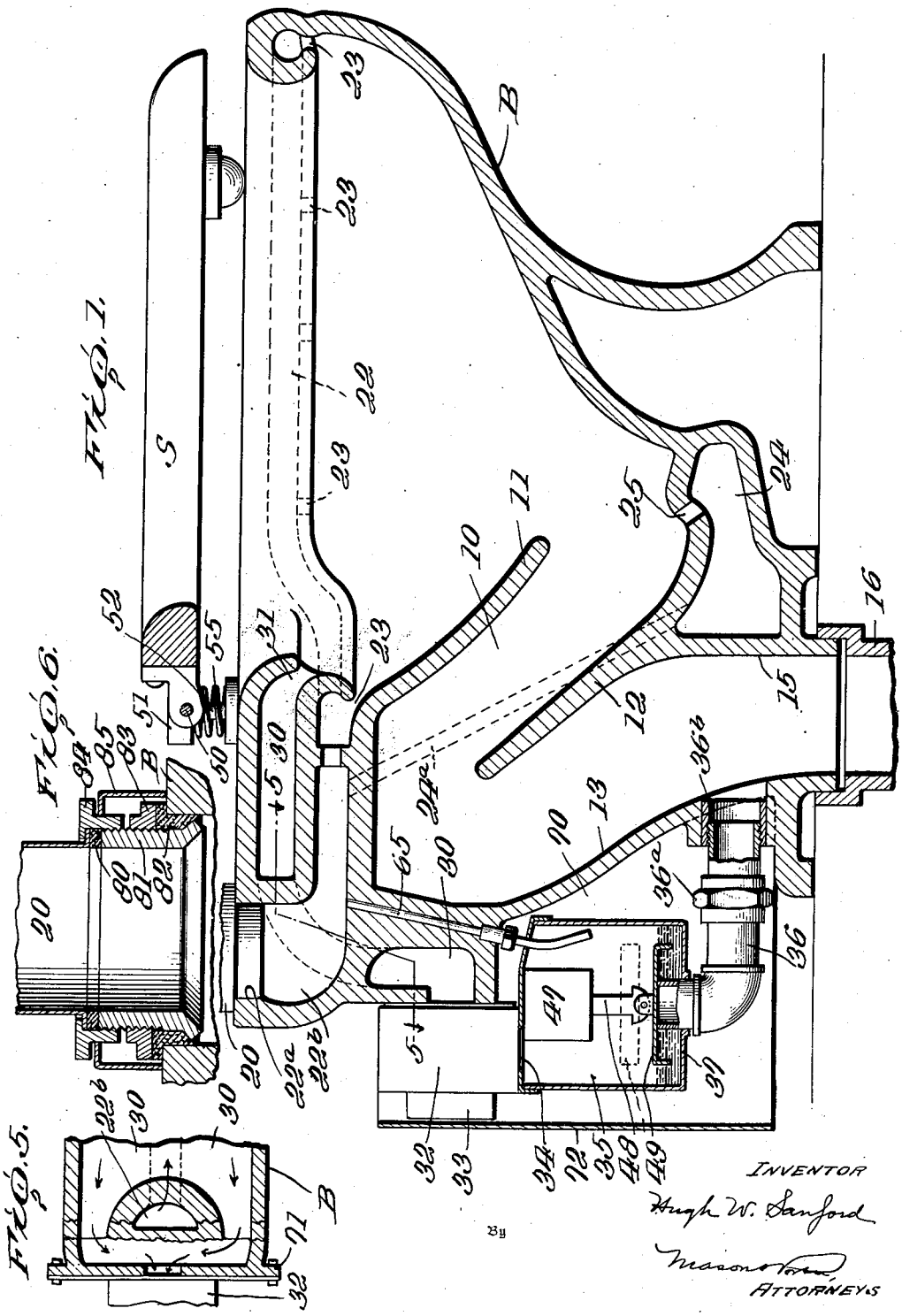
Sept. 14, 1943. H. W. SANFORD 2,329,221

DEODORIZER

Filed April 10, 1941 3 Sheets-Sheet 1



Sept. 14, 1943. H. W. SANFORD 2,329,221

DEODORIZER

Filed April 10, 1941 3 Sheets-Sheet 2

FIG. 2.

