Nov. 2, 1937. E. C. MADDEN ET AL 2,098,208

VENTILATOR FOR TOILETS

Filed April 27, 1935

FIG. 1.

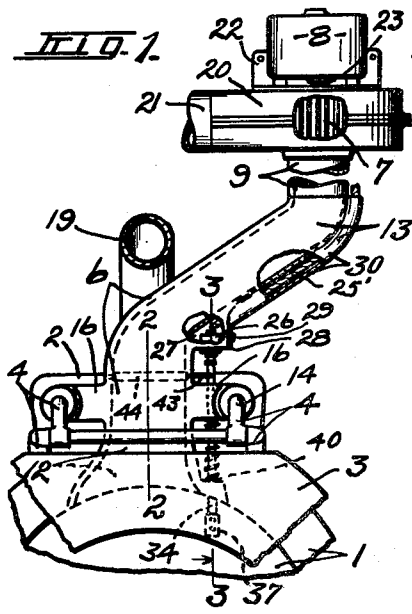


FIG. 9.

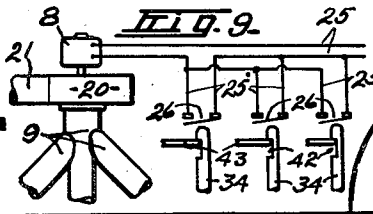


FIG. 2.

FIG. 3.

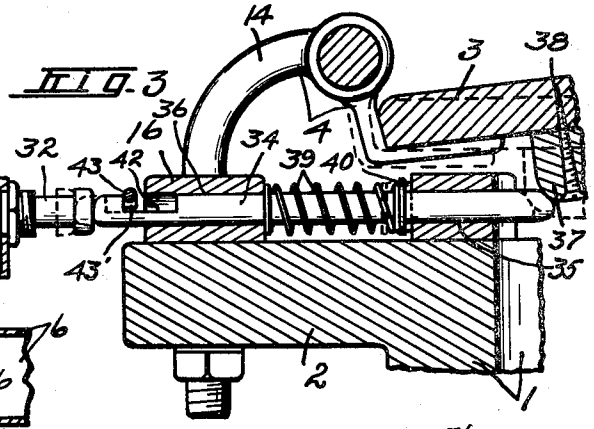


FIG. 4.

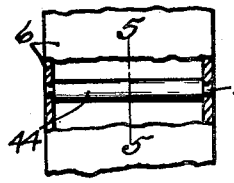


FIG. 5.

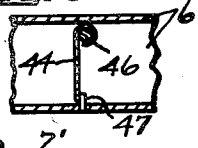


FIG. 6.

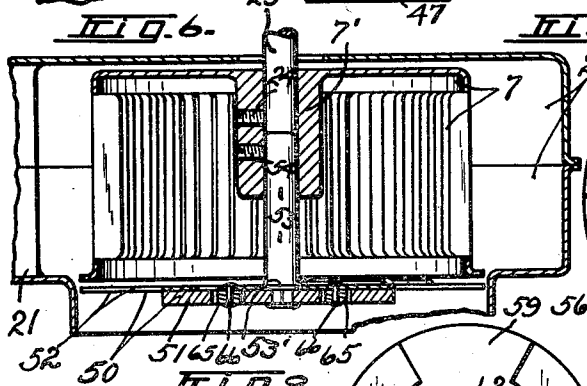


FIG. 7.

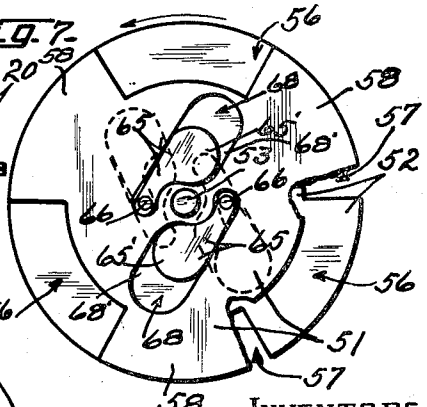
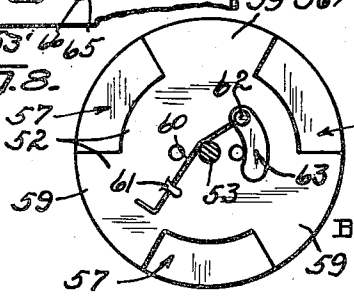


FIG. 8.



