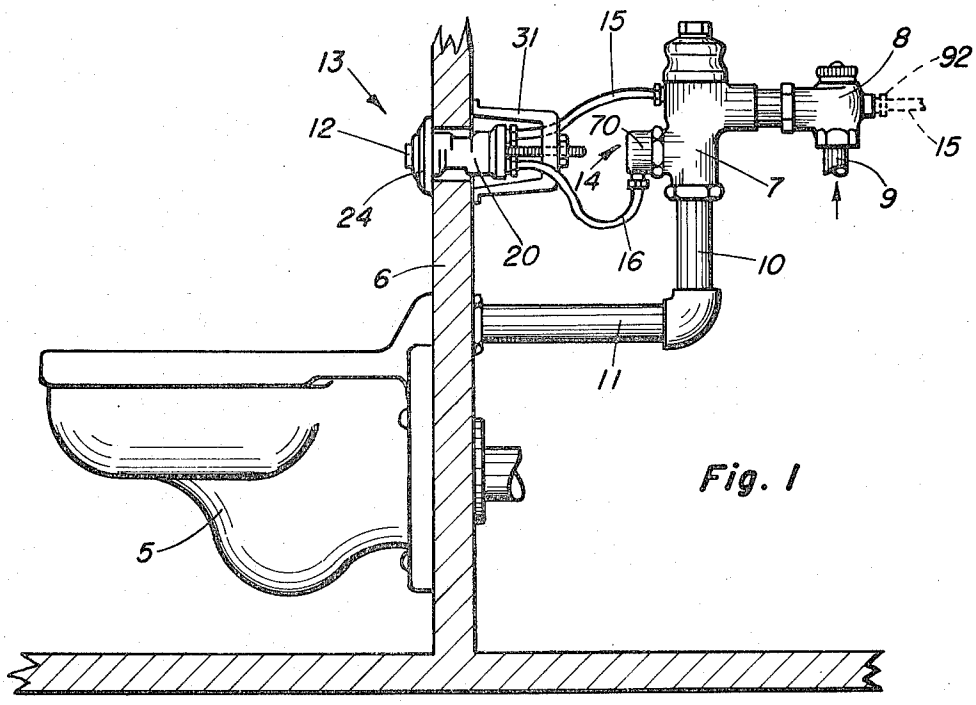



Fig. 1

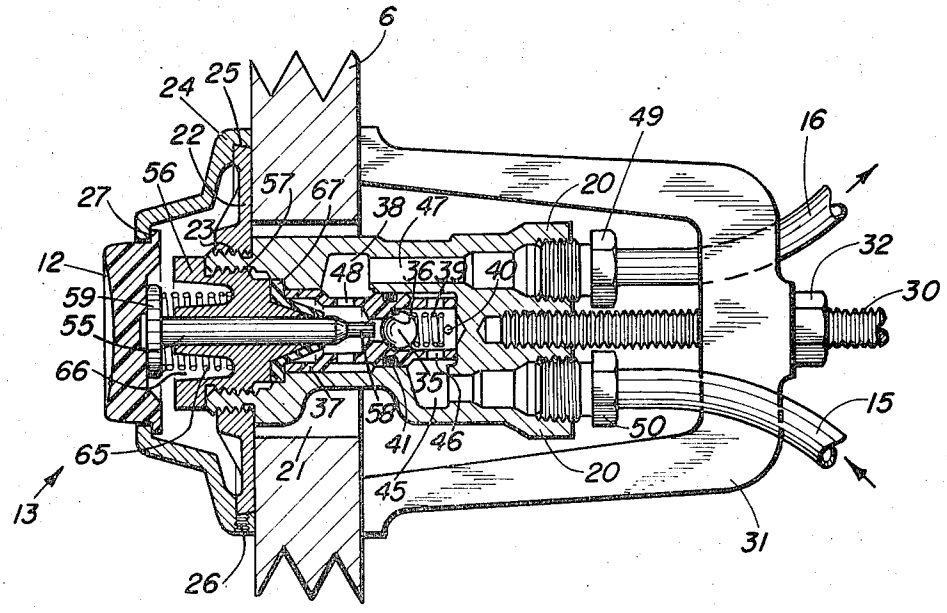



Fig. 2

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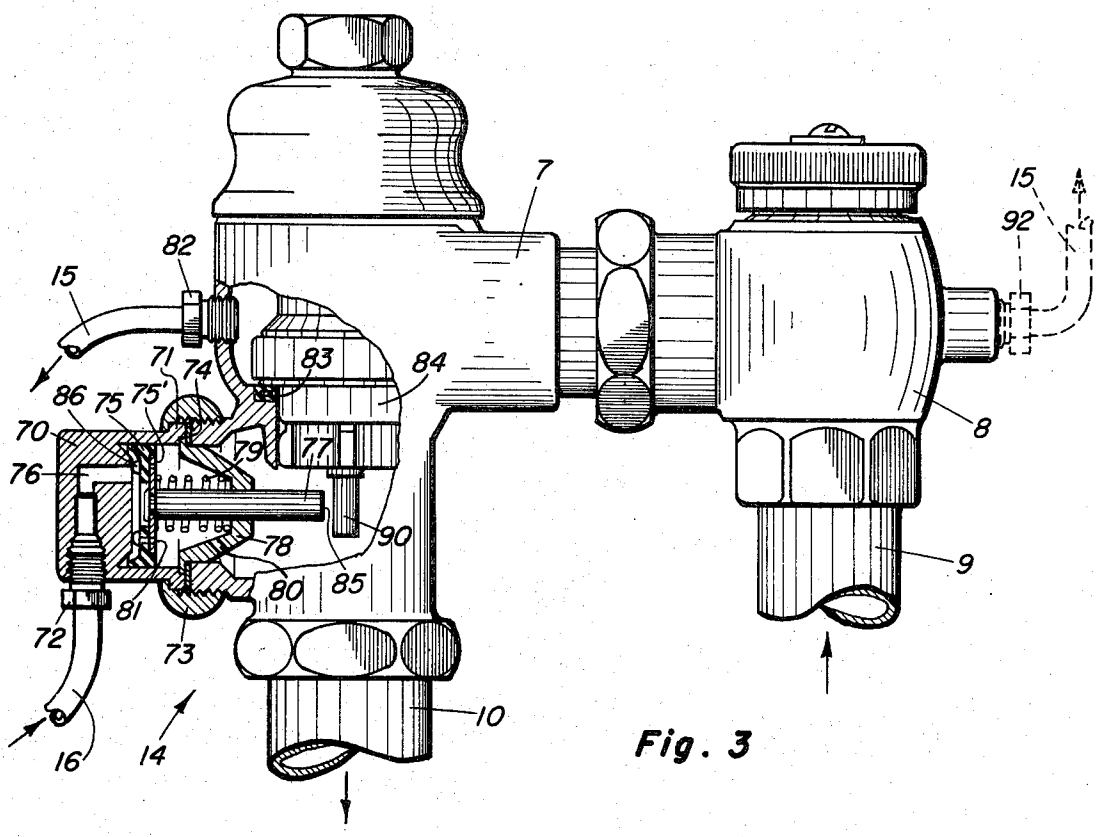


Fig. 3

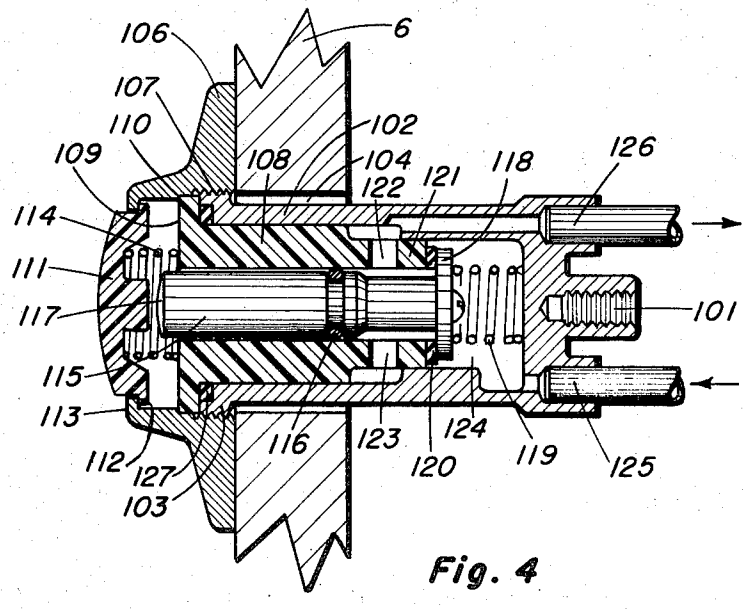


Fig. 4

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# REMOTELY ACTUATED FLUSH VALVES

## BACKGROUND OF THE INVENTION

The invention relates generally to the operation of flush valves for plumbing fixtures from a remotely located operating button, and the principal object of the invention is to provide a new and improved hydraulic actuating mechanism for the aforesaid purpose.

