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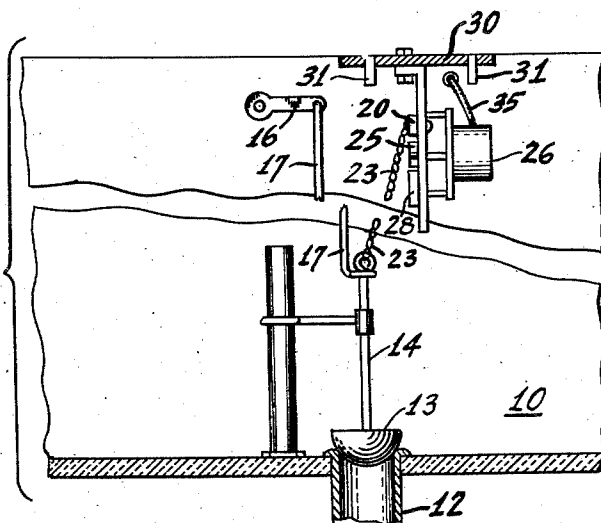
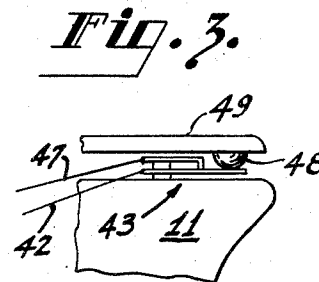
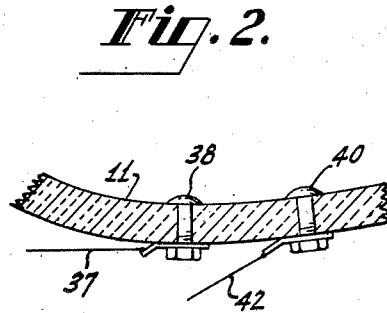
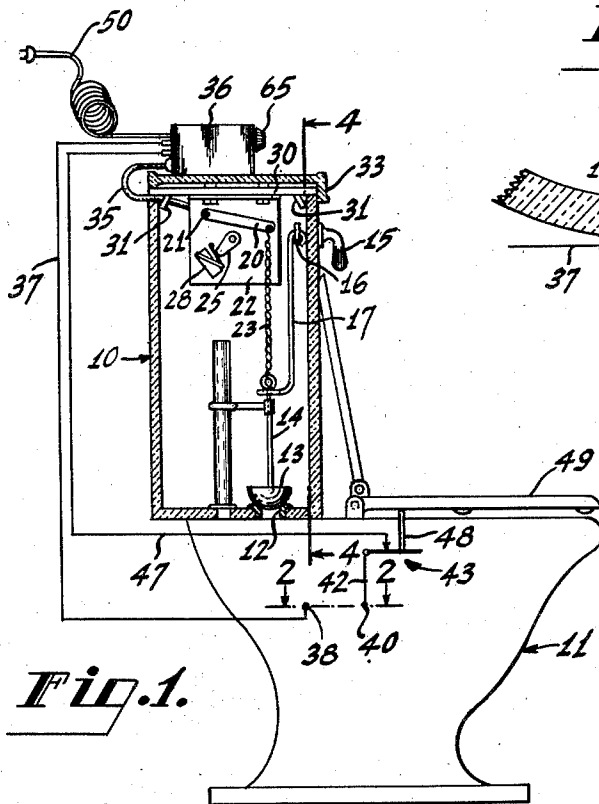
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2,813,274