WITNESS
J. J. Ryans

INVENTORS
Ernest C. Madden
Bert F. Cooper
Earl R. Cuykendall
BY Theodore E. Simonton,
ATTORNEY

Patented Nov. 2, 1937 2,098,208

UNITED STATES PATENT OFFICE

2,098,208

VENTILATOR FOR TOILETS

Ernest C. Madden, Rochester, Bert F. Cooper, Medina, and Earl R. Cuykendall, Rochester, N. Y., assignors to Rochester-Ventoilet Company, Rochester, N. Y., a corporation of New York

Application April 27, 1935, Serial No. 18,616

7 Claims. (Cl. 4—213)

This invention relates to certain new and useful improvements in a ventilator for a toilet in which a ventilating pipe or conduit is associated with the toilet bowl.

An object of the invention is to provide a ventilating system for toilets with a normally closed damper in the ventilating pipe for the toilet bowl which will be opened by the action of the ventilating fan.

Another object of the invention is to provide a ventilating system for toilets having a normally closed damper with means for automatically securing the damper in the closed position when the toilet is not being used.

A further object of the invention resides in providing a ventilating device of the above mentioned class which may be quickly and easily installed in operative relation with the toilet bowl and which is simple, durable and economical in construction and automatic and efficient in operation.

Other objects and advantages relating to the specific parts of the invention will be brought out in the following description taken in connection with the accompanying drawing, in which:—

Figure 1 is a plan view, partly in section, of a ventilating system embodying the various features of this invention associated with a toilet bowl having a vertically movable seat, said bowl and seat being shown partly broken away.

Figures 2 and 3 are enlarged detail vertical sectional views taken respectively on lines 2—2 and 3—3, Figure 1.

Figure 4 is a plan view of a section of the ventilating pipe or conduit, partly broken away and in section, illustrating a modified arrangement of our novel damper.

Figure 5 is a detail vertical sectional view taken substantially on line 5—5, Figure 4.

Figure 6 is an enlarged horizontal sectional view through the ventilating fan and housing therefor and illustrating a modified form of damper connected with the fan.

Figure 7 is an outer face view of the damper illustrated in Figure 6 with a portion of the outer disc or supporting plate broken away.

Figure 8 is an inner face view of the damper shown in Figures 6 and 7 illustrated in reduced scale.

Figure 9 is a diagrammatic view of a portion of the ventilating system, illustrating the ventilating fan and a portion of a modified form of a ventilating pipe system adapted to connect the fan with a plurality of toilets, together with control means associated with each toilet for automatically controlling the operation thereof.

In Figures 1, 2 and 3 of the drawing, there is illustrated a portion of a toilet bowl 1 including a substantially flat rearward extension 2 and a seat 3 pivotally connected to the extension by a pair of hinge members 4 for vertical swinging movement about a horizontal axis toward and from the top of the bowl.

The ventilating system, as shown, comprises primarily a rectangular relatively shallow pipe section 6, a ventilating fan 7, a motor 8 for operating the fan, and a pipe section 9 connecting the fan with the pipe section 6. The pipe section 6 has the forward end portion as 12 thereof of less height than the remaining or rear portion 13 and open at the bottom.

The length of the forward end portion 12 is substantially equal to the length of the bowl extension 2 and is mounted on the extension between the hinge bolts 14 of the hinge members 4, as shown in Figures 1 and 2, so that the bottom of this end section is closed by the bowl extension.

In order that the pipe section 6 may be readily secured to the toilet bowl, we utilize the hinge bolts 14 which, as shown in Figures 1 and 2, extend downwardly through suitable openings provided in opposite projecting lugs or ears 16 secured to or made integral with the respective sides of the portion 12 of the pipe section 6. The pipe section 6 is formed with a shoulder 17 at the junction of the forward portion 12 and rearward portion 13 thereof which abuts against the rear end face of the extension 2 to assist in firmly holding the pipe in place.

The height of the forward section 12 of the pipe 6 is so related to the construction of the hinge members 4 and thickness of the lugs or ears 16 that when the seat 3 is in the lowered position upon the toilet bowl, the forward end of the pipe portion 12 will readily extend beneath the toilet seat with the forward end thereof in communication with the interior of the bowl, as illustrated in Figures 1, 2 and 3.

