Feb. 19, 1957 R. H. MARCHANT 2,781,519

FLUSHING SYSTEM

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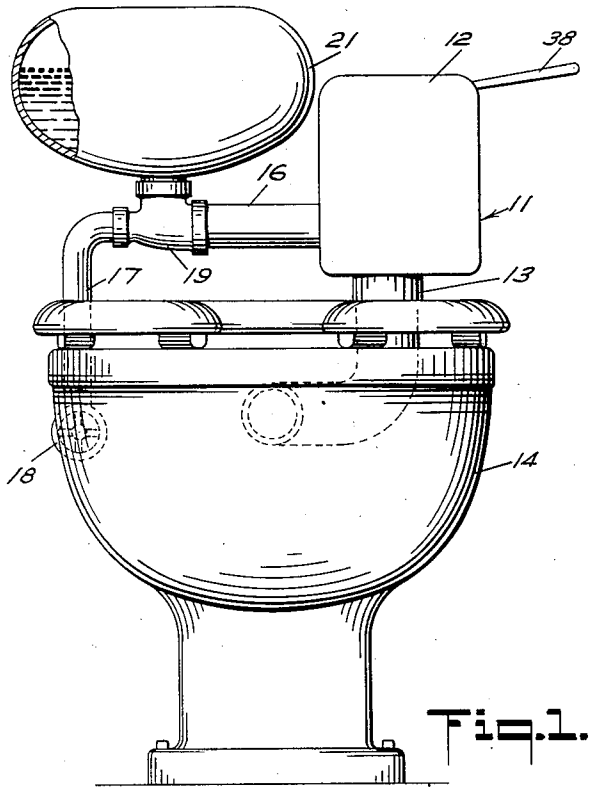


Fig. 1.

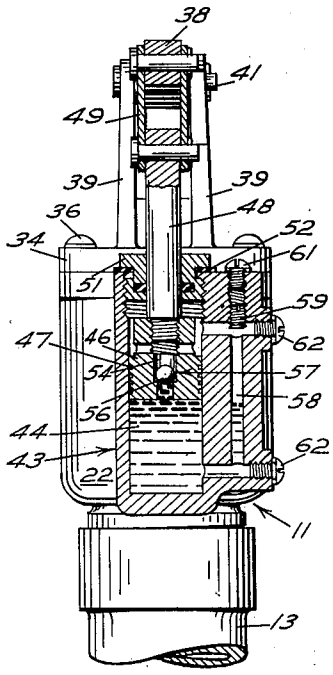


Fig. 3.

Fig. 2.

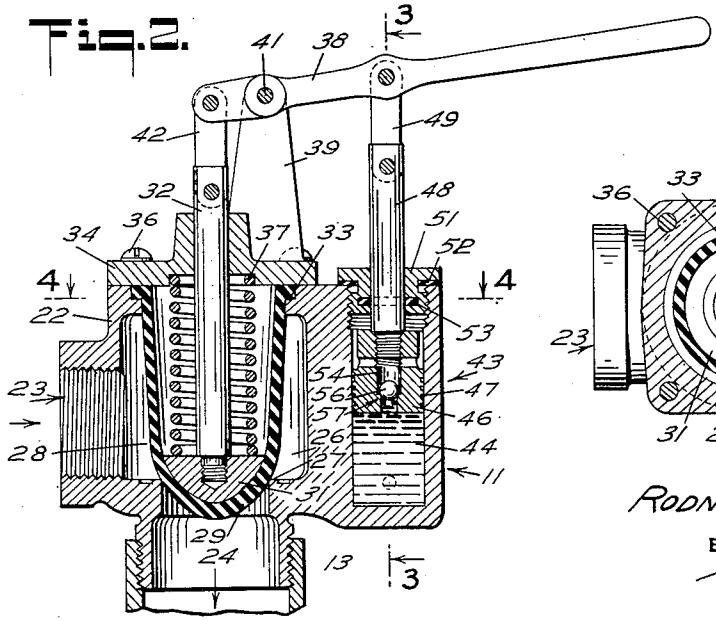
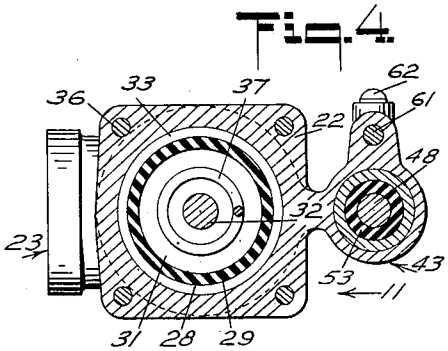


