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(54) Ventilator which is closable to inhibit spread of smoke and fire.

(57) A ventilator comprises: a panel (1) having at least one ventilation opening; at least one shutter (4) movably mounted on the panel, the shutter or shutters in a first position allowing flow of air through the ventilation opening or openings and in a second position closing the opening or openings; means, such as electromagnetic means (15), for holding the shutter or shutters in said first position; means, (13) for holding the shutter or shutters in said second position; means, such as springs (14), for effecting movement of the shutter or shutters from said first position to said second position; and sealing means (5, 6,11,12,13) which when the shutter or shutters are in said second position cooperate with the shutter and the panel to provide a seal extending substantially completely around the ventilation opening or openings.

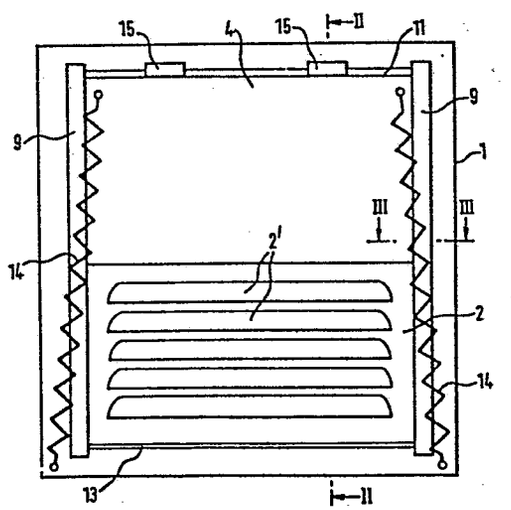

FIG.1.

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Ventilator which is closable to inhibit spread of smoke and fire

The present invention relates to a ventilator of the type comprising a panel having ventilation openings and a shutter for closing the openings to inhibit passage of smoke through the openings for example in the event of fire or smoke being detected.

Various ventilators of the type referred to above are known. However, it has proved difficult to provide such a ventilator where flow of air through the ventilation openings is normally not unduly impeded but such flow of air is reliably prevented when the openings are closed and which can operate reliably in different orientations.

The present invention aims to provide an improved ventilator of the type referred to.

In accordance with the present invention, there is provided a ventilator comprising: a panel having at least one ventilation opening; at least one shutter movably mounted on the panel, the shutter or shutters in a first position allowing flow of air through the ventilation opening or openings and in a second position closing the opening or openings; means for holding the shutter or shutters in said first position; means for holding the shutter or shutters in said second position; means for effecting movement of the shutter or shutters from said first position to said second position; and sealing means which when the shutter or shutters are in said second position cooperate with the shutter or shutters and the panel to provide a seal extending substantially completely around the ventilation opening or openings.

It is to be understood that the ventilator may comprise (a) only one shutter movable between the first position in which air is allowed to flow through the ventilation opening or openings and the second position in which the shutter causes the sealing means to cooperate with the shutter and the panel to provide the seal extending substantially completely around the ventilation opening

or openings or (b) a plurality of shutters movable between respective positions in which air is allowed to flow through the ventilation opening or openings and respective positions in which the shutters together cause the sealing means to cooperate with the shutter and the panel to provide a seal extending substantially completely around the ventilation opening or openings.

The means for holding the shutter or shutters in said first position may be electromagnetic means which when de-energized releases the shutter or shutters to allow it or them to move to said second position. Such electromagnetic means may be one of more electromagnets or solenoids which magnetically hold the shutter or shutters in said first position or may comprise an electromagnetically operated catch which when released allows the shutter or shutters to move to said second position.

The shutter or shutters may be urged towards said second position by gravity or means such as one or more springs or hydraulic or pneumatic means may be provided to urge the shutter or shutters towards said second position.

In one preferred aspect of the invention the means for effecting movement of the shutter or shutters from said first to said second position and for holding it or them in said second position may be one or more springs connected between the shutter or shutters and the panel.

Alternatively the means for holding the or each shutter in said first position, the means for holding the shutter in said second position and the means for effecting movement of the shutter may comprise a threaded shaft connected to the shutter and driven by a motor such that rotation of the shaft effects the movement of the shutter.