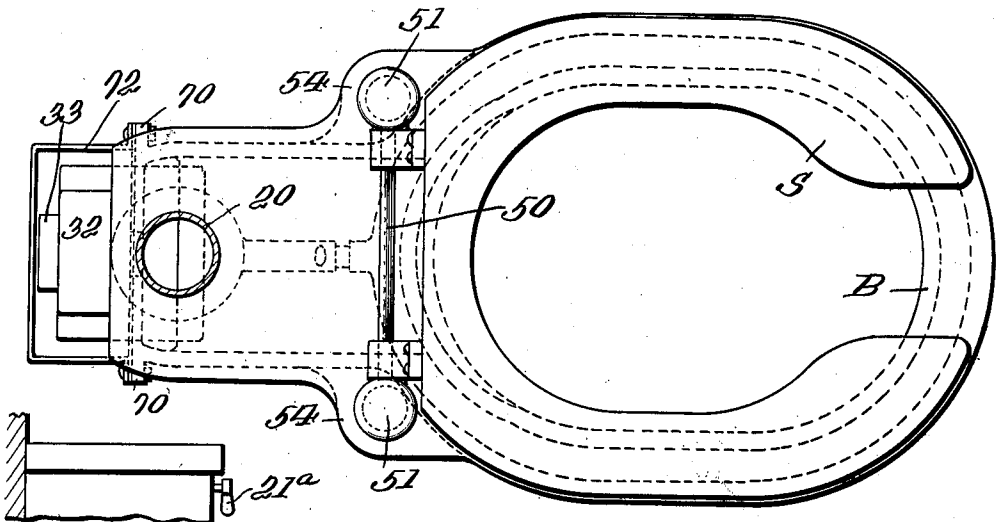


FIG. 3.

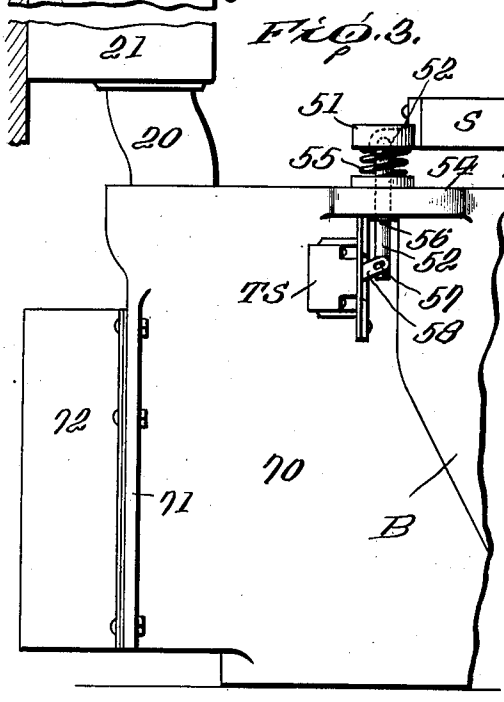
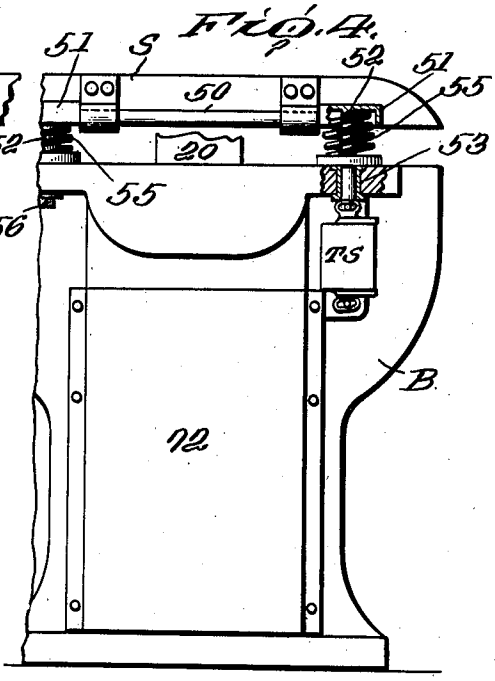


FIG. 4.