Fig. 4.



INVENTOR

RODNEY H. MARCHANT

BY Gardner & Zimmerman

ATTORNEYS

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FLUSHING SYSTEM

Rodney H. Marchant, Oakland, Calif.

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2 Claims. (Cl. 4—31)

The present invention relates to an improved valve system and in particular to an improvement in flushing systems for toilet bowls and the like.

Present day flushing systems for toilet bowls and the like employ a rather large tank which is filled with some five gallons of water and is dumped to provide a flush. This system, while in use for some seventy or more years, has numerous disadvantages such as the large volume of water employed for each flush, the reliance upon float controlled valves, and the use of gravity controlled closure means for the tank. Further, conventional systems dispose the valves thereof within the tank so that water contacts same both inside and outside with consequent rusting and damage to the valves, and also this type of flushing system provides control only for dumping of the tank for flushing and does not provide for flushes with lesser volumes of water.

While various improvements have been made in the above-noted conventional system these improved systems require the installation of large water pipes within the building and leading to the flushing system, this being of course somewhat impractical in existing buildings, and further the improvements in controlled flushing commonly include complex structures having a multitude of operating parts whereby the possibility of failure and faulty operation is multiplied.

In addition to the above noted difficulties attendant existing flushing systems there are further faults resulting from the fact that flushing water is ordinarily not pure. Impurities in flushing water tend to clog the system and to impede the flow of water therethrough. Impurities also increase the destructive effect of water contact with metal valve parts, this being particularly important in connection with moving parts which may be rapidly rendered inoperative by continued contact with such water.

Although the unsightly and space consuming toilet tank has been generally accepted as a necessary evil such is not now the case for the present invention completely removes the necessity for same and in addition provides a flushing system having superior operating characteristics and increased life and dependability.

Accordingly it is an object of the present invention to provide an improved flushing system having positively operating valve means.

It is another object of the present invention to provide an improved flushing system having all moving parts thereof sealed from the flushing water.

It is still another object of the present invention to provide in an improved flushing system a controlled direct flow of water from water lines to the bowl to be flushed.

It is yet another object of the present invention to provide an improved flushing system having means positively controlling the volume of water employed in individual flushes.

It is a further object of the present invention to provide an improved flushing system having a small automatically vented reservoir operating in connection with valve means

for operation with small water pipes to provide flushing without storage of large volumes of water.

It is a still further object of the present invention to provide an improved valve system for flushing and having in addition to a positively-acting main valve and manual operating means therefor a simple adjustable timing means operating upon said actuating means to regulate the length of each flush.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claims.

With reference to the drawing illustrating a single preferred embodiment of the invention there are included a variety of views as follows:

Figure 1 showing the entire flushing system attached to a toilet bowl.

Figure 2 showing the valve system in elevational section.

Figure 3 showing the valve system in elevation with the timing means in section taken at 3—3 of Figure 2, and

Figure 4 showing the valve system in sectional view taken at 4—4 of Figure 2.

