Oct. 25, 1960 R. D. LAMPING 2,957,181

TOILET FLUSHING APPARATUS

Filed Sept. 3, 1957 2 Sheets-Sheet 1

FIG. 1

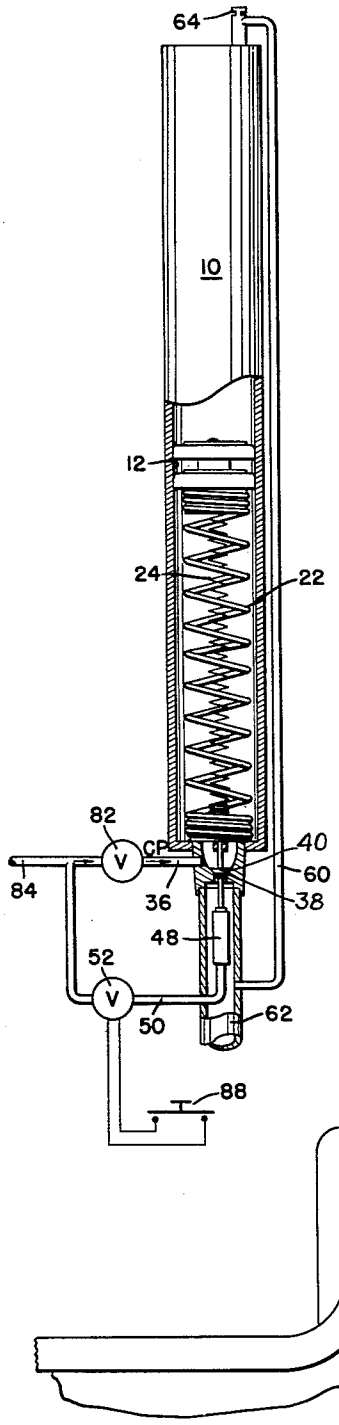
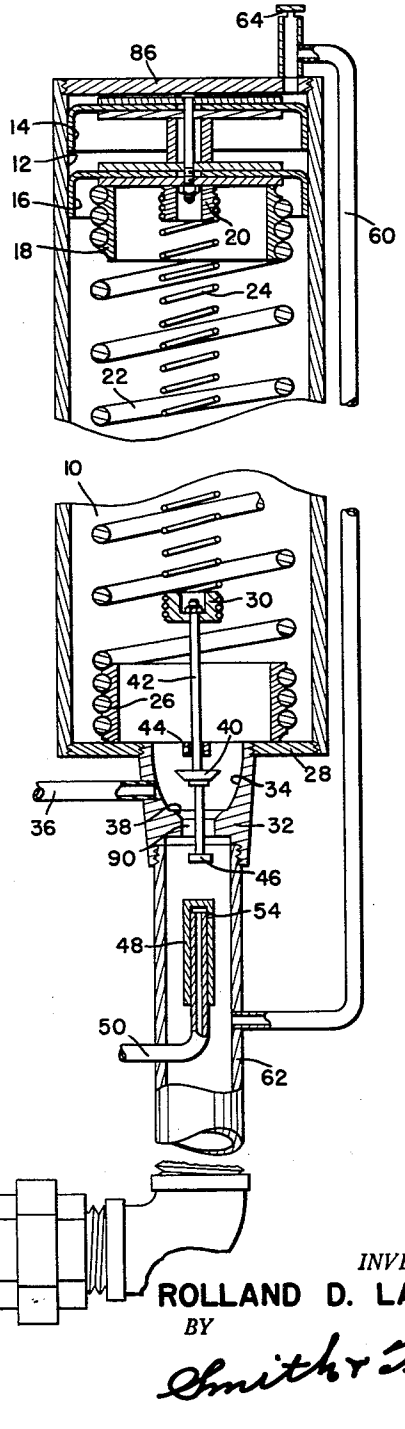


