United States Patent [19]

Stone

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[54] **VENTILATOR**

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[73] Assignee: **Ventrola Manufacturing Company,** Owosso, Mich.

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[21] Appl. No.: **381,901**

[52] **U.S. Cl.** **98/43;** 98/116; 137/533.27

[51] **Int. Cl.²** **F24F 7/02;** F24F 13/10

[58] **Field of Search** 98/43, 119, 116, 42, 20, 98/79; 137/533.27

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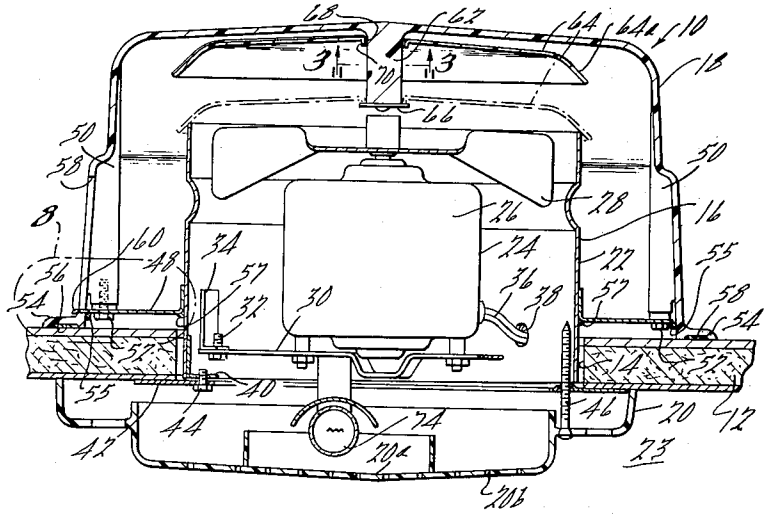
Primary Examiner—William E. Wayner

Attorney, Agent, or Firm—Harness, Dickey & Pierce

[57] **ABSTRACT**

A powered ventilator particularly suited for installation in the ceilings of mobile or modular homes, recreational vehicles, etc. The unit has a leakproof construction provided by an improved damper structure and by an improved mounting and sealing arrangement.