Considering now the details of the illustrated form of the invention and referring to the drawings, it is first seen that the valve system 11 is preferably enclosed in a box or envelope 12 and is adapted to have connected thereto an outlet pipe 13 extending therefrom to the toilet bowl 14 to be flushed. There is provided a connecting pipe 16 which is joined to valve system 11 and is connected to a water inlet pipe 17 from a standard building plumbing system through a conventional valve 18. A reducer 19 may be employed to connect water pipe 17 and connecting pipe 16 as pipe 16 has a rather large diameter, as for example 1", and water pipe 17 may have any conventional size depending upon the plumbing system. In the instance where water pipe 17 is relatively small, say ½" diameter, there is provided a reservoir 21 which is entirely closed except for an opening in the bottom thereof and reducer 19 is connected to reservoir 21 to communicate with the interior thereof through the bottom aperture therein. Reservoir 21 is employed where water pipe 17 is too small to carry sufficient water for an adequate flushing of bowl 14 and in this instance connecting pipe 16, outlet pipe 13 and the opening through valve system 11 is larger than the inlet water pipe 17.

Thus, with valve system 11 closed and water pipe valve 18 open, reservoir 21 is filled to some level depending upon the water pressure in the plumbing system and there is trapped within reservoir 21 an air pocket as shown. Opening of valve system 11 to provide communication between connecting pipe 16 and outlet pipe 13 allows the water from water pipe 17 to flow into bowl 14 and the water in reservoir 21 to join therewith and flow into bowl 14 to provide a good flushing action. When reservoir 21 is emptied and water continues to flow past same from water pipe 17 and into bowl 14 reservoir 21 is automatically self vented for the water from pipe 17 cannot fill connecting pipe 16 or outlet pipe 13 owing to the difference in sizes thereof and thus reservoir 21 is vented to bowl 14 through the piping system. This overcomes the common problem of vacuum lock or evacuation of a floating reservoir which commonly occurs in piping systems and which impedes proper operation thereof.

Considering now the valve system 11 and referring in

particular to Figures 2, 3 and 4, there is shown a housing 22 having an inlet port 23 threaded to receive connecting pipe 16 and an outlet port 24 threaded to receive outlet pipe 13. A chamber or passage 26 communicates between inlet and outlet ports 23 and 24 within housing 22 and there is formed a valve seat 27 about passage 26. Closure means 28 is movably disposed within passage 26 of housing 22 for engagement with valve seat 27 of passage 26. Closure means 28 preferably includes an elongated resilient envelope 29, such as rubber or the like, having a cylindrical configuration with one closed rounded end and an open upper end. Within resilient envelope 29 there is disposed a semi-spherical rigid nose piece 31 which fits into the closed end of resilient envelope 29 and is rigidly joined thereto as by suitable bonding means, not shown. A shaft or valve stem 32 is attached to nose piece 31 as by threaded engagement therewith and extends axially of envelope 29 out of the open end thereof and exterior of housing 22.

Housing 22 has in addition to inlet and outlet ports 23 and 24 an opening communicating with passage 26 and through which shaft 32 extends. Resilient envelope 29 is preferably formed with an outwardly extending flange about its open end and a shoulder 33 is provided about the opening in housing 22 for contacting this flange, as shown. A cover plate 34 is provided for closing this opening in housing 22 and is secured in position by suitable means, such as bolts 36 extending therethrough and threadably engaging housing 22, to force cover plate into contact with housing 22 and to clamp the flange about resilient envelope 29 between same and shoulder 33 of housing 22. By this means the opening in housing 22 is effectively closed and resilient member 29 is sealed to prevent water from entering same.

Cover plate 34 has an aperture therethrough to accommodate valve stem 32 in slidable relation and cover plate 34 has an indentation upon the inner surface thereof about the aperture therethrough to contain one end of a spring member 37 that extends from nose piece thereto concentric about valve stem 32. Spring 37 is mounted in compression to urge nose piece 31 away from cover plate 34 and thus to force resilient envelope 29 into contact with valve seat 27 to close valve passage 26. Closure means 28 is therefore normally in closing relation to passage 26 and is maintained in such position by the force of spring 37 urging resilient envelope 29 into contact with valve seat 27.