In many plumbing installations it is desirable that the flush valves for flushing the water closets and urinals be concealed behind the toilet room wall in front of which the plumbing fixture is located. In such an arrangement, it is necessary that the handle or push button for operating the flush valve be mounted on the front wall where it is readily accessible to the user of the fixture, while the rigid extension coupling for the handle passes through the wall and is rigidly connected to the flush valve. Upon installing such concealed flush valves, the plumber was formerly confronted with the problem of ordering the correct length of rigid handle coupling because of the many different wall thicknesses encountered and which may be changed when the wall is finally finished. Furthermore it was always difficult for the plumber to accurately line up the flush valve with the opening in the wall through which the handle or push button protrudes. It was also necessary for him to place the flush valve to the left of the closet bowl so the operating handle or push button would be accessible to the user on that side of the bowl. This installation therefore required the use of additional elbows and piping connections extending from the flush valve outlet to the closet bowl, thereby increasing the costs of labor and materials. The dimensions also had to be fairly accurate so that a neat installation would be presented, a difficult task for the plumber.

## SUMMARY OF THE INVENTION

The foregoing disadvantages are all overcome by the present invention in which a novel remotely controlled actuator and hydraulic mechanism is provided for operating the flush valve. The push button actuating mechanism is universally adapted for any wall thickness which may be encountered on a job; the roughing-in dimensions of the flush valve need not be accurately made; the installation is much cheaper and simpler; and the need for the plumber to stock rigid handle extensions of different lengths for various wall thicknesses, is eliminated.

An object of the invention therefore is to design a new and improved flush valve actuating mechanism which is positive and reliable in operation, simple in construction, easy to install, is adaptable to various wall thicknesses, and solves many unforeseen problems encountered in installation.

Another object of the invention is to utilize the hydrostatic pressure of the inlet water supply line for actuating the operating mechanism to cause the flush valve to operate.

A feature of the invention resides in the provision of a piston actuator on the flush valve responsive to the supply line pressure and which has an orifice therein smaller in diameter than the inlet connection to the piston, thereby providing a pressure drop across the piston insuring the positive operation of the piston. The orifice also serves to relieve the pressure on the front side of the piston permitting its restoration, after the inlet pressure has been disconnected by the push button.



With the foregoing and other objects in view, the invention consists of certain novel features of construction, operation, and combination of elements which will be more fully described, illustrated, and pointed out hereinafter.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial cross-sectional side view of a typical plumbing installation illustrating the invention;

FIG. 2 is a cross-sectional side view of the push button operating unit mounted in the wall;

FIG. 3 is a partial cross-sectional side view of the actuating unit attached to the flush valve; while

FIG. 4 is a cross-sectional side view of a modified form of the push button operating unit.

## DETAILED DESCRIPTION

Referring to FIG. 1, this illustrates a typical installation of a wall hung water closet bowl 5 mounted on a wall surface 6 and connected with a commercially known type of flush valve such as a "Sloan Crown" flush valve 7 for flushing the water closet 5. A throttle valve 8 is attached to the inlet side of the flush valve 7 and to the inlet water supply pipe 9. The outlet flush pipes 10 and 11 from the flush valve 7 lead into the closet bowl 5 in the usual manner. An operating push button assembly 12 for operating the flush valve 7 is mounted on the front of the wall surface 6 in any desirable location where it is readily accessible to a person using the water closet. If desired, the common hand operated handle could be substituted for the push button 12. The manual operating unit or assembly indicated generally at 13 is supported in the wall 6 while the actuating unit assembly indicated generally at 14, FIG. 3, is mounted directly upon the usual handle opening of the flush valve 7. A pair of small flexible tubes, preferably copper tubing such as 15 and 16, extends between the assembly units 13 and 14 and the flush valve 7. The flexible tube 15 is normally under constant hydraulic pressure from the water supply line 9 and the inlet side of the flush valve, while the tube 16 is normally at zero line pressure.

