Aug. 25, 1953 J. R. McRAE 2,649,591

ELECTRONIC CONTROL FOR FLUSHING APPARATUS

Filed Oct. 22, 1951 2 Sheets-Sheet 1

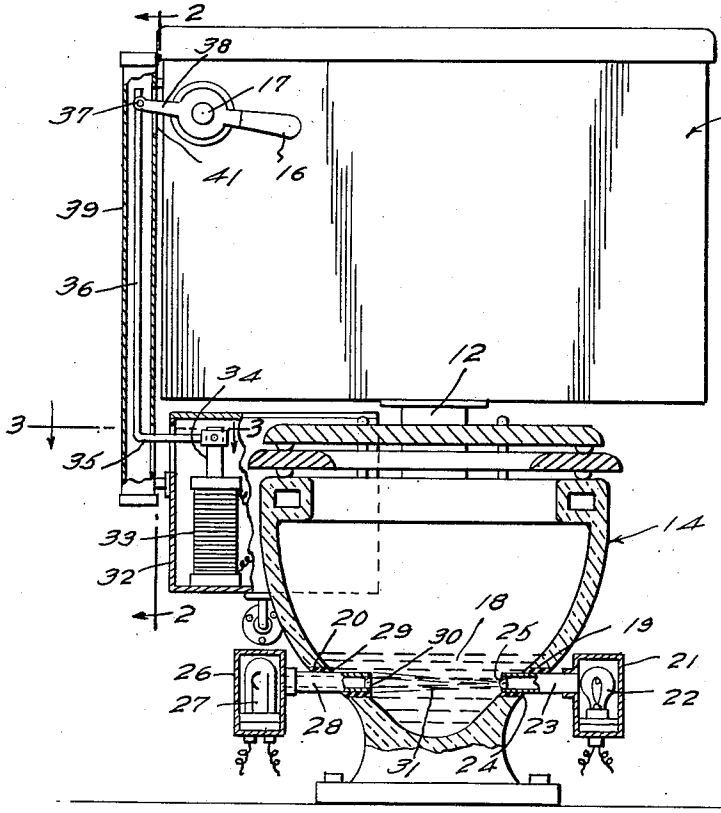


Fig. 1.

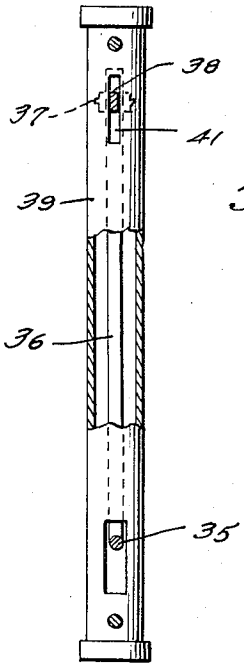
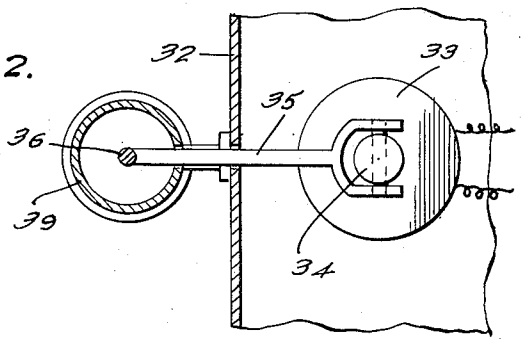


Fig. 2.

Fig. 3.



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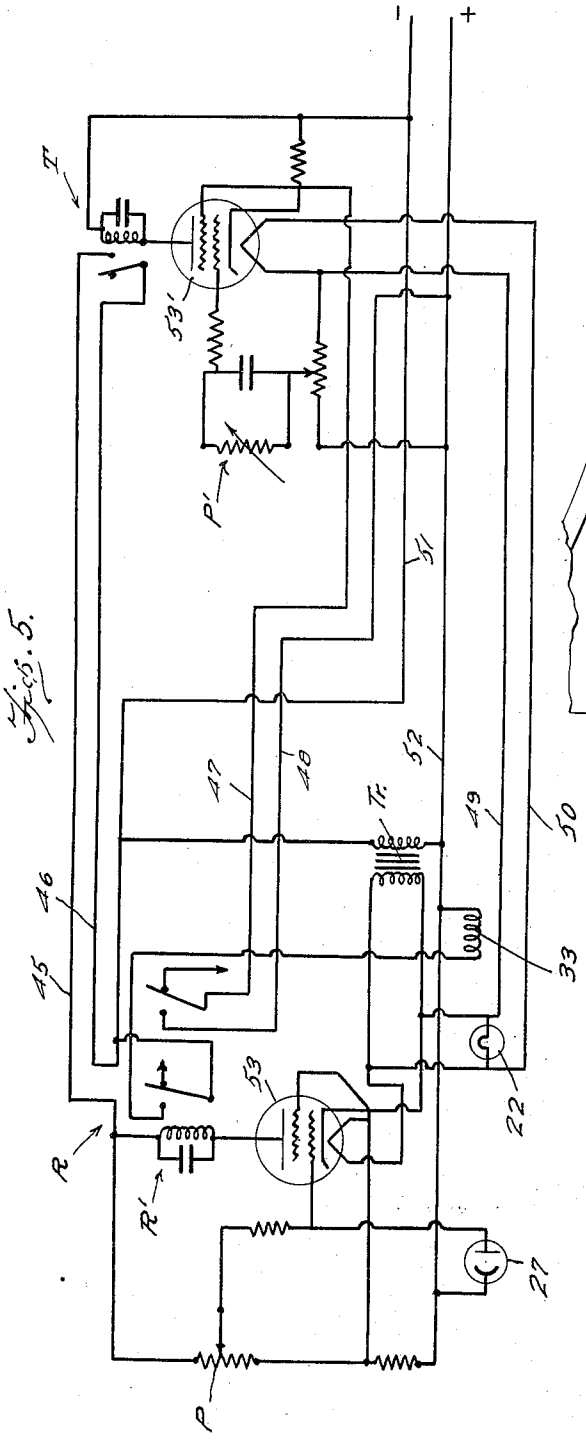


