May 9, 1939. L. E. HANSEN 2,157,664

RETARDED SWITCH

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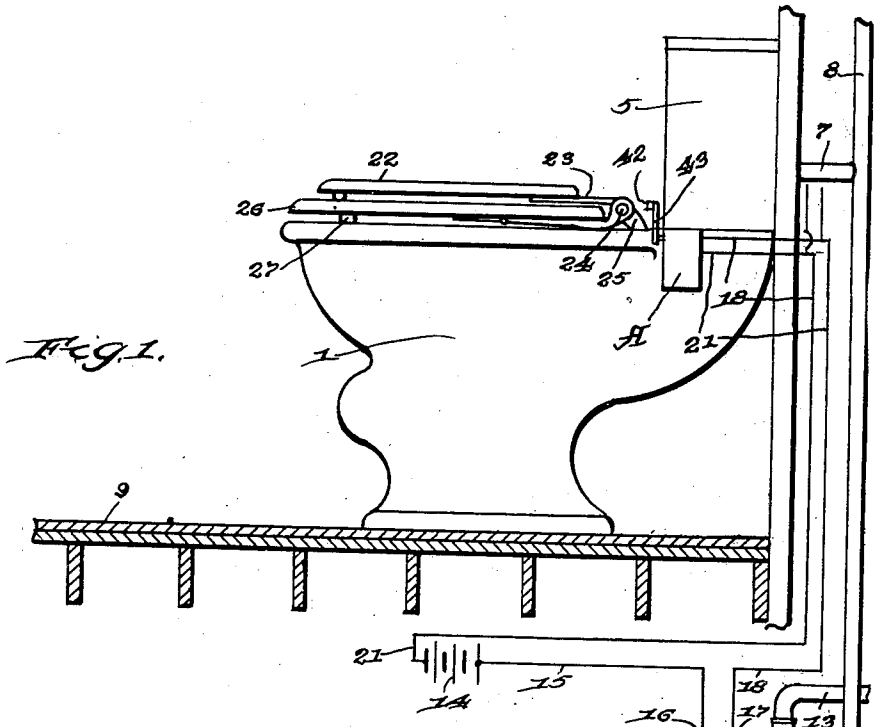


Fig. 1.

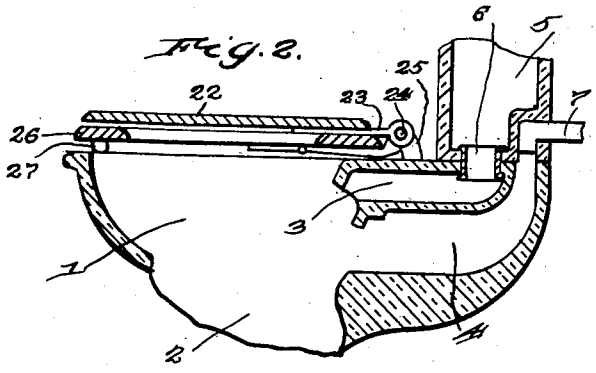


Fig. 2.

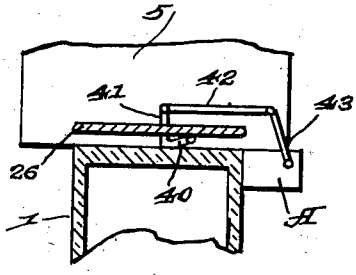


Fig. 4.

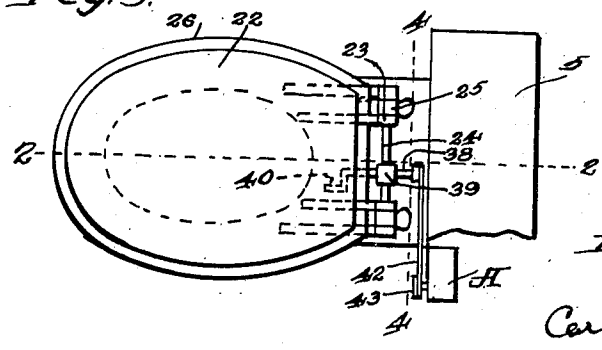


Fig. 3.

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Fig. 5.