FIG. 2



INVENTOR.
ROLLAND D. LAMPING
BY
Smith & Tuck

Oct. 25, 1960 R. D. LAMPING 2,957,181

TOILET FLUSHING APPARATUS

Filed Sept. 3, 1957

2 Sheets-Sheet 2

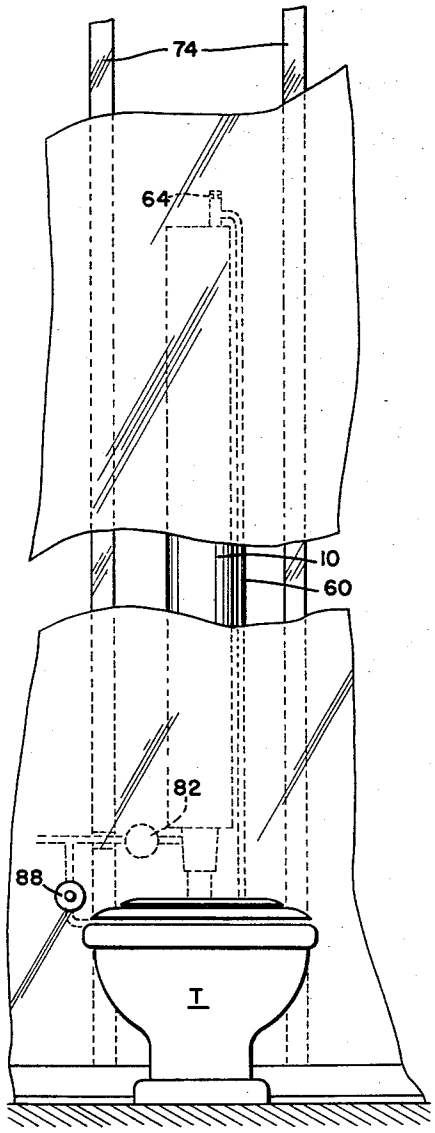


FIG. 3

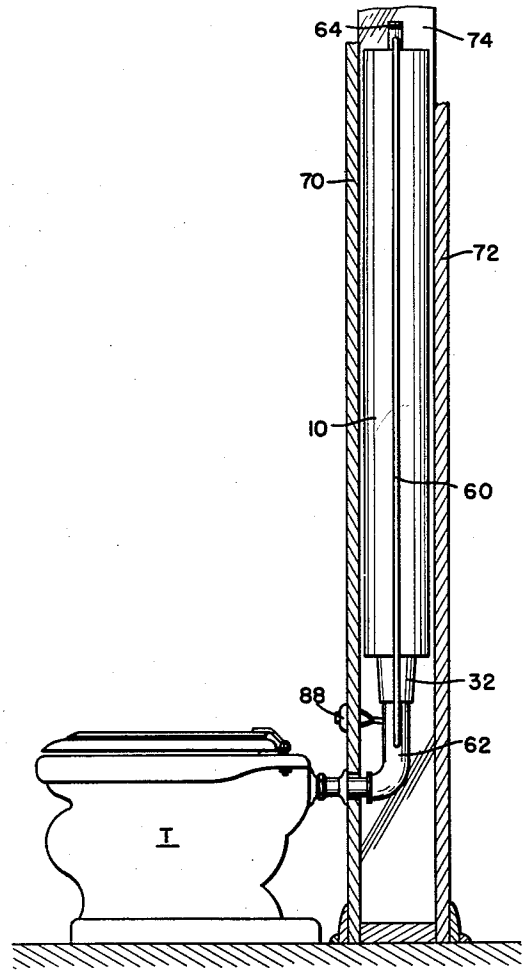


FIG. 4

ROLLAND D. LAMPING

INVENTOR.

BY Smith & Tuck

United States Patent Office

2,957,181

Patented Oct. 25, 1960

2,957,181

TOILET FLUSHING APPARATUS

Rolland D. Lamping, 6523 Windermere Road, Seattle 5, Wash.

Filed Sept. 3, 1957, Ser. No. 681,534

6 Claims. (Cl. 4—26)

This invention relates to the general art of toilet flushing devices and more particularly to a toilet flushing apparatus which is arranged to provide mechanical pressure means on the stored flushing water.

The production of equipment to insure the adequate flushing of toilets has been under study apparently since the introduction of the flushing toilet. In the past steps have been taken to use the static water pressure of the supply means, and many delayed action valves have been provided to introduce the water, under water main pressure substantially, into the toilet for flushing purposes. Due, however, to the need for a considerable volume of water and a large continuous flow of water at the inception of the flushing operation in order to insure creation of the siphonic action required to empty the toilet bowl, large supply pipes were required. The large sized pipe required large sized valving means, particularly the delayed action valves, making the installation very expensive and this genral plan, except in commercial buildings, has largely been superseded by some form of pressurized water storage means.

The most readily available means of storing the required energy to promote the relatively high velocity desired in the flushing water is to entrap air and then to compress it by the static pressure available in the water mains. These arrangements, however, have on the whole proved very unsatisfactory even though the problem has been approached from many different design concepts. One of the greatest deterrents apparently has been the entrainment or absorption of the trapped air in the water which it is to expel and while the simplicity of the system has much to commend it, the practical application of it has apparently been too difficult to achieve.

