Sept. 7, 1954 J. J. FILLIUNG 2,688,141

AUTOMATIC FLUSHING SYSTEM

Filed Nov. 8, 1950

Fig. 1.

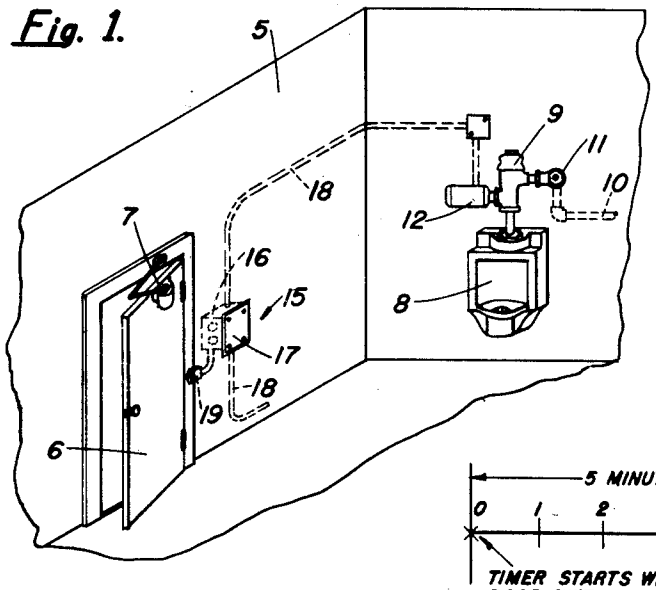


Fig. 5.

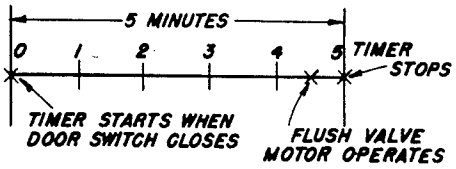
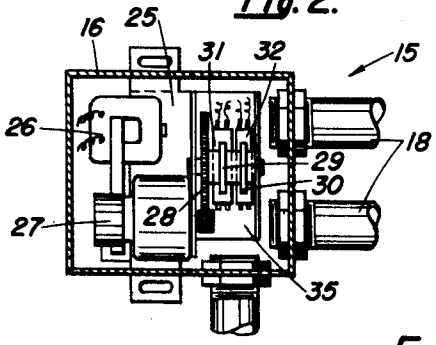


Fig. 2.



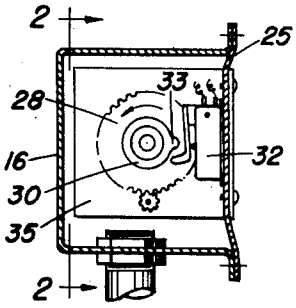
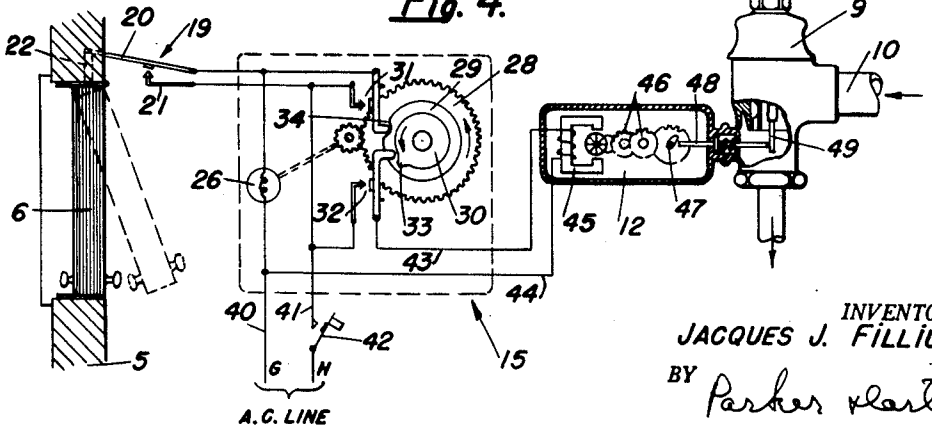


Fig. 3.

Fig. 4.



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AUTOMATIC FLUSHING SYSTEM

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5 Claims. (Cl. 4—101)

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The present invention relates in general to plumbing equipment, but more particularly to a plumbing system for automatically controlling the operation of flush valves in a toilet room, and the principal object of the invention is to provide a new and novel arrangement for electrically operating flush valves.