3 Claims, 8 Drawing Figures



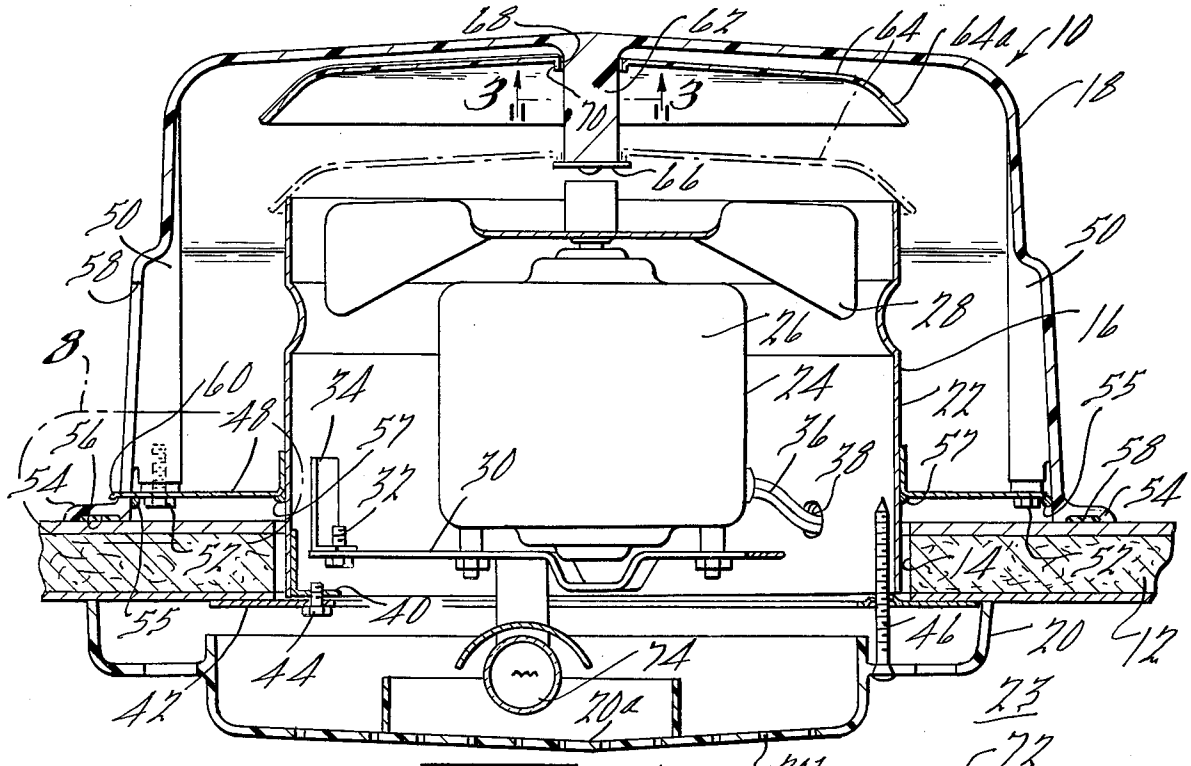


FIG. 1.

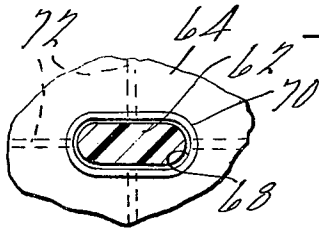


FIG. 3.

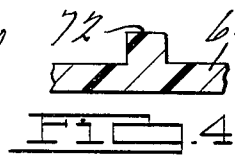


FIG. 4.

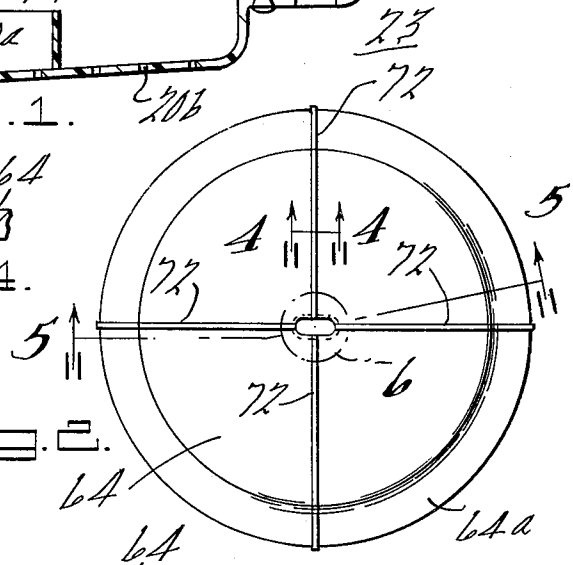
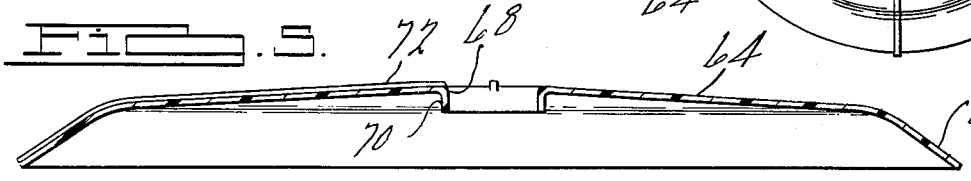


FIG. 2.

FIG. 5.



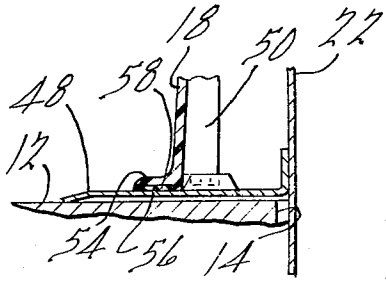


FIG. 8.

