

AUTOMATIC PHOTOELECTRIC FLUSHING APPARATUSFOR URINALS

5 This invention relates to an automatic
photoelectric flushing apparatus for urinals,
particularly to that type of flushing apparatus with
photoelectric emitting and sensing devices so arranged
that fixed flushing operation will be automatically
effected without incurring any error action.

10 At present, conventional flushing apparatus for
men's stall urinals are confined to the following three
types:-

1) Manual type--using hand press the flushing
valve fixed on the water pipe thereof for flushing
15 operation. The problems of this type are that: if the
water pressure is low, flushing cannot be made
therewith; most users usually either forget to flush or
do not know how to use it; and it is easily infected
with contagious diseases through hand operation.

20 2) Timing type--using a timer to open and close a
water valve for time-fixed flushing operation. The
problems of this type are: it is ineffective to keep the
urinal clean because of the fixed time interval; and it
consumes too much water during the time the urinal is
25 not used at all.

3) Automatic flushing type--using supersonic or
infrared devices to effect flushing operation. In the
supersonic type, error actions often occur for flushing
operation since the stall urinals are installed in a
public lavatory with close array, which is susceptible
to erroneous sound reflection and causes error
operation. As to the infrared type, problems are: if
the distance between the transmitting body and the
reflecting body is too close, error action is easily
35 produced; and if the urinals are installed in a close
array, interference often occurs, resulting in erroneous
flushing operations.

It is accordingly a primary object of this invention to provide an automatic photoelectric flushing apparatus that improves the known flushing apparatus and overcomes the problems associated with the prior art.

5 With the above and other objects in mind, according to the present invention there is provided an automatic photoelectric flushing apparatus for urinals having a flushing device connected to the water pipe thereof, comprising a housing fixed on the water pipe over the
10 top of the urinal in connection with the flushing device; a control means disposed in the housing for switching the flushing device; a photoelectric emitting device arranged in the housing body for generating a light beam and including means for focussing the light
15 beam at a preselected point; and photoelectric sensing means arranged in the housing body for receiving the light beam which will be reflected from an object at the preselected point or between the preselected point and the photoelectric emitting means, in order to sense
20 a said object and provided in connection with the control means so as to automatically effect water flushing in the dependence upon said sensing.

25 These advantages and other features of the present invention will become clear from a preferred embodiment of the invention, described by way of example, conjunction with the accompanying drawings, in which:

Figure 1 is a sectional view of a preferred embodiment of an automatic photoelectric flushing
30 apparatus according to this invention;

Figure 2 is an enlarged sectional view of a photoelectric emitting device and a photoelectric sensing device arranged in the preferred embodiment;

35 Figure 3 is a block diagram showing the operational relationship of the preferred embodiment; and

Figure 4 is a circuit diagram of a control circuit disposed in the preferred embodiment.

Referring to Figure 1 there is shown a preferred embodiment of an automatic photoelectric flushing apparatus for urinals according to this invention, which apparatus comprises: a housing body 2 fixed over the water pipe at the top area of a stall urinal 1 with a flushing device 21 such as an electromagnetic valve installed therein; a control circuit 3 disposed in the housing body 2 for controlling the switching of the flushing device 21; a photoelectric emitting device 30 arranged in the housing body 2 for generating light beam therefrom; and a photoelectric sensing device 31 disposed in the housing body 2 in conjunction with the control device 3 and the photoelectric emitting device 30 for effecting water flushing operation.

The arrangement of the photoelectric emitting device 30 and the photoelectric sensing device 31 is shown in Figure 2, wherein the device 30 includes a concentrating tube 301 and a lens 302 which is capable of concentrating the light beam produced by the photoelectric emitting device 30, and the device 31 also includes a concentrating tube 311 and a lens 312 which is capable of dispersing the light beam produced by the photoelectric emitting device 30. The two light beams respectively produced by the device 30 and the device 31 intersect at point P which is about 40^{cm} away from the center point R defined by the concentrating tubes 301 and 311.

Referring to Figure 3, the operational relationship of the preferred embodiment of the photoelectric flushing apparatus are as follows:

A timing and oscillating device 40 provides stimulating pulses to the photoelectric emitting device 41 for producing the light beam and concentrated through the concentrating action 42 of the concentrating tube and the lens thereof. If the concentrated light beam is

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reflected by a light reflecting object 43, the concentrated light beam will undergo a dispersing action 44 through the concentrating tube and the lens thereof and being sensed by a photoelectric receiving device 45 for being fed into an amplifying circuit 46. The amplified light signals are developed across a sync and comparing circuit 47 and an integrating circuit 48, and are fed into driving circuit 51 through a delay action 49 and a timing and oscillating circuit 50 for actuating the flushing device 52 so as to effect the water flushing operation.