AUTOMATIC WASTE BOWL FLUSHER

Filed Nov. 13, 1956

2 Sheets-Sheet 1



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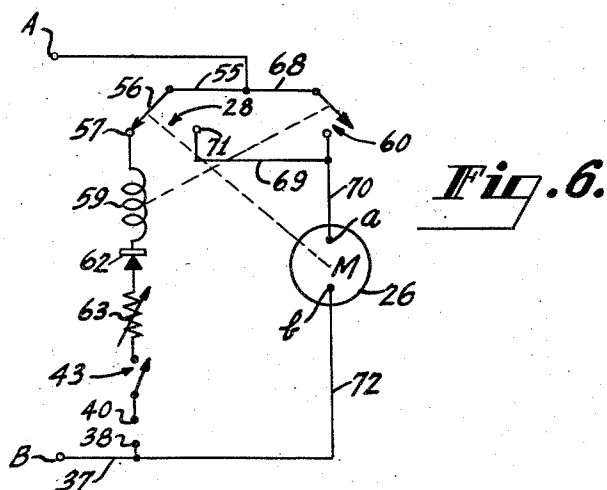
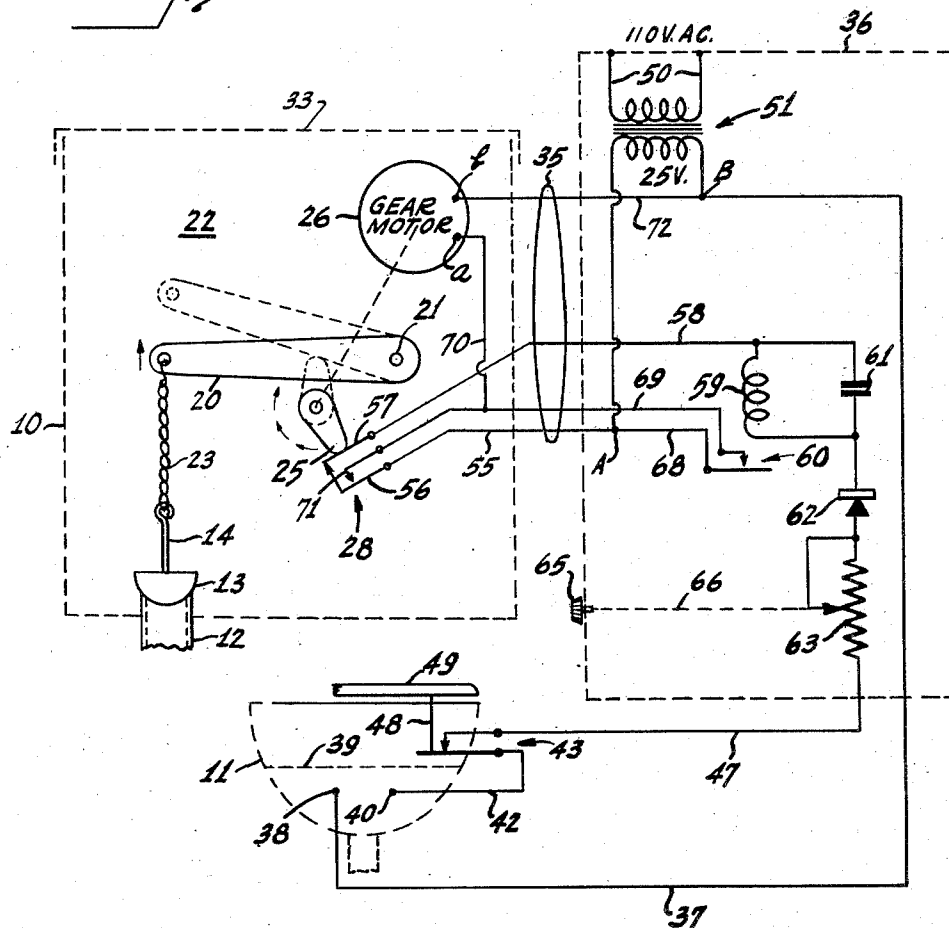
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Fig. 5.



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AUTOMATIC WASTE BOWL FLUSHER

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11 Claims. (Cl. 4—12)

This invention relates to an automatic electrically-operated waste bowl flusher which is especially useful as applied to a urinal or toilet.

The manual operation of toilet flushers is often neglected by forgetful or hurried people, both children and adults, in both public places and private homes. Some people neglect to flush a toilet out of concern regarding the cleanliness of the operating handle. Yet the prompt flushing of toilets is important to all for sanitary and aesthetic reasons. It is therefore a general object of this invention to provide an improved and fully automatic means for flushing waste bowls.

