

March 25, 1952

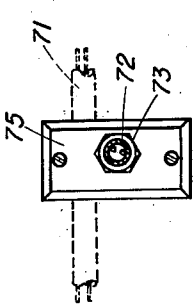
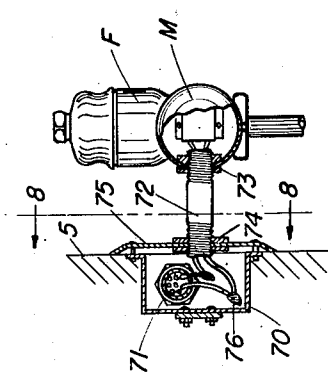
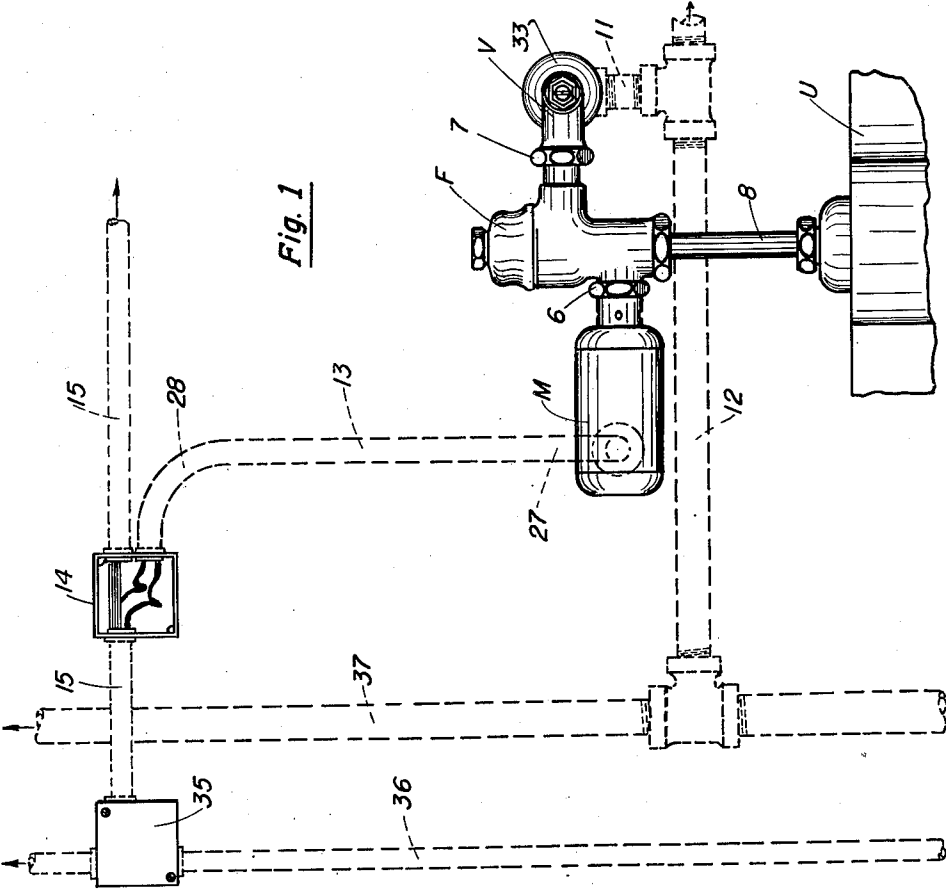
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2,590,147