INVENTOR

Hugh W. Sanford,

By

Mason Fenwick

ATTORNEYS

Sept. 14, 1943. H. W. SANFORD 2,329,221

DEODORIZER

Filed April 10, 1941 3 Sheets-Sheet 3

FIG. 7.

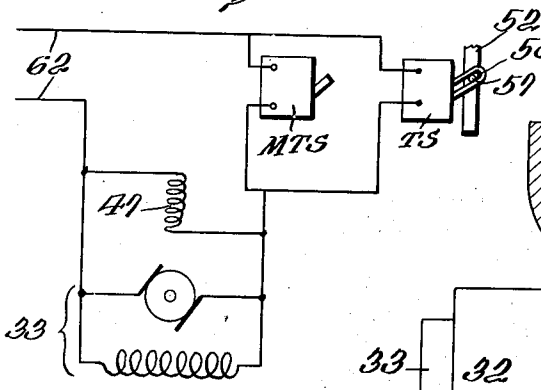


FIG. 8.

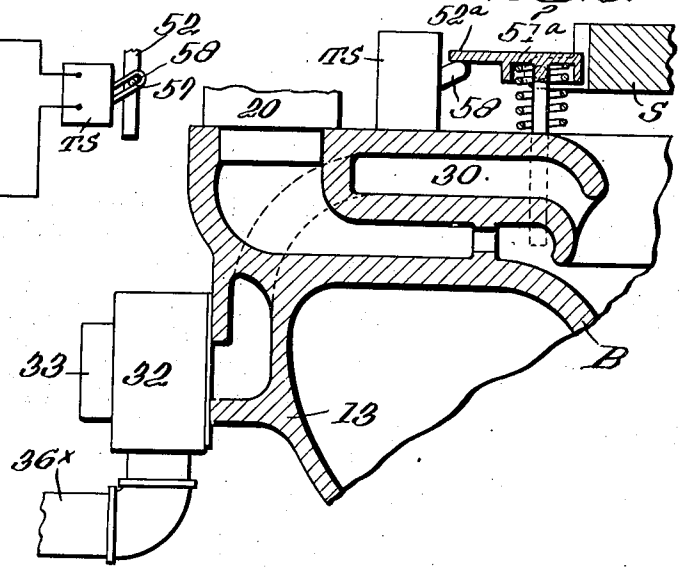


FIG. 9.

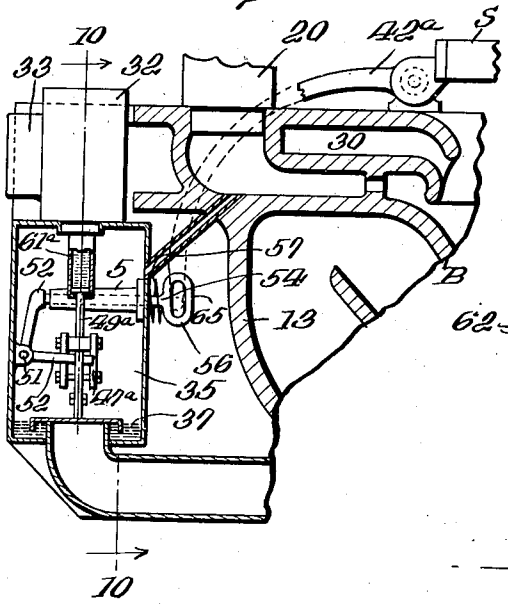
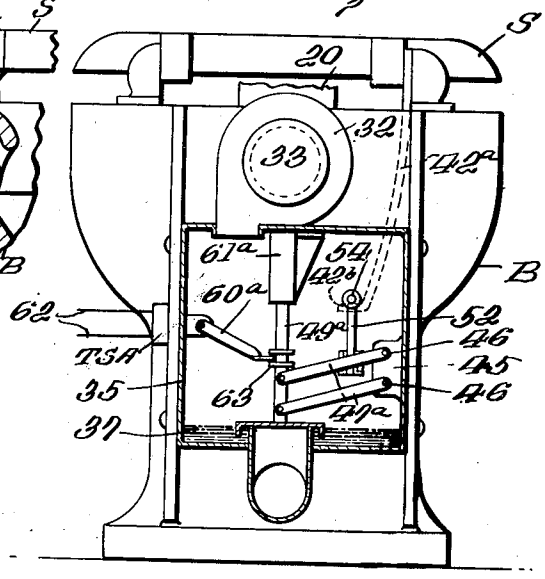