Another object of the invention is to provide an electrical flush valve operating system in which the flush valves are automatically operated by the action of a person entering the toilet room.

A further object is to provide an automatic flushing system in which the flush valves are operated automatically a predetermined time interval after a person enters the toilet room.

Another object is to provide an automatic flushing system for a toilet room in which the flush valves are electrically operated by a timing device a predetermined time after the timing device has been automatically started in operation by a person opening the toilet room door, and in which the timing device is stopped automatically after the flush valve has been operated independent of any intermediate openings of the toilet room door.

Another object of the invention is to design an automatic flushing system which will conserve the supply of water by only flushing the plumbing fixtures when they have been used.

Another object is to design a new and novel circuit arrangement for an automatic flushing system in which a toilet room door switch is arranged to start the operation of an electric timing device and in which the timing device actuates the flush valve after a time interval and is then stopped independent of the door switch.

In many plumbing installations, it is customary to provide flush valves for urinal fixtures equipped with operating handles to manually flush the urinal fixture by a person using the same. Many persons, however, for hygienic reasons, are reluctant to operate the flush valve handles, or neglect to do so, and as a result, the urinal becomes fouled and obnoxious, thereby consituting a health hazard. It is therefore desirable that some means be provided for eliminating the human element from operating the flush valves and instead provide means for automatically flushing the same at periodic intervals. In accordance with the present invention, the manually operated handle on the flush valve is replaced with an automatic operating device, preferably in the form of a small electric motor which in turn is controlled by an electric timing

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device having a time cycle of, for example, five minutes. The timing device is started into operation automatically from an electric door switch operated by a person entering the toilet room and runs for the time period set when it automatically stops. A short time prior to the end of the specified time period, the flush valve is operated by the timer and any intermediate door openings during the same time period are ineffective. It is therefore apparent that the flushing action occurs only when the plumbing fixture is used and at all other times the equipment remains idle. The conservation of water for the plumbing fixtures will accordingly be considerable over former automatic flushing systems in which the fixtures are flushed at regular intervals regardless of the frequency of use. A system of the latter type is disclosed in Patent 2,507,966, issued May 16, 1950, to applicant.

With the foregoing and other objects in view, the invention consists in certain novel features of construction and arrangement of parts and circuits which will be hereinafter more fully described, claimed and illustrated in the accompanying drawings in which:

Fig. 1 is a perspective view of a section of a toilet room showing the invention;

Figs. 2 and 3 are front and side views respectively of a timing device of the invention;

Fig. 4 is a schematic circuit diagram illustrating the circuit connections involved; while

Fig. 5 is a chart illustrating the time periods concerned with the invention.

Referring now particularly to Fig. 1 of the drawing, a typical toilet room is indicated at **5** in fragmentary perspective, having the usual entrance door **6** held closed, for example, by a pneumatic door check **7**. A urinal fixture **8** is supported on the room wall **5** and is flushed by any well known type of hydraulic flush valve **9** supported above the fixture **8**. An inlet water supply pipe **10** is connected to the ordinary stop or throttle **11** associated with the flush valve **9** and in place of the usual manually operated handle for the flush valve an electric operating device **12**, preferably in the form of a small motor, is provided. This flush valve motor **12** may be of the type disclosed in Patent No. 2,552,625, issued May 15, 1951, to applicant.

Mounted in the wall **5** of the toilet room, adjacent the door **6**, is a timing device, indicated generally at **15**. This timing device is mounted preferably in an ordinary conduit box **16** recessed in the wall **5** and closed by the cover plate **17**. Suitable electrical conduit connections, such as **18**,

connect the timer with the motor operator 12, and with the electrical supply line. Mounted in a recess in the door frame is a door switch indicated generally at 19 which may be of any well-known construction and specifically includes a pair of contact leaf springs 20 and 21 arranged to be normally held apart by a pin 22 extending into the door frame, when the door 6 is closed, as shown in Fig. 4. When the door 6 is opened inwardly, it moves away from the pin 22, permitting contact spring 20 to close on spring 21 due to the tension in leaf spring 20. As soon as the door closes under control of the door check 7, the pin again is pushed inward as shown, opening the contacts. The electrical connections for the door switch 19 extend by conduit into the conduit box 16 containing the timing device 15.