FLUSH VALVE ARRANGEMENT AND INSTALLATION

Filed June 3, 1946

3 Sheets-Sheet 1



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2,590,147

FLUSH VALVE ARRANGEMENT AND INSTALLATION

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3 Sheets-Sheet 2

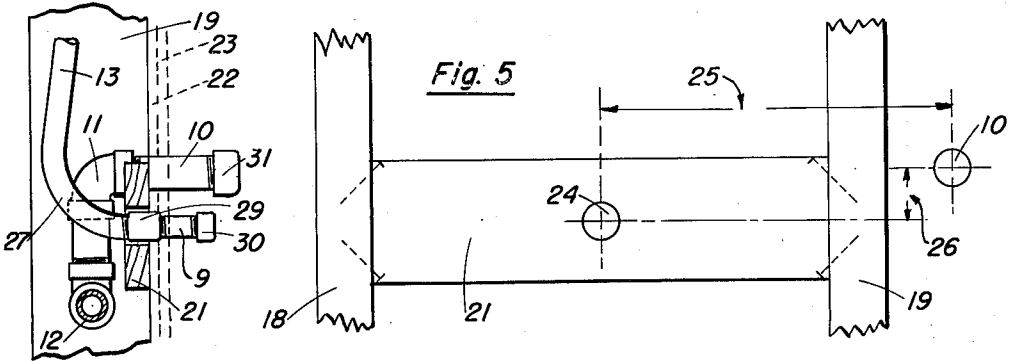


Fig. 4

Fig. 3

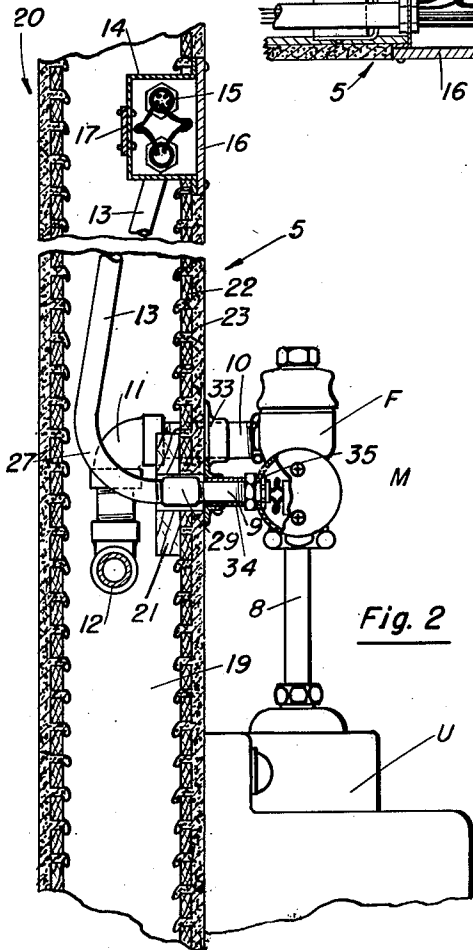
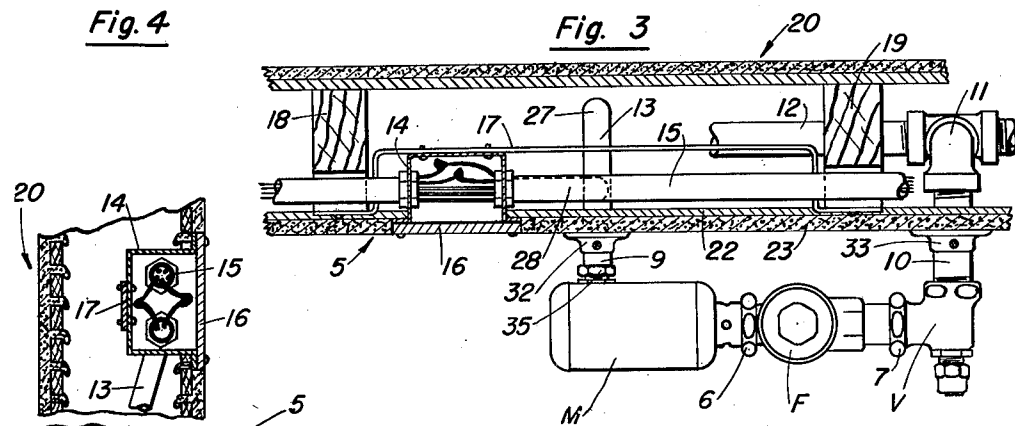
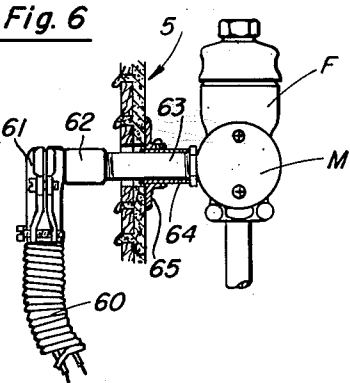