Fig. 5.

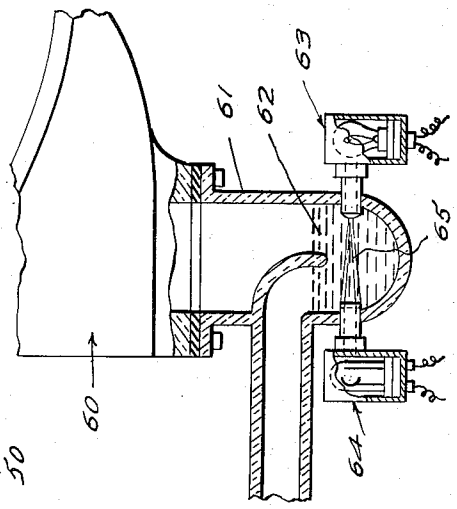


Fig. 4.

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ELECTRONIC CONTROL FOR FLUSHING APPARATUS

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3 Claims. (Cl. 4—10)

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This invention relates generally to the class of baths and closets and is directed particularly to improvements in means for flushing toilet bowls.

An object of the present invention is to provide an improved means whereby a toilet bowl or urinal may be automatically flushed under certain predetermined conditions, without requiring the attention of any human agency for the purpose, as a result of which such units will be automatically kept clean and sanitary regardless of conditions surrounding their use.

A further and more specific object of the invention is to provide an improved means for automatically flushing devices of the character stated when or if the water which usually lies in such articles, becomes unclear for any reason whatsoever, such unclearness or opacity of the water being utilized as a means for interrupting a light beam controlling an electrical circuit whereby such electrical circuit becomes energized to put into operation an electrical means for effecting the flushing of the device.

More specifically the invention contemplates the employment of a light beam which is passed transversely through, or in some way is directed through a part of the water which normally lies in the bottom of a toilet bowl or urinal, which beam functions so long as it passes freely through the water, to maintain an electronic circuit inoperative but functions when any cloudiness or reduced transparency of the water ensues, to activate the electronic circuit for the purpose of energizing an actuating solenoid which is operatively connected with the flushing apparatus associated with the receptacle.

In addition to the foregoing the invention contemplates the provision of a time delay circuit associated with the solenoid operating circuit whereby a time lapse is effected following the activation of the primary circuit as a result of interruption of the controlling light beam.

Other objects and advantages of the invention will become apparent as the description of the same proceeds and the invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of the specification, with the understanding, however, that the invention is not to be limited to the exact details of construction shown and described since obvious modifications will occur to a person skilled in the art.

In the drawings:

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Figure 1 is a view of a toilet bowl or stool in transverse section together with the customary water or flush tank in elevation, showing in association with such structures the control apparatus of the present invention, parts of which are in section.

Fig. 2 is a view in elevation and partly in section and on an enlarged scale of the flush valve actuating rod and enclosing means therefor, the view being a vertical section taken substantially in the plane of section line 2—2 on Figure 1.

Figure 3 is a horizontal sectional view taken substantially on the line 3—3 of Figure 1.

Figure 4 is a view illustrating the application of the detection unit to the bowl of an urinal, portions of the latter structure being in section.

Figure 5 is a circuit diagram for the electrical control.

Referring now more particularly to the drawings the numeral 10 generally designates a conventional type of flush tank which is connected in the conventional manner by an outlet pipe 12, with the back of a toilet bowl or stool which is generally designated 14, the latter being more or less conventionally illustrated.

At 16 is indicated the usual lever for rotating a shaft 17 to effect the opening of the discharge valve, not shown, which is enclosed in the tank 10 to permit the discharge of the flushing water from the tank into the bowl.

The numeral 18 designates the usual small quantity of water which remains in the bottom of the bowl at all times.

In accordance with the present invention there are provided at opposite sides of the bowl below the normal level for the water 18, the transversely aligned openings 19 and 20, the axial centers of which pass through the water 18 across the lower part of the bowl. On one side of the bowl is located a lamp housing 21 in which is enclosed an electric incandescent lamp 22 and leading from the side of the housing is a light tube 23 which passes through an insulation sleeve 24 in the bowl opening or passage 19. The inner end of the light tube 23 has a lens 25 therein which is exposed within the lower part of the bowl and directed across toward the passage 20.

