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FLUSH VALVE CONTROL FOR PLUMBING FIXTURES

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3 Sheets-Sheet 2

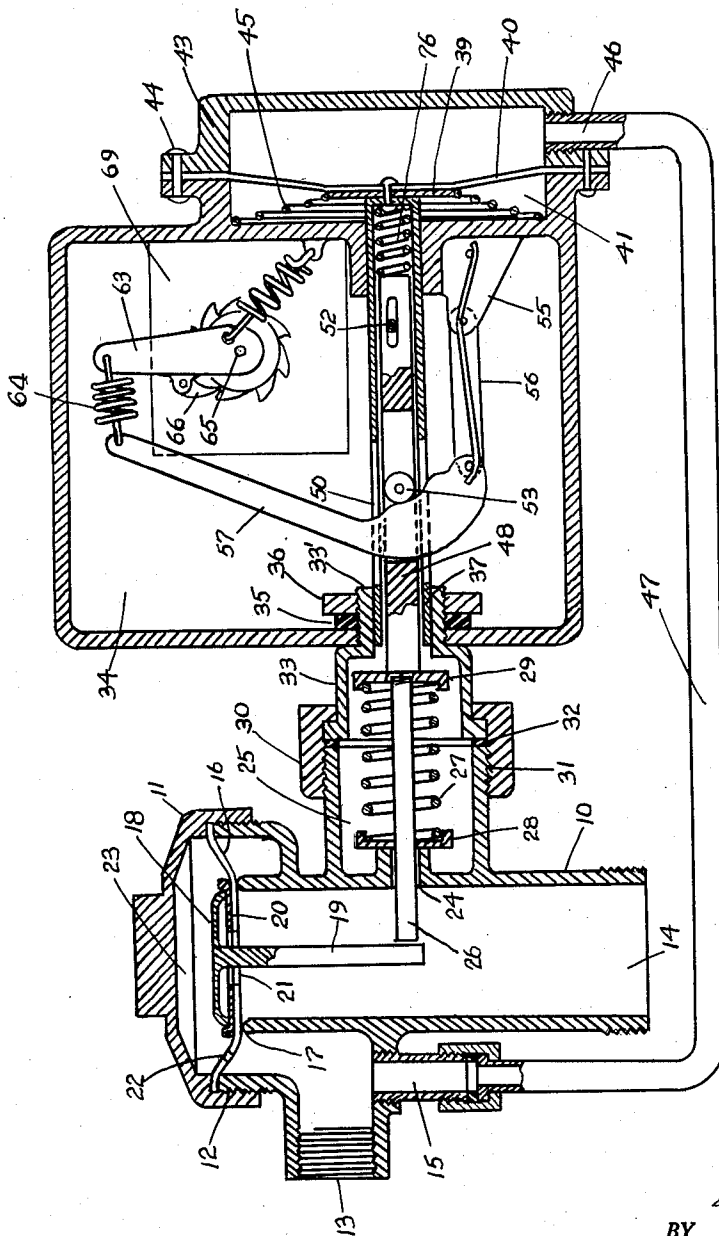


Fig. 3

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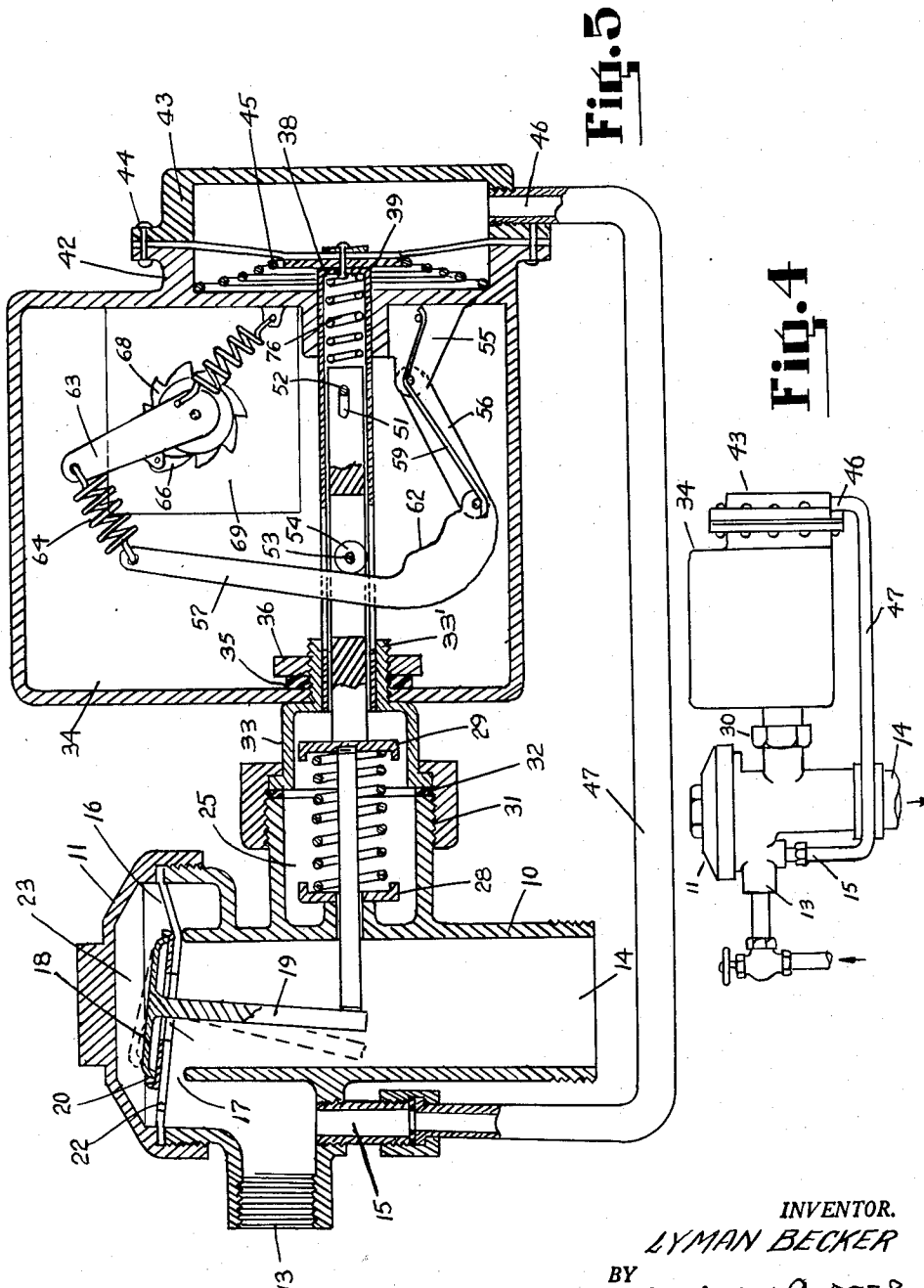
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FLUSH VALVE CONTROL FOR PLUMBING FIXTURES

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4 Claims. (Cl. 161—7)

My invention relates to a flush valve control and more particularly to a means of controlling periodically the flushing of plumbing fixtures by means of a flush valve.

The principal object of my invention is to provide a flush valve control with a timing mechanism actuated by the water pressure so as to be actuated automatically at spaced intervals of time.

A further object of my invention is to provide a device of the character described which needs no winding or servicing for and during its performance.

As is well known to anyone familiar with the operation and function of plumbing fixtures, such as urinals or the like, the public is not dependable, and for sanitary reasons periodical flushing of such fixtures is imperative. In carrying out my invention, I provide a device for this purpose which is positive in its operation, is easy to install, and is equipped with a timing or escape movement which determines each successive time of operation. The operation of the device is entirely automatic and is actuated by means of the water pressure.

Other and further objects of my invention will become more apparent as the description proceeds.