Fig. 2

Fig. 6



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3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,590,147

FLUSH VALVE ARRANGEMENT AND  
INSTALLATIONJohn I. Bellamy, Brookfield, Ill., assignor to Sloan  
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Application June 3, 1946, Serial No. 674,136

3 Claims. (Cl. 4-101)

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This invention relates in general to plumbing installations, but more particularly to the arrangement and installation of flush valves for urinal fixtures and the principal object of the invention is to provide a new and improved arrangement and method of installing urinal flush valves and associated electrical operating devices therefor.

A further object is to provide a new and improved method of installing a flush valve and associated operating device which can be easily and economically made and in which the water supply piping and the electrical conduits may be roughly placed in position and the connections made irrespective of slight variations of the final positions of the flush valve and operating device.

Another object is to provide an improved installation arrangement for a plurality of flush valves and associated operating devices in which a common water supply pipe is provided for all of the flush valves of a group and an individual electrical conduit for the operating devices, and in which each conduit is so arranged that it is easily connected to its operating device regardless of the position of the same with respect to the associated flush valve.

A further object is to arrange the water supply connection to a flush valve and the electrical conduit connection to the valve operating device in such a manner that there will be no strain upon the valve operating device to effect its reliable operation.

It is another object of the invention to provide a new and improved arrangement for automatically operating a plurality of flush valves in which the flush valves are arranged in different groups and means are provided for operating the flush valves sequentially in each group at recurring intervals.

Another object is to provide an arrangement for automatically operating a group of flush valves in sequence in which the flush valves are operated at greater frequencies during one time interval and at lesser frequencies during a different time interval, and means are provided for adjusting the time when the different intervals are to be effective.

Other objects, novel features, and advantages of the invention will be apparent from the following description which taken with the accompanying drawings discloses a preferred embodiment and several modifications of the invention.

In the drawings:

Fig. 1 shows a front elevation of a portion of a flush valve installation showing the electrical conduit and water supply pipe connections;

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Fig. 2 is a cross-sectional side view of the installation showing the piping between the walls of the room;

Fig. 3 shows a top view of the same installation;

Fig. 4 is a cross-section side view of the roughing-in arrangement of the water pipe and electrical conduit;

Fig. 5 is a front elevation of the roughing-in prior to installation of the piping;

Fig. 6 is a cross-sectional view of a modified form of the wiring arrangement using flexible conduit;

Fig. 7 is a cross-section of another form of the wiring arrangement;

Fig. 8 is a view along the line 8-8 of Fig. 7, while

Fig. 9 shows a diagrammatic arrangement of a typical installation showing a plurality of groups of urinal flush valves including the water supply piping and electrical connections together with the automatic timing device for controlling the sequential operation of the flush valves.

The use of automatic flushing systems in toilet rooms is highly desirable as usually the general public is hesitant about operating urinal flush valves manually, because the operating handles are presumed to be insanitary, and in addition due to negligence the handles are not operated to flush the valve after the fixture has been used. Under such conditions, the urinal fixture becomes fouled and in consequence the toilet room becomes obnoxious. In many localities it is mandatory that urinal flush valves be provided with means for automatically flushing the same. Previously automatic flushing of urinals was provided by a water tank located in the toilet room which periodically operated a float to flush the urinal fixtures. This was not entirely satisfactory because the intervals of flushing operation were not controlled reliably with any degree of accuracy and operations were continuous at the same rate day or night, resulting in wastage of the water supply.