It is another object to provide an automatic electrically-operated toilet flusher which is relatively simple and economical to manufacture and which readily may be applied to existing water closets.

It is a further object to provide an improved automatic electrically-operated toilet flusher which is readily adjustable in sensitivity and which is not subject to premature operation.

It is a still further object to provide an automatic waste bowl flusher including means to prevent premature operation.

In one aspect, the invention comprises a gearmotor-driven cam mounted for cooperation with a pivoted lever and for cooperation with a single-pole double-throw switch. This assemblage is adapted to be mounted inside the top of the reservoir chamber of a conventional toilet. A mechanical connection is made from the lever to the float valve. Two electrical terminals are provided below the water level in the toilet bowl. A series circuit including the bowl terminals, a seat-operated switch, the operating coil of a relay, and one position of the single-pole double-throw switch is connected across a source of electrical energy. When the conductivity of the solution in the bowl and the position of the seat-operated switch permits current to flow in this series circuit, the relay contacts connect the source to the gearmotor which drives the cam, which in turn lifts the lever connected to the ball valve and causes the toilet to flush. In the process of turning, the cam moves the single-pole double-throw switch to its other position in which the relay coil is deenergized and the gearmotor is energized thru the switch. The cam finally returns to its initial position where it moves the single-pole double-throw switch to its original position wherein the gearmotor is deenergized and the system is in readiness for the next following cycle of operation.

These and other objects and aspects of the invention will be apparent to those skilled in the art from the following more detailed description of the invention taken in conjunction with the appended drawings, wherein:

Figure 1 is an elevation, partly in section, of a water closet provided with an automatic electrically-operated flusher constructed according to the teachings of this invention;

Figure 2 is a section taken on the line 2—2 of Fig. 1 and

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showing the electrical terminals below the water level in the bowl of the water closet;

Figure 3 is a detail view showing a form of seat-operated switch which may be incorporated in the system of Fig. 1;

Figure 4 is a sectional view taken on the line 4—4 of Fig. 1 and showing the interior of the reservoir of the water closet;

Figure 5 is a schematic electrical circuit diagram of an embodiment of the invention; and

Figure 6 is a simplified circuit diagram which will be referred to in describing the operation of the invention.

Referring now in greater detail to the drawings, Fig. 1 shows a water closet including a water reservoir 10 and a ceramic waste bowl 11. The reservoir is in communication with the bowl by means of a pipe 12 which is normally closed by a ball valve 13 having a lift rod 14. The ball valve 13 may be manually lifted by a handle 15 connected thru a crank 16 and a rod 17 to the lift rod 14.

The float valve 13 can also be lifted by a lever 20 pivoted at one end 21 on a vertical plate 22 and connected at the other end to the lift rod 14 by means of a chain 23. The lever 20 is lifted or pivoted about the end 21 by means of a cam 25 mounted on the vertical plate 22 and driven by a gearmotor 26 which is also mounted on the vertical plate 22. A single-pole double-throw switch 28 is mounted on the vertical plate 22 on the opposite side of the cam 25 with relation to the lever 20. The drawings show the normal or initial position of the cam 25 wherein the cam holds the switch in its normal or initial position.

The vertical plate 22 is fastened to a horizontal plate 30 having downwardly extending ears 31. The edges of the horizontal plate 30 rest on the top of the reservoir 10 with the ears 31 extending down into the reservoir in such a way as to prevent lateral displacement of the horizontal plate. The horizontal plate 30 is of metal and is thin enough so that it does not interfere with the seating of the ceramic cover 33 of the reservoir 10.

A four-conductor electrical cable 35 is connected from the gearmotor 26 and switch 28 in the reservoir 10 to an electrical control box 36 which may be positioned on the top of the cover 33. The control box may be located within the reservoir 10 if desired. In this case, the components in the box should be constructed in such a way as to be unaffected by moisture. A lead 37 extends from the control box 36 to a terminal 38 positioned in the ceramic bowl 11 below the water line 39, as shown to advantage in Fig. 2. A second bowl terminal 40 is spaced from terminal 38 by a suitable distance such as six inches. The terminals 38 and 40 are preferably constructed of stainless steel. The terminals may be affixed by drilling holes in a standard bowl, or the terminals may be molded in place at the time of manufacture of the bowl.