The manually operated assembly unit 13 as seen in FIG. 2 has a rearwardly extending body portion 20 passing through an opening 21 cut in the wall 6. The unit 13 has a mounting flange 22 which clamps against the front wall surface 6 and is threaded at 23 onto the left hand end of the body 20. A cover plate 24 encloses the mounting flange 22 and is attached thereto by slipping the angular periphery of the cover plate 24 over the inclined surface 25 formed in the mounting plate 24. At one edge a locking screw 26 holds the cover plate 24 securely to the mounting flange 22. The push button 12 protrudes from the center of the cover plate 24 and is spring pressed against the inner side 27 of the cover plate opening by spring 65.

At the rear end of the body portion 20 a threaded stud 30 is screwed into the unit. This stud 30 may be of any desired length and passes through a hole in a U-shaped mounting bracket 31, the two legs of which straddle the body 20 and bear against the rear wall surface 6. A clamping nut 32 is threaded on the stud 30 so that the push button unit 13 is firmly clamped to the

wall 6 between the front mounting plate 22 and the bracket 31. In this manner the push button unit 13 is adapted to be solidly supported in position regardless of the thickness of the wall 6. The unused end of the stud 30 may be cut off if desired.

The push button assembly 13 includes a valve arrangement comprising a ball type valve member 35 normally seated upon valve seat 36 formed in a valve or sleeve cage 37. The valve cage 37 is of hollow tube shape and fitted into a hollow portion or chamber 38 formed axially within the body 20. A light spring 39 normally holds the ball valve member 35 closed on its seat 36, and a pin 40 across the end of valve cage 37 holds the spring 39 in place. An O-ring seal 41 around the valve cage 37 seals it in the chamber 38 on each side of the valve seat 36. An inlet fluid passage 45 is formed in body portion 20 around chamber 38 and valve cage 37, and leads into ports 46 and the inlet side of closed ball valve member 35. An outlet fluid passage 47 leads into chamber 38 and into ports 48 formed in valve cage 37 which connect with the downstream side of the valve seat 36. The flexible lengths of tubing 15 and 16 are firmly connected to the end of their respective passages 45 and 47 by means of suitable compression fittings 49 and 50.

For actuating the ball valve member 35 a plunger 55 is provided which is axially slidable within a threaded bushing 56 in turn threaded at 57 into the front end of the body portion 20. One end 58 of plunger 55 is arranged in spaced operative relationship to the ball valve member 35 while the opposite end has a headed part 59 formed on it. A restoring spring 65 extends between the head 59 and a recess 66 formed in bushing 56 to normally bias the plunger 55 against the under side of the push button 12 and hold it in position against the ledge 27 of the cover plate 24. In order to seal the plunger 55 in bushing 56 a cone type seal 67 surrounds the plunger 55 and is clamped in position between the right hand end of bushing 56 and the left end of valve cage 37. This seal 67 also prevents leakage outward between the bushing 56, the body portion 20, the several passages, and ports in chamber 38 and valve cage 37.

Referring now particularly to FIG. 3, this shows the detail structure of the actuating unit 14 for causing the flushing action of the flush valve 7. The unit 14 comprises a cup-shaped casing 70 having a leak proof compression fitting 72 at its side end for connection of the flexible tube 16 thereto. The opposite end of the casing 70 has a shoulder 71 for the engagement of the coupling nut 73 which is threaded to the side of the flush valve body and securely clamps the casing 70 in position on the valve. A sealing gasket 74 is positioned between the shoulder 71 and the flush valve opening. Slidable within the casing 70 there is a piston 75 preferably of rubber, which is exposed on the left hand side to the pressure fluid when present, through flexible tube 16 and passage 76 into the casing 70. On the opposite side of piston 75 there is a backing plate 75' and a plunger 77 attached thereto extending into the flush valve body opening. The plunger 77 passes through the bottom of a bushing 78 where it is guided in its forward movement to control and trip the relief valve stem 90 of the flush valve to cause the flush valve to operate. Bushing 78 is supported by being clamped at its edges between the shoulder 71 and the valve body by the coupling nut 73. A restoring spring 79 for the piston 75 encircles the plunger 77 and extends between the piston 75 and the bushing 78. The bushing 78 has a drain opening 80 in one side which is arranged to point downward towards the outlet of flush tube 10 of the flush valve 7. The piston 75 and its backing plate 75' also have an opening or orifice 81 extending therethrough which opening 81 is somewhat smaller in diameter than the opening 80. The orifice 81 being smaller in diameter than the inlet passage 76, provides a pressure drop across the piston to insure its positive operation.