Referring now specifically to Figs. 2 and 3, this shows the timing device 15 supported in the conduit box 16 by means of an L-shaped mounting bracket 25 which may be attached to the conduit box by means of screws threaded into ears on the bracket and box. A small synchronous motor having an operating coil 26 and a gear box 27 is supported on the bracket 25, and a small spur gear extending outside of the gear box 27 meshes with a larger gear 28, rotatably mounted in a turned up portion of the bracket 25. Mounted on the same shaft with the gear 28 is a pair of cams 29 and 30, which are arranged for rotation so as to actuate a pair of microswitches 31 and 32, respectively. These switches are suitably supported on a transverse bracket 35, carried by bracket 25. The gear box 27 is arranged to rotate the large gear 28 and cams 29 and 30 preferably at a speed of one revolution in five minutes. As more clearly seen in Fig. 4, the cam 30 is provided with a bump 33, adapted to establish a movement of the armature of micro-switch 32 to close its switch contacts, while cam 29 is provided with a notch 34 within which the end of the armature of micro-switch 31 is adapted to normally rest, and when moved out of the notch, close the contacts of the switch.

As shown in the schematic circuit diagram Fig. 4, the timer 15 is preferably energized by a source of alternating current of 115 volts, 60 cycles, over the line conductors 40 and 41. An ordinary toggle switch 42 may be inserted in the line 41 to activate the system, if desired. Line conductor 40 extends in series with the coil winding 26 of the timing device and then to contact springs 20 and 21 of the door switch 19, and back over the other line conductor 41. A parallel branch circuit also extends in series with the homing micro-switch contacts 31. A second circuit extends from line conductors 40 and 41 over conductors 43 and 44 in series with the coil winding 45 of the motor operator 12, and a portion of line conductor 43 extends in series with the micro-switch contacts 32.

The motor operator 12 is provided with a set of gears 46, the last one of which has a cam 47 on its drive shaft. This cam 47 is adapted to move a plunger 48 inward each time the motor operator 12 is operated. Pushing the plunger 48 inward causes the auxiliary valve stem 49 of the flush valve 9 to be tripped, and this in well-known manner causes the hydraulic operation of the flush valve 9 to permit a measured quantity of water to flow from the inlet water supply 10 into the urinal 8.

In the normal operation of the system, the switch 42 is closed and the system is dormant or at rest until a person opens the door 6 to enter the toilet room 5. It requires approximately seven to ten seconds for the door 6 to open and then to slowly close under control of a suitable door check such as 7. This opening and closing of the door is sufficient to permit the door switch 19 to close its contacts 20 and 21 for a short time interval. A circuit connection is thereby established for the coil winding 26 over the line conductors 40 and 41 and door switch contacts 20 and 21 in series. This causes the timing motor 15 to be energized, resulting in the gear 28 being rotated and in turn the cams 29 and 30. The rotation of cam 29 immediately causes the armature of the homing micro-switch 31 to ride out of the cam notch 34 and close contacts 31 independent of the door switch 19, thereby establishing a second operating circuit for the timing coil 26. After this latter circuit has been closed, it will be apparent that contacts of the door switch 19 can be again closed and that any number of subsequent door openings may be made without affecting the operation of the timer in any manner. The notch 34 in cam 29 is arranged to be of sufficient width to permit a time interval of about three seconds to elapse before the door 6 will close to open the door switch 19.

The timer 15 continues to operate and rotate its cams 29 and 30 after the door 6 has been closed. After a period of five minutes, the cam notch 34 will again come within the path of the armature of microswitch 31, whereupon the armature drops into the notch opening the homing contacts 31. This disconnects the supply line conductors 40 and 41 from the timer motor 26, causing the motor to stop. At a predetermined time prior to the opening of the homing switch 31 by notch 34, the bump 33 on cam 30 actuates the armature of switch 32, causing a closure of the contacts. As a result, an energizing circuit is thereby established over the line conductors 40 and 41, contacts 32, and in series with the coil winding 45 of the motor operator 12. Accordingly, the motor operator 12 rotates its gears 46 and cam 47 to trip the auxiliary valve 49, causing an actuation of the flush valve 9 and flushing the urinal fixture 8. The width of the cam bump 33 is sufficient to permit a closure of contacts 32 for approximately four seconds, after which the contacts are opened. This four second impulse to the motor operator 12 is sufficient to provide at least one full operation of cam 47, in the manner pointed out in the aforesaid patent, No. 2,552,625. A short time after the motor operator 12 has actuated the flush valve 9, the timing device 15 is automatically stopped, as pointed out, and the complete system is again dormant until the door 6 is again opened.