Preferably the means for effecting movement of the shutter or shutters is connected to a smoke detector, the detection of smoke causing the shutter or shutters to move to said second position. The smoke detector may be mounted in a housing of the ventilator or otherwise be closely associated with the ventilator or may be positioned remote

from the ventilator, e.g. on a ceiling of a room, in a wall or door of which the ventilator is mounted.

Preferably the seal is provided by sliding sealing members extending in the direction of movement of the or each shutter and resilient sealing members extending transverse to said direction. Such sealing members may be held under compression to enhance their sealing ability and to compensate for any irregularities in the surfaces against which they seal.

The invention is further described below by way of example with reference to the accompanying drawings, wherein;

Figure 1 is a rear view of a first ventilator according to the invention;

Figure 2 is a section along line II-II of Figure 1;

Figure 3 is a section along line III-III of Figure 1;

Figure 3A shows a modification of the arrangement shown in Figure 3;

Figure 4 is a diagrammatic rear view of a second ventilator according to the invention;

Figure 5 is a rear view of a third ventilator according to the invention; and

Figure 6 is a rear view of a fourth ventilator according to the invention.

In the drawings like reference numerals indicate like parts.

Referring to the drawings, the first ventilator shown therein comprises a casing, a front panel 1 of which has an aperture therein. There is fastened to the panel 1, over the aperture, by means of screws (not shown)

a louvre plate 2. A plurality of louvres 2' are pressed out of the plate 2 thereby to provide openings 3 for flow of air.

A steel shutter 4 is slidably mounted on the rear of the panel 1. Two polytetrafluorethylene (ptfe) strips 5 are affixed to the rear of the panel 1. Two ptfe strips 6 are affixed to the front of the shutter 4 adjacent its side edges and, as described below, each strip 6 slides on a respective one of the strips 5. Also a plurality of holes 7 are provided in the shutter 4 adjacent its side edges. Each hole 7 accommodates a steel ball 8.

The edges of the strips 6, facing inwardly of the shutter 4, are flush with the corresponding edges of the strips 5 and the strips 5 extend substantially the whole length of the members 9. The strips 6 extend from the top edge of the shutter 4 to the bottom edge of the shutter.

Two guide members 9 are mounted in the rear of the panel 1. Each provides a concave guide track 10 in which the balls 8 at the respective sides of the shutter 4 engage. The shutter 4 can thus slide up and down relative to the panel 1, the balls 8 rotating on the concave guide track 10 and the ptfe strips 6 sliding on the ptfe strips 5. The guide members 9 may be spring loaded to compensate for irregularities in e.g. the surface of the track 10 or the engaging surfaces of the strips 5 and 6.

Along the top edge of the shutter 4 is provided a resilient blade 11 engaging, at its free edge, the panel 1. The ends of the blades 11 are in contact with or closely adjacent the respective strips 5 and 6. On the front of the shutter 4, adjacent its bottom edge, an elongate resilient sealing member 12 is affixed. Each end of the member 12 is in contact with or closely adjacent the respective strip 6. On the panel 1 below the louvres 2' is affixed another elongate sealing member 13, each end of which is in contact with or closely adjacent the respective strip 5.

Two tension coil springs 14 (not shown in Figure 3) are connected

between the panel 1 and the shutter 4 and urge the shutter downwardly (as viewed in Figure 1).

Two electromagnets 15 are mounted on the panel 1 and connected to a smoke sensor.

Normally the electromagnets 15 are energized and hold the steel shutter 4 in its first position as shown in Figure 1. Ventilation air can thus pass freely through the openings 3 provided by the louvres.

If smoke is detected by the smoke detector, the electromagnets 15 are de-energized. The shutter 4 is then pulled by the springs 14 to its second position in which the resilient members 12 and 13 sealingly engage each other, the member 13 acting as a stop to limit downward movement of the shutter. A seal is also provided by each pair of engaging ptfe strips 5 and 6 and by the blade 11 engaging with the panel 1. Thus effectively a continuous endless seal is provided around the louvres 2 and the openings 3 preventing flow of air (and consequently also passage of smoke and fire) through the ventilator.

The ventilator of Figures 1 to 3 may be modified as described below with reference to Figure 3A.