FIG. 10.



INVENTOR
Hugh W. Sanford,

By

ATTORNEYS

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UNITED STATES PATENT OFFICE

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DEODORIZER

Hugh W. Sanford, Knoxville, Tenn.

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8 Claims. (Cl. 4—213)

This invention relates to ventilating and deodorizing constructions for toilets.

One of the features of the invention is the provision of means by which gases are withdrawn from the toilet bowl and discharged into a duct, and including power means for effecting the withdrawal of the gases and timing devices whereby the energization of the power means is continued for a predetermined time after the operation has been performed and shutting off the power.

Another feature of the invention is the provision of means by which gases are withdrawn from the toilet bowl and discharged into a duct, and for preventing at all times the return of sewer gases to the toilet bowl.

Another feature of the invention is the provision of means for causing withdrawal of gases from the toilet bowl while occupied, and automatically effective for preparing a path for such gases whereby the same are delivered into a discharge duct, with a construction and arrangement for interrupting the said path when the discharging system becomes quiescent again.

A further feature of the invention is the provision of means for withdrawing gases from the toilet bowl and for preparing a path by which they are discharged into a duct, together with time-delay means for assuring a continuance of operation during the period when normally odors might be discharged from the bowl, said parts being constructed and arranged to be restored to an initial condition at which gas cannot pass from the duct to the room.

A still further feature of the invention is a provision of electrically-operated means for effecting withdrawal of gases from the toilet bowl, together with conjointly actuated means for opening a path to a discharge duct while the gas-withdrawing devices are in operation.

Another feature of the invention is the provision of simple and convenient parts for installation as a whole, or as an attachment to a prior installation of an existing toilet bowl of proper design.

With these and other features as objects in view, illustrative forms of practicing the invention are shown in the accompanying drawings, in which:

Figure 1 is an upright sectional view through a toilet having the deodorizing structures attached thereto.

Figure 2 is a top plan view.

Figure 3 is a side elevation of a part of the bowl, and showing the external appearance of the structural parts.

Figure 4 is an end view corresponding to Figure 3.

Figure 5 is a sectional view substantially on line 5—5 of Figure 1, showing the relationship of water and air passages.

Figure 6 is a detailed view showing a water- and gas-proof connection.

Figure 7 is a diagrammatical view showing circuit connections.

Figure 8 is a view corresponding to a portion of Figure 1, showing a modified manner of mounting an electrical control switch, and for providing a quick discharge of gases.

Figure 9 shows a further modified form which employs a mechanical actuation of the gas trap devices.

Figure 10 is an upright sectional view substantially on line 10—10 of Figure 9, showing the gas trapping device and actuating structures therefor.

In the illustrative form shown in Figs. 1 to 5, the toilet bowl B is illustrated as having the usual reception cavity which communicates with the usual discharge passage 10 located between the downwardly extending rear wall 11 and the upwardly extending web wall 12. The wall 13 of the body coacts with the web wall 12 to provide a siphon passage 14 leading to the connection 15 with the sewer pipe 16.