According to the present invention, applicant has overcome the foregoing disadvantages by providing an automatic flushing system and arrangement in which a battery of urinal flush valves are automatically operated for certain intervals throughout the daytime for example, and for longer intervals during the night-time. The urinal flush valves are operated in consecutive order so that too great a drain will not be placed upon the water supply piping beyond its capacity at any one time. In a large installation involving several floors, each containing a battery of uri-

nals, the invention contemplates staggering the operation of the flush valve between the different floors.

The electrical operator for the flush valves may be of the type disclosed in Patent No. 2,388,990, issued November 13, 1945, to R. M. Nelson and J. I. Bellamy, or may be that disclosed in application Serial No. 653,507, filed March 11, 1946, J. J. Filliung, Jr., now Patent 2,552,625, dated May 15, 1951.

In an installation of the foregoing type, the urinal flush valves are each provided with an electrical operating device such as a solenoid or motor operator which directly causes the operation of the flush valve. A problem is presented in such an installation in that the water supply piping to the flush valve is first roughly placed in position when the building is in the process of construction and shortly afterwards or at the same time the electrical conduit connection for the electrical device is placed in position. It is necessary in these roughing-in operations by the electrician and the plumber that the conduit and the water supply pipe be placed in the approximate position they are to occupy when the finished wall surface is applied, and the flush valve and its associated operating device are mounted into position. In practice, therefore, a certain degree of latitude must be provided between the respective locations of the electrical conduit and the water supply pipe so that any variations in the exact position of the flush valve and electrical device can be compensated for. According to the invention, this roughing-in may be readily accomplished with ease and exactitude, and the finished installation present a neat and substantial appearance. In addition to the foregoing, it is necessary that the electrical operating device, which is rigidly mounted upon the flush valve, be relieved of all strains and stresses which may cause unreliable operation of the device, and the installation as disclosed obviates any such strain.

Referring now particularly to the drawings, Figs. 1, 2 and 3, a preferred installation and arrangement is disclosed in which a flush valve F is located in spaced relationship to the wall surface 5 of a toilet room, and is provided with an electrical operating device M supported directly upon the flush valve F by means of coupling nut 6. A shut-off stop and throttle valve V is coupled to the inlet side of the flush valve F by the coupling nut 7. The outlet side 8 of the flush valve F connects to the top of a urinal fixture U which may be of any desirable type. Extending rearwardly from the electrical device M is a conduit coupling 9 passing through the wall surface 5. The inlet water supply pipe 10 also passes through the wall 5 and is connected with the shut-off stop V. Behind the wall 5 the water supply pipe 10 is connected to an elbow 11 and this in turn with the horizontally disposed water supply header or pipe 12, which extends in multiple to all of a series of flush valves which may be arranged in a battery in the same toilet room.

Connected with the conduit nipple 9, which extends to the electrical device M, is a relatively long electrical conduit or pipe 13 extending preferably upwardly within the wall space to a conduit or junction box 14 recessed in the wall surface 5. This conduit box 14 is preferably arranged in a toilet room above the normal eye level of persons, so that it will be relatively inconspicuous. Extending from the conduit box 14, and connected thereto, is a second and horizon-

tally arranged conduit 15 which extends in series to all similar conduit boxes arranged above their associated electrically operated flush valves F in the same toilet room. A suitable flush type wall plate 16 is provided as a cover for the conduit box 14. The conduit box 14 is supported in any suitable manner as by a section of strap metal 17 (Fig. 3) which is anchored at opposite ends in the usual manner to the vertical wooden studding 18 and 19, which studding is the usual 2 x 4's extending between the front wall 5 and the rear wall 20.