A conductor 42 is connected from the bowl terminal 40 to one contact of a normally-closed seat-operated switch 43. The other contact of the seat-operated switch 43 is connected by lead 47 back to the control box 36. The switch 43 is opened by the action of a protrusion 48 extending from the hinged seat 49. The switch elements are stiff enough so that the weight of the seat alone is not sufficient to open the contacts. However, the contacts are opened by the weight of a user. Fig. 3 shows a switch construction differing from that in Fig. 1 but having corresponding reference numerals.

An electric cord 50 extends from the control box 36 for connection to an outlet providing the usual 110 volt alternating current supply. The other end of cord 50 is connected, as shown in Fig. 5, to the primary coil of a step-down transformer 51 located in the control box. The secondary coil, which may provide 25 volt alternating current, is connected to two terminals A and B, which may be considered the terminals of a source of electrical energy.

The source terminal A is connected over lead 55 to the common contact 56 of the single-pole double-throw switch 28, from which connection is made in one position of the switch to the contact 57. The contact 57 is connected by lead 58 to one side of the operating coil 59 of a relay including normally open contacts 60. The coil 59 is shunted by a capacitor 61 which may have a value of 300 microfarads and which acts to prevent chatter of the contacts 60 when fluctuating direct current is applied to the operating coil 59. The other side of the operating coil 59 is connected thru a rectifier 62, a variable resistor 63, the lead 47, the seat-operated switch 43, the lead 42, the bowl terminals 40 and 38, and the lead 37 back to the source terminal B. The rectifier 62 may be a selenium rectifier for converting the alternating current of the source to a unidirectional current for operating the relay 59, 60. The variable resistor 63 is controlled by means of a knob 65 mounted on the outside of the control box 36 and connected to the movable shorting contact of the variable resistor by means of a shaft 66.

The terminal A of the source is also connected over lead 68, through the normally-open relay contacts 60, and the leads 69 and 70 to one terminal *a* of the gearmotor 26. The terminal *a* of the gearmotor is also connected to the contact 71 of the single-pole double-throw switch 28. The other terminal *b* of the gearmotor is connected by lead 72 to the source terminal B.

The operation of the invention will now be described starting from the initial or normal condition wherein the mechanical and electrical elements are in the positions shown in the drawing. The weight of a user opens the seat-operated switch 43. This prevents the annoyance that would otherwise be occasional by the premature operation of the automatic system. Waste deposited in the bowl 11 increases the conductivity of the water therein to the point where a current can flow in the water between the bowl terminals 38 and 40. Current flow is possible thru the water because of the lowered resistance and also because of ionization of the solution and polarization of the electrodes in the electrolyte formed. The ease with which current can flow through the solution results from applicant's arrangement including the rectifier 62 which translates the alternating current of the source to a direct current for application across the bowl terminals 38 and 40.

After the user leaves the seat 49, the seat-operated switch 43 returns to its normal closed position. It is then possible for pulsating direct current to flow from the source terminal A thru the single-pole double-throw switch contacts 56, 57, the relay operating coil 59, the rectifier 62, the seat-operated switch 43, the conductive liquid between the bowl terminals 38, 40, and lead 37 to the source terminal B. This current, in flowing through the relay coil 59, causes the normally-open relay contacts 60 to close. Alternating current is thus connected from source terminal A thru lead 68, relay contacts 60, and leads 69 and 70 to terminal *a* of the gearmotor 26. The terminal *b* of the gearmotor is permanently connected to the source terminal B.

The gearmotor 26, being energized, begins to run and turn the cam 25. As the cam 25 leaves the single-pole double-throw switch 28, the common spring contact 56 breaks connection with contact 57 and makes connection with contact 71. It will be understood that the action of the cam 25 is purely mechanical and not electrical. The cam 25 may be of insulating material, or the switch 28 may be provided with an operating button of insulating material which is engaged by the cam 25. When the common contact 56 moves to connect with contact 71, the relay coil 59 is deenergized and the relay contacts 60 return to their normal open-circuit position. However, alternating current continues to be supplied from the source terminal A to the gearmotor terminal *a* thru lead 55, switch contacts 56, 71 and leads 72 and 70.