It will be understood that flushing water may be supplied to the bowl in any suitable manner, usually with the employment of a manually operable flushing valve. By way of illustration, the toilet bowl is indicated as connected by a drop pipe 20 with a tank 21 (Fig. 3) which contains the usual valves and a control 21*a* whereby flushing water may be delivered into the spud hole 22*a* (Fig. 1) and thence to the chamber 22*b* and to the water passage 22 in the rim, from which it is discharged through the usual rim holes 23 into the bowl, for flushing the internal surfaces thereof. Further, it will be understood that water passages 24*a*, and including the base chamber 24, may be used to deliver water to the jet opening 25, this opening being so directed that the jet of water issuing therefrom accelerates the discharge movement of the contents of the bowl along the passage way 10.

In accordance with this invention, the bowl also is provided with a passage 30 for air which (Figure 5) illustratively extends around the water passage 22*b* and has the communication opening 31 at its forward end by which air and gases may

be withdrawn from the toilet bowl. The air passage 30 is illustrated as being cored within the porcelain of the bowl and opening at the rear surface thereof. In the form illustrated in Figure 1, a fan 32 of centrifugal type is actuated by an electric motor 33 and serves for receiving gases from the passage 30, and delivering them through a discharge port 34 into a chamber 35 having enclosing walls which shut the interior off from the atmosphere save for the port opening 34, a discharge connection through an outlet pipe 36, and a water replacement duct 65. The outlet pipe 36 in Figure 1 is shown as leading to the sewer pipe connection 15, so that the gases are discharged to the sewer line, and thus may escape either upwardly or downwardly in the usual sewer stack. The outlet pipe 36 is provided with a coupling union 36a and may have its outlet stub threaded into a sleeve 36b in the porcelain wall 13, or may be connected thereto as shown in Figure 6. The inlet end of outlet duct 36 extends upwardly above the floor of the chamber 35, so that an annular space 37 is provided by the end of the duct 36, the floor of the chamber 35, and the wall of the chamber 35 for containing a sealing liquid.

Within the chamber 35 is a solenoid 47 having a plunger 48 connected to a bell 49 which has a closed top and skirt, with the skirt adapted to enter the annular sealing space 37 as aforesaid. In the form shown, plunger 48 is connected to the bell 49 by loose pivot means, so that the bell adjusts and sets itself upon the upper end of the discharge duct 36 when the solenoid 37 is de-energized.

The toilet also includes a seat S mounted on a pivot rod 50 so that it may be swung in the usual manner. The pivot rod 50 is carried by the upper caps 51 of stems 52 which are guided in sleeves 53 (Figure 4) in ears 54 illustratively integral with the porcelain bowl B. The springs 55 normally hold the caps 51 in raised position, but are depressed when the seat S is occupied. The stems 52 are provided with pins 56 beneath the ears 54, to prevent separation of parts.

A stem 52 extends downwardly and has a pin 57 engaged with the actuating lever 58 of an electrical switch TS. This switch is of a type which includes a timing mechanism and contact parts so that a downward or clockwise movement (Figure 3) of the actuating lever 59 closes the circuit at the switch TS, and this circuit remains closed so long as the lever 58 is in depressed position, but upon an upward or counterclockwise movement of the lever 58, the timing mechanism is released and becomes effective for opening the circuit again after a predetermined time interval, such as 40 seconds after the return movement of the stem 52. Such timing switches are commercially available, and since the specific construction thereof is not a part of this invention, a conventional showing of the casing is presented.

The annular sealing trough 37 receives water at each flushing operation through the duct 65 which leads from the water chamber 22b. It is preferred to have the outlet pipe 36 extend upwardly into the chamber 47 by a distance of one inch or more, and to fill the annular trough to half its height with mercury, thus providing a non-volatile liquid seal of such specific gravity that it is not swept from position by the energy of the air blast, the skirt 49 dipping into this pool of mercury. The mercury is heavier than dirt or other solid impurities normally present in a water supply, and hence such impurities float on the surfaces of the mercury, so that when flushing water is discharged, the water moving through the duct 65 operates to flush away such impurities and to maintain the seal in effective condition.