In this present invention advantage has been taken of the highly desirable arrangement of having a relatively small amount of water under positive pressure, but in this instance to provide the pressure mechanically as by means of a coil or spiral spring. Such devices can be made to have a life expectancy far in excess of any associated equipment. The mechanical operation of a piston by a spring has the further advantage that it can be made very compactly and lends itself very well to inclusion in the studding space of the wall immediately behind the toilet; also that it provides sufficiently high, positive and continuous pressure to successfully operate the blow out type of bowl and also permits modern wall hung bowls to use high rear outlets to simplify plumbing. As a result this equipment presents a very neat appearance and is believed to be a dependable, quiet, economical solution to this perplexing problem.

A principal object of this invention therefore is to provide storage means for a sufficient amount of water to insure adequate flushing of a toilet and then to place this water under high and mechanically applied pressure to insure the operation of the various types of toilets.

A further object of this present invention is to provide a toilet flushing means adapted to provide accelerated delivery of the water and to house this entire apparatus

in very compact means which can be readily built into the wall of a bathroom.

A further object of this invention is to provide a simple, economical electric control means for the operation of the flushing mechanism to the end that the push button or other switching means may be installed in positions most convenient for operation by the user of the toilet.

Further objects, advantages and capabilities will be apparent from the description and disclosure in the drawings, or may be comprehended or are inherent in the device.

Figure 1 is an elevational view partly in section showing the general arrangement of the essential parts making up this present toilet flushing apparatus.

Figure 2 is a fragmentary enlarged vertical sectional view showing the various parts employed, in substantially their operational arrangement, and with certain parts broken away so that the essential elements can be more conveniently illustrated on an increased scale.

Figure 3 is a front elevational view illustrating the ease with which installations can be made of this present equipment within the walls of a conventional toilet room.

Figure 4 is a side elevational view showing the walls of a toilet room in section and illustrating the manner of installing this present equipment within the studding space of the walls.

Referring more particularly to the disclosure in the drawings; the numeral **10** designates the flushing water storage tank. A preferred form of this tank employs a cylindrical tubing of a diameter which will fit in the studding space of a wall. As most building codes require a five inch inside diameter vent pipe it is common to employ six inch studding in one of the bathroom walls that is to take the piping and venting and this places a practical limit on the diameter of tank **10**. Normally five inch diameter tubing is most preferable.

The chamber **10** can be six or seven foot long if it is desirable; however, experience has shown that a pipe five inches in diameter and approximately four feet long will contain all the water essential for a successful flushing operation and this reduces the cost of the equipment and, in some cases, the cost of installing the equipment. Disposed for longitudinal movement within tube **10** is a built-up piston arrangement **12**. This piston should have sufficient length to prevent canting of the piston within the chamber **10** as it is put into use. To this end, two cup washers as **14** and **16** are employed in a spaced apart arrangement probably best illustrated in Figures 1 and 2.

Secured to the under side of piston assembly **12** are spring anchors **18** and **20**. These are normally arranged with spiral grooves so that springs **22** and **24** may have their ends arranged in closely spaced coils and screwed into these grooves. In this manner a very firm anchorage is provided for the respective springs and they can be easily removed and replaced. At its lower end the water expulsion spring **22** is similarly anchored to the fixed anchor **26** secured in turn to the end wall **28** of tank **10**. This arrangement provides adequate anchorage so that spring **22** can properly function as a tension spring. The axially disposed and lighter pressure balancing spring **24** is somewhat similarly secured in anchor **30**, in an arrangement in which spring **24** functions as a tension spring.

Secured to end plate **28** is a bell fitting **32**. This fitting provides the bell chamber **34** into which the pressure control water line **36** discharges and further provides a valve seat, at **38**, for a check valve **40**. In order to assure axial alignment of valve **40**, its actuating stem **42** is provided with an intermediate bearing **44**. It is to be noted that the discharge of the pressure controlled water line **36** is above valve **40** when

it is seated on its seat 38. The upper end of valve stem 42 is secured in a tractive arrangement in spring anchor 30 to the end that as piston 12 ascends in chamber 10 it tends to lift valve 40 off its seat substantially as indicated in Figure 2. At its lower end valve stem 42 is provided with a bearing portion 46 adapted to receive further actuating force from the slidable cap member 48.