Referring to Fifgure 3A, each guide member 9 has a channel-section portion 9'. Springs 20 act between the base of the channel section portion 9' and a steel carrier strip 21. To the strip 21 is affixed a ptfe strip 22. To the rear of the shutter 4, adjacent each of its side edges, is affixed a ptfe strip 23. Each strip 23 extends from the top edge of the shutter to its bottom edge. Each ptfe strip 22 is urged by the springs 21 against the corresponding ptfe strip 23. When the shutter 4 moves between its first and second positions and the strips 23 slide on the strips 22.

Referring to Figures 1 to 3A a sealing strip similar to strip 13 may be provided on the panel 1 at a position for the blade 11 to engage therewith when the shutter 4 is in its second position.

Alternatively the blade 11 may be replaced by a pair of strips similar to strips 12 and 13 and affixed respectively to the rear of the shutter 4 adjacent the upper edge and to the rear of the panel at a position such that the two strips sealingly engage with each other when the shutter 4 is in its second position.

As a further alternative, the top edge of the shutter may be provided with a lip and a resilient sealing member fixed on the rear of the panel 1 such that when the shutter 4 is in its second position the lip sealingly engages with the resilient sealing member. Both the lip and the resilient sealing member should extend completely between the ptfe strips 5 and 6.

Intumescent material may be provided on the louvres 2', e.g. on their rear surface, so that in the event of a fire, the intumescent material intumesces and closes the openings 3 thereby preventing flow of air through the ventilator even if any of the sealing members 11,12 and 13 or the ptfe strips 5 and 6 lose their sealing capability under the heat of the fire. Intumescent material may also be provided on the front and/or rear surface of the shutter 4.

The strips 5 and 6 may be made of low friction material other than ptfe.

A brush, e.g. a nylon brush, may be used instead of the resilient blade 11.

The blade 11 may be replaced by a compression seal. Similarly the sealing members 12 and 13 may be replaced by a single compression seal or a pair of compression seals. Such compression seals may be tubular resilient compression seals.

More than two springs 14 may be provided. Only one electromagnet 15 may suffice.

Although the plate 2 is shown as a louvre plate it may instead

be in the form of a grille or grating or perforated sheet.

Externally visible means may be provided to indicate that the shutter 4 is in its second position so that it is readily apparent when the ventilator has been closed and needs to be reset (i.e. reopened by moving the shutter to its first position). Also externally operable means may be provided to enable the ventilator to be readily manually reset when necessary.

Each of the casing, the plate 2 and the shutter 4 may, instead of being made of metal, be made as a flame-retardant polyester resin moulding.

Referring to Figure 4, the ventilator shown therein is similar to that shown in Figures 1 to 3 except that it has two shutters 4' connected by the springs 14. When the shutters 4 are in their first position they are disposed respectively to the left and right of the louvres 2 When the electromagnets are de-energized the shutters 4 are pulled by the springs 14 to cover the louvres.

It will be understood that the electromagnets, guide members and sealing members are omitted from Figure 4 for the sake of clarity.

The third ventilator shown in the drawings comprise a circular ventilator panel 1. A plurality of openings 3 are provided in the panel for flow of air, portions 1a of the panel being disposed between the openings 3.

A steel shutter 4 is mounted on the rear of the panel 1 and is rotatable about the centre 5 of the panel.

The shutter 4 comprises blades 4'. When the shutter 4 is in a first position the blades 4' are in registry with the portions 1a of the panel 1 so that air can flow freely through the openings 3. An electromagnet (not shown) similar to the electromagnets 15 referred to above is provided for retaining the shutter 4 in the first position (as indicated by broken lines in Figure 4). A tension spring (not shown) is provided for urging the shutter

4 to a second position (as indicated by full lines in Figure 4) in which the blades 4' are in registry with and close the openings 3 to block flow of air through the openings.

The electromagnet is connected to a smoke sensor.

Normally the electromagnet holds the shutter 4 in the first position but if smoke is detected by the smoke detector the electromagnet is de-energized and the shutter is pulled by the tension spring to its second position.

Sealing means may be provided around the entire periphery of each blade 4' and/or around the entire periphery of each opening 3 so that when the shutter is in its second position the openings 3 are sealed closed. Such sealing means may be constituted by sealing members similar to the sealing members described above with reference to the first ventilator. Thus the seal may be provided at the radially outer edges of the blades 4' and the openings 3 in the same manner as the seal is provided along the side edges of the panel 1 in the first ventilator and the seal may be provided along the radially extending edges of the blades 4' and the openings 3 in the same manner as the seal is provided along the top and bottom edges of the panel 1 in the first ventilator.

