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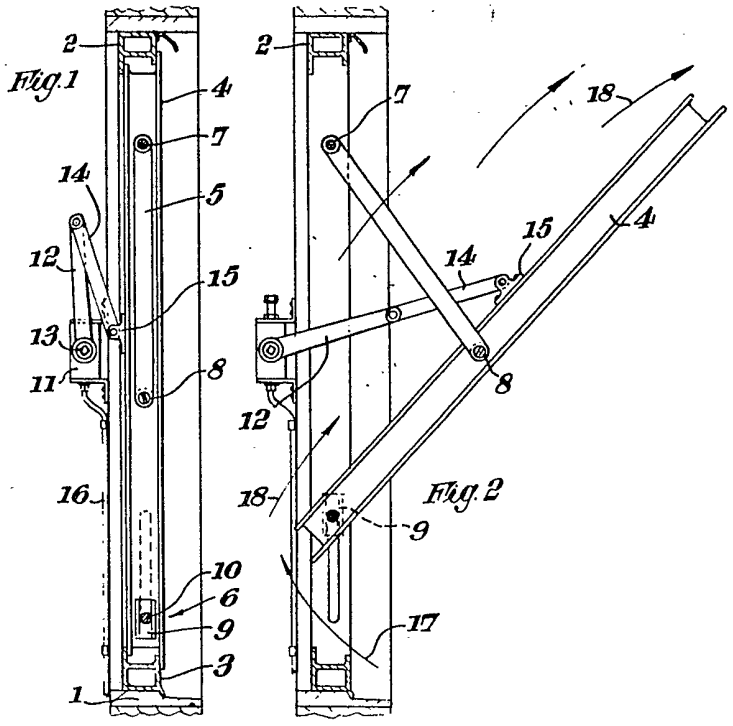
(71) Applicant
K G Smoke Dispersal Limited (United Kingdom),
51–63 St Dunstan's Road, Worthing, West Sussex
BN13 1AA

(72) Inventor
Cyril Herbert Moss

(74) Agent and/or Address for Service
G F Redfern & Co,
Marlborough Lodge, 14 Farncombe Road, Worthing,
West Sussex BN11 2BT

(54) Ventilator actuator

(57) A ventilator comprises a panel or glazed sash (4) mounted in a frame installed in a building and pivotable about a first horizontal axis (10) which is slideable along a vertical path defined in the frame (by shoe 9). The panel (4) is also supported by a pair of first arms (5), one end of which is pivotally connected to the frame (at 7) and the other end of which is pivotally connected to the panel (at 8). One end of a second arm (14) is pivotally connected to the panel (4) (at 15) and the other end of the arm (14) is pivotally connected to a third arm (12), the other end of which is rotatable about a second horizontal axis by means of a pneumatic torque actuator (11).