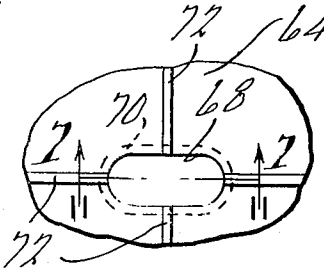


FIG. 6.

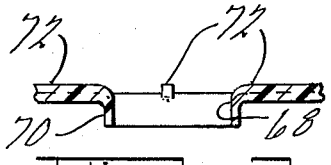


FIG. 7.

VENTILATOR

CROSS REFERENCE TO RELATED APPLICATION

Reference is made to commonly assigned copending application Ser. No. 224,052, filed Feb. 7, 1972 now U.S. Pat. No. 3,785,271 and state of the art references cited therein.

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to ventilating apparatus and, in particular, to powered ventilating apparatus particularly suited for installation in the ceilings of mobile or modular homes, recreational vehicles, etc.

Heretofore, various types of ventilators, both powered and non-powered, have been mounted in the ceilings of mobile homes and vehicles to ventilate interiors thereof. The ventilator is customarily mounted in an opening in the ceiling and the exterior of the ventilator is exposed to the outside. Among the problems with such prior ventilators are: that water can leak around and/or through the ventilator and into the interior room space; the ventilators are difficult to install, often requiring many fasteners passing into the ceiling; the damper arrangements fail to assure positive opening and closing when desired; operating noise levels are high; the overall structure is relatively complicated, requiring a large number of individual parts.

Among the objects of the present invention are to provide an improved ventilator which: alleviates, or eliminates entirely, the problems mentioned above; is of relatively simple construction and is especially vertically compact; has improved mounting, sealing, and damper arrangements; requires only a single opening in the ceiling for mounting; can be quickly installed; operates reliably; and, in numerous respects, is better than prior ventilators.

The foregoing objects, as well as additional objects, advantages, features and benefits of the invention will be seen in the ensuing description and claims which are to be taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

The drawing illustrates a preferred embodiment of the invention in accordance with the best mode presently contemplated for carrying out the invention.

FIG. 1 is a vertical, sectional view through a ventilator according to the present invention, the ventilator being installed in the ceiling of a recreational vehicle, mobile or modular home, etc.

FIG. 2 is a reduced plan view of one of the elements of FIG. 1.

FIG. 3 is an enlarged horizontal, sectional view taken along line 3—3 in FIG. 1.

FIG. 4 is an enlarged vertical, sectional view taken along line 4—4 in FIG. 2.

FIG. 5 is an enlarged vertical, sectional view taken along line 5—5 in FIG. 2.

FIG. 6 is an enlarged view taken in circle 6 of FIG. 2.

FIG. 7 is a vertical sectional view taken along line 7—7 in FIG. 6.

FIG. 8 is a view taken approximately in circle 8 in FIG. 1, but illustrating a modified form.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, an improved ventilator unit 10, according to the present invention, is shown mounted on the ceiling 12 of a recreational vehicle, mobile or modular home, etc. A single circular opening 14 is provided in ceiling 12 to accommodate unit 10, and no further modifications to ceiling 12 are required for mounting unit 10 thereon. Ventilator 10 comprises a body 16, a cover 18, and a grill 20.