In order to properly locate the conduit 13 in its approximate position, a cross-piece 21 made of lumber is first nailed between the studding 18 and 19, as shown in Fig. 5, and extends directly behind the lathe 22 and the plaster 23 of the wall 5. It will be noted that the inlet water supply 10 is located to the right of and slightly above the position where the conduit 13 extends through the wall surface 5 and in roughing in such an installation, it is presumed that the plumber first locates his inlet pipe 10 in the correct position. Then the electrician measures over a certain distance to the left, as indicated at 25 (Fig. 5), and likewise a definite distance below the location of the water inlet 10, as shown at 26, where a hole 24 is then bored in the cross-piece 21. This hole 24 is larger in diameter than the conduit nipple 9. The electrician then takes a conduit section 13 and at its upper end applies a right angle bend 28, which is subsequently attached to the conduit box 14. At the lower end, the conduit 13 is given a right-angle bend 27, which is made at an angle of ninety degrees laterally from the bend 28. This bend 27 is pushed through the opening 24 in the cross-piece 21. There is sufficient latitude in the conduit 13 for this to be readily accomplished. A coupling 29 is then screwed very tightly on the bent end 27 of conduit 13, after which the nipple 9 is loosely threaded into nipple 29 and a cap 30 (Fig. 4) closes the end of the nipple. A similar cap 31 applied by the plumber closes off the inlet supply pipe 10. The purpose of these caps is to prevent plaster and foreign objects from entering the pipes before the finished installation is made.

The foregoing is the condition of the installation prior to the application of the plaster 23 and any other finishing operations necessary in the toilet rooms. When the urinal fixture U and the flush valve F and its electrical operator M are ready to be installed, the plumber removes the cap 31 from the water supply pipe 10 and installs the flush valve F and stop V rigidly in position, and connects the outlet 8 to the urinal fixture U by means of a slip joint connection. The electrical operator M is then coupled to the flush valve F by the coupling nut 6 so that it is rigidly supported thereon. The electrician removes the cap 30 from the nipple 9 and threads this end of the nipple into the connector 35 arranged on the side of the casing of the electrical operator M. He then passes the necessary electric wiring through the conduits 13 and 15, and makes the required connections in the conduit box 14. The wires are next pulled out through the nipple 9 which is solidly screwed into the coupling 29 and the electrical connections made to the electric operator M. Should there be any variations in the location of the conduit outlet 35 of the motor operator M, with respect to the end of nipple 9, this is readily compensated for by the electrician either pulling the nipple 9 inward or outward

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with respect to the wall surface 5 thereby swinging the conduit 13 about an axis rotatable on its connecting nuts in the conduit box 14. If it is necessary to provide leeway either vertically or horizontally, there will be sufficient clearance in the opening 24 to provide for this variation in location. Due to the bent portions 27 and 28 on opposite ends of the conduit pipe 13, sufficient flexibility is provided that such lateral motion of the nipple 9 may be readily accomplished.

It will be noted that the conduit 13 is totally unsupported between its ends, being connected at one end to the conduit box 14 and hanging freely at the other end, but attached to the electrical operator M within the hole 24. This arrangement insures that no undue strain is placed upon the electrical operator M to cause its unreliable operation which may occur should a rigid connection be made to the device in any place but at its coupling connection with the flush valve M. In order to provide a finished appearance to the installation, the flange members 32 and 33 are first slipped over the respective conduits and water pipes and held in position as shown, and a metal sleeve 34 may also be slipped over the conduit nipple 9.

Referring to Fig. 1, the horizontally disposed conduit pipe 15 connects with a main junction box 35, to which is also connected a vertically arranged conduit pipe 36 extending upwardly between different floors of the building. The horizontal water supply pipe 12 is connected with a water supply riser 37 extending between the respective floors of the building.