The rear portion 13 of the pipe section 6 is shown as a one-piece member deflected laterally mainly to one side of the forward portion 12 and at an angle thereto for convenience of installation, particularly when the vertical portion of the flush pipe as 19 leading from the water storage tank, not shown, to the toilet bowl is positioned relatively close to the bowl. The rear end of the pipe portion 13 is made cylindrical for receiving the adjacent end of the ventilating pipe section 9 which may extend from the pipe section 6 to any convenient remote location in a house or building, as to the attic, not shown. The other end of the pipe section 9, as illustrated in Figure 1, is operatively connected to the housing 20 for the fan 7. The fan 7 and the housing 20 may be of any suitable construction and the outlet as 21 of the fan housing is preferably connected, in any suitable manner not herein necessary to further disclose or describe, to the outside of the building in which the toilet is located in communication with the atmosphere.

The motor 8 for operating the fan 7 is, as shown, preferably an electric motor which, in this instance, is mounted on a base or supporting bracket 22 adapted to be secured to any suitable support, not shown, adjacent the fan housing. The motor 8, in this instance, has the armature shaft as 23 extending into the interior of the fan housing 20 and the fan 7 is directly mounted upon said shaft and secured thereto to be operated thereby in any suitable manner as by set screw 24, as illustrated in Figure 6.

The motor 8 is of small size and requires only a weak current to operate it, which may be supplied from any suitable source as the house lighting or power circuit 25 through a suitable circuit comprising cables 25' and a normally open switch 26 which is preferably positioned in close proximity to the toilet bowl, as in a switch chamber 27 provided in one side of the pipe section 6.

The chamber 27 is provided with an open side which is normally closed by a cover plate 28 secured in position to the pipe section by any suitable means as screw 29. The rear end of the chamber 27 is in communication with a conduit 30 which, in this instance, is made integral with the pipe section 6 adjacent one side thereof for containing the end of the cable 25 adjacent the switch. The switch 26 may be of any well-known type and, in this instance, is provided with an operating member or plunger 32 which extends forwardly through the wall of the switch chamber 27 with the outer end thereof in operative relation with a push rod 34 mounted for longitudinal reciprocative movement in suitable guide openings as 35 and 36 provided in the forward end portion of the pipe section 6 and in the adjacent lug or ear 16 respectively, as shown in Figure 3.

The forward end of the push rod 34 extends a short distance beyond the forward end of the pipe section 6 into the path of movement of an operating member or cam block 37 secured to the underside of the seat 3 in any suitable manner, as by screws 38. The cam block 37 is so related to the push rod 34 that when the seat is moved to its lowermost position in engagement with the upper face of the toilet bowl 1, the push rod will be moved rearwardly by the cam block to effect the closing of the switch 26.

The push rod 34 is normally maintained in its forwardmost position by a spring 39 coiled about the push rod with the rear end thereof in engagement with the adjacent lug 16 and with the forward end in engagement with a stop pin 40. Pin 40 extends diametrically through the push rod and is adapted to engage the wall of the guide opening 35 for limiting the forward movement of the push rod.

The tension of the spring 39 is not only sufficient to return the push rod to its forward position when the rod is released but to also elevate the seat through the medium of the push rod 34 and cam block 37 to a partially open position when said seat is released.

The rear end portion of the push rod 34 is provided with an axially extending slot 42 in the upper face thereof adapted to receive therein one end of a damper shaft 43. Shaft 43 extends through the interior of the pipe section 6 and is journaled in the side walls thereof at approximately the junction of the forward and rear portions 12 and 13 of said pipe section in substantially the plane of the rear end of the bowl extension 2.

The damper shaft 43, in this instance, is positioned at the upper portion of the interior of the pipe, as illustrated in Figure 2, and has secured thereto a damper 44. Damper 44, in this instance, is a substantially flat plate corresponding in size to the adjacent portion of the interior of the pipe and is adapted to engage the rear end of the bowl extension 2 when in its closed position. The rear end of the bowl thus limits the forward swinging movement of the damper and thereby prevents the damper from being opened by any downward or forward draft which may be created in the pipe section 6. At the same time, the damper is free to swing outwardly away from the bowl extension when an upward or rearward draft is created in the pipe section 6 from any cause as by the fan 7.