One of the lengths of flexible tubing 15 is connected by a compression fitting 82 to the side wall of the flush valve body 7 so that the tubing 15 is constantly under water supply pressure present above the flush valve seat 83 and the piston 84 and extending from the control stop 8 and the inlet supply pipe 9. The other flexible tubing 16 is connected to the casing 70 by the compression fitting 72 and is under no particular fluid pressure although it may contain some fluid, or even be empty.

It will be apparent that, with the foregoing construction as described, it is immaterial in what position the flush valve is located behind the wall 6 in relation to its operating push button 12. It may be at any remote location relative to the push button and no particular problem need be experienced by the plumber in installing or precisely positioning the flush valve. The flush valve is amply supported by the flush tubes 10 and 11 from the wall 6 and by the inlet supply pipe 9. The flexible tubing 15 and 16 can be cut to almost any length desired or bent in any direction without kinking. The flush valve may therefore be located any distance in back of the wall as well as either to the right or left hand side of the push button or closet bowl. The flush valve furthermore can be located either higher or lower than the push button without affecting its reliable operation.

## OPERATION OF THE INVENTION

In the operation of the remote flush valve arrangement, according to the invention, the normal condition of the system is as illustrated with the flexible tubing 15 under supply line pressure from the inlet 9 to the ball valve member 35, while the tubing 16 is at zero pressure. The user of the equipment desiring to operate the flush valve 7 to flush the water closet bowl 5, depresses the push button 12. This action projects the plunger 55 inward to force the ball valve member 35 off of its valve seat 36 against the fluid pressure in chamber 45 and also against the tension of springs 65 and 39. The full supply line pressure now takes effect from the flexible tubing 15, and the supply pipe 9.

Within the push button assembly 13 the fluid flow takes place over a path through passages 45 of chamber 38, ports 46 in the sleeve 37, the open valve seat 36, ports 48 in sleeve 37, passage 47, through the flexible tubing 16, and into the actuating unit 14. The fluid pressure in tubing 16 is now exerted at the flush valve through passage 76 of cup-shaped casing 70 and against the left side of piston 75, projecting it forward in the casing 70 together with the attached plunger 77. The end 85 of plunger 77 as a result contacts the lower

end of relief valve stem **90** in the flush valve to tilt the same off its seat (not shown) resulting, in well known manner, in the upward operation and movement of the flush valve piston **84** from the main valve seat **83**. Full water flow now takes place from the inlet supply pipe **9**, control stop **8**, valve seat **83**, and downward through flush tubes **10** and **11** into the closet bowl, flushing the same, as is well understood.

The fluid pressure from tubing **16** against piston **75** is rendered more effective because the area of the piston exposed to this pressure is at its maximum due to the presence of the small bumps **86** on the pressure side of the piston. These bumps **86** normally space the piston slightly away from the bottom of the casing **70** and also enable drainage to take place from the tube **16** and passage **76** outward through openings **81** and **80**. The restricted orifice **81** provides a pressure drop across the piston to insure its positive operation when the inlet pressure occurs on the front side of the piston.

Upon the release of the push button **12** by the user, the plunger **55** is restored by spring **65** thereby permitting the ball valve member **35** to be seated upon its valve seat **36** and cutting off further flow of pressure fluid from tubing **15** into tubing **16**. As a further result piston **75** is restored by spring **79** and any residual fluid is drained out of the tube **16** and passage **76** in front of piston **75** through the bleed openings **81** and **80**, offering no restriction to the free restoring action of the piston. The drainage takes place through opening **80** and downward at an angle into the flush tube **10** of the flush valve away from the end of the relief valve stem **90**, so as not to interfere with the operation of the flush valve.

