

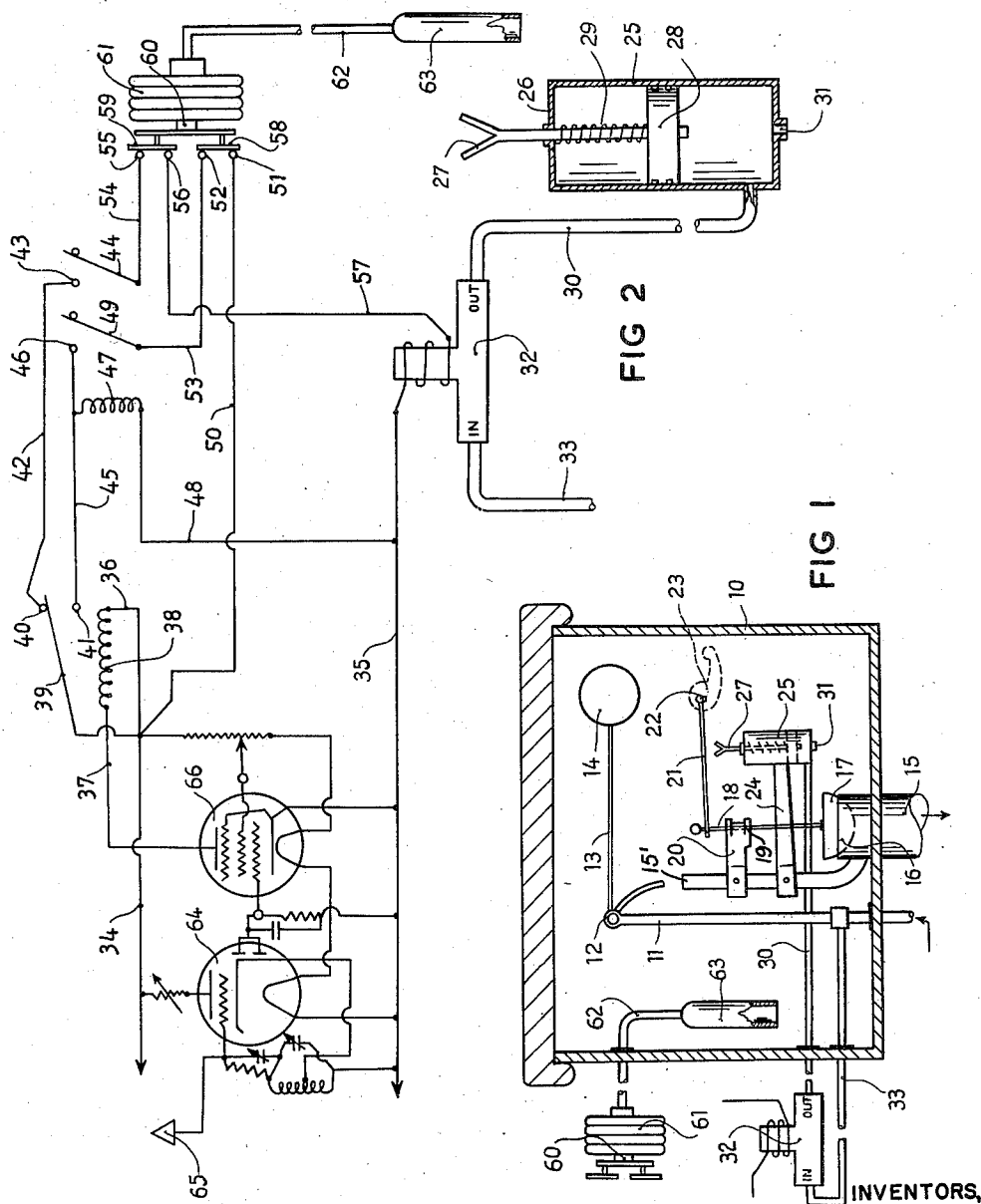
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ELECTRONIC TOILET FLUSHER