In order that the damper 44 will be securely maintained in its closed position against the bowl extension 2 when the seat 3 is maintained in the elevated position by the push rod 34 and spring 39, the slot 42 in the push rod is so related with the damper shaft 43 that the rear end wall of the slot will engage the adjacent portion of the damper shaft when the push rod is in its forwardmost position. The outer end of the shaft 43 is provided with a laterally disposed normally downwardly extending stop member or shoulder 43' formed, in this instance, by bending the outer end portion of the shaft laterally at substantially right angles to the remaining portion thereof.

The axial length of the slot 42 is sufficient so that when the push rod is in its rearmost position, as illustrated by broken lines in Figure 3, the stop member or pin 43' will be out of contact with the wall of the slot and the shaft will thereby be free to rotate on its axis.

It will now be observed that when the seat 3 is unoccupied and is being yieldingly maintained in the slightly elevation position against its own weight by the tension of the spring 39 acting upon the push rod 34 to maintain said rod in its forward position, the switch 26 will be open. The motor 8 and fan 7 will thus be inoperative and the damper 44 will be securely maintained in the closed position by the engagement of the push rod with the damper shaft 43 in the manner previously described.

It will also be understood that when the seat 3 is depressed, as when being occupied, the push rod 34 will be moved axially rearwardly against the action of the spring 39 by the engagement of the cam block 37 with the forward end thereof. This rearward movement of the push rod, effected by the seat, is sufficient to close the switch 26 and at the same time release the damper shaft 43 so that the damper is then free to swing rearwardly from the closed position to the open position.

As soon as the switch 26 is closed, the motor 8 will be operated by the current thus supplied thereto which will produce a corresponding rotary movement of the fan 7. The draft thus caused by the fan 7 in the pipe sections 9 and 6 will produce a corresponding rearwardly swinging movement of the damper 44, thereby bringing the fan 7 into communication with the interior of the bowl 1 for removing the obnoxious odors therefrom and discharging them outwardly through the outlet pipe 21 to the outside atmosphere.

Immediately upon releasing the weight or pressure upon the seat 3, the spring 39 will restore the push rod 34 to its normal forward position, thereby elevating the seat 3 and at the same time

effect the opening of the switch 26 and the securing of the damper 44 in its closed position.

It will now be evident that the motor 8 and fan 7 are operated only when the seat 3 is being occupied, thereby conserving the current energy for the motor and prevent excessive wear of the moving parts of the system.

In Figure 9, we have illustrated a modified form of our novel ventilating system in that the fan 7 is common to a plurality of toilet bowls, and a plurality of control circuits, one for each bowl, are connected with the motor whereby, when any one of the series of toilet seats is being occupied, the motor will be operated. The damper in the ventilating pipe associated with the toilet being used will be released and permitted to be opened by the action of the current produced in the corresponding ventilating pipe. Meanwhile the dampers in the ventilating pipes associated with the remaining or unoccupied toilets will be securely maintained in the closed position against the action of any current of air tending to be produced in said ventilating pipes by the action of the fan 7 so that the operation of the fan 7, although operatively connected with each of the several toilets, will not produce a ventilating draft in the unoccupied toilets.

It will, therefore, be seen that the securing of the damper 44 in the closed position when the toilet associated therewith is not being used, is not only advantageous to prevent an outward draft through the ventilating pipe sections 6 and 8 as may be caused by an outside current of air passing the outlet of the ventilating system but also prevents an upward draft through the unoccupied toilets of a series during the operation of the fan due to one of the toilets of the series being occupied.

In Figures 4 and 5, we have illustrated a slightly modified form of our novel damper in that the damper shaft 46 does not extend beyond the outer face of the wall of the pipe in which the damper is mounted. In this instance, the damper 44 may be mounted at any suitable position in the pipe section 6 and is maintained in the closed position against movement in one direction by a stop pin 47 which, as shown in Figure 5, is secured in the bottom wall of the pipe section.

The damper in this construction is free at all times to swing about the shaft 46 as an axis away from the pin 47 in one direction, as by a current of air produced in the section by the fan 7, as in the ventilating operation, but will remain in the closed position and prevent downward or inward draft when the fan is rendered inoperative by the opening of the circuit for the motor 8.

In Figures 6, 7, and 8, there is disclosed a still further modified form of damper which is particularly adapted to be connected with the fan 7 to be opened thereby by the rotation thereof.