The gearmotor 26 continues turning the cam 25 until the cam engages and raises the lever 20. When the lever is raised, the motion is transmitted through the chain 23 and lift rod 14 to the ball valve 13. The ball valve is lifted, resulting in the flushing of the waste bowl 11. The gearmotor continues to turn the cam 25 until it engages the single-pole double-throw switch 28 and causes contacts 56 and 71 to break and contacts 56 and 57 to make. This interrupts the flow of alternating current from source terminal A thru contacts 56, 71 to the motor, and stops the gearmotor 26 and cam 25. The system is then in its initial or normal condition and is ready to repeat its cycle of operation when bowl terminals 38 and 40 are again bridged by a conductive solution in bowl 11.

The variable resistor 63 is a sensitivity control which is operated by the knob 65. By turning knob 65 any desired degree of sensitivity may be obtained. For example, the knob may be set to automatically cause flushing when there is the slightest amount of waste in the bowl 11, or it may be set to limit operation to conditions when a greater amount of waste is present. If the water supply contains minerals making it slightly conductive, the sensitivity control may be set to the proper threshold so that flushing does not result in the absence of waste in the bowl. If desired, it may be convenient to employ a toilet paper which is treated to increase the conductivity of the water in the bowl when deposited therein.

The invention may be applied to a water closet of the type employing a flush valve in a water line under pressure, instead of a ball valve in a reservoir. In this case, the lever 20 is connected to the flush valve rather than to the ball valve 13.

It is apparent that according to this invention there is provided an improved means for automatically flushing a water closet whenever there is waste present in the bowl.

What is claimed is:

1. Means for automatically operating a water closet having a water supply connected thru a valve to a waste bowl, comprising, motor means to operate said valve, a source of electrical energy, first and second current paths including said motor for connection across said source, a third current path for connection across said source, a relay having an actuating coil in said third path and normally open contacts connected for completing said first path, spaced electrical terminals positioned below the water level of said bowl and connected in said third path, and switch means mechanically operated by said motor and connected for successively completing said second and third paths.

2. Means for automatically operating a water closet having a water supply connected thru a valve to a waste bowl, comprising, motor means to operate said valve, a source of electrical energy, first and second current paths including said motor for connection across said source, a third current path for connection across said source, a relay having an actuating coil in said third path and normally open contacts connected for completing said first path, spaced electrical terminals positioned below the water level of said bowl and connected in said third path, a variable resistor sensitivity control in said third path, and switch means mechanically operated by said motor and connected for successively completing said second and third paths.

3. Means for automatically operating a water closet having a water supply connected thru a valve to a waste bowl, comprising, motor means to operate said valve, a source of electrical energy, first and second current paths including said motor for connection across said source, a third current path for connection across said source, a relay having an actuating coil in said third path and normally open contacts connected for completing said first path, spaced electrical terminals positioned below the water level of said bowl and connected in said third path, a nor-

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mally closed seat-operated switch in said third path, and switch means mechanically operated by said motor and connected for successively completing said second and third paths.

4. Means for automatically operating a water closet 5 having a water supply connected thru a valve to a waste bowl, comprising, motor means to operate said valve, a source of electrical energy, first and second current paths including said motor for connection across said source, a third current path for connection across said source, a 10 relay having an actuating coil in said third path and normally open contacts connected for completing said first path, spaced electrical terminals positioned below the water level of said bowl and connected in said third path, a rectifier in said third path, and switch means mechanically operated by said motor and connected for successively 15 completing said second and third paths.