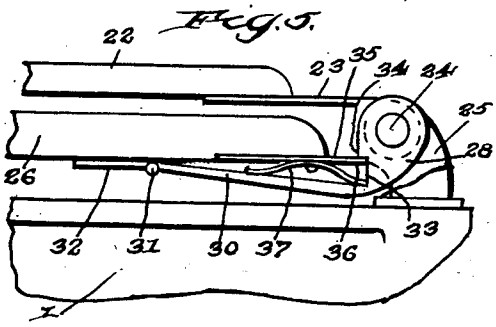


Fig. 6.

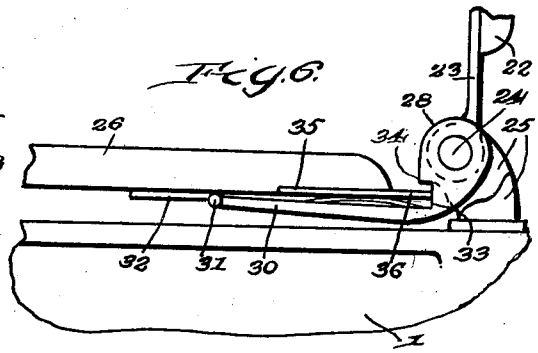


Fig. 7.

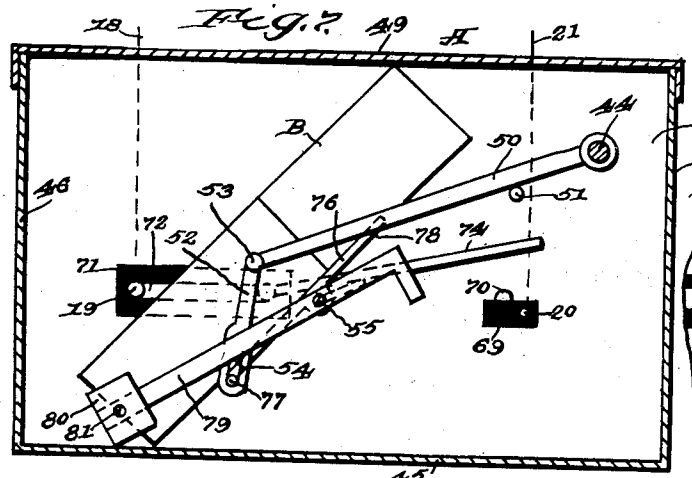
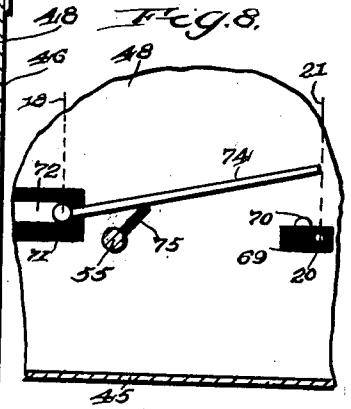


Fig. 8.



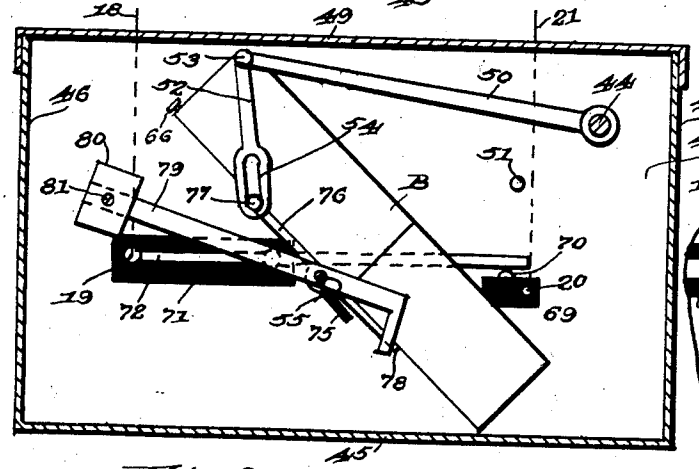
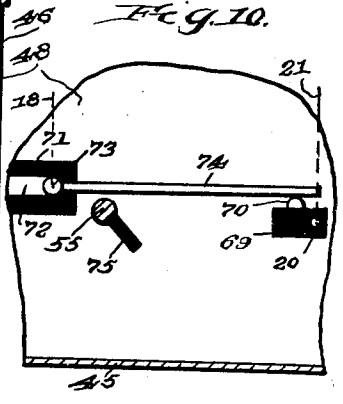


Fig. 9.