Cap member 48 is forced upwardly any time water pressure is applied to the water supply line 50. Water is normally supplied to this line by means of solenoid valve 52 at the time the toilet is flushed. An air relief opening is provided at 54 so that when pressure is cut off line 50, cap 48 will seat of its own weight and any excess trapped water or air can be discharged out through vent 54.

In order to insure the free functioning of piston 12 within chamber 10 a fluid escape line is provided at 60. This escape or vent line 60 is introduced at its lower end into the water discharge pipe 62 which leads through suitable connections to the toilet bowl T. It should be apparent, it is believed, that as piston 12 is driven upwardly by the introduction of water under pressure any water that may have passed by the piston assembly will thus have an escape and the water that is discharged will be properly directed into the toilet bowl and ultimately into the waste. As piston 12 comes down during the period of water discharge, there will need to be a supply of air to fill what would otherwise be a drawn vacuum and this is provided by the air intake vent 64. This vent also will permit the escape of trapped air as piston 12 is driven upwardly during the filling of tank 10.

The preferred arrangements for installing this equipment in a bathroom and in association with a toilet T is illustrated in Figures 3 and 4. Here it will be noted that tank 10 is easily housed within the space provided by the walls 70 and 72 which are spaced apart by studding 74 which are the load bearing members of the wall. It will be apparent, it is believed, that there will be adequate space for the water by-pass pipe 60 and the various valving means associated with the apparatus. It is to be noted that this equipment lends itself to a very simple and compact installation and this in turn will be reflected in reduced cost to the home owner.

Mode of operation

In describing a cycle of operation of this equipment it may be assumed that the toilet has just been flushed and that will result in piston 12 being withdrawn by spring 22 with some assist from spring 24 to its lowermost position. In this position of rest there would be no water flowing through pipe 50 and therefore valve 40 would come to rest on its seat 38 as shown in Figure 1. At this time the only supply line for water is through supply line 36 that is under control of the pressure reducing valve 82 which accepts the normal water supply line pressure from pipe 84 and reduces it to a considerably lower pressure. With the general proportions of the springs as illustrated, it has been found that water at a pressure of fifteen lbs. per square inch, passing through pressure regulating valve 82, will be adequate for all practical purposes and this pressure will be sufficient to force piston 12 to the upper portion of tank 10 until the spring loading is balanced with the water pressure as shown in Figure 2. It is noteworthy that there is no air space left at the top of this tank arrangement as compressed air is in no way employed in the functioning of the equipment. Water supplied at fifteen lbs. pressure through the relatively small pipe 36 is adequate to cause the filling of the tank, the extending of springs 22 and 24 and at the same time supplying sufficient pressure to hold valve 40 on its seat 38 even against the upward force exerted by spring 24. As soon as the piston 12 reaches its upper limit where water pressure is balanced by spring loading the water passing through valve 82 stops flowing and the supply unit is filled and in condition for re-use. It is desirable to point out that springs 22 and 24 must be generously proportioned so that they can hold their tension without distortion for long periods as they will be under tension the greater portion of the time.

When it is desirable to flush the toilet the user presses the solenoid valve switch 88 thus energizing and opening the solenoid valve 52. When valve 52 is opened the full service pressure of the water from supply pipe 84 is free to pass through discharge pipe 50. One of the first functions of this introduction of high pressure water is to move cap 48 upwardly against valve stem head 46 and thus raise valve 40 off its seat 38 by impact. As soon as the valve is unseated then its tension spring 24 takes control to bring it upwardly against guide and stop member 44. The opening of this valve now permits the water stored within tank 10 to pass out through the nozzle-like arrangement of bell 34, valve seat 38, and the passageway 90 to the discharge pipe 62 into toilet T. A ratio of 1 to 3 to 4 in relative areas of discharge opening 90 to pipe 62 is desirable.

Following the normal functioning of tension springs, spring 22 as it moves piston 12 downwardly will have its greatest application of force as it starts down from its top position and this operates to give a rush of water at considerably increased velocity over the normal toilet flushing arrangement and it quickly builds up a volume of water in the toilet bowl so that siphonic action or blowing out the bowl is started immediately and with certainty. The cap 48 is returned against its seat by action of check valve 40 closing and rod 46 acting on cap 48. One complete discharge having now been completed and with valve 40 closed water at reduced pressure is supplied through valve 82 and pipe 36 and reservoir or tank 10 is filled, thus driving piston 12 to its uppermost position as shown in Figure 2.

While I have shown my invention in connection with siphon type toilet bowls, it will be apparent to those skilled in the art that this invention is equally useful and operable with the blow-out type bowl as well. There is sufficient water velocity produced to cause appropriate discharge with the latter bowls.