Referring now to details of the embodiment of the invention disclosed in the drawings:

Figure 1 is a sectional view of the device taken in a longitudinal vertical plane, with the control mechanism and valve in a neutral position.

Figure 2 is a fragmentary detail plan view, in part section, of the tube and pusher bar arrangement.

Figure 3 is a view similar to that shown in Figure 1, but showing the control mechanism in an intermediate position of actuation.

Figure 4 is an outside view of the assembled unit showing the by-pass arrangement.

Figure 5 is a view similar to those in Figures 1 and 3 but with the mechanism in a fully advanced position for opening the valve for flushing.

Referring now to details of the embodiment of the invention shown in the drawings, 10 indicates the body of a flush valve of conventional form, having a cap 11 which threadedly engages the body 10 at 12. The body has an inlet 13 and an outlet 14, the inlet 13 being provided with a by-pass tube 15.

Between the cap 11 and the body 10 of the device is a diaphragm valve 16 which seats at 17 on the outlet passage of the valve body 10.

The valve assembly also includes a flat plate 18 and a valve stem 19 which stem extends downward through a plate 20 resting on top of diaphragm 16. Both the plate 20 and the diaphragm 16 are provided with a centrally disposed opening 21 for the valve stem to extend

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through. The diaphragm 16 is provided as usual with an aperture or port shown as 22 to permit the water under pressure from inlet 13 to pass into the space 23 above the diaphragm 16 to maintain the latter in closed position until the valve stem 19 is rocked to opening position.