Closure means 28 is opened by means of valve stem 32 which is raised to further compress spring 37. This is accomplished by a lever 38 having a handle formed thereon and being pivotally mounted upon standards 39 extending upward from cover plate 34. Lever 38 extends between standards 39 and is attached thereto by a pin 41 passing through standards 39 and lever 38 in rotatable relation thereto and maintained in position as by a head formed thereon and disposed on the outer side of one of the standards 39 and a cotter pin engaging the pin 41 on the outer side of the other standard 39, all as shown in Figure 3. A link 42 is pinned to the end of lever 38 which is disposed in line with valve stem 32 and link 42 is pinned at the other end to the end of valve stem 32 so that moving the handle of lever 38 downwardly pivots lever 38 about standards 39 to raise valve stem 32 through connecting link 42. This raises resilient envelope 29 off of valve seat 27 against the force of spring 37 and opens passage 26 between inlet and outlet ports 23 and 24. Immediately upon release of lever 38 resilient member or envelope 31 is positively reseated upon valve seat 27 under the urging of spring 37 and is retained in this position by the force of spring 37.

In order to provide for adequate and proper flushing of bowl 14 there is employed an auxiliary valve or timing means 43 which may be integral with housing 22 or alternatively may be rigidly affixed thereto. As shown, there is provided within housing 22 a cylinder chamber 44, a projection of the axis of which intercepts lever 38 in mounted position as described above. Within cylinder 44 there is disposed a plunger or piston 46 which slidably engages the walls of cylinder 44 and which has sealing rings 47 thereabout to make substantially fluid tight connection wtih said walls. A piston rod or stem 48 is attached to piston 46 and extends exterior to housing 22 where it is connected by pinned link 49 to lever 38 on the opposite side of the standards 39 from the connection of valve stem 32. Cylinder chamber 43 is closed by a plug 51 threadably engaging the end walls thereof and having a flange thereabout to engage a gasket 52 and compress same against housing 22 for insuring a fluid tight closure of cylinder 43. Plug 51 has a central aperture therethrough accommodating piston rod 48 in slidable relation and is recessed about the aperture to receive a fluid seal 53 which contacts piston rod 48 to prevent fluid leakage therealong.

Piston 46 is provided with an aperture 54 therethrough having a shoulder therein upon which rests a ball 56 that seats upon the shoulder and is movable upward therefrom to comprise a check valve 57 allowing fluid flow only in one direction through piston 46. Ball 56 normally rests upon the shoulder in piston aperture 54. To close this aperture, however, ball 56 is freely movable upward therefrom by fluid pressure from beneath to allow fluid to flow through aperture 54 from the bottom to top of piston 46. Aperture 54 is formed in the shape of a T, or the like, or at least does not extend in full dimension to the top of piston 46 in order that ball 56 will be retained within aperture 54 and not displaced therefrom. As shown, piston 46 has a threaded aperture in the top to engage piston rod 48 and this aperture is made sufficiently large to accommodate ball 56 so that the ball may be readily inserted in position but following assembly of piston 46 and piston rod 48 the ball is thus trapped within the expanded portion of aperture 54; for the upper outlet portions thereof are smaller than ball 56, as is the lower inlet portion below the shoulder.

Cylinder chamber 44 is filled with a fluid such as hydraulic oil and in normal position of piston 46 this oil is disposed at the bottom of cylinder 44 below piston 46 which is held at the top of cylinder 44 by valve spring 37 acting through lever 38. A restricted fluid passageway 58 is provided in housing 22 communicating between the top of cylinder 44 and the bottom thereof. A timer screw 59 threadably engages housing 22 and extends into passageway 58, by means of which the restriction of passageway 58 may be varied to control the rate of flow of fluid therethrough. Preferably timing screw 59 does not extend exterior to housing 22 but is instead slotted at the outer end thereof for rotation as by a screw driver or the like and a protection and locking screw 61 is inserted in the same housing aperture exterior to timing screw 59, as shown, for tightening thereagainst to lock same in position and prevent inadvertent turning thereof. Fluid filling and draining ports are also provided in housing 22 in communication with passageway 58 and are normally closed by screws 62 threadably engaging the walls thereof.