As shown in Figure 7, the time switch TS is connected to one conductor of the supply line 62. The windings for the armature and field of the motor 33 and the solenoid 47 are connected in parallel between the switch TS and the other supply conductor 62. In Figure 7 is also shown a second timing switch MTS which may be operated manually or by a toilet room door, if so desired, for controlling the operation of the system, either conjointly with or alternatively to the switch TS.

The bowl B may be provided with flange walls 70 which extend rearwardly and partly enclose the fan and discharge structures. Flanges 71 on these walls receive a cowling 72. The cowling 72 extends around the structures for protecting and concealing them, and is illustratively secured by bolts to the flanges 71.

In Figure 6 a connection for water lines is shown, which does not require the use of a sleeve connected into the porcelain structure. When employed for the water pipe 20, this pipe is provided with an outwardly extending flange which rests upon a gasket 80, and this in turn presses against the end wall of an externally threaded sleeve 81 which has a lower outwardly beveled flange to receive a clamping and sealing gasket 82. The pressure nut 83 is engaged with the sleeve 81 and compresses the gasket 82 into the space between the beveled flange and the porcelain walls so that a tight mechanical and sealing joint is provided. The second nut 84 engages the flange of tube 20 and holds it against its gasket 80. For appearance, a bell 85 may be introduced.

In operation of this form of the structure, the normal static position is with the seat unoccupied and its rear edge held in raised position, by the springs 55. The switch TS is open, the fan 72 is quiescent, and the bell 39 has its skirt extending into the sealing within the annular trough 37.

Upon depression of the toilet seat in occupying it, the springs 55 are compressed, and the stems 52 move downward, thus moving the actuating lever 58 and closing the switch TS. Current now flows through the solenoid 47 and the motor 33. The solenoid 47 lifts the bell 49 so that the chamber 35 is now opened by discharge pipe 36. The fan 32 begins to turn, so that air and gases are withdrawn through the opening 31 by the air passage 30 and discharged into the sewer connection 15.

Following use of the toilet, the flushing water may be delivered thereto in normal fashion by tripping the control 21a. When the seat is vacated, the springs 55 raise its rear edge, and the lever 58 of switch TS moves back again so that the timing mechanism of this switch comes into action.

After a time controlled by the setting of the switch TS, its contacts are opened, and the solenoid 47 and fan 32 are de-energized. The bell 49 falls with the plunger 48 and again seals the passage so that there can be no return toward the toilet bowl. The fan comes to a standstill, and all parts are thus restored to an initial position.

In the modified form shown in Figure 8, the cap 51a has a rearwardly-extending finger 51b for engaging the actuating lever 58 of the timing

switch TS which in this form is mounted on top of the bowl B. In operation, occupancy of the bowl causes depression of the cap **51***a* so that the actuating lever **58** is moved downwardly to effect closing of the contacts and storage of power in the timing mechanism, this position being held so long as the seat S is being occupied. When the seat S is vacated, the cap moves upwardly and the actuating lever is permitted to return under the control of the timing mechanism until it effects a reopening of the contacts at a predetermined time after its movement is permitted.

In Figure 8, further, fan **32** is not connected, as in Figure 1, through a discharge pipe **36** with a sewer connection or other means which normally may receive gases from several toilets: but instead is provided with a direct discharge connection **36***x* to the outside atmosphere. With this arrangement, the sealing trap is not required, since there is not a sufficient quantity of offensive gases remaining within a normally short connection **36***x* to require protection against return.

In the modified form shown in Figures 9 and 10, the chamber **35** is provided internally with a member **45** which supports two pivots **46** upon which are mounted parallel arms or legs **47***a* which preferably are of identical length and are connected at their free or movable ends with the upright stem **49***a* of the closure bell **49**. This bell **49** cooperates with the trough **37** and the sealing liquid therein. A further inwardly projecting member supports the pivot **51** upon which is mounted a crank lever **52** having an arm **53** which extends beneath one of the parallel arms **47***a*.