At the opposite side of the bowl from the light 22 is a housing 26 for a photo-electric cell 27 of any suitable type. Extending laterally from the side of the housing and opening thereinto is a light ray tube 28 which passes through an insulation sleeve 29 in the passage 20 of the toilet bowl and into the lower part of the bowl beneath the water level, the inner end of the tube 28

being closed by a suitable window 30 which receives the light beam or rays 31 passing through the lens 25 from the oppositely positioned incandescent lamp 22.

Enclosed at a suitable location and within a suitable housing 32 is a solenoid 33 having the core 34 which normally is projected from the solenoid in the manner shown in Figure 1. The outer end of this core 34 is connected to the laterally turned end or arm 35 of the vertically extending pull row 36, the upper end of the rod being suitably pivotally connected as at 37 with the arm 38 which extends from the end of the flush lever 16.

The pull rod 36 is preferably enclosed in a housing 39 which is here shown as of tubular form and secured to the side of the water tank and at its upper and lower ends such tube or housing has the slots 40 and 41 respectively for the extension respectively of the arms 38 and 35, the first into the housing for attachment to the rod 36 and the latter out of the housing for attachment to the solenoid core 34.

In Figure 5 there is shown a combined photo-electric relay circuit and timer circuit which are operated by the photo-electric cell 27 when the light beam reaching the cell from the lamp 22 is cut off or has its intensity reduced for any reason.

If desired the relay circuit may be employed alone or independently of the timer circuit, the relay circuit being generally designated R and the timer circuit being generally designated T. If the relay circuit is to be used alone the conductors 45 and 46; the conductors 47 and 48; the conductors 49 and 50; and the conductors 51 and 52 are separated from the timer circuit. In this case the conductors 45 and 46 will be electrically connected and the conductors 51 and 52 are connected with a suitable source of electric current such as the house current supply of 110 volts and this voltage is reduced by the transformer Tr to approximately 6.3 volts for the operation of the thyratron 2050 tube 53 and also to supply the necessary reduced voltage to the electric lamp 22.

The conductors 49 and 50 will, of course, terminate at the connections with the two sides of the lamp 22.

When the relay circuit is properly adjusted by the potentiometer P the light beam falling on the cell 27 will maintain the relay R_1 open but when this light beam is reduced in intensity or broken the necessary current flow through the tube 53 will be permitted to operate the relay and this will energize the solenoid 33 to effect the desired movement of the core or amature 34 in a direction to operate the flush tank lever 16.

If the timer circuit T is connected with the relay circuit in the manner illustrated then by adjusting the value of the variable resistance P_1 of the timer circuit the energization of the solenoid 33 can be delayed for a predetermined period after the light beam has been broken or reduced in intensity as, for example, the timer circuit may be so adjusted that the operation of the thyratron tube 53' can be delayed for a given number of minutes.

As will be readily apparent this electronic flushing means can also be applied to urinals as illustrated in Figure 4 where such a fixture is generally designated 60 and is shown as having a water receptacle 61 having water 62 in the lower part thereof.

The numerals 63 and 64 designate respectively a light source and a photo-electric cell unit which are set up so that the beam 65 which is projected from the source 63 to the cell unit 64 may control the relay circuit hereinbefore described.

It is thought that from the description previously given of the operation of the apparatus in association with the toilet bowl, its operation in association with the urinal 60 will readily be obvious and accordingly it is not believed that a repetition of the operation is necessary.

An electronic flushing device of the character herein set forth has the advantage over other types generally in use in homes, public buildings, industrial plants etc., such as those which flush intermittently or by reason of body weight, that it operates only under such conditions as such receptacles are designed for or, in other words, when there is cloudiness, discoloration or other conditions reducing the light transmitting ability of the water in the bowl. As long as the water in the bowl remains clear no flushing is necessary but if the water becomes discolored or for any other reason has its light transmitting ability reduced the apparatus functions to flush the bowl until clear water remains therein.

I claim:

1. In combination, a toilet bowl and flush tank assembly and an electronic operating means for the flushing mechanism of the tank, said means comprising a pair of light conducting tubes extending in alignment through opposite sides of the bowl below the normal level of the water therein, a light source mounted on the outer end of one of said tubes, a photo-electric cell mounted on the outer end of the other of said tubes, a solenoid supported at one side of said bowl and having a vertical movable core, and a member extending vertically from the upper end of said core and connected with the flush valve operating lever of the flushing mechanism, the passage of light between said tubes being blocked by any discoloration of the water within the bowl, said cell being de-activated upon the failure of the light and thereby causing said solenoid to be energized from a current source with which it is connected.

2. The invention as defined in claim 1, with housings carried by the outer ends of said tubes and enclosing the light source and said cell.

3. The invention as defined in claim 1, with an electronic timer relay controlled by said cell for causing the energization of said solenoid, and means for adjusting said circuit to delay the operation of the solenoid for a predetermined period of time.

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