The body of the valve 10 is also provided with a side opening shown as 24, leading into an integral enclosure 25. A rod 26 extends horizontally through aperture 24 and enclosure 25 and a resilient compression spring shown as 27 is disposed between two washers 28 and 29. The washer 28 is slidably mounted on the rod 26 for abutting engagement with body 10, and the washer 29 is threadedly attached to the opposite end of the rod 26. A coupling nut 30 threadedly connects the enclosure 25 at 31 to an extension 33, with a washer 32 between said parts. The extension 33 has a threaded sleeve 33' at its outer end which passes through the walls of a timer housing 34 and is connected to the latter by a washer 35 and a nut 36 holding the entire flush valve assembly and the housing 34 in engagement with one another.

Within the housing 34 is a tube 37, one end of which is slidably mounted in the sleeve 33' of the enclosure 34, the other end of which is slidably mounted in and extends through the opposite walls 34' of the housing 34. The outer end of the tube 37 is closed at 38 and is attached to a washer 39 and a diaphragm 40 disposed within an auxiliary enclosure 41. The latter enclosure is formed by the outwardly projecting walls 42 of the housing 34 and a cap 43 attached to the walls 42 by screws or rivets 44.

Between the outer end wall 34' of the housing 34 and the washer 39 on the diaphragm 40 is a conical spring 45 which normally tends to urge the diaphragm 40 toward an outwardly extended position as seen in Figure 1. The cap 43 forming a part of the auxiliary enclosure 41 is also provided with an inlet 46 which is connected by a tube 47 to the by-pass 15 in the inlet 13 of the flush valve body 10, so that the water under pressure may pass through the tube 47 from the by-pass 15 to the inlet 46.

Slidably mounted in the tube 37 is a pusher pin 48 which has a slot 49 near one end, adapted to register with a slot 50 in the tube 37. An auxiliary smaller slot 51 is formed near the opposite end of the pusher pin 48 at right angles to slot 49, and a pin 52 attached to and spanning the outer walls of the tube 37 passes through the auxiliary slot 51. The pusher pin 48 is also provided with a pivot pin 53 on which is rotatably mounted a wheel 54, which is disposed within the slot 49. A bracket 55 is carried on the outer wall 34' to which is pivoted at 60 a link 56. The free end of link 56 is pivotally connected at 58 to the lower end of a cam lever 57. A leaf spring 59 has its inner end held by a pin 61 on bracket 55, and passes over the pivot point 60 into engagement with the outer end of link 56 so as to urge the latter link upwardly.

The cam lever 57 has an indented cam surface 62 for seating the roller 54 when the cam lever 57 is in a raised position within the slot 49 of pusher pin 48, as seen in Figure 1.

The upper end of the cam lever 57 is connected to an escapement lever 63 by a coil spring 64. This lever 63 is pivotally mounted on a shaft 65 of a conventional es-

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capement mechanism (not shown) in a casing 70, and carries a dog 66 pivotally connected thereto at 67. The dog 66 engages a ratchet gear 68 which is fixed on the shaft 65 of the escapement mechanism. A coil spring 72 is attached to the lever 63 at 73 and to the end wall 34' of the housing 34 at 74, so as to urge said lever in a clockwise direction as seen in Figure 1, with the cam lever in the raised, outwardly inclined position shown.

The use and operation of the device shown in Figures 1 to 5 may now be described as follows:

Water under pressure enters the inlet 13 of the valve body 10. The diaphragm 16 and valve head 18 are normally held in seated engagement over the opening 21 in plate 20 and diaphragm 16, and the diaphragm is held in seated engagement against the outlet passage 14 by the water pressure passing through the aperture 22 in said diaphragm into the upper chamber 23 as is common with conventional flush valves of this type. A portion of the water under pressure is by-passed through the outlet 15 and tube 47, inlet 46, into the enclosure 75 in the cap 43 on the outer side of the diaphragm 40. The water pressure forces the diaphragm 40 inwardly so as to push the tube 37 toward the left and compress spring 76 against rod 48, as seen in Figure 3. During the initial movement of the tube, the upper end of cam 57 will start to swing toward the left, and, in so doing, it will start to pull the lever 63 of the timing mechanism through spring 64 slowly toward the left, restrained by the escapement mechanism in casing 70.

Movement of the pusher rod 48 toward the left is, restrained by engagement of wheel 53 with the cam lever 57 connected through spring 64 to the slow-moving escapement lever 63. As the pusher rod 48 moves toward the left, the roller 53 moves upwardly along the cam surface 62 of cam lever 57 and thence outwardly along the adjacent straight portion of said cam lever, until the lever 63 of the timing mechanism is forced to its extreme position toward the left shown in Figure 5.

When pin 52 reaches the right-hand end of slot 51, as seen in Figure 5, the tube 37 then acts directly through pin 52 to force rod 48 toward the left.