Body 16 comprises a circular, cylindrical, thin-walled conduit 22 coaxial with opening 14. The upper and lower ends of conduit 22 are open, and conduit 22 forms a central vertical passage through which air is drawn from the interior room space 23 for discharge to outside. A blower assembly 24, consisting of an electric motor 26 and a fan 28, is coaxially supported within conduit 22 on a rigid mounting strap 30 which extends diametrically across the inside of conduit 22. Motor 26 may be of either the conventional AC or DC type, depending upon the type of electric power available. Preferably, mounting strap 30 is removably secured to conduit 22 to facilitate removal of blower assembly 24, if necessary. This is done by means of two screws 32 (only one of which appears in FIG. 1) which pass through suitable openings at the ends of strap 30 to threadably engage mounting brackets 34 affixed to the inner wall of conduit 22. The wiring 36 for motor 26 exits from conduit 22 by means of a suitable small opening 38 and leads to a switched source of electric power. A plurality of three additional mounting brackets 40 (only one of which appears in FIG. 1) are affixed to the inner wall of conduit 22 at a level vertically below the level of mounting brackets 34. Brackets 40 are arranged uniformly around conduit 22 in angularly offset relation to brackets 34. Pursuant to one aspect of the invention, a circular, annular ceiling plate 42 is attached to brackets 40 by means of screws 44 which pass through suitable clearance holes in ceiling plate 42 to threadably engage mounting brackets 40. As will be seen in greater detail herein, ceiling plate 42 clamps unit 10 sturdily on ceiling 12. Ceiling plate 42 is also fashioned with a pair of threaded holes (only one of which appears in FIG. 1) to which grill 20 is fastened by screws 46. An annular flashing plate 48 is affixed to the outer wall of conduit 22 at a level slightly above the outside of ceiling 12. The inner periphery of plate 48 is of circular shape including an upturned flange for attachment to conduit 22. The outer periphery of flashing plate 48 fits closely within cover 18 and, as will be hereinafter seen, is important in providing a portion of the improved sealing arrangement of the present invention.

Cover 18 is of generally rectangular configuration and encloses body 16. Preferably, cover 18 is molded from a plastic such as high-density polyethylene. A vertical pad 50 at each of the four inside corners of cover 18 serves to attach flashing plate 48 by means of screws 52 passing through clearance holes in plate 48 to threadably engage pads 50. A peripherally continuous sealing flange 54 extends around the lower peripheral edge of cover 18 and seals against ceiling 12 when the unit 10 is installed. Flange 54 includes a peripherally continuous recess 56 formed in the underside thereof. A continuous deformable seal 58 is contained within recess 56 for sealing between flange 54 and ceiling 12.

The outer peripheral edge of flashing plate 48 is of rectangular shape to fit closely within the corresponding rectangular shape of the interior of cover 18. For a recreational-type vehicle, cover 18 is fashioned with a single generally rectangular opening 58 in one of its four sides, and the corresponding edge of flashing plate 48 includes a lip 60 which extends through and overhangs the lower edge of opening 58. (In a mobile home installation cover 18 preferably has three openings 58.) A continuous bead of sealant 55 is deposited as a fillet to seal between the outer periphery of flashing plate 48 and cover 18. Another continuous bead of sealant 57 is deposited as a fillet to seal between the inner periphery of flashing plate 48 and the outer wall of conduit 22.