Fig. 10.



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Fig. 11.

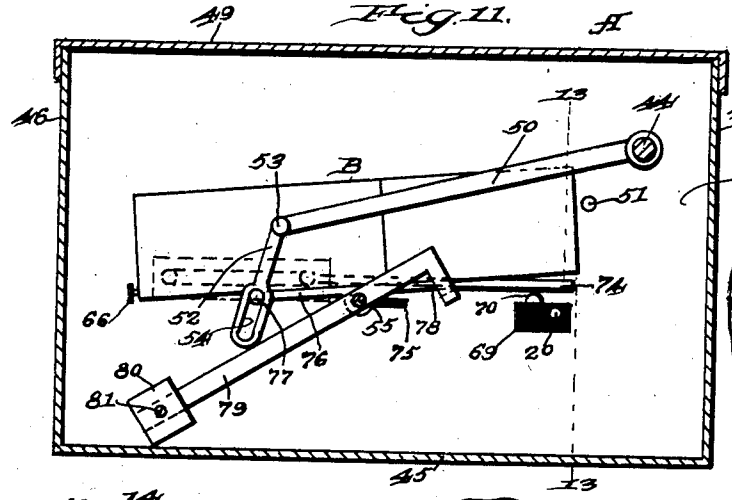


Fig. 12.

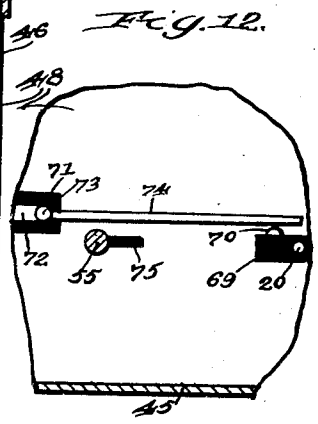


Fig. 13

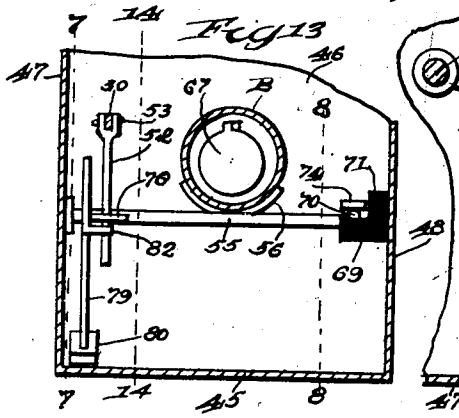


Fig. 14

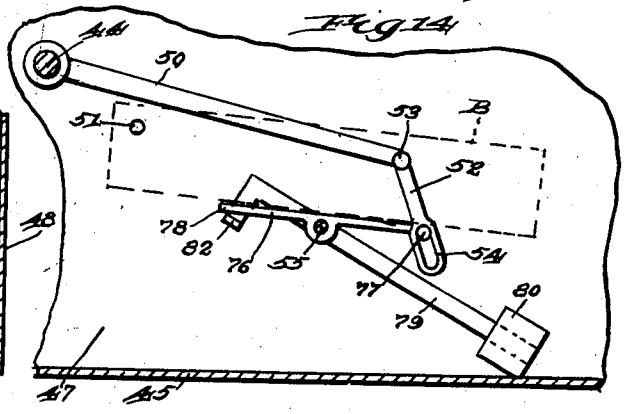
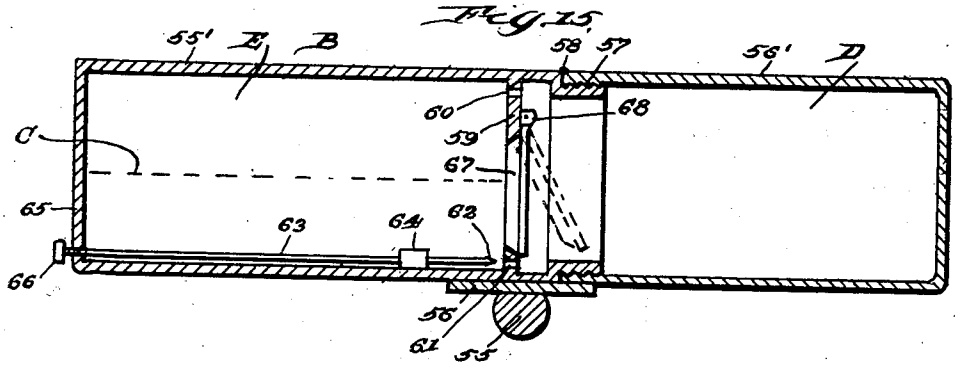