The ventilator shown in Figure 6 is similar to the previously described ventilators, in particular the ventilator of Figures 1 to 3A except as described below.

Referring to Figure 6, the ventilator comprises, mounted within the casing 1, an electric motor 40, a compartment 41 for accommodating a transformer or battery for powering the motor and a compartment 42 accommodating a smoke-detector unit and a siren.

The motor 40 is provided with a geared drive shaft 43 which has a threaded portion engaging in an internally threaded bush 44 non-rotatably attached to the shutter 4. (Conveniently the shaft 43 is made of conventional studding).

When smoke is detected by the smoke detector, the smoke detector

causes the motor 40 to operate to rotate the shaft 43 thereby to cause the bush 43 to move along the shaft and the shutter 4 to move from its first to its second position. Also the siren is caused to sound by the smoke detector when the latter detects smoke.

A trip switch (not shown) is provided to switch off the motor 40 when the shutter reaches its second position.

Provision may be made to enable the smoke detector to be tested to ascertain that when it is actuated the shutter is caused to move from its first to its second position.

To return the shutter 4 to its first position, provision is made to enable the motor 40 to rotate the shaft 43 in the opposite sense to that in which it rotates when the shutter is moved to its second position. To this end, operation of the trip switch may cause the motor to be put into reverse so that when the motor is operated again the shutter is caused to return to its first position.

Although the ventilator functions as an independent unit the smoke detector may be connected to an alarm system external of the ventilator.

Preferably the sealing around the shutter 4 in the ventilator of Figure 6 is provided by sliding ptfe strips, as shown in Figure 3 or 3A and by sponge Neoprene sealing members such as members 12 and 13 shown in Figure 2.

As an alternative to the rotating threaded shaft and bush attached to the shutter of Figure 6 the motor may comprise a threaded shaft which engages in a fixed non-rotatable internally threaded bush of the motor, the shaft being attached to the shutter in a manner that allows the shaft to rotate. Rotation of the shaft by the

motor then causes the shaft to move along its longitudinal axis to cause the shutter to move between its first and second positions.

It is to be understood that the various options discussed above with respect to the seal of the first ventilator apply equally to the second, third and fourth ventilators. Similarly the various options discussed above with respect to the louvre plate of the first ventilator apply equally to the second and fourth ventilators.

CLAIMS

1. A ventilator comprising: a panel having at least one ventilation opening; at least one shutter movably mounted on the panel, the shutter or shutters in a first position allowing flow of air through the ventilation opening or openings and in a second position closing the opening or openings; means for holding the shutter or shutters in said first position; means for holding the shutter or shutters in said second position; means for effecting movement of the shutter or shutters from said first position to said second position; and sealing means which when the shutter or shutters are in said second position cooperate with the shutter and the panel to provide a seal extending substantially completely around the ventilation opening or openings.

2. A ventilator according to claim 1, wherein the means for holding the shutter or shutters in said first position is electromagnetic means which when de-energized releases the shutter or shutters to allow same to move to said second position.

3. A ventilator according to claim 2, wherein said electromagnetic means is at least one electromagnet which when energized magnetically hold the shutter or shutters in said first position.

4. A ventilator according to any preceding claim, wherein the shutter or shutters is or are urged towards said second position by one or more springs.

5. A ventilator according to claim 4, wherein said springs are connected between the shutter or shutters and the panel and the means for holding the shutter or shutters in said second position comprises said spring or springs.

6. A ventilator according to claim 1, wherein the means for holding the shutter or shutters in said first position, for holding the shutter or shutters in said second position and for effecting movement of the shutter or shutters comprise a threaded shaft

member and an internally threaded member with which said shaft engages, one said member being connected to the shutter and the other said member being rotatably driven by a motor such that rotation of said other member effects the movement of the shutter.

7. A ventilator according to any preceding claim, wherein the means for effecting movement of the shutter or shutters is connected to a smoke detector, the detection of smoke causing the shutter or shutters to move to said second position.