In accordance with another aspect of the present invention, a post 62 of non-circular (for example, oval) cross section (see FIG. 3) is integrally formed with cover 18. Post 62 depends centrally vertically downwardly from the top of cover 18 to level just above the upper end of blower 24, and coaxially aligns with body 16. A damper 64 (details of which are shown in FIGS. 2–7), preferably constructed from a plastic such as ABS plastic, is retained on post 62 by means of a washer 66 affixed to the lower end of post 62. Damper 64 is fashioned with a central opening 68 which is of the same shape as the cross section of post 62 and provides damper 64 with a close sliding fit on post 62. An annular depending lip 70 is formed around opening 68 to provide a guiding surface facilitating vertical bodily movement of damper 64 on post 62. Thus, damper 64 can slide vertically on post 62 but is constrained against rotation thereon. Damper 64 is of relatively low mass, but is of sufficient rigidity to be self-supporting. Damper 64 inclines downwardly and outwardly from post 62 with the outer margin 64*a* thereof having a somewhat steeper slope than the inner portion thereof. The overall diameter of damper 64 is slightly greater than the diameter of conduit 22. Four ribs 72 are formed on the upper surface of damper 64 and extend radially outwardly from opening 68. When blower 24 is idle, damper 64 assumes a closed position indicated by the broken lines in FIG. 1. In this position, margin 64*a* rests on the open upper end of conduit 22 and slightly overhangs the edge of the conduit. Damper 64 completely closes conduit 22 and prevents both back draft through the unit into the interior room space 23 and also water from entering the upper end of the conduit. As seen in FIG. 1 damper 64 is normally biased into a closed position by its own weight or in any other suitable manner. When blower 24 is operated, damper 64 rises vertically on post 62, having a maximum upward travel indicated by the solid lines of FIG. 1. While damper 64 completely closes conduit 22 in the drawing, it will be appreciated that, in practice, margin 64*a* may not have a continuous peripheral contact with the upper edge of conduit 22 due to manufacturing tolerances. However, such mismatch is not critical so long as it is not excessive.

Grill 20, which is preferably molded from plastic, may optionally include a central solid translucent portion 20*a*, positioned around and beneath an optional lamp 74 which is supported from body 16. When blower 24 is operated, air from interior space 23 flows upwardly through the open portion 20*b* of grill 20.

The structural elements of the preferred embodiment having been described, further development of the inventive features of the disclosure is now presented.

With cover 18 being securely affixed to conduit 22 via flashing plate 48, the improved mounting arrangement of the present invention provides a weather-tight seal of flange 54 against ceiling 12 when unit 10 is installed. Moreover, installation of the unit is greatly simplified. The installation procedure is as follows. With ceiling plate 42 and grill 20 removed, the unit is aligned with opening 14 and placed on ceiling 12. Ceiling plate 42 is then attached to body 16 by screws 44. Screws 44 are actuated to draw ceiling plate 42 against ceiling 12, and continued actuation of screws 44 thereafter tends to draw body 16 downwardly. The connection of cover 18 to body 16 by flashing plate 48 causes flange 54 to be drawn tightly downwardly on ceiling 12. Thus, ceiling 12 is tightly clamped between ceiling plate 42 and flange 54 to thereby securely mount unit 10. Seal 58 is deformably held between flange 54 and ceiling 12 to prevent precipitation or condensation from intruding into opening 14 from between cover 18 and ceiling 12. Thus, it will be observed that opening 14 is the only modification to ceiling 12 required to mount ventilator 10 and that only the three screws 44 have to be actuated to mount the ventilator. In addition to seal 58, the two seals 55 and 57 around the outer and inner peripheries of flashing plate 48 prevent water from intruding into opening 14 from between conduit 22 and cover 18. Precipitation which may collect on flashing plate 48 will tend to flow outwardly through opening 58 over lip 60. Furthermore, with damper 64 disposed at a level vertically above opening 58 and with the particular construction of damper 64, precipitation or condensation cannot enter conduit 22. While damper 64 preferably has a close sliding fit on post 62 which tends to prevent moisture from running down post 62 through opening 68, ribs 72 may be incorporated in damper 64 and they tend to collect any liquid condensation or precipitation on post 62 around opening 68 and to carry it outwardly on the top surface of damper 64 away from post 62.

When blower 24 is actuated, fan 28 draws air from within the interior room space 23 and moves the same upwardly via grill 20 through conduit 22. The air pressure developed against damper 64 by blower 24 causes the damper to rise vertically upwardly on post 62 so that air can flow outwardly over the upper edge of conduit 22 for subsequent discharge via opening 58 in cover 18. During operation of blower 24, the positive pressure existing within conduit 22 both maintains damper 64 in a raised position and prevents precipitation from intruding into conduit 22. Since damper 64 is constrained against rotation and snugly guided on post 62, the operating noise level of unit 10 is kept to a minimum, damper 64 being unable to spin or noisily flutter. Furthermore, it will be observed that the structure of damper 64 and its mounting are highly economical and require only a few parts. Furthermore, since damper 64 moves bodily on post 62, the total distance traveled can be relatively small to provide a sufficient outlet opening; thus, the ventilator is especially compact in the vertical direction.