Fig. 15.



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Patented May 9, 1939

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UNITED STATES PATENT OFFICE

2,157,664

RETARDED SWITCH

Louis E. Hansen, Spokane, Wash., assignor of twenty-four and one-half per cent to William B. Robinson and twenty-four and one-half per cent to Albert Rutherford, both of Spokane, Wash.

Application April 27, 1938, Serial No. 204,553

7 Claims. (Cl. 200—33)

The object of this invention is to provide a novel form of ventilating means for toilets, and also to provide a novel type of time mechanism for limiting the operation of said ventilating means.

It is a feature of the invention to withdraw the foul air from the toilet during occupancy of the user, and for a limited time after the user has vacated the seat, so that the room in which the toilet is located will be free from the usual bad odor resulting from human use of the toilet.

A special feature of the invention resides in a novel means incorporated in the hinged connection of the seat which permits of the seat being swung from operative and inoperative positions, and which also provides for initiation of the operation of my improved ventilating means as a result of the imposition of the weight of the occupant upon the seat.

The invention includes a suction means or fan with a suitable prime mover which are interposed in an electric circuit having a switch for closing and opening the circuit, and a primary feature of the invention resides in a switch actuator which functions to close the switch when an occupant is disposed on the seat and which maintains the switch closed for a period of time dependent upon the manner in which the actuator is adjusted.

The invention has many other objects and features which will be more fully described in connection with the accompanying drawings and which will be more particularly pointed out in and by the appended claims.

In the drawings:

Fig. 1 is a view of a toilet bowl in side elevation and showing the attachment of the device of my invention thereto.

Fig. 2 is a sectional view on line 2—2 of Fig. 3, showing the internal construction of the toilet bowl.

Fig. 3 is a plan view of the bowl shown in Fig. 2.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3, looking toward the right of the latter.

Fig. 5 is a fragmentary view of a portion of the bowl and the seat and cover with both of the latter in a closed position.

Fig. 6 is a similar view with the cover tilted into an open position and the seat shown under stress of the weight of an occupant.

Fig. 7 is an enlarged sectional view of the actuator taken on line 7—7 of Fig. 13, and showing the time body in one extreme position which is a starting or non-operating position.

Fig. 8 is a fragmentary sectional view on line 8—8 of Fig. 13, showing the position of the switch when the parts are in the Fig. 7 position.

Fig. 9 is a view similar to Fig. 7, with the time body in an extreme switch closing position.

Fig. 10 is a view similar to Fig. 8, showing the switch closed.

Fig. 11 is a view similar to Figs. 7 and 9, showing the time body rocked back into a return flow position with the switch still in a closed position.

Fig. 12 is a view similar to Figs. 8 and 10, showing the switch closed.

Fig. 13 is a sectional view on line 13—13 of Fig. 11, looking toward the left of the latter.

Fig. 14 is a sectional view taken on line 14—14 of Fig. 13, looking toward the left of the latter.

Fig. 15 is an enlarged sectional view of the time body.

Like characters of reference designate similar parts throughout the different figures of the drawings.

First referring to Figs. 1 to 6, 1 designates a toilet bowl having the usual main receiving cavity 2 and provided with a water flushing passage 3 and an air withdrawal passage 4. A water tank 5, equipped with the usual controlling means, not shown, opens at 6 for delivery of flushing water to passage 3, which discharges into the receiving cavity 2 of bowl 1. An air vent pipe 7 leads from passage 4 and may join pipe 8 adapted to extend to an upper story or stories of the building. Pipe 8 extends below the floor 9 and connects with a fan 10 at the intake thereof. A prime mover, which may be an electric motor 11, is shown having its shaft 12 directly connected with fan 10. A discharge pipe 13 leads from the periphery of the fan 10 to a suitable outdoor or other point of discharge for the foul air.