Referring now to Fig. 5, this discloses a time chart illustrating the principles of operation. The chart is laid out in minutes for a period of five minutes and shows that when the door is first opened, the timer is started into operation and continues to operate for the full five minutes when it is automatically stopped. Due to the homing circuit provided by cam 29, any intermediate door openings will be without effect upon the timer. Approximately one-half minute prior to the automatic stopping of the timer, the flush valve motor 12 is energized. This period for the energization of the motor operator 12 may be chosen anywhere within the five minute time period run off by the timer. It is merely necessary to rotate the cam 30 relative to cam 29 on the shaft to provide this adjustable period.

It has been determined from observation that

a person entering a toilet will require no more than three or four minutes to perform any necessary toilet and other functions before leaving the room. Therefore, the five minutes chosen within which to stop the timer would insure that the urinal 8 had been used and subsequently flushed by the flush valve 9. It will be apparent that the flushing action could conceivably occur after the person has left the room, but a period no longer than five minutes will have elapsed since he first entered the washroom. Assume also that one person had entered the washroom and left prior to the expiration of the five minute period. Another person then enters during this time, but leaves the room after the five minute period has expired. This latter person then when he opens the door to go out, will start the automatic operation of the timer and cause flushing of the flush valve 9 four and one-half minutes after he has gone out. It is apparent that the system will remain inactive entirely until a person enters the room and this may be any subsequent time after a previous person had used the toilet room. Any number of people may enter and leave the toilet room, but the system will function to only provide five minute intervals to flush the flush valve.

Assume that in certain installations as where a large number of urinals are provided and the traffic is relatively heavy, the door 6 may be propped open as by a door catch. In such condition, the door switch 19 would remain closed indefinitely or as long as the door was held open. As a result, the timer would function to flush the flush valve 9 and any others every five minutes, regardless of how many persons entered or left the room. This is desirable because under these circumstances the heavy traffic in the toilet room will require the urinals to be flushed periodically every five minutes.

The present system, it will be apparent, presents numerous advantages over other known automatic flushing systems, because the flush valves are only operated when they are actually used. The saving of water will therefore be considerable over flushing systems in which the urinals are flushed automatically perdiocally regardless of the traffic into the toilet room. The system likewise overcomes many disadvantages which have been encountered in attempting to automatically operate the flush valves directly by the opening and closing of a door without the use of a timing device.

While only a preferred embodiment of the invention has been illustrated and described, it will be apparent that modifications of the same may be made by those versed in the art. It is therefore desired that the invention be not limited to the precise disclosure, but only by the scope of the appended claims:

What is claimed is:

1. In an automatic flushing system for a toilet room having an entrance door and a flush valve for flushing a plumbing fixture, an electric operator for initiating the operation of said flush valve, a timing device having a motor and including cam means, a homing switch and an electric operator switch, both switches being operated by said cam means, said electric operator switch controlling the operation of said electric operator and said homing switch controlling said timing device motor, a door switch adapted to be closed when the door is opened and adapted to be opened when the door is closed, an electric power source for said timing device motor, said door switch and said homing switch being connected in parallel circuit with each other and in series with said timing device motor and said power source, the closing of said door switch being effective to start said timing device motor in operation, said cam means being thereby effective to close said homing switch and to continue the operation of said timing device motor independently of repeated opening and closing of said door switch, said cam means being adapted to open said homing switch after a predetermined time interval, whereby to stop the operation of said timing device motor, said electric operator switch being adapted to be closed by said cam means prior to the stopping of said timing device motor, to close the operating circuit of said electric operator in series with said power source, said door switch being held closed in the event the door is held open, whereby the timing device motor continues to hold closed the operating circuit of said timing device motor independently of the opening of said homing switch by said cam means, so that said electric operator is periodically operated.