This damper as 50 is composed of two plate or disc members 51 and 52. One of the plates or discs as 51 is a relatively thick supporting member which is fixedly secured to one end of a supporting shaft 53. This shaft 53, as shown in Figure 6, extends from the outer side of the fan 7 inwardly into the central boss as 7' of the fan in which the armature shaft 23 of the motor 8 is mounted, and is secured to said boss so as to be caused to be rotated by the fan by any suitable means as the screw 54. The other plate or disc as 52 is a relatively thin member and is journaled upon the shaft 53 in a groove 53' in said shaft adjacent the rear or inner face of the plate 51 for movement relatively to said plate for controlling the air passage therethrough.

The plates or discs 51 and 52 are provided with a plurality of, in this instance three, slots or recesses 56 and 57 respectively in the peripheral edge thereof. These slots or recesses are of substantially the same size and are arranged in equal circumferential spaced relation so that the plates are provided with corresponding projections or blades 58 and 59 respectively arranged intermediate the corresponding slots or recesses.

As illustrated in the drawing, the slots or recesses 56 and 57 and the projections or blades 58 and 59 are of substantially equal circumferential length, or in other words, they are each inscribed in an angle of substantially 60 degrees, so that when the blades of one plate or disc are in registration with the slots or recesses in the other disc, the slots of both discs will be closed thereby and the damper will be in its closed position, and when the projections or blades of the disc are in registration with each other, the slots will be substantially fully uncovered and the damper will be in its open position.

The plates 51 and 52 are normally maintained in such relation to each other that the projections or blades 59 in the plate 52 will register with the corresponding slots 56 in the plate 51 for closing the damper by a spring member 60. Spring 60 normally extends substantially diametrically across the outer or exposed face of the inner plate 52 with one end thereof slidably connected with a stop member 61 formed, in this instance, by stamping outwardly a portion of the plate. The other end of the spring is fixedly secured to a pin or stud 62 which extends through an arcuate slot 63 formed in the plate 52 concentric therewith and is secured to the adjacent portion of the outer plate 51.

The intermediate portion of the spring 60 engages the adjacent portion of the shaft 53, as illustrated in Figure 8, so that the spring is normally tensioned to move the plate 52 in a clockwise direction, as viewed in Figure 8. The control plate 52 is rotated in a counter-clockwise direction, as viewed in Figure 8, or in a direction against the action of the spring 60 when the plates are rapidly revolved, as by the armature shaft 23 and fan 7, by means of a pair of fly arms 65. The fly arms 65 are pivotally connected at one end by shouldered studs or pins 66 to the plate 52 at diametrically opposite sides thereof, as illustrated in Figures 3, 6 and 7.

These arms 65 are, in this instance, weighted at their outer or free ends by the provision of an enlarged portion 65' and are mounted for sliding movement in respective slots 68 arranged in the supporting plate 51 to extend in substantially diametrically opposite directions from the pivots 66. The outer end portions of each slot 68 are enlarged as at 68' for the reception of the enlarged portion 65' of the arms 65. The connection between these enlarged portions of the slots with the remaining portions thereof correspond in outline substantially to that of the corresponding portions of the arms 65 so that the control plate 52 will be maintained against the action of the spring 60 when the control plate is in position to close the slots in the supporting plate 51 by the engagement of the enlarged portion 65' of each arm with the inner end of the enlarged portion 68' of the respective slot 68, as illustrated in Figure 7.

It will, therefore, be seen that when the fan 7

and damper 50 are at rest, the damper is normally closed and the fly arms 65 are normally maintained in their innermost position in contact with the inner end portions of the slots 68 in the plate 51, and that the control plate is thereby normally maintained in position for closing the air passage through the damper. Furthermore, it will be observed that when the fan is being operated, the fly arms 65 will be actuated by centrifugal force as the speed of rotation of the fan and damper increases to produce rotary movement of the control plate 52 relative to the supporting plate 51 by the outward pivotal movement of the arms about the stud 66. The blade portions 58 and 59 of the plates 51 and 52 are thus moved out of registration with corresponding slots 56 and 57 and thereby open the air passage through the damper.

As soon as the speed of rotation of the damper and fan decreases or entirely ceases, the control plate will be returned to its normal position relative to the supporting plate 51 by the action of the spring 60 and thereby be maintained in a normal closed position.