A suitable source of current 14 has one pole connected by a lead 15 with one pole 16 of motor 11, the remaining pole 17 being connected by a lead 18 which joins one terminal 19 (Fig. 7) of a switch which is controlled by my improved time actuator. The remaining terminal 20 of said switch is connected with lead 21, which is in turn connected with the remaining pole of the source of current 14.

Reference will next be made to the seat and cover of the bowl and to the manner in which the former functions in connection with the device of my invention.

The cover is indicated at 22 and is provided with hangers 23, which are journalled on a rod 24, mounted in bearings 25, secured to bowl 1. Thus the cover can be tilted upwardly as shown

in Fig. 6 or disposed in overhanging relation to the seat 26, as shown in Fig. 5. Seat 26 has the usual rubber or like studs 27 for engagement with the forward margins of the bowl 1, which, in this invention, also form fulcrums for the seat 26 as will presently appear.

Reference will next be made to the manner in which the seat is hinged and to the means whereby the seat is rendered capable of actuating my improved switch actuator.

The seat 26 is connected with shaft 24, by hangers which are identical in form and function hence only one need be described in detail.

The seat hanger (Figs. 5 and 6) is designated at 28 which is journalled on rod 24, and is provided with a hanger arm 30 that extends under seat 26 and is pivoted at 31 to a strap 32, which latter is secured to the bottom of said seat. Said hanger is provided with a recess 33, which provides a retaining shoulder 34. A retaining bar 35 is secured to the bottom seat 26 and its free end 36 projects into the recessed portion 33 so as to be able to engage shoulder 34. A spring which may be a strip spring 37 is secured to bar 35 and its free ends engage the top of hanger arm 30, and said spring normally sustains the retaining bar 35 in engagement with shoulder 34, as shown in Fig. 5. This avoids a loose or wobbly connection when the seat is swung upwardly. When the weight of an occupant is imposed on the seat the spring 37 yields, as shown in Fig. 6, and the seat 26 fulcrums on studs 27 with the rear end of the seat descending from the normal, as will now be clear by viewing Fig. 6. When the occupant rises spring 37 restores the rear end of seat 26 to the normal position shown in Fig. 5.

Reference will next be made to the manner and means whereby depression of the rear end of the seat actuates my improved switch actuator.

A crank shaft 38 (Figs. 3 and 4) is journaled in a bearing 39, mounted on bowl 1, and the forward end of said shaft has a crank 40 which extends under the rear margin of seat 26. The rear end of shaft 38 has an arm 41 connected with link 42, which in turn is connected with arm 43, which latter is mounted on shaft 44 (Fig. 7) of my improved actuator, which is generally indicated at A.

It will now be clear that when seat 26 is depressed crank 40 will shift arms 41 and 43 with link 42 to the right of Fig. 4, thereby turning shaft 44 in a clockwise direction, viewing Fig. 7. A restoring spring may be applied to restore the parts to the Fig. 4 position if desired, but in practice I have not found it necessary.

Reference will next be made to my improved actuator as shown in Figs. 7 to 15.

The actuator A is shown including a casing which may be of electrical insulating material and which may comprise a bottom 45, end walls 46, side walls 47 and 48, and a removable cover 49. The actuating shaft 44 is journalled in side walls 47 and 48 and is provided with an actuating arm 50 which is limited in one direction of movement by a stop 51. A floating link 52 is pivoted to said arm 50 at 53 and has a slotted portion 54.

A rock shaft 55 is journalled in side walls 47 and 48 and has suitably secured thereto a liquid containing time body generally indicated at B. As shown in Figs. 13 and 15, body B is mounted on a saddle 56 and secured thereto in any desired manner, the mounting being substantially midway of the length of said body B and below the liquid contents thereof.