In the event that the push button **12** is held operated an unduly long time in an attempt to cause the continuous operation of the flush valve, this action will be without effect. The flush valve **7** is provided with the usual telescoping relief valve stem **90** the end of which comes to rest upon the top end **85** of the now inwardly held plunger **77**. The flush valve accordingly closes off upon the main valve seat **83** to stop the flushing action. However since the ball valve **35** would still be held off of its valve seat **36** and the supply pressure holds the piston **75** operated, a slight dribble will occur through the openings **80** and **81** into the flush valve outlet tube **10**. This is however without effect upon the operation of the flush valve and when the push button **12** is again released the parts are all restored to normal condition.

In certain instances it may be desirable to attach the pressure tubing **15** directly to the body of the control valve **8** with the compressing fitting **92** instead of to the flush valve body **7** by the fitting **82** as shown in FIG. **3**. This will enable all flush valves manufactured to be of the same construction whether used for the purpose of the present invention or not. It is obvious that the standard flexible tubing employed can be of any length when supplied to the job and simply cut off to the desired length to fit the installation, the plumber furnishing the tubing and compression fittings from his stock.

As a further alternate arrangement for mounting the push button assembly **13** upon the wall and considered a more economical one, several mounting screws in mounting plate **22** may be screwed into suitable anchor lugs set in the wall **6**. This does away with the use of the clamping bracket **31**, stud **30** and clamping nut **32**. This arrangement would also securely hold the push button assembly in place regardless of the wall thickness.

Referring to the modification of the push button assembly shown in FIG. **4**, this is a structure employing fewer parts most of which may be made of some suitable plastic material easily molded into the desired shapes. The push button assembly may be supported on the front of the wall surface **6** by means of a similar bracket as shown in FIG. **1**, with the stud **30** threaded into the rear end **101** of the hollow cylindrical body **102**. The body **102** has a front flange **103** formed on it which butts up against the wall **6** while the body portion **102** passes through the wall opening **104** to the rear side. A front mounting plate **106** is threaded at **107** around the edge of the front flange **103** to hold the plate **106** in place. An inner sleeve **108** fits into the hollow body **102** and has an outwardly formed flange **109** around its front end which rests against the front of flange **103**. A shoulder **110** on plate **106** clamps the outer end of flange **109** against flange **103** so that all three parts **103**, **109** and **106** are assembled into a secure unitary structure against the wall **6**.

An operating push button **111** is arranged on the front of the unit and has its outer edge **112** normally urged by spring **114** against a shoulder **113** formed around the edge of the plate **106**. The spring **114** extends between the bottom of push button **111** and the flange **109**. Slidable within the hollow sleeve **108** is an operating plunger **115** together with an O-ring seal **116** around it for preventing leakage outward through the push button **111** and through the sleeve **108**. The gasket seal **127** prevents leakage outward between the sleeve **109** and body **102**. The left hand end **117** of plunger **115** is arranged in close proximity to the rear side of push button **111** while the opposite end is provided with a washer type valve member or seal **118**. A restoring spring **119** normally urges the plunger **115** forward and seal **118** into closing contact with valve seat **120** formed around the plunger **115**.

Valve seat **120** is held in position on a shoulder **121** formed on the end of sleeve **108** adjacent the ports **122** and **123** arranged on opposite sides of the sleeve **108**. An inner chamber **124** is located in the body **102** in to which the inlet tube connection **125** leads, the end of the tube being sweat soldered to the body **102**. The outlet tube **126** leads into port **122** and is also sweat soldered to the end of body **102** as shown.

The supply pressure from the tube **125** is present in chamber **124** and it will be apparent that when the push button **111** is operated plunger **115** is pushed inward to move the valve member **118** from its seat **120** thereby permitting water flow to take place from tubing **125**, chamber **124**, ports **123** and **122** and into tubing **126**, to cause the operation of the flush valve as before.

The advantages of this structure is that the parts **111**, **108**, **115**, can be made cheaply from suitable plastic materials, while it is preferable to form the body **102** of brass for sturdiness and to enable the tubing to be soldered to the connection.