The foregoing description of the installation of the electrically operated flush valves is presumed to have taken place in a newly constructed building involving the construction of new walls and the complete installation of the plumbing equipment. There are many instances in which the flush valves are already installed in existing buildings and the valves provided with manually operated handles. In adapting such plumbing equipment for automatic flushing, it is merely necessary to remove the usual flush valve operating handle and by means of the coupling 6 attach the electrically operated device M to the valve. In such old installations, it is not feasible to install rigid conduit behind the wall surface, but it is customary to use flexible conduit or BX conduit.

Such a construction is illustrated in Fig. 6, wherein the flexible conduit 60 containing a pair of wires is attached by means of a connector 61 to the coupling member 62. A nipple 63 passing through the wall surface 5 threads into the coupling 62 while the other end of the nipple 63 is attached by means of the usual nuts to the casing of the electrical operator M. To finish the installation, it is desirable to slip a finished piece of tubing 64 over the nipple 63 and close up the openings in the wall 5 around the nipple 63 by means of a flange 65. In such an installation the flexible conduit 60 may be easily fed behind the wall surface 5 and connections made to a suitable conduit or junction box located some distance from the connection with the flush valve and where the control circuits are extended.

A modification of the arrangement disclosed in Figs. 1, 2 and 3 is illustrated in Figs. 7 and 8. In this modification, the conduit or junction box 70 is recessed in the wall surface 5 at a point directly behind the electric operator M. This of course will entail the provision of a larger sized opening in the wall than that shown in Fig. 1.

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The horizontally arranged rigid conduit 71 is attached to one end of the conduit box 70 and passes in series through any other conduit boxes arranged in the same battery of urinal valves.

Extending between the conduit box 70 and the electric operator M is a nipple 72 which is threaded for its entire length, so that any variations in the roughing-in distances between the electric operator M and the conduit box 70 can be compensated for by merely threading the clamping nuts 73 and 74 at the correct position to the casing of the electric operator M and to the cover or wall plate 75. This cover plate 75 is attached by screws in the usual manner to the conduit box 70 as shown.

It is apparent that in this roughing-in arrangement the relative position of the electric operator M with respect to the wall surface is readily compensated for by the threaded arrangement of the coupling 72. To compensate for variations in locations vertically or horizontally, the electrician punches an opening in the wall plate 75 at the exact point where the coupling 72 projects from the electric operator M. This may not be exactly in the center of the wall plate 75, but may be located eccentric from the center or slightly to one side as shown in Fig. 8. This off-side location will not detract from the general appearance of the finished installation, since it is located behind the electric operator M and hidden partially thereby.

A material advantage results in the modification shown in Fig. 7 in that the electrician will feed his wires into the conduit box 70 from the conduit 71 and also through the nipple 72 from the electric operator M and splice the wires together within the conduit box 70. This arrangement, it will be noted, differentiates from that shown in Fig. 2 where the electrical connections between the conduit 13 and the electrical operator M are made within the space provided at the end of the electrical operator M.

Referring now particularly to Fig. 9, this discloses a typical arrangement of an automatic flushing system comprising, for example, a plurality of floors, A, B and C, and a basement D. The urinals are usually arranged in batteries of any number with the flush valves of each connected in parallel with the header 12 to the water supply riser 37. It will be noted that this riser 37 is progressively reduced in size between the different floors as with the arrangement disclosed all of the flush valves are not operated at any one particular time but in sequence on each floor. This results in a substantial saving in the cost of piping since larger size piping is not required.

In order to effect the sequential operation of the urinal flush valves, a timing device T is provided preferably located in the basement D in the building engineer's room, for example. This timing device T is suitably arranged in a box, and is connected with a source of alternating current over the current supply leads 40 and 41. A synchronous driving motor 42 is connected across the current source and operates continuously. By means of suitable gearing, a day-night clock dial 43 is rotated in the direction indicated once in 24 hours, and is provided with a pair of adjustable arms 45 and 46, which are adapted to be adjustable on the clock dial 43 to any hour position. The adjustable arm 45 is adapted to actuate at any selected time, the toggle switch 47 in one direction while the arm 46 operates the toggle switch 47 in the

other direction at any other selected time. Suitably geared to the shaft 44 is a cam 48 rotating at 1 R. P. H., which is adapted to close the hour contacts 49, and a second cam 50 rotating at  $\frac{1}{2}$  R. P. M. Within the path of rotation of the notch in cam 50 is a series of individual contact sets 51, 52, etc., each of which has a lead extending from the timer T outward within the conduit 36 and vertically through all the floors A, B and C. The common return wire 40 likewise extends through the conduit 36.