8. A ventilator according to any preceding claim, wherein the seal is provided by sliding sealing members extending in the direction of movement of the or each shutter and resilient sealing members extending transverse to said direction.

9. A ventilator according to claim 8, wherein the sealing members are held under compression.

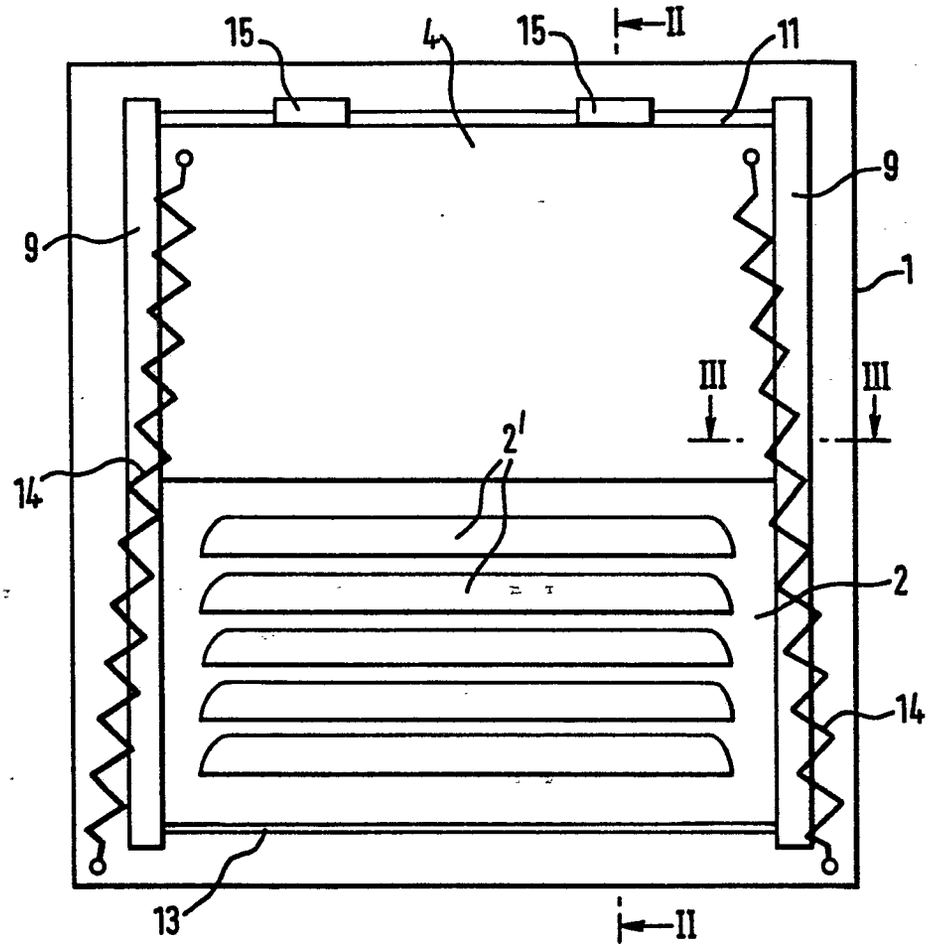

FIG.1.

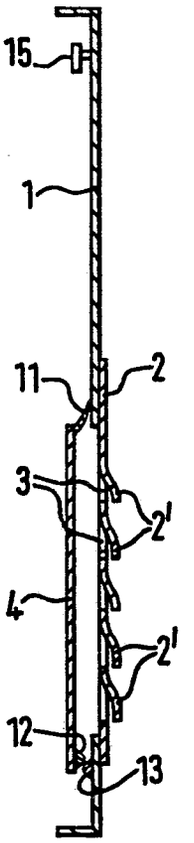

FIG.2.

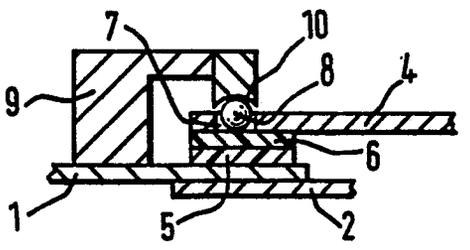

FIG.3A.