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2 Sheets-Sheet 1



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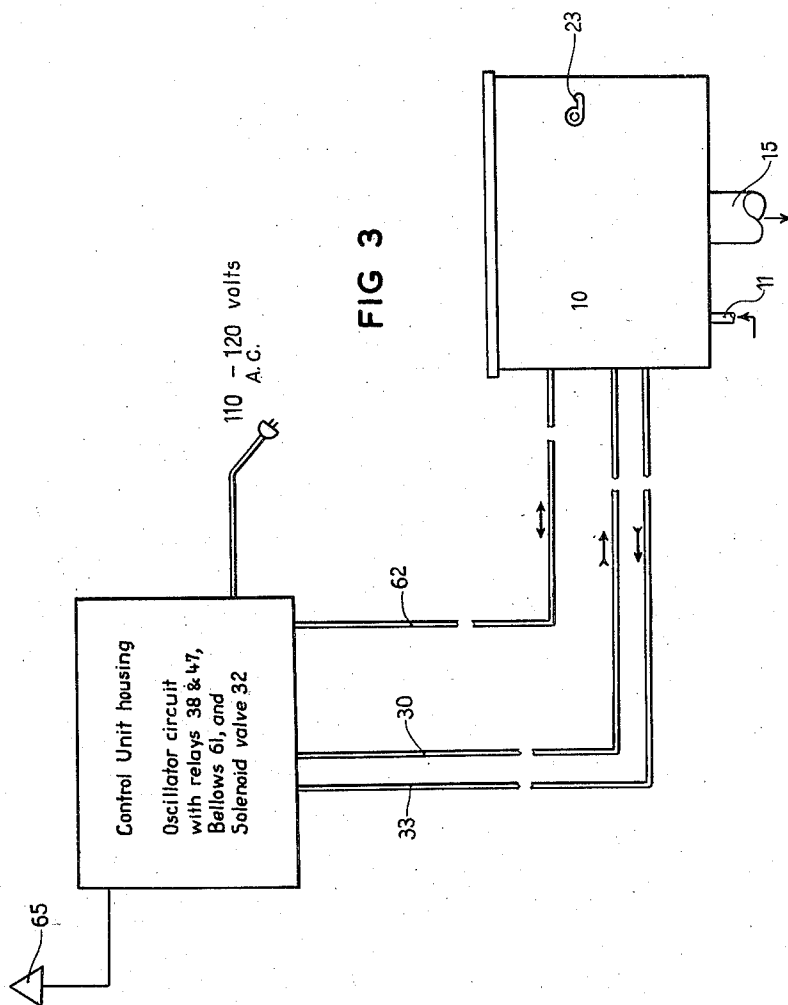
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ELECTRONIC TOILET FLUSHER

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8 Claims. (Cl. 4—68)

This invention relates to improvements in an electronic toilet flusher.

Toilet flushers at present in use range from manually operated mechanisms to some form of electrically operated mechanisms, which however do not answer the purposes or solve the problems with which we are concerned.

Hotels, departmental stores, service stations, railway stations, office buildings, and schools and many other types of public buildings are provided with toilets or rest rooms for the convenience of their patrons or customers, and these rooms are under inspection to insure their being maintained in a sanitary condition as far as is possible.

Users of these facilities frequently fail, either through forgetfulness or indifference to read and follow the instructions usually posted in these rooms, and if these instructions are not observed an omission may result in the rooms being left in a condition distasteful to subsequent users.

The proprietors of some public buildings have provided for the automatic flushing of toilets when a user sits on the toilet seat and these flushers continue to operate during the whole period that the toilet seat is depressed, with the result that the continuous flow of flushing water is noisy and sometimes is very disagreeable since the flushing water is apt to splash on the person of the user of the toilet.

Other attempts at solving the flushing problem have been to provide automatic periodic flushing of the toilet, so that the flushing takes place whether the toilet is in actual use or not. When water is metered to a public building, these types of flushers have the objection that they are not economical in water, and in fact much water actually runs to waste.

We are principally concerned with toilet flushers in which an intruder electric circuit is to be used to implement automatic flushing of the toilet, and at the same time provision is made for manually operated mechanical flushing of the toilet in the event of a lapse or failure of electrical power which controls the automatic flushing of the toilet.

In our opinion the objects which should be attained to provide an efficient combined manual and electrically controlled toilet flushing system are as follows:

One of the objects of our invention is to construct a toilet flushing system which will be automatically flushed only during a predetermined period after the toilet has been used, thereby conserving the supply of water used for flushing operations.

Another object is to permit of the automatic operation of the flusher when a person enters the toilet cubicle and thereby intrudes into an electric field of the circuit controlling the operation of the flusher.

A further object is to provide an automatic toilet flushing system under the control of a capacity sensitive oscillator.

A further object is to provide an electronic toilet

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flusher having a pneumatically controlled circuit closer operable by the rise and fall of the water level in the toilet water tank.

Still another object is to permit of manually flushing the toilet in the event of failure of the electric power which normally controls the automatic operation of the flusher.

A further object is to provide an electrically controlled water valve which may be opened only after the water in the toilet tank has reached a predetermined level and under prearranged conditions.