As shown, said body B is in the form of a tube which may be cylindrical and is comprised of sections 55' and 56', threaded together as at 57 and sealed as at 58 to form a substantially air and liquid tight body. Said body contains any suitable form of liquid, the level of which is indicated at C. Said body is divided off by valve means into switch closing and opening chambers D and E, respectively. Said valve means or structure includes a valve seat 59 suitably secured to section 55' and provided above the normal liquid level with a restricted air passage opening 60 to permit of transfer of air from chamber E to D, and vice versa, as the time body B is rocked to different positions.

Said valve seat 59 is also provided, preferably below the liquid level, with a liquid passage 61. This passage 61 permits the liquid to pass slowly from chamber D to chamber E, as will later appear. In order to control this passage of liquid I provide means for varying its flow through said opening 61 in order to contract or extend the duration of movement of body B, and hence vary the duration at which the switch is closed.

As shown, I taper the opening 61 and provide a valve 62 which is mounted on a stem 63 that is journalled in bearing 64 and threaded in end wall 65, and provided with a finger grip 66. By turning grip 66 the valve 62 may be projected or retracted to more or less close opening 61 and thereby vary the time of passage of the liquid from switch closing chamber D to switch opening chamber E. A valve closure is indicated at 67 which is hinged at 68, and which coacts with valve seat 59. When body B is tilted or rocked into the Fig. 9 position, closure 67 is opened by thrust of the liquid and permits the latter rapidly to transfer from chamber E to chamber D. When body B is tilted or rocked into the Figs. 7 or 11 positions, the impulse of the liquid will shift closure 67 against its seat 59 to close passage of the liquid from chamber D to chamber E, except for opening 61, as will later appear.

Reference will next be made to the mechanism for actuating body B.

Reference will first be made to the electric switch which includes the terminal 20, which may comprise a block of insulating material 69 secured to wall 48, and having a switch element 70. An insulating strip 71, secured to wall 48, has a conducting bar 72 secured thereto and connected with lead 18. Pivoted to this bar 72 at 73 is a switch member 74 adapted to contact switch member 70 to close the circuit, this engagement being by gravity when member 74 is released. Rock shaft 55 has a means which may be an arm 75, of insulating material, which serves to elevate member 74 out of engagement with member 70 to open the circuit when shaft 55 is rotated in one direction, and when rotated in another direction, arm 75 permits switch member 74 to engage switch member 70, by gravity, to close the circuit.

A body rocking bar 76 is rigidly mounted between its ends to rock shaft 55 and one end has a stud 77 which is slidable in the slotted portion 54 of link 52. The remaining end 78 is adapted for engagement with a weight lever which I will next describe. Said weight lever is indicated at 79 and is rotatively mounted on rock shaft 55 to oscillate thereon freely and independent of the rotative position of shaft 55. On its longer end I fix a weight 80 by means of a set screw 81, whereby the

weight may be adjusted to different longitudinal positions on said lever. The remaining end of said lever 79 (Fig. 13) has a lug 82 which extends into the path of end 78 of rocking bar 76. Thus, when bar 76 is rocked into the Fig. 9 position it will engage lug 82 and rock the weight lever 79 upwardly as shown, thereby lifting weight 80 out of contact with the bottom wall 45.

While the operation may be clear from the foregoing, it will be briefly recapitulated as follows:

When the cover 22 is raised (Fig. 6) and seat 26 is in the Fig. 5 position, the actuator will be in one extreme or starting position, as shown in Fig. 7. When the user of the toilet imposes his weight on seat 26 the spring 37 will yield and the rear portion of the seat will descend about the studs 27 (Fig. 2) as a fulcrum. The crank 40 (Fig. 4) will be shifted downwardly against the top of bowl 1 thereby shifting arm 43 to the right and rotating shaft 44 (Fig. 9) in a clockwise direction to elevate arm 50 and link 52, which will raise stud 77 and hence tilt body B. Lug 82 will engage end 78 and tilt weight lever 79 and raise weight 80 into an active position. With body B in the extreme switch closing position, as shown in Fig. 9, the liquid previously disposed in end E of body B will engage and swing closure 67 into an open position, as shown in dotted lines in Fig. 15, thereby allowing the liquid quickly to pass into the switch closing end D of body B.