The other end of the lever **52** can be rocked by a plunger **54** which is slidable in the sleeve **55** carried within the chamber **35**. This plunger **54** projects outside of the chamber so that it can be actuated by the lever **42***a* connected to the seat, this lever having a downwardly turned portion for this purpose provided with a pin **42***b* which engages in the loop **56** formed at the end of the plunger **54**. A compression coil spring **57** is interposed between the loop **56** and the outer surface of the chamber **35** and is effective to hold the seat S in a slightly raised condition when unoccupied.

In this form, the switch TSA is mounted on a wall of chamber **35** and has an operating arm **60***a* which extends between the collars **63** carried fixedly on the stem **48**. The upper end of the stem **48** extends into a dashpot **61***a*.

With this structure, occupation of the seat causes its downward movement as before, with a rocking of the lever arm **42***a*, so that the plunger **54** is moved toward the left in Fig. 4, thereby rocking the crank lever **52**, **53**, and raising the parallel links **47***a*, and moving the bell **48** out of the trough. At the same time, the upward movement of the stem **48***a* causes an actuation of the switch arm **60***a*, so that the switch TSA is closed. In these movements, the dashpot **61***a* exercises no control. The motor **33** is energized as before, and the operation is as described above. When the seat is vacated, the spring **57** tends to return the seat **8** to its initial raised position, and this action can be accomplished immediately, in the form shown, due to the loose action between the lower arm **53** and the links **47**. However, the downward movement of the stem **48***a* is retarded by the dashpot **61***a*, and the fan continues to operate until the switch lever **60***a* has been moved to a position for opening the switch TSA. Thereupon, also, the bell **49** enters the annular trough **39** and accomplishes a resealing. The parts are now in initial position, ready for further service.

It will be noted that the structure can be applied to an existing toilet bowl of the design shown. Thus, the toilet bowl may be manufactured and installed with the openings for ducts **36** and **65** temporarily plugged: at a later time, the switch TS or TSA, the fan and chamber assembly, and the ducts can be mounted in place. It is preferred, under such circumstances, to mount the fan and chamber assembly in the cowling structure **72** which fastens to the flange **71**, after removing the sealing plate which is originally supplied on these flanges in such cases. Such cowling provides means for access to the parts for inspection, adjustment and repair.

The employment of a mechanical valve structure with an associated hydraulic seal is advantageous in that water need only be introduced for replenishing that which has escaped by evaporation; since the seal chamber is essentially closed to the atmosphere save by paths leading to the bowl and to the stack, each of which already contains water, the atmosphere of the chamber and these passages is maintained substantially saturated in water vapor so long as the bowl contains the water seal demanded in good sanitary practice, and evaporation is retarded. Further, the employment of the mechanically-actuated sealing means has the advantage over prior structures in that the blast of gas from the fan is not required to clear a pathway for itself by lifting or expelling water from the seal, and in that the provision of a quantity of liquid ready to form the seal in cooperation with the mechanical structure permits the continuance of operation of the fan after the normal flushing period has been finished and yet assures maintenance of water in the hydraulic seal by diverting a small quantity of water during the normal flushing periods, in instances where such water is embodied in the seal itself.

The employment of mercury in the sealing trough is of advantage, in that a seal is perfected between the movable closing element and the mercury with a relatively small immersion, and yet with ample protection against breakage of this seal by change of pressure between the stack and the atmosphere of the apartment.

It will be understood that the invention may be practiced in many ways within the scope of the appended claims.

I claim:

1. A toilet deodorizer for a toilet bowl having water-flushing means and a sewer connection with a water seal between the bowl and sewer, comprising a gas evacuation conduit leading from said bowl to said sewer independently of said water seal, said conduit including a fan, a chamber having a second liquid seal, and a valve cooperating with said second liquid seal to close communication through said evacuation conduit, and means for concurrently energizing said fan and opening said valve and being effective to permit closing of said valve concurrently with the stopping of said fan.

2. A toilet deodorizer for a toilet bowl having water-flushing means and a sewer connection with a water seal between the bowl and sewer, comprising a gas evacuation conduit leading from said bowl to said sewer independently of said water seal, said conduit including a fan, a chamber having a second liquid seal, and a valve cooperating with said second liquid seal to close communication through said evacuation conduit, means for concurrently energizing said fan and opening said valve, and a water duct from the water-flushing means to said second liquid seal

for supplying water to the latter during the flushing period.