During this final movement of the pusher rod 48, the washer 29 on the adjacent end of the pin 26 will also be pushed to the left against the compression of coil spring 27, as well as against spring 45, thus causing the end of the pin 26 to tilt the valve stem 19 and valve plate 18 so as to release the water under pressure from the inlet 13 through the outlet 14 of the flush valve 10. When this occurs, the pressure of the water through by-pass 15, pipe 47 and inlet 46 into the enclosure 75 will be diminished, so that the spring 45 in the housing 41 will cause the diaphragm 40 to resume its initial position as shown in Figure 1, thereby pulling back the tube 37 and pusher rod 48 to their initial positions shown in Figure 1, and permitting the valve assembly again to seat itself on valve seat 17 of the flush valve 10. The pin 26, urged by spring 27 will also resume its initial retracted position of Figure 1.

Retracting movement of the pusher rod 48 will also permit the cam lever 57 to resume its initial position shown in Figure 1, aided by the return spring 72 connected to the escapement lever 63, which is then free to swing in a clockwise direction relative to the escapement wheel 69 by clockwise movement of dog 66 relative to the ratchet gear 68. When the cam lever 57 is brought back into initial position, as shown in Figure 1, the device will again be set for repeated actuation of the timing mechanism so as to cause the flushing cycle to occur at periodic intervals.

It will be further understood that the sleeve 37, the rod 48 slidable therein, and the pin 26 together form, in effect, a pusher rod means including a lost-motion device between the sleeve 37 and rod 48, cooperating with the cam lever 57 and the timing unit, to permit the timing control mechanism to be reset each time the pressure is

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relieved in the pressure chamber 45 by opening of the flush valve.

Although I have shown and described certain embodiments of my invention, it will be understood that I do not wish to be limited to the exact construction shown and described but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. A control device for use in combination with a flush valve of the diaphragm type, including a valve stem movable for opening said valve, said control device including an enclosure supported adjacent said flush valve, pusher rod means slidably supported within said enclosure with one end extending therefrom into position for engagement with said valve stem to open the valve, yieldable means normally urging said pusher rod means out of engagement with said valve stem, a pressure chamber supported on said enclosure having a movable diaphragm connected to one end of said pusher rod means and responsive to variations in the pressure in said chamber, for moving said pusher rod means into engagement with said valve stem against said yieldable means, lost motion means interconnected with said movable diaphragm and said pusher rod means, a by-pass tube leading from the inlet of said flush valve to said pressure chamber, and a spring-actuated timing unit including an escapement mechanism for restraining the movement of said pusher rod means toward said valve stem under delayed action of said escapement mechanism.

2. A control device for use in combination with a flush valve of the diaphragm type, including a valve stem movable for opening said valve, said control device including an enclosure supported adjacent said flush valve, pusher rod means slidably supported within said enclosure with one end extending therefrom into position for engagement with said valve stem to open the valve, yieldable means normally urging said pusher rod means out of engagement with said valve stem, a pressure chamber supported on said enclosure having a movable diaphragm connected to one end of said pusher rod means and responsive to variations in the pressure in said chamber, for moving said pusher rod means into engagement with said valve stem against said yieldable means, a by-pass tube leading from the inlet of said flush valve to said pressure chamber, a spring-actuated timing unit including an escapement mechanism for restraining the movement of said pusher rod means toward said valve stem under delayed action of said escapement mechanism, a cam lever pivotally mounted within said enclosure with one end connected to the timing unit and having cam means thereon engageable with the actuating end of said pusher rod means, said pusher rod means having a lost motion device between the movable wall on the pressure chamber and the valve actuating end of said pusher rod means to prevent relatively slow movement of the actuating end of the pusher rod means under the control of the timing unit while the diaphragm in the pressure chamber is under operating pressure.

3. The structure of claim 2, wherein the lost motion device consists of a sleeve having one end fixed to the movable wall in the pressure chamber, the actuating end of said pusher rod means includes a rod slidably mounted in the sleeve, and yieldable means normally urge the rod towards the open end of the sleeve under control of the timing unit.

4. A control device for use in combination with a flush valve of the type having a movable valve closing member dividing a flush valve body into an upper chamber and a lower chamber with bypass means connecting said two chambers, and a valve stem for opening a valve in said member to permit equalization of pressures in said chambers, said control device including an enclosure supported adjacent said flush valve body, pusher

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rod means slidably supported within said enclosure with one end extending therefrom into position for engagement with said valve stem to open the valve, yieldable means normally urging said pusher rod means out of engagement with said valve stem, a pressure chamber 5 supported on said enclosure and having a movable diaphragm connected to one end of said pusher rod means and responsive to variations in the pressure in said chamber, for moving said pusher rod means into engagement with said valve stem against said yieldable means, lost 10 motion means interconnected with said movable diaphragm and said pusher rod means, a bypass tube lead-

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ing from the inlet of said flush valve to said pressure chamber, and a spring actuated timing unit including an escapement mechanism for restraining the movement of said pusher rod means toward said valve stem under delayed action of said escapement mechanism.

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