In operation, timing means 43 is actuated by lever 38 which upon depression opens the main valve by raising resilient member 29 out of engagement with valve seat 27, all as described above. This same motion of lever 38 forces attached piston rod 48 and piston 46 downward within cylinder 44. As piston 46 is forced downward through cylinder 44 check valve 57 in piston 46 opens by fluid pressure raising ball 56 from seated engagement with the shoulder in aperture 54. Thus fluid freely flows through aperture 54 from the bottom to the top of piston 46 until piston 46 reaches the end of its travel. At this time lever 38 may be released by the operator and as noted above closure means 28 of the main valve thereupon attempts to immediately close by reseating resilient member 29 upon valve seat 27 under the force of spring 37. However, as valve stem 32 is

attached to lever 38, spring 37 must also move lever 38 back into its original position to close closure means 28 and there is thus exerted upon piston rod 48 an upward force transmitted through lever 38 from spring 37. As piston 46 attempts to rise in cylinder 44 ball 56 immediately falls back upon the shoulder in piston aperture 54 thereby closing check valve 57 to fluid flow. The only remaining path for fluid to flow from one end of cylinder 44 to the other is passageway 58 and thus as piston 46 is forced upward by the force of spring 37 fluid is forced to flow through passageway 58 from the top to the bottom of piston 46 within cylinder 44. The rate of fluid flow through passageway is determined by the setting of timer screw 59 which controls the restriction of passageway 58 and thus the rapidity with which piston 46 travels and consequently the time required for lever 38 to resume normal position is also controlled.

It will thus been seen that the present system provides a quick opening valve operated by simply depressing lever 38 and in addition provides an adjustable valve closing time through a simple and dependable timing means mechanically linked to the main closure means. No operating parts of the system come in contact with flushing water and the entire system is positive acting and readily adjustable to provide maximum operating efficiency. Further any desired amount of water may be employed for individual flushing operations by controlling the amount that lever 38 is moved, for lesser movement causes timer 43 to hold closure means 28 open for a correspondingly reduced period.

Inasmuch as no limitation is intended by the above description of a single preferred form of the invention attention is directed to the following claims for a precise definition of the true scope of the invention.

I claim:

1. An improved bowl flushing system comprising a main valve having a passage therethrough and a movable valve member therein, said valve being adapted for connection between a supply of water and a bowl to be flushed, said movable valve member having a normally closed and an open position to control water flow through said valve to said bowl; a pivotally mounted lever engaging said valve member for moving same from closed to open position; and a timer including a piston connected to said lever to retard return motion thereof to closed position of said valve member, a housing about said piston defining a piston chamber thereabout in substantially parallel spaced relation to the movement of said movable valve member, a fluid within said chamber, a ball check valve within said piston and communicating therethrough for transmitting fluid flow in one direction through said piston, and a restricted passageway in said housing between opposite ends of said chamber and adapted to accommodate return flow of fluid about said piston whereby said main valve is maintained opened a predetermined time each time it is actuated.

2. In an improved valve system provided with a housing having a passage therethrough, a valve within said passage and having open and closed positions with respect thereto, and a resilient member urging said valve into closing relation to said passage; a pivotally mounted lever having an end portion thereof engaging said valve for forcing same into open position against the force of said resilient member, said housing further defining a cylinder chamber, a piston slidably mounted within said cylinder substantially parallel to said resilient member and being pivotally connected to an intermediate portion of said lever to move in said cylinder in accordance with movement of said lever, said piston having a central aperture therethrough, a ball check valve disposed in said piston aperture for opening same when said piston is moved by said lever opening said valve and closing said aperture to return motion of said piston and lever, a fluid within said cylinder that passes through said piston when same is moved by said lever opening said valve, and a restricted passageway connecting opposite ends of said cylinder whereby the force of said resilient member acting through said lever and piston urges said fluid therethrough to return said piston and attached lever to position wherein said valve is closed.

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