The air in end D will be shifted through opening 60 and also through the valve seat, into end portion E, so that no resistance will be offered against passage of the air from chamber D to chamber E. Thus body B will be heavily counterbalanced to retain it in the Fig. 9 position. When this position has been attained by engagement of the lower slotted end of link 52, with stud 77, the arm 75 (Fig. 10) will have swung downwardly thereby allowing switch member 74 to descend into engagement with switch member 70 to close the circuit. This will start motor 11 and fan 10, and air will be withdrawn through passage 4 (Fig. 2) of bowl 1, through pipe 7, into pipe 8, and thence to fan 10, and discharged therefrom through pipe 13. The circuit can be extended to upper floors of an apartment house, and likewise pipe 8, so that the same motor and fan equipment can service toilets in upper stories of a house or apartment. As long as the occupant remains upon the seat the fan will operate, and the parts will remain in the position just described.

As soon as the occupant rises from seat 26, spring 37 will recoil and force end 36 into engagement with shoulder 34, thereby allowing crank 40 to return to the Fig. 4 position. The weight of arm 50 will serve to perform this function. Thus, when crank 40 releases shaft 44, arm 50 will descend toward stop 51 and the slotted end of link 52 will assume the Fig. 11 position. Just as soon as rotative thrust on shaft 44 has been released, weight 80 will lower lever 79 to the Fig. 11 position, causing lug 82, which has been in engagement with end 78 of rock bar 76, to rock body B into the return flow position shown in Fig. 11, in which position the chamber E is slightly lower than chamber D, and hence the liquid will seek to enter the former chamber by gravity. In other words, the body B is inclined from the horizontal for this purpose. Engagement of weight 80 with bottom wall 45 prevents further movement of body B, and the weight is of sufficient heft to tilt body B back to the Fig. 11 position, in spite of the over-balance caused by the major portion of the liquid being in chamber D. Such movement of body B will of course cause the liquid to engage closure 67 and seat the same so that the liquid cannot flow through the closure opening of seat 59. Arm 75 (Fig. 12) will not elevate switch member 74, therefore the circuit will remain closed and the fan will continue to operate.

Body B will remain in the Fig. 11 position as the liquid slowly passes through opening 61 in seat 59, into chamber E, and this will take some time, the duration of which may be changed by adjustment of rod 62, to vary the speed or volume of liquid passing through opening 61. Opening 60 in the top of seat 59 will permit the air to pass from chamber E to chamber D as fast as the liquid is transferred from the latter to the former so that the air will offer no resistance to such passage.

As soon as enough liquid has passed through opening 61 from chamber D to chamber E, so that a greater weight will be disposed in the latter, then this weight or over-balance of liquid will automatically rock body B from the Fig. 11 to the Fig. 7 position, and stud 77 will descend into the lower end of the slotted link 52 and arm 75 will elevate switch member 74 out of contact with switch member 70 and open the circuit thereby causing the motor 11 to cease operating.

Thus the parts will now be in a starting position as first described. It will now be clear that while there is not, strictly speaking, a lost motion connection between lug 82 and end 78, there is a lost motion action between these parts.

Thus it will be seen that the body B is equipped with means for causing the liquid to move more freely from one chamber to the other, when said body is tilted into one position, and when tilted into another position, the liquid moves less freely from one chamber to the other.

It is also pointed out that if the seat is depressed momentarily and then released, the body B will immediately be tilted from a switch opening to a return flow position, and if the seat is released quickly enough to prevent much of the liquid from entering chamber D, the body B will quickly be returned to a switch opening position by the weight 80.

It will be clear that when the switch actuator is used in capacities other than that shown, arm 50, shaft 44, and link 52 may be omitted and manual or mechanical rotary thrust may be applied directly to the rock shaft 55'.

It will be seen that the tube B is mounted to shaft 55, at a point which is clearly below the liquid contents of the tube when the latter is in the Fig. 11, position, which is an active and functioning position as far as the liquid is concerned. This mounting of the tube B, affords the liquid a greatly increased leverage to rocking the tube, as will now be clear. Further, this feature is enhanced by the fact that the valve 67 is hung at 68, which is near the top of tube B, which permits the valve to open and close freely.

It is believed that the device of my invention will be fully understood from the foregoing description, and while I have herein shown and described one specific form of my invention, I do not wish to be limited thereto except for such limitations as the claims may import.