A further object still is to provide a reciprocating flushing valve operating mechanism which is resiliently controlled in one direction, and hydraulically controlled in the other direction by water under pressure from the stand pipe in the toilet tank, through the medium of the electrically controlled water valve which is actuated by a cycle of operations implemented when the toilet is being used.

Other objects will be made clear as the specification develops.

So that the nature of our invention will be clearly understood, we have illustrated an embodiment of the same which we shall describe in detail, but we wish it to be understood that we do not limit or curtail our invention to this specific construction, but reserve the right to modify or change the elements of construction within the scope of our appended claims.

In the drawings:

Figure 1 is a vertical section through a water tank of a toilet, showing the arrangement of the hydraulic mechanism for operating the flush valve of the tank and the relationship of the electrically operated valve through which water from a usual pressure system is delivered to the hydraulic mechanism.

Figure 2 is a diagrammatic view of a preferred hook-up of an electronic capacity sensitive oscillator circuit, electrically controlled valve and hydraulic mechanism for operating the flushing mechanism of the toilet water tank.

Figure 3 is a layout showing a convenient arrangement wherein the electronically controlled equipment is assembled in a cabinet with suitable connections thereto from the water tank of the toilet.

Like characters of reference refer to like parts in the several figures.

Referring to the drawings, 10 represents the water tank of a toilet fixture provided with a stand pipe 11 which projects below the bottom of the tank and is secured to a water supply main. The upper end of the stand pipe is provided with a valve casing 12 housing a conventional valve which is provided with an actuating arm 13 on the free end of which a float 14 is secured.

The tank 10 is further provided with an outlet 15 to a toilet, and the upper end of this outlet is formed with a valve seating 16 with which a conventional rubber valve 17 co-acts. The valve 17 is secured to the lower end of a stem 18 which projects upwardly to slidably engage a guide 19 on one end of the supporting arm 20, the other end of which is rigidly attached to the overflow pipe 15'.

A crank lever 21 is attached to one end of a spindle 22 which projects through the front wall of the tank 10, and the spindle is provided with a hand grip 23 by means of which the lever 21 is rocked to engage the upper end of the stem 18 to unseat the valve 17 from the valve seating 16 on the outlet pipe 15. The above installations are conventional and their operation need not be amplified.

Our invention includes the mounting of a second supporting arm 24 rigidly to the overflow pipe 15', at one end, and the other end of the arm is rigidly attached to

the cylinder 25, the upper end of which is closed by the cover 26 through which the piston rod 27 is slidably mounted and by which cover said rod may also be held against rotation.

The forked upper end of the piston rod 27 operatively engages the crank lever 21 and the lower end of the piston rod is rigidly connected to the piston 28, which is reciprocally mounted in the cylinder 25. Between the upper face of the piston 28 and the under face of the cylinder cover 26 a coil spring 29 is mounted which encircles the piston rod 27.

The downward movement of the piston 28 is resiliently controlled by the spring 29, and the upper movement of the piston is hydraulically controlled by water under pressure fed to the lower end of the cylinder through the pipe 30. The lower wall of the cylinder 25 is provided with a small calibrated orifice 31 through which water may be slowly drained from the cylinder 25 into the toilet tank 10 as will be explained hereafter.

The pipe 30 is connected to a solenoid actuated water valve 32, which is further connected through the pipe 33 with the stand pipe 11, so that when the solenoid controlled valve is opened, water under pressure is delivered from the stand pipe 11 through the pipe 33, valve 32 and pipe 30 to the lower end of the cylinder 25, to move the piston 28 upwardly against the action of the spring 29.

The solenoid for the valve 32 is included in an electric circuit connected to the line wires 34 and 35 which are further connected through the wires 36 and 37, with the ends of the relay 38, such as an S. P. D. T. plate relay, which controls the operation of the pivoted armature 39 with the contacts 40 and 41. The contact 40 is connected by the wire 42 with the contact 43, with which the pivoted armature 44 co-acts.

The contact 41 is connected by the wire 45 with the contact 46 and a second relay 47, here shown as a D. P. D. T. 110 volt A. C. relay, which in turn is connected by the wire 48 with the line wire 35. Coacting with the contact 46 is a pivoted armature 49 so that the relay 47 controls the operation of the pivoted armatures 49 and 44 to engage the contacts 46 and 43.

The line wire 34 is connected by the wire 50 with the contact 51, and the spaced contact 52 is connected by the wire 53 with the pivoted armature 49. The pivoted armature 44 is connected through a wire 54 to the contact 55, and the contact 56 which is spaced from the contact 55, is connected by the wire 57 with the winding of the solenoid valve 32 and then to the line wire 35.