It is believed that it will be clearly apparent from the above description and the disclosure in the drawings that the invention comprehends a novel construction of a toilet flushing apparatus principally for toilet bowls where good volume of water and high velocity are mandatory.

Having thus disclosed the invention, I claim:

1. A toilet flushing apparatus, comprising: a vertically disposed tank adapted to be housed in the wall of a bathroom; a piston disposed for reciprocation within said tank; a retracting tension spring for retracting said piston, anchored to said piston and to the lower end wall of said tank; a bell fitting secured to said lower end closure, a valve seat at the lower end of the bell cavity and a discharge tube of reduced diameter connected to said valve seat and to a toilet bowl; a valve, disposed to seat in said valve seat, and having a valve stem with an upwardly extending portion and a downwardly extending portion; a pressure balancing tension spring, disposed coaxially with and inside of said retracting spring, having its upper end secured to said piston and its lower end secured to the upwardly extending portion of said valve stem; piping connecting said bell fitting to a toilet to form a flushing water passageway; air venting and supply means connected to the top of said tank; a full pressure water actuated means disposed to rise vertically at speed and impact the downwardly extending portion of said valve stem; a reduced pressure water supply line connected to said bell fitting, above said valve and having a pressure reducing means therein; a water supply line connected to operate water actuated means and having a solenoid con-

trolled valve means therein which operates to initiate and control the flushing apparatus.

2. A toilet flushing apparatus, consisting of: an elongated tubular tank; a water tight piston disposed for reciprocation within said tank; a metal spiral spring disposed to move said piston toward the discharge end of said tank; valve means for introducing water from a water service line, at reduced pressure, in a manner to move said piston toward the closed end of the tank and against the pressure of the said spiral spring; discharge valve means for quickly releasing water stored in said tank, to provide a full flow, into a passageway having several times the cross sectional area of the bell discharge opening; said water being propelled at an accelerated rate by the energy stored in said spiral spring during the filling of said tank and venting means for the tank end opposite from the discharge end.

3. A toilet flushing apparatus, consisting of: an elongated tubular tank; a water tight piston disposed for reciprocation within said tank; a metal spiral spring disposed to move said piston toward the discharge end of said tank; valve means for introducing water from a water service line, in a manner to move said piston toward the closed end of the tank and against the tension of the said spiral spring; impact operated discharge valve means for effecting an immediate full stream release of water stored in said tank, into a passageway communicating with a toilet bowl; and said water being propelled at an accelerated rate by the energy stored in said spiral spring.

4. A toilet flushing apparatus, consisting of: an elongated tubular tank; an elongated water tight piston disposed for reciprocation within said tank; a metal spiral tension spring secured at one end to said piston and at its other end to the lower end of said tank, disposed to move said piston toward the discharge end of said tank; valve means for introducing water from a water service line through a pressure reducing valve in a manner to move said piston toward the closed end of the tank and against

the pressure of the said spiral spring; impact operated water discharge valve means for effecting an immediate full stream release of water stored in said tank, into a passageway communicating with a toilet bowl; and said water being propelled at an accelerated rate by the energy stored in said spiral spring.

5. The subject matter of claim 4 in which said water discharge valve means consists of: a bell fitting secured to the lower end of said tank and having a communicating passageway therethrough; a poppet type valve disposed for axial movement in said bell; a valve seat for said valve disposed in the lower portion of said bell; a valve guide in the upper portion of said bell and disposed to form a stop to arrest the upward movement of said valve; a pressure balancing tension spring secured at one end to said piston and at the other end to the upper end of said valve and reciprocating impact means for initiating the operation of said valve.

6. The subject matter of claim 5 in which said reciprocating impact means, comprises: a full pressure water supply line having a vertically disposed open pipe end; a solenoid valve for opening said supply line and having means for retarding its closing of said supply line; a cap disposed for reciprocation on said pipe end, substantially axially aligned with said valve and adapted to give an impact blow to said valve when full water pressure is supplied to said pipe end, to cause it to overcome the water pressure loading on said valve and start the opening of the same and permit the said pressure balancing valve spring to complete the opening and hold the valve open during the flushing cycle of the toilet.

References Cited in the file of this patent

UNITED STATES PATENTS

802,951	Waterman	Oct. 24, 1905
932,716	Murray	Aug. 31, 1909
1,323,875	Larson	Dec. 2, 1919
2,619,915	Ifield et al.	Dec. 2, 1952