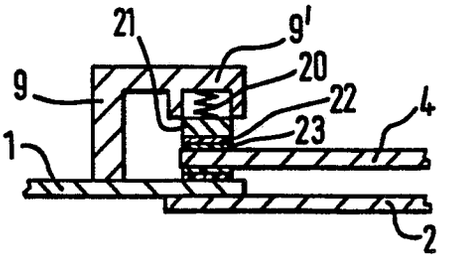

FIG.3B.

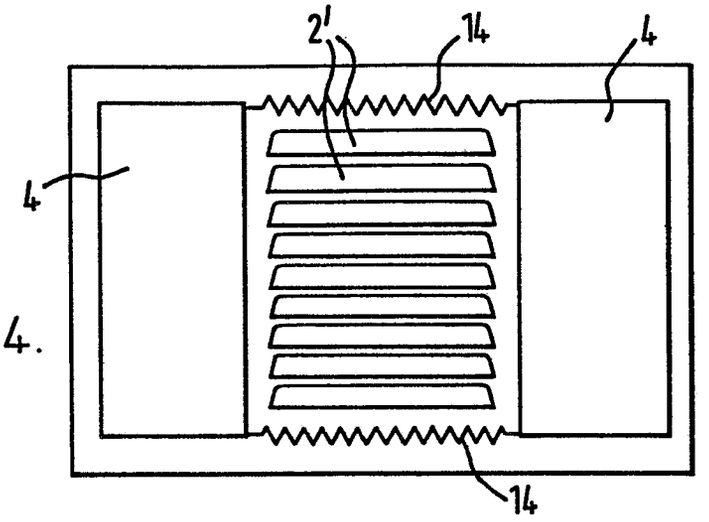

FIG.4.

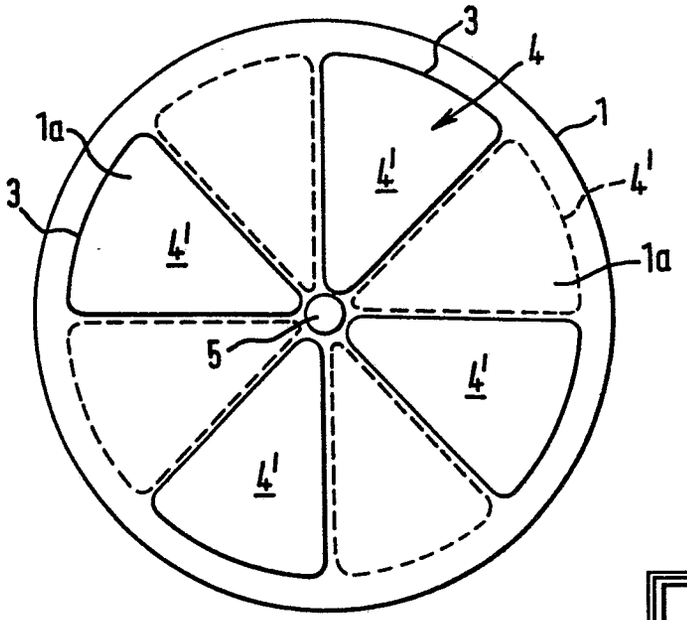

FIG.5.

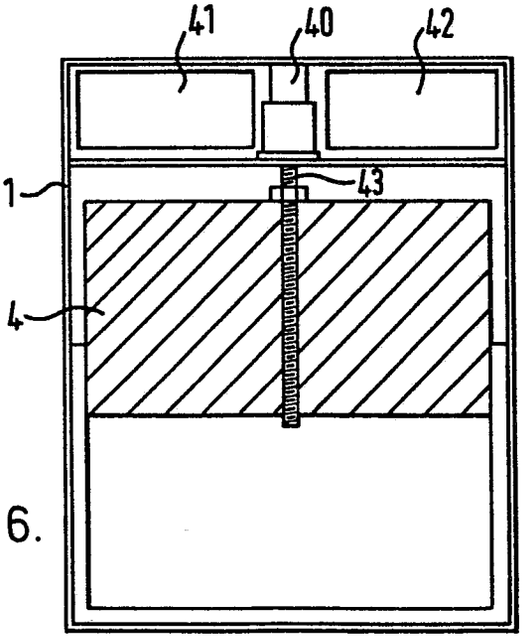

FIG.6.