The contacts 51 and 52 and the contacts 55 and 56 are bridged by the arms 58 and 59 of the switch 60 which is operated by the bellows 61. These bellows are connected to the bellows pipe 62 which extends into the toilet tank 10 to a point well below the high water level of the toilet tank. The end of the bellows pipe 62 which enters the tank 10 is enlarged for the major portion of its length to form an enlarged chamber 63 for the entrapment of air, and when the water in the tank 10 rises, a water seal is formed at the open end of the bellows pipe 62, and as the water rises in the tank 10 to its normal high level, it compresses the air in the enlarged chamber 63 and the bellows pipe 62, so actuating the bellows 61, and the arm 58 bridges the contacts 51 and 52 while the arm 59 bridges the contacts 55 and 56. By forming the enlarged air chamber 63 at the mouth of the bellows pipe 62, the bellows 61 become readily sensitive to the change of water level in the tank 10.

While various types of so-called intruder circuits are known which could be used to effect operation of this automatic flusher such as those employing a photo electric cell, it has been found that a capacity sensitive oscillator circuit with a pick-up antenna having a range of approximately twelve inches is suitable. Such a capacity sensitive circuit is illustrated in Figure 2, wherein it will be seen to consist of a conventional triode double diode tube 64 of the 150 ma. filament type, such as 12SQ7

or 12AV6, employed as an oscillator whose frequency is varied by the capacity of antenna 65 to ground. The rectified R. F. voltage is supplied to a power pentode tube 66 of the 50L6 or 50C5 variety, that in turn operates a S. P. D. T. relay.

The flushing operation is as follows: When a person is about to use the toilet, the electric circuit is in its primary position as shown in Figure 2, and the solenoid valve 32 is de-energized. As the person enters the electric field surrounding the antenna 65 which may be located in any convenient unobtrusive place in the toilet cubicle such as behind the toilet paper holder, then the relay 38 is energized from the line wires 34 and 35 through the wires 36 and 37.

On energizing the relay 38 then the pivoted armature 39 disengages the contact 40 and engages the contact 41. The relay 47 is now energized by current flowing through the line wire 34, armature 39, contact 41, wire 45, relay 47 and wire 48 to the line wire 35. The energized relay 47 attracts the pivoted armature 49 and armature 44 to engage the contacts 46 and 43.

When the person using the toilet moves out of the electric field surrounding the antenna 65, then the relay 38 is de-energized, and the armature 39 is disengaged from the contact 41 and engages the contact 40. Current flows from the line wire 34, armature 39, contact 40, wire 42, contact 43, armature 44, wire 50 to contact 55, through the arm 59 to contact 56, and through the wire 57 and the solenoid winding to the line wire 35, so energizing the solenoid valve 32.

The relay 47 remains energized by current flowing through line wire 34, wire 50, contact 51, arm 58, contact 52, wire 53, armature 49, contact 46 through the relay 47 to wire 48 and thence to the line wire 35.

During this period the bellows 61 are inflated so that the contacts 51 and 52 and the contacts 55 and 56 are bridged by the arms 58 and 59 respectively.

When the solenoid valve 32 is energized the valve is opened permitting water under pressure to flow from the stand pipe 11 through the pipe 33, solenoid valve 32 and pipe 30 to the lower end of the cylinder 25. This water under pressure forces the piston 28 upwardly against the action of the spring 29 and as the piston rod 27 moves upwardly, its upper forked end engages the lever 21 rotating it through an arc in a clockwise direction on the spindle 22, and so lifts the stem 18 to unseat the valve 17 and permit water to flow from the tank 10 into the discharge pipe 15 to flush the toilet.

As the water level in the tank 10 falls below the bell mouth 63 of the bellows pipe 62, then the air pressure in the bellows pipe is released and the bellows 61 are deflated, so breaking the contact of the arm 58 with the contacts 51 and 52, and also breaking the contact of the arm 59 with the contacts 55 and 56. The relay 47 then becomes de-energized and the solenoid of the solenoid valve 32 is also de-energized, and the valve closed, cutting off the flow of water from the stand pipe 11 to the cylinder 25.

Since the tank 10 has now become emptied due to the flushing operation, then the water in the lower end of the cylinder 25 drains through the calibrated orifice 31 into the tank 10, thus permitting the piston 28 to be moved downwardly under the action of the spring 29, and the slow draining of the water through the orifice 31 obviates jarring of the piston during the downward motion. This lowering of the piston 28 and piston rod 29 disengages the forked end of the piston rod from the lever 21 which returns to a normal position so that the rubber valve 17 again engages the valve seat 16.