In the operation of the timer T the first contact set 51 is closed by the rotation of the cam 50 to energize the associated wire 53 over a circuit extending from the feed line 41, normally closed contacts of the toggle switch 47, wire 54, contacts 51, wire 53, through each of the first ones of the electric operators M located in each battery on each of the floors, A, B and C. From there the circuit extends over the common lead 40 back to the line circuit. The first flush valve F in each battery is therefore energized to flush its associated urinal. When the cam 50 engages contact 52, the lead 55 is energized and the second of the electric operators M on each floor is energized. From this it is seen that the cam 50 energizes the electric operators on each floor in sequence. Since not more than one flush valve is operated on a floor at any time, the capacity of the header 12 is not exceeded at any one time, resulting in a material saving in the size of the piping normally required.

Since the cam 50 is arranged to rotate at  $\frac{1}{5}$  R. P. M., the urinals are flushed once in every five minutes. It is desirable that this rate be discontinued during the period when less frequent use is made of the urinals, for example during the night-time period. To provide for this, the arm 45 of the timer T is set at six o'clock in the evening so it will snap the toggle switch 47 over and close its normally open contacts, thereby completing the energizing circuit from the line 41 through the now closed contacts of toggle switch 47, the contacts 49 of the one-hour cam 48 and through the various contacts operated in sequence by the cam 50. Each time the one-hour cam 48 engages its notch with the contact 49, the foregoing circuits are completed. The notch in the cam 48 is of sufficient length so that the cam 50 completes one full revolution before cam 48 again opens the contacts 49.

As only a typical installation has been described, it will be quite obvious that various arrangements and modifications of the same can readily be made, for example, several batteries or groups of urinals may be disposed on the same floor at various locations, depending on the size of the installation, and more than the number shown may constitute one battery. In such a case more than one urinal will be flushed at one time in that same battery.

While a preferred embodiment and several modifications have been illustrated and described, it will be apparent that many changes

may be made in the general construction and arrangement of the invention without departing from the spirit thereof, and it is therefore desired that the invention be not limited to the exact disclosure, but only to the extent of the appended claims:

What is claimed is:

1. In a plumbing system having a plurality of groups of plumbing fixtures, each of said groups including a plurality of said plumbing fixtures, a common water supply for the fixtures of each group, a flush valve for each fixture and an electrically operable actuator for each flush valve; an electrical control system for energizing said electrically operable actuators including main circuit means common to all of said electrically operable actuators and electrically connecting together one side of each thereof, individual circuit means for each electrically operable actuator and connected to the other side of each thereof respectively, and plural branch circuit means each connecting a plurality of different individual circuit means associated respectively with predetermined electrically operable actuators of flush valves, selected one each from several of said fixture groups, and timing switch mechanism for consecutively energizing the branch circuit means to thereby simultaneously actuate the flush valves of selected fixtures only at predetermined timed intervals.

2. The plumbing system described in claim 1 wherein said timing switch mechanism includes means for energizing said branch circuit means consecutively for said time intervals during one portion of a time cycle and for different time intervals during another portion of the time cycle.

3. The plumbing system described in claim 1 wherein said timing switch mechanism includes means for energizing said branch circuit means consecutively for said time intervals during one portion of a time cycle and for different time intervals during another portion of the time cycle, and means in said timing switch mechanism for adjusting the time intervals in any desired time cycle.

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