It will thus be observed that the motor 8 and fan 7 are operated only when the seat 3 is being occupied. Also when the motor and fan are at rest or inoperative, the damper associated with the ventilating system, whether of the type shown in Figures 1 and 2 or in Figures 4 and 5 or that shown in Figures 6, 7 and 8, will be in the closed position and that as soon as the fan is caused to be rotated, the damper will be opened by the action of the fan.

It is thus seen that the construction and operation of the apparatus as described is particularly simple and highly efficient, and although there has been shown and described the preferred embodiment of the invention, it is not wished to be limited to the exact construction shown, as it is evident that various changes may be made in the structural details without departing from the spirit of the invention as set forth in the appended claims.

We claim:

1. In a ventilating system for a toilet bowl having a vertically movable seat, a ventilating pipe communicating with the interior of the bowl, means for circulating a current of air through the ventilating pipe, a normally closed damper in the pipe adapted to be opened by the action of said current of air, and means associated with the seat and effective when the seat is in a raised position for maintaining the damper in the closed position and to release said damper when the seat is in the lowered position.

2. In a ventilating system for a toilet bowl having a vertically movable seat, a ventilating pipe communicating with the interior of the bowl, means for circulating a current of air through the ventilating pipe, a normally closed damper in the pipe adapted to be opened by the action of said current of air, seat-engaging means for yieldingly maintaining the seat in a slightly elevated position, and co-acting means associated with the damper and seat-engaging means for securing the damper in the closed position when the seat is in the elevated position and to release said damper when the seat is lowered.

3. In a ventilating system for a toilet bowl having a vertically movable seat, a ventilating pipe communicating with the interior of the bowl, means for circulating a current of air through the ventilating pipe, a normally closed damper in the pipe adapted to be opened by the action of said current of air, a spring operated means for normally holding the seat in a slightly elevated position, and co-acting means associated with the damper and the spring operated means for maintaining the damper in the closed position when the seat is in the elevated position and to release said damper when the seat is lowered.

4. In a ventilating system for a toilet bowl having a vertically movable seat, a ventilating pipe communicating with the interior of the bowl, a fan associated with said pipe, an electric motor for actuating the fan, a circuit for the motor including a normally open switch, a normally closed damper in the ventilating pipe, spring-operated means for normally holding the seat in a slightly elevated position and movable during the lowering of the seat for closing said switch, and co-acting means associated with the spring-operated means and with the damper adapted when said spring-operated means is in one position to releasably lock the damper in the closed position.

5. In a ventilating system for a toilet bowl having a vertically movable seat, a ventilating pipe communicating with the interior of the bowl, a fan associated with said pipe, an electric motor for actuating the fan, a circuit for the motor including a normally open switch, a normally closed damper in the ventilating pipe, means including a push rod for normally holding the seat in a slightly elevated position and movable during the lowering of the seat for closing said switch, and co-acting means associated with the push rod and damper comprising a slot and a stop member for maintaining the damper closed when the seat is raised and to release said damper when the seat is lowered.

6. In combination with a toilet bowl having a seat hingedly connected thereto and a ventilating pipe in communication with the interior thereof, means for circulating a current of air through the ventilating pipe, a shaft journaled in the pipe, a damper secured to said shaft to swing about the axis thereof from a closed position to an open position by the action of said current of air, means including an element operatively connected with the seat for movement therewith for yieldingly maintaining the seat in a slightly elevated position, and means associated with the element and with said shaft co-acting, when the seat is in the raised position for holding the damper in the closed position and when the seat is lowered to release the damper whereby said damper may have free swinging movement.

7. In combination with a toilet bowl having a seat hingedly connected thereto and a ventilating pipe in communication with the interior thereof, means including a drive member for producing a forced current of air through the ventilating pipe, a control element for the drive member, a normally closed damper in the ventilating pipe adapted to be opened by the action of said current of air, means associated with the seat and effective when the seat is in a raised position for maintaining the damper in the closed position and to release said damper when the seat is in the lowered position, and means operatively connecting said latter means with the control element to actuate said element for effecting operation of the drive member when the seat is in the lowered position.

ERNEST C. MADDEN.
BERT F. COOPER.
EARL R. CUYKENDALL.