2. In an automatic flushing system for a toilet room having an entrance door and a flush valve, an electric operator adapted to initiate the operation of said flush valve, a timing device including a cam means and a pair of cam switches operated thereby, one of said cam switches being adapted to control the operation of said electric operator, the other cam switch being adapted to control said timing device, a door switch adapted to be closed by the opening of said door and adapted to be opened by the closing of said door, for initiating the operation of said timing device independently of the second of said cam switches, circuit connections including an electric power source interconnecting said door switch with said timing device cam swithes and said timing device with said electric operator, whereby the closure of said door switch by said door closes the circuit of said timing device with said power source to start the timing device in operation, said second cam switch in said timing device closing an operating circuit for said timing device with said power source independent of the repeated opening and closing of said door siwtch, said second cam switch being adapted automatically to open the operating circuit of said timing device to stop the operation of the same, said cam means in said timing device effective prior to its stopping for closing the circuit of said electric operator through the first of said cam switches to operate said electric operator, whereby to initiate the operation of said flush valve, said door switch being closed when the door is held open, whereby the timing device continues to cause periodic actuation of said electric operator.

3. In an automatic flushing system for a toilet room having an entrance door and a flush valve, an electric operator adapted to initiate the operation of said flush valve, a timing device including cam means and a pair of cam switches operated thereby, one of said cam switches being adapted to control the operation of said electric operator, the other cam switch being adapted to control said timing device, a door switch adapted to be closed by the opening of said door and adapted to be opened by the closing of said door for initiating the operation of said timing device independently of the second of said cam switches, circut connections between said door switch and said timing device, other circuit connections between said timing device, said sam switches, and said electric operator, an electric power source

connected in said circuits, whereby the closure of said door switch by said door completes an operating circuit for said timing device, and said second cam switch completes a secondary operating circuit for said timing device independently of the repeated operation of said door switch, and whereby said second cam switch automatically disconnects the operating circuit of said timing device after a time interval, said first cam switch being adapted at a time prior to the stopping of said timing device to complete an operating circuit for said electric operator, said door switch being held closed when said door is held open, whereby said timing device continues to cause periodic operation of said electric operator.

4. In an automatic flushing system for a toilet room having an entrance door, a flush valve, an electric operating device adapted to initiate the operation of said flush valve, an electric timer including cam means and a pair of cam switches operated thereby, one of said cam switches being adapted to control said operating device, the second cam switch being adapted to control said timing device, a door switch adapted to be closed by the opening of said door when a person enters the toilet room and be opened by the closure of said door, electric circuit connections including a power source interconnecting said door switch, said cam switches, said timer, and said operating device, said door switch being adapted to close the starting circuit of said timer, said second cam switch being adapted to close after said timer has started, for completing an operating circuit for said timer independent of said door switch, whereby said entrance door can be opened an indefinite number of times and said door switch opened and closed after said timer has started to operate, said second cam switch automatically opening the operating circuit of said timer to stop its operation after a predetermined time period has elapsed, said first cam switch being closed by said timer for completing an operating circuit for said operating device a predetermined time interval prior to the stopping of said timer, said door switch being held closed in case said door is held open, whereby said timing device continues to

cause periodic operation of said electric operator.

5. In an automatic flushing system for a toilet room having an entrance door equipped with a door check for slowly closing the door after it has been opened by a person entering the toilet room, a flush valve for flushing a plumbing fixture in the room, an electric operator on the flush valve for operating the same, an electric timing device including cam means and a homing switch and a second switch both operated by said cam means, said homing switch being adapted to control the operation of said timing device, said second switch being adapted to control said electric operator, a door switch closed by the opening of said door and opened when said door is closed, electric circuit connections including a power source interconnecting said door switch, said cam switches, said timer, and said operator, the opening of said door causing said door switch to close an initial operating circuit for said timer, said homing switch being adapted to close a homing circuit for said timer independent of the repeated operation of said door switch and the closing of the initial operating circuit of said timer, the slow closing of said door by said door check enabling said homing switch to be closed before said door switch is opened by the closing of the door, said homing switch opening the homing circuit of said timer to stop the timer after it has run for a certain time interval, said second switch being adapted to close the circuit for said electric operator to operate said flush valve prior to the stopping of said timer, said door switch being held closed when said door is held open, whereby said timing device continues to cause periodic operation of said electric operator.

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