What is claimed is:

**1**. In a flush valve operating arrangement, an actuating unit mounted on said flush valve, a remotely located manually operated unit, a pair of flexible tubes extending between said flush valve unit and said remote

operated unit, one of said flexible tubes being under supply line pressure, means in said remote operated unit for connecting the supply line pressure from the said one tube to the other tube, said actuating unit including a housing, an inlet connected to said other of said flexible tubes, and a piston responsive to said supply line pressure for actuating said flush valve, means in said actuating unit for reducing the line pressure in said other tube after said remote operated unit means is restored and said flush valve has been operated including an opening in said piston, and spacing means on said piston arranged between said housing and the pressure side of said piston for normally spacing said piston from said housing to maintain constant communication between said opening and said other of said flexible tubes, to permit drainage of said other flexible tube and said housing through said piston opening and into the outlet of said flush valve.

2. In a flush valve operating arrangement, an actuating unit mounted on said flush valve, a manually operated unit located at a remote point from said flush valve, a pair of flexible tubes extending between said flush valve and said remote operated unit, one of said flexible tubes being normally at zero supply line pressure and connecting said remote operated unit and said actuating unit, the other of said flexible tubes being normally at supply line pressure and connecting said remote operated unit with the inlet supply side of said flush valve, means in said remote operated unit for admitting the supply line pressure from said other tube into the first tube, means in said actuating unit responsive to said said supply line pressure in said first tube for operating said flush valve, and means in said actuating unit for bleeding off the supply line pressure in said first flexible tube after said remote operated unit has been restored and said flush valve has been operated, means in said flush valve for closing it upon its seat after having been operated regardless of the continued operation of said remote operated unit, the bleeding off of the supply line pressure being reduced to a dribble into said flush valve outlet from said supply line.

3. In a flush valve operating arrangement for a flush valve located behind a wall, an actuating unit supported on said flush valve, a remote manually operated unit mounted on the front of the wall, a first flexible tube extending between said manually operated unit and said actuating unit, a second flexible tube extending between said manually operated unit and said flush valve, said second flexible tube being normally under zero line pressure, valve means in said remote manually operated unit operable for admitting the supply line pressure from said second flexible tube into said first flexible tube, and piston means in said actuating unit responsive to said supply line pressure being admitted into said first flexible tube for causing the operation of said flush valve, means in said piston for reducing the supply line pressure after said remote operating unit has been released and said piston restored, said piston being continually held operated in case said remote operating unit is not released, said reduced line pressure being thereby expelled through said piston means into said flush valve outlet, and means in said flush valve for closing its valve seat in case the piston is held operated by said remote operating unit.

4. The flush valve operating arrangement as set forth in claim 3 in which the piston in said actuating means is provided with an orifice for reducing the line pressure in said first flexible tube when said remote manually operated unit is restored.

5. The flush valve operating arrangement as set forth in claim 3 in which the remote manually operated unit consists of a push button adapted to open and close a valve member from its valve seat to establish communication between said flexible tubes.

6. The structure of claim 1 further characterized in that said spacing means includes a plurality of projections on the pressure side of said piston.

7. In a push button assembly for operating a flush valve located at a remote point from the push button assembly and behind a wall, said push button assembly being supported upon the front wall surface and having a rearwardly extending body portion passing through the wall, a pair of fluid passages in said body portion extending to the rear of said body portion, a flexible tube connected to each of said fluid passages and to said flush valve, a valve cage in said body portion having fluid ports therein leading into said body passages, said valve cage having a valve seat therein and a valve member normally closed upon said valve seat, spring means in said valve cage for holding said valve member on its seat, said valve member also being held on its seat by fluid pressure in one of said flexible tubes, a plunger in said body portion having one end in operative relation to said valve member for opening the same from its seat, a push button on the front of said assembly in operative relation to the other end of said plunger for actuating the same, spring means for normally biasing said push button and said plunger away from said valve member, sealing means between said valve cage and said body fluid passages, other sealing means around said plunger, a bushing secured to the front end of said body portion for clamping said last sealing means and said valve cage in position in said body portion, a mounting flange supported on the front end of said body portion and against said wall, a cover plate for said mounting flange and for supporting said push button in position on the end of said plunger, and cooperating locking means for locking said cover plate to said mounting flange.

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