3. A toilet deodorizer for a toilet bowl having a seat which is depressible when occupied, water-flushing means and a sewer connection with a water seal between the bowl and the sewer, comprising a gas evacuation conduit leading from said bowl to said sewer independently of the water seal, said conduit including a fan, a chamber having a second liquid seal, and a valve cooperating with said second liquid seal to close communication through said evacuation conduit, the fan having an electric driving motor and the valve including a solenoid for opening the same, and means for concurrently energizing said fan and opening said valve and being effective to permit closing of the valve concurrently with the stopping of the fan, said energizing means including a switch controlled by the seat for closing, when the seat is occupied, current supply means connected through said switch to the motor and solenoid, and time-delay means for maintaining the supply of current to said motor and solenoid for a predetermined time after the seat is vacated.

4. A toilet deodorizer for a toilet bowl having water-flushing means and a sewer connection with a water seal between the bowl and sewer, comprising a gas evacuation conduit leading from said bowl and said sewer independently of said water seal, said conduit including a fan, a chamber for a second liquid seal, and a valve cooperating with said second liquid seal to close communication with said evacuation conduit, said chamber having a partial filling of mercury and also providing a layer of water above said mercury, a water duct from the water-flushing means to said second liquid seal for supplying water thereto during the flushing period, said valve having a closing skirt which extends downwardly through the water layer into the mercury in the closed position of the valve, and means for concurrently energizing said fan and opening said valve, and being effective for permitting the valve to move downwardly into the liquid seal concurrently with the stopping of the fan.

5. A toilet deodorizer for a toilet bowl having water-flushing means and a sewer connection with a water seal between the bowl and sewer, comprising a gas evacuation conduit leading from said bowl to said sewer independently of said water seal; said conduit including a fan, a chamber having an annular second liquid seal in its bottom, and movable valve means having an annular skirt for entering said annular liquid seal in its lowered position for closing the duct and being effective in a raised position to permit gas flow between the skirt and the liquid seal, and means for concurrently energizing said fan and opening said valve and for maintaining said energization for a time after completion of operation of said water-flushing means and thereupon effective for concurrently de-energizing the fan and closing said valve.

6. A toilet deodorizer for a toilet bowl having a duct leading from the bowl space and also having a flushing means, comprising the combination therewith of means for withdrawing gas from the bowl through the duct and discharging the same outside the apartment in which the bowl is located, said duct including a portion with wall means for establishing an annular trough to contain a liquid seal, a valve having an annular skirt to enter said trough in a lowered position for closing the duct and being effective in a raised position to permit gas flow between the trough and skirt, and a water duct from said flushing means for delivering water to said annular trough during the flushing period.

7. A toilet deodorizer for a toilet bowl having a movable seat, comprising in combination therewith a duct leading from the bowl space, means for withdrawing gas from the bowl through said duct and discharging the same outside the apartment in which the bowl is located, a water seal and a normally closed valve member cooperating with said seal to prevent return of foul gases through said withdrawing means, means responsive to the position of the seat for energizing said withdrawing means and opening said valve member when the seat is occupied, and a time-delay device for maintaining the said energization for a predetermined time after the seat is vacated and for longer than the normal period of flushing said toilet bowl.

8. A toilet deodorizer for a toilet bowl having water-flushing means and a sewer connection with a water seal between the bowl and sewer, comprising a gas evacuation conduit leading from said bowl to said sewer independently of said water seal, said conduit including gas-moving means and a valve member for closing the passage through said evacuation conduit, means for energizing said gas-moving means and opening said valve member, a chamber providing a second water seal for assuring the closing of said passage by said valve member, and a water duct from the water-flushing means for supplying water to the second liquid seal during the flushing period in sufficient quantity to compensate the second liquid seal against evaporation.

HUGH W. SANFORD.