5. Means for automatically operating a water closet having a water supply connected thru a valve to a waste bowl, comprising, motor means to operate said valve, a 20 source of electrical energy, first and second current paths including said motor for connection across said source, a third current path for connection across said source, a relay having an actuating coil in said third path and normally open contacts connected for completing said first 25 path, spaced electrical terminals positioned below the water level of said bowl and connected in said third path, a variable resistor and a seat-operated switch connected in series in said third path, and switch means mechanically operated by said motor and connected for successively 30 completing said second and third paths.

6. Means for automatically operating a water closet having a waste bowl and a water reservoir in communication thru a valve with said bowl, comprising, a mechanical operator connected to said valve, an electric motor hav- 35 ing a shaft provided with a cam mounted to actuate said operator, two electrical terminals below the water level in said bowl, a source of electric energy, a relay having an operating coil and contacts, a single-pole double-throw switch mounted to be actuated by said cam, said switch having a first position connecting said operating coil and said bowl terminals across said source, and having a second 40 position connecting said motor across said source, and means including said relay contacts to connect said motor across said source when the relay coil is energized. 45

7. Means for automatically operating a water closet having a waste bowl and a water reservoir in communication thru a valve with said bowl, comprising, a pivoted lever arm mechanically connected with said valve, an electric motor having a shaft provided with a cam mounted 50 to actuate said operator, two electrical terminals below the water level in said bowl, a source of electric energy, a relay having an operating coil and contacts, a single-pole double-throw switch mounted to be actuated by said cam, said switch having a first position connecting said 55 operating coil and said bowl terminals across said source, and having a second position connecting said motor across said source, and means including said relay contacts to connect said motor across said source when the relay coil is energized.

8. Means for automatically operating a water closet having a waste bowl and a water reservoir in communication thru a valve with said bowl, comprising, a mechanical operator connected to said valve, an electric

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motor having a shaft provided with a cam mounted to actuate said operator, two electrical terminals below the water level in said bowl, a source of electric energy, a relay having an operating coil and contacts, a normally-closed seat-operated switch, a single-pole double-throw switch mounted to be actuated by said cam, said switch having a first position connecting said operating coil and said bowl terminals and said seat-operated switch in series across said source, and having a second position 10 connecting said motor across said source, and means including said relay contacts to connect said motor across said source when the relay coil is energized.

9. Means for automatically operating a water closet having a waste bowl and a water reservoir in communication thru a valve with said bowl, comprising, a mechanical operator connected to said valve, an electric motor having a shaft provided with a cam mounted to actuate said operator, two electrical terminals below the water level in said bowl, a source of electric energy, a 15 relay having an operating coil and contacts, a normally-closed seat-operated switch, a variable resistor, a single-pole double-throw switch mounted to be actuated by said cam, said switch having a first position connecting said operating coil and said bowl terminals and said seat-operated switch and said variable resistor in series across 20 said source, and having a second position connecting said motor across said source, and means including said relay contacts to connect said motor across said source when the relay coil is energized.

10. Means for automatically operating a water closet having a waste bowl and a water reservoir in communication thru a valve with said bowl, comprising, a mechanical operator connected to said valve, an electric motor having a shaft provided with a cam mounted to 35 actuate said operator, two electrical terminals below the water level in said bowl, a source of electric energy, a relay having an operating coil and contacts, a normally-closed seat-operated switch, a variable resistor, a rectifier, a single-pole double-throw switch mounted to be actuated by said cam, said switch having a first position 40 connecting said operating coil and said bowl terminals and said seat-operated switch and said variable resistor and said rectifier in series across said source, and having a second position connecting said motor across said source, and means including said relay contacts to connect 45 said motor across said source when the relay coil is energized.

11. Means for automatically operating a water closet having a waste bowl and a water reservoir in communication thru a valve with said bowl, comprising, a mechanical operator connected to said valve, switch means, 50 an electric motor position to successively engage said operator and said switch means when said motor is energized, a source of electric energy, two electrical terminals below the water level in said bowl, a relay coil, a rectifier, a variable resistor, and a seat-operated switch 55 connected in series with said bowl terminals and connected thru said switch means across said source, and contacts associated with said relay coil to connect said source to said motor when said relay coil is energized, 60 said switch means being operative to connect said source to said motor after said relay is energized.

No references cited.