As the float 14 is now in its lowest position, it opens the valve in the casing 12 thus permitting water to flow from the stand pipe 11 into the tank 10 to refill the tank.

As the water rises in the tank 10 it reaches the open end of the chamber 63 of the bellows pipe 62 and forms a water seal to the pipe, and the further rising of the

water level in the tank 10 to its normal height compresses the air in the bellows pipe 62, and this air pressure inflates the bellows 61, moving the switch 60 so that the arms 58 and 59 bridge the contacts 51 and 52, and the contacts 55 and 56 respectively. The electric circuit is then in the position shown in Figure 2, until a subsequent intrusion of a user of the toilet into the antenna range of the capacity sensitive oscillator causes another sequence of operations similar to those described above.

Should the electric power fail, then the toilet may be flushed by the user rotating the hand grip 23 to actuate the lever 21 and so unseat the rubber valve 17 permitting of the manual flushing of the toilet in the usual way.

From the foregoing description taken in connection with the accompanying drawings, it will be manifest that an electronic toilet flusher is provided that will fulfil all the necessary requirements of such a device but as many changes could be made in the above description and many apparently widely different embodiments of the invention may be constructed within the scope of the appended claims without departing from the spirit or scope thereof, it is intended that all matters contained in the said accompanying specification and drawings shall be interpreted as illustrative and not in a limitative or restrictive sense.

What is claimed as new is:

1. For a two-way control toilet flushing mechanism, a manual operated control member co-acting with the flushing mechanism, an automatic control also co-acting with the said member and having an intruder circuit controller for said mechanism, an antenna therefor, and a capacity sensitive oscillator in said circuit whose frequency is varied by the antenna's capacity to ground, either control being operable independent of and without impairing the other control.

2. The combination with a conventional toilet tank including a stand pipe, flush valve, a valve operating lever and manual control for said lever, of reciprocable means located in the tank and designed to co-act with the said lever of tank flushing mechanism, means responsive to hydraulic pressure for moving the reciprocable means in one direction to actuate said lever, resilient means controlling the movement of the reciprocable means in the other direction, an intruder electric circuit, and an electrically operated means operatively controlling the operation of the hydraulic pressure responsive means and actuated by the user of the toilet on entering and subsequently leaving the intruder circuit, the manually operated control and the electrically operated control being operated independent of and without impairing the other.

3. The combination with a conventional toilet tank including a stand pipe, flush valve, a valve operating lever and a manual control for said lever, of a cylinder located in the tank, a piston reciprocally mounted in

the cylinder and co-acting with said lever, means controlling the delivery of fluid under pressure to the under side of the piston to move the piston in one direction to actuate said lever, resilient means for moving the piston in the opposite direction, an automatic electric circuit including said means for controlling the delivery of fluid under pressure, a switch in the circuit, and means responsive to the rise and fall of water in the tank to operate the said switch, the manually controlled member and the automatic electric control circuit each being operable independent of and without impairing the other.

4. The combination claimed in claim 3 in which said cylinder has upper and lower walls and the resilient means consists of a spiral spring located between the upper face of the piston and the under face of the upper wall of the cylinder.

5. The combination claimed in claim 4, in which the said cylinder has a lower wall that is provided with a calibrated orifice to drain fluid from beneath the piston during the reciprocation of the piston and without jar to the piston.

6. The combination with a conventional toilet tank including a stand pipe, a flushing mechanism and a manually operated lever for the flushing mechanism, of reciprocable means located in the tank and designed to co-act also with the tank flushing mechanism, hydraulic pressure means for moving the reciprocable means in one direction, resilient means for controlling the reciprocable means in the other direction, an intruder electric circuit control, an electrically operated means in the circuit adapted to control the operation of the hydraulic pressure means when a user of the toilet enters and leaves the intruder circuit, a switch in the circuit and pressure fluid-operated means responsive to the rise and fall of water in the toilet tank adapted to actuate the switch, the manually operated lever and the intruder electric circuit control being operable independently of and without impairing the other.

7. The combination claimed in claim 6 in which the switch actuating means consists of a bellows and a bellows pipe extending into the tank and having its open end downwardly disposed in the tank, whereby the rise and fall of water in the toilet tank controls the compressing and release of actuating fluid in the bellows to close and open the switch.

8. The combination claimed in claim 7 in which the downwardly disposed open end of the bellows pipe extending into the toilet tank is enlarged for the major portion of its length to form a chamber for the entrapment of air.

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