I claim:

1. In a time actuator for electric switch devices, an electric switch, a rocking time body adapted to contain an actuating liquid, a non-return valve means dividing said body into switch opening and closing chambers and said valve structure opening

under liquid impulse for quick transfer of the liquid from said switch opening to said switch closing chamber when said body is manually or mechanically rocked from a switch opening to a switch closing position, and said valve means having restricted air and liquid openings for delayed passage of the liquid back to said switch opening chamber, a weight for rocking and holding said body into a return flow position, means actuated by said body for causing said switch to close when said body is in switch closing and return gravity flow positions and opening said switch when the return flow has over-balanced said body into a switch opening position, and means for regulating one of said openings to vary the timing action of said body.

2. In a time actuator for electric switch devices, an electric switch, a rocking time body adapted to contain an actuating liquid, a non-return valve means dividing said body into switch opening and closing chambers and said valve means opening under liquid impulse for quick transfer of the liquid from said switch opening to said switch closing chamber when said body is rocked from a switch opening to a switch closing position, and said valve means having restricted air and liquid openings for delayed passage of the liquid back to said switch opening chamber, means for rocking and retaining said body into a return gravity flow position, and means actuated by said body for causing said switch to close when said body is in switch closing and return flow positions and opening said switch when the return flow has overbalanced said body into a switch opening position.

3. In a liquid time actuator for electric switch devices, an electric switch, a rocking time body having valve means dividing said body into switch opening and closing chambers and opening for quick transfer of the liquid from the former to the latter and restricting return movement from the closing to the opening chamber, means having lost motion connection with said body for rocking the latter into a switch closing position and then releasing the same, a weight for rocking and holding said body into a return flow position in opposition to the liquid in said switch closing chamber for delayed gravity transfer of the liquid to said switch opening chamber, and means actuated by said body for causing said switch to close when said body is in switch closing and return flow positions and opening said switch when the return flow has overbalanced said body into a switch opening position.

4. In a liquid time actuator for electric switch devices, an electric switch, an air sealed rocking time body having a valve seat and valve closure dividing said body into switch opening and closing chambers and said closure opening toward the latter for quick transfer of the liquid thereinto and closing against return of the liquid to said opening chamber, said seat having an air opening above the liquid level and a restricted liquid opening below said level for transfer of air to either chamber and restricted transfer of liquid from said closing to said opening chamber, respectively, mechanism for rocking said body from a switch opening to a switch closing position and then rocking said body back to a return flow position, means actuated by said body for causing said switch to remain closed while said body is in switch closing and return flow positions and opening said switch when the return flow has overbalanced said body into a switch opening position.

5. In a liquid time actuator for electric switch devices, an electric switch, a rocking time body having means for causing the contents to flow more easily in one direction than in the other, mechanism for rocking said body into one extreme position to quickly transfer the contents into one portion of said body and then rocking said body into a return flow position for effecting slow gravity flow into another portion of said body to cause the liquid to rock said body into another extreme position, and means actuated by said body to cause prolonged closing of said swtich while said body is in one extreme position and during its return flow position and serving to open said switch when said body is rocked into the remaining extreme position.

6. In a liquid time actuator for electric switch devices, an electric switch, a rocking time body having means permitting the contents to flow quickly into one portion and slowly into another portion of said body, means for rocking said body into one extreme position to quickly transfer the contents into one portion and then releasing said body, means for immediately rocking said released body into a return flow position for a prolonged duration while the contents is slowly flowing into another portion of said body sufficiently to rock the latter into another extreme position, and means actuated by said body for causing said switch to remain closed through the duration in which said body is in a return flow position and acting to open said switch when said body attains the last named extreme position.

7. In a liquid time actuator for switches, an electric switch, a liquid containing time tube, means rockably mounting said tube substantially between its ends and below the liquid contents thereof to permit the liquid to increase its leverage in rocking said tube about a substantially horizontal axis, a non-return valve in said tube hung near the top thereof to open freely under liquid impulse for quick transfer of the liquid from one portion of said tube to another and closing under liquid impulse for delayed transfer of the liquid to another portion of said tube as the latter is rocked to various positions, and means actuated by said tube to cause prolonged closing of said switch while said tube is moving from one position to another and serving to open said switch when said tube is rocked to another position.

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