FIG. 8 illustrates a modified form of the invention wherein a different flashing plate 48 is used. Flashing plate 48 is positioned against ceiling 12 and extends radially outwardly beneath flange 54. This form is desir-

able for use with conventional roofing practice wherein flashing is provided around members which protrude through the roof, for example, chimneys, pipes, etc.; however, the same sealing and retention arrangement is utilized and the benefits enumerated above apply to the modified form shown in FIG. 8.

It is to be understood that the foregoing description is that of a preferred embodiment of the invention. Various changes and modifications may be made without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A ventilator adapted to be mounted on the ceiling of a room space to be ventilated and to ventilate the room space to the outside via an opening extending through the ceiling from the inside of the ceiling to the outside of the ceiling, said ventilator comprising a body, said body comprising a conduit having a generally vertical axis and defining a generally vertical passage, said conduit being open at the upper end thereof and adapted to communicate the room space to the outside via the ceiling opening, blower means for drawing air from the room space and blowing the same through said conduit to the outside, mounting means for mounting the ventilator on the ceiling, a damper located above said blower means and disposed over the open upper ends of said conduit, and guide means for guiding said damper for generally vertical bodily movement relative to said conduit, said damper being biased into a closed position closing the open upper end of said conduit when said blower means is idle and being displaced bodily upwardly from its closed position when said blower means is actuated, said guide means comprising a post generally coaxial with said conduit, said damper comprising means defining an opening therein, said post passing through said damper opening, said damper opening and the cross section of said post being of similar noncircular shape thereby to provide said damper with vertical sliding engagement with said post and substantially constraining said damper against rotary displacement about said post, and a cover covering the upper end of said body, said post being disposed on said cover, and retaining means for retaining said damper on said post, and an annular flashing plate generally around said conduit and extending in an outward direction therefrom generally parallel to the roof line.

2. In combination with the ceiling of a room space t be ventilated wherein the exterior of the ceiling is ex posed to outside weather conditions, a ventilator uni for ventilating the room space to outside via an openin extending through the ceiling, said ventilator unit com prising: a conduit extending vertically through said ceil ing opening and having an open upper end disposed a a level above the ceiling; blower means disposed withi said conduit; a damper disposed over the open uppe end of said conduit; vertically extending guide mean centrally located with respect to said damper for guid ing said damper for vertical displacement relative t said conduit so as to permit said damper to close th open upper end of said conduit when said blowe means is idle and to permit said damper to be displace bodily upwardly from the open upper end of said con duit when said blower means is actuated; a cover en closing said damper and the open upper end of sai conduit means, said cover comprising a top portion dis posed vertically above said damper and a side portio extending downwardly from said top portion aroun said damper and said conduit to the ceiling; means de fining an opening in said cover side portion which i substantially disposed vertically below the open uppe end of said conduit and through which room exhaus passes when said blower means is actuated; an annula flashing plate extending between said conduit and sai cover side portion at a level vertically above the ceiling said flashing plate including a lip portion thereof ex tending through said cover side portion opening; sai damper sloping downwardly in the radially outward di rection from said guide means and overhanging th open upper end of said conduit whereby moistur which collects on the upper surface of said dampe tends to run off the damper, to drop onto said flashin plate, and to run off through said cover side portio opening.

3. The combination as claimed in claim 2 wherei said damper comprises a radially inner portion havin a given downward slope and a radially outer portio having a downward slope greater than the downwar slope of said radially inner portion, said radially oute portion resting on the open upper end of said condui when said blower means is idle.

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