Referring to Figure 4, there is shown a circuit diagram of the control circuit 3 disposed in the preferred embodiment of Figure 1, wherein a pair of timing oscillators 60 and 61 are disposed at both ends thereof for performing flushing control functions. The first oscillator 60 is an astable oscillator while the second oscillator 61 is a monostable type. The oscillating signals generated by the first oscillator 60 will cause a light source 62 combined therewith to produce a light beam to undergo a light concentrating action through lens 63 and concentrating tube 64 of photoelectric emitting device 30. If the concentrated light beam meets a reflecting object presenting in the area within 40CM range, it will be relayed to the photoelectric sensing device 68 through the concentrating tube 66 and the lens 67 of photoelectric sensing device 31 whose function is to turn the concentrated light beam into its original form for facilitating the sensing action of the photoelectric sensing device 68 where the sensed signals will be strengthened through a transistor 69 and an operation amplifier OP. If the strengthened signals are in synchronization with the signals outputted from the pin 3 of the oscillator 60, they will be transferred to the time-delay circuit 71 through a NAND gate, an

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integrating circuit R1, C11 (which is used for preventing error action), and an inverter 601. As the resistance of the resistor R3 is much smaller than that of the resistor R2 in the time-delay circuit 71, most of the signals will pass through the diode D3 and the resistor R3 to charge the capacitor C2 whose charging time can be set in advance. After the charging is done, the signals thereof will be impressed across the pin 2 of the second oscillator 61 through a pair of inverters 602 and 603 connected in series between the time-delay circuit 71 and the oscillator 61. At this time, however, the oscillator 61 will remain unactuated thereat. When the light reflecting object departed from the place, the pin 2 of the oscillator 61 will be changed into a low-potential state, and the oscillator 61 is therefore actuated to conduct therefrom and drive the flushing device 73 to effect water flushing operation. The duration of the drive signals produced by the oscillator 61 can also be set in advance. When the predetermined time is met, no signals will be fed into the flushing device 73, and the water flushing operation is ceased accordingly. On the other hand, if no light reflecting object is present to reflect the light beam to the photoelectric sensing device 68, the input of the NAND gate will be in a reverse direction to that before the presence of the light reflecting object. Therefore, the flushing device 73 remains unactuated thereat.

Referring to Figure 2 again, there is an included angle defined by the concentrating tube 301 of the photoelectric emitting device 30 and the concentrating tube 311 of the photoelectric sensing device 31. The purpose of this included angle is to ensure that only the light reflecting object is present within the effective range (40cm), can the control circuit 3 be actuated so as to avoid error action in flushing operation.

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In shall be appreciated that the frequency required for the time and oscillating device can be arranged with different ranges, particularly when a plurality of stall urinals have to be installed in one place, so that no
5 interference will occur for producing error action.

(12)

CLAIMS:

1. An automatic photoelectric flushing apparatus for urinals having a flushing device connected to the water pipe thereof, comprising
- 5 a housing fixed on the water pipe over the top of a urinal in connection with the flushing device;
- a control means disposed in the housing for switching the flushing device;
- 10 a photoelectric emitting means arranged in the housing for generating a light beam and including means for focussing the light beam at a preselected point, and photoelectric sensing means arranged in the housing for receiving the light beam which will be reflected from an
- 15 object at the preselected point or between the preselected point and the photoelectric emitting means, in order to sense a said object and provided in connection with the control means so as to automatically effect water flushing in dependence upon said sensing.
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2. An automatic photoelectric flushing apparatus according to Claim 1, wherein said control means comprises
- 25 a first oscillator disposed for generating oscillating signals to said photoelectric emitting means in producing the beam thereof;
- a photoelectric sensing circuit provided in connection to said first oscillator;
- a transistor coupled with said sensing circuit;
- 30 an operation amplifier connected to said transistor;
- a NAND gate circuit combined with an inverter connected to said operation amplifier;
- a time-delay circuit combined with a pair of inverters coupled with said NAND gate circuit; and
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a second oscillator connected to said inverters and the flushing device for automatically effecting water flushing operations.

5 3. An automatic photoelectric flushing apparatus according to Claim 1 wherein said photoelectric emitting means comprises
a first light concentrating tube provided in said housing ~~body~~ and
10 a first lens installed in said first light concentrating tube for concentrating the light beam produced thereat.

4. An automatic photoelectric flushing apparatus
15 according to Claim 1 wherein said photoelectric sensing means comprises
a second light concentrating tube provided in said housing ~~body~~ in conjunction with said first light concentrating tube of said photoelectric emitting
20 means and
a second lens installed in said second concentrating tube for dispersing the light beam produced by said photoelectric emitting means.

25 5. An automatic photoelectric flushing apparatus according to Claim 4, wherein the arrangement of said second concentrating tube is characterized in that an included angle is formed between said first concentrating tube and said second concentrating
30 tube.

6. An automatic photoelectric flushing apparatus according to Claim 5, wherein said included angle is characterized in that the distance between the intersect~~ion~~ point and the center point of said first and
35 second lenses is ~~preferably~~ 40 centimeters.



7. An automatic photoelectric flushing apparatus according to Claim 2, wherein said oscillators are characterized in that different frequencies can be arranged for meeting the requirement of a plurality of
5 urinals installed ⁱⁿ on one place so as to eliminate possible interference thereof.

8. An automatic photoelectric flushing apparatus according to Claim 2, wherein said oscillators are
10 characterized in that the first oscillator is an astable type while the second oscillator is a monostable type.

9. An automatic photoelectric flushing apparatus for
15 urinal substantially as hereinbefore described with reference to the accompanying drawings of Figure 1 through to Figure 4.

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