GB 2 140 077 A

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

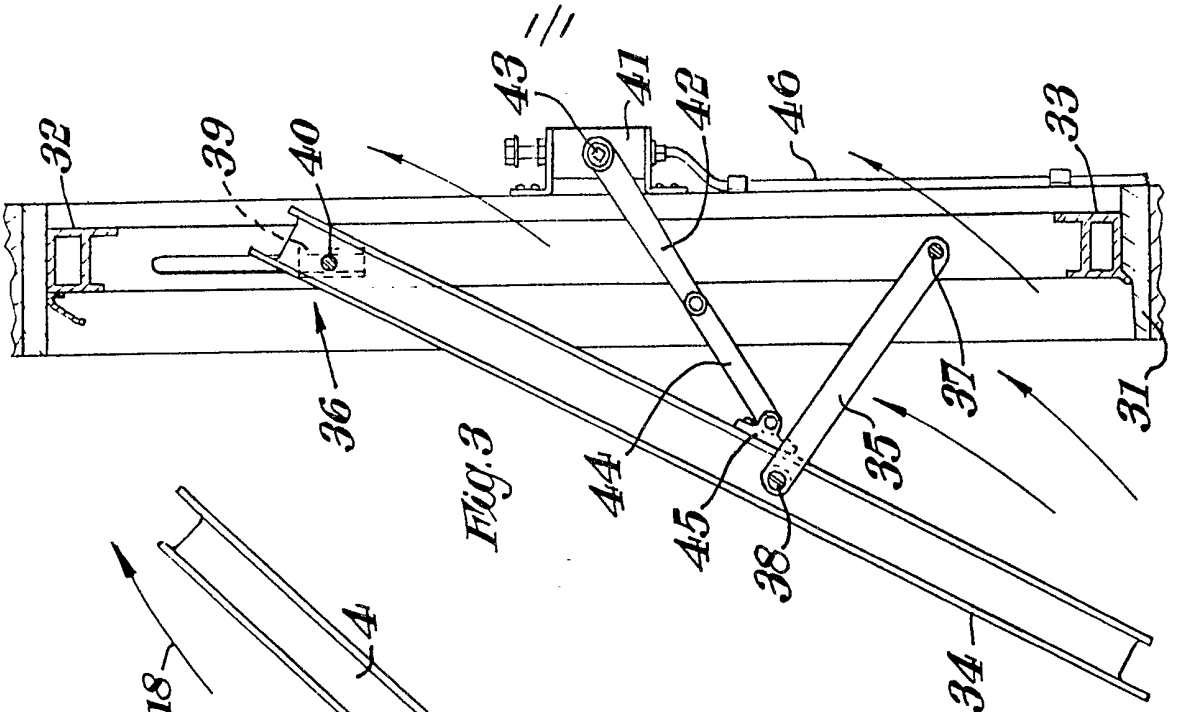


Fig.3

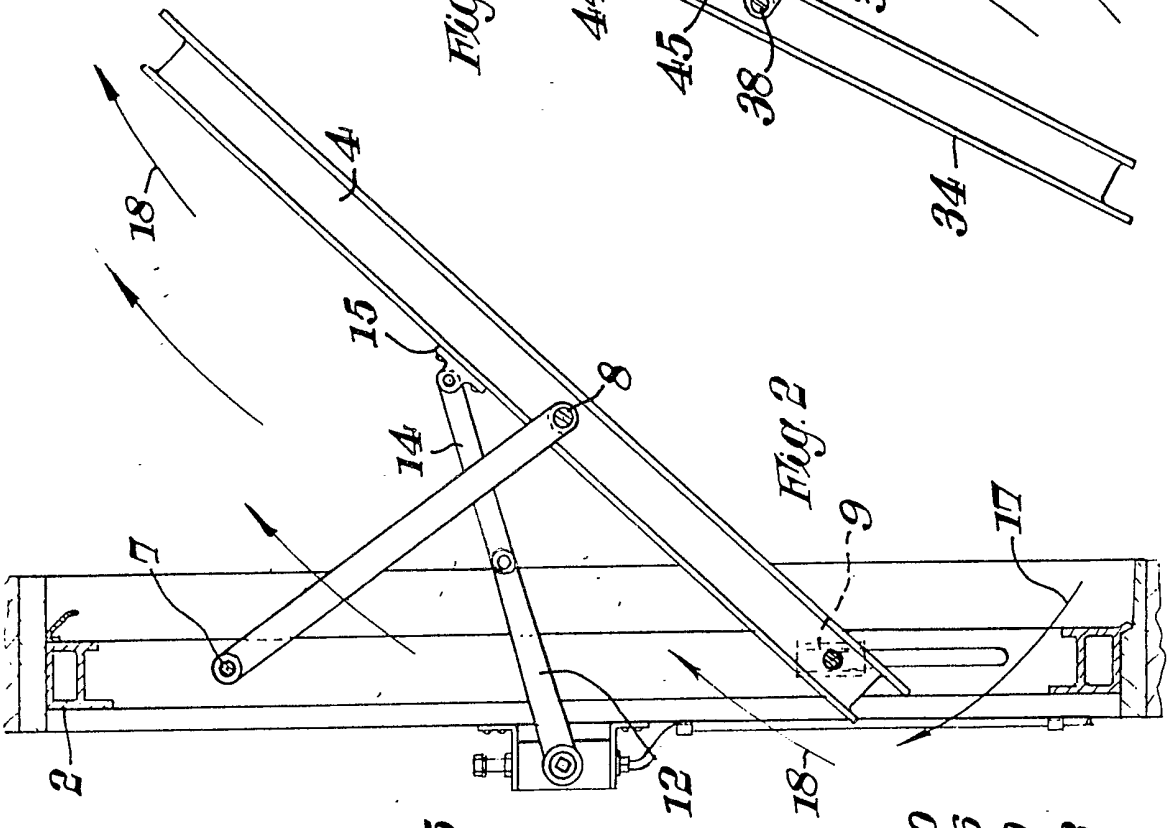


Fig.2

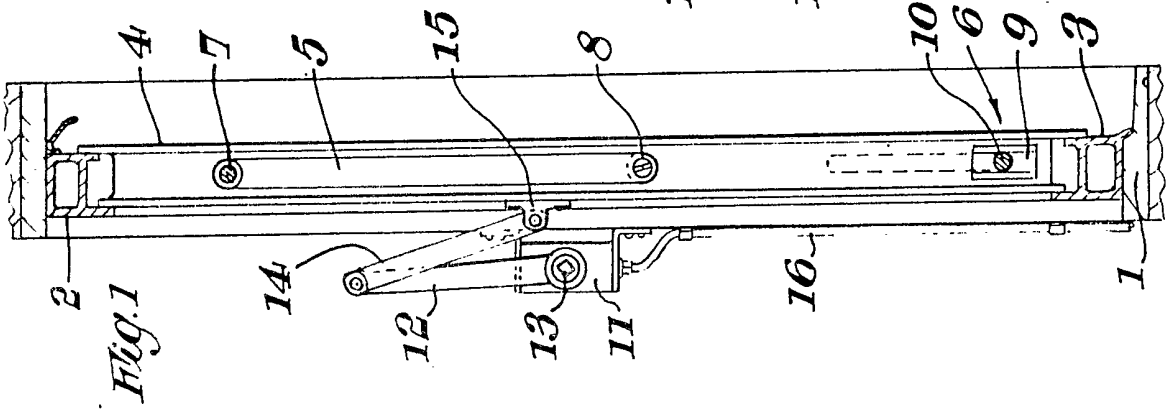


Fig.1

SPECIFICATION

Improvements in or relating to ventilators

This invention relates to ventilators and provides a ventilator which may be used advantageously for a number of different purposes. In particular it provides a ventilator which may be automatically opened to allow smoke to escape from a building in which it has been detected, or it may be used to automatically close when noxious gases are detected outside the building. In addition, it may be used under manual control in places which are inaccessible. Finally, it is particularly advantageous for use in circumstances in which it is necessary that, when the ventilator is opened, there should be no parts projecting beyond one side of the frame.

From one aspect the invention consists in a ventilator comprising a frame installed in an aperture in a wall of a building, a panel mounted to pivot about a first horizontal axis which is slideable along a vertical path defined in said frame, a pair of first arms, one end of each of which is pivotally connected to said frame, and the other end of each of which is pivotally connected to said panel at a point below its centre of gravity, a second arm, one end of which is pivotally connected to said panel at a point above the connections of said first arms, a third arm, one end of which is pivotally connected to the other end of said second arm, and the other end of which is rotatable about a second horizontal axis by means of a pneumatic torque actuator to cause said panel to open and close said aperture.

It will be understood that the majority of the weight of the panel will be applied through the first arms to the frame. The various dimensions are chosen so that a minimum force is required to move the panel from the open to the closed position, and vice versa. Thus the panel can be opened and closed by means of a relatively small torque actuator which preferably operates to move the panel to one of its two end positions when air under pressure is admitted to the actuator, and operates under the influence of spring means to move the panel to its other end position when air is allowed to escape from the actuator.

A ventilator in accordance with the invention is preferably arranged as a fail-safe device. It is to be understood that the "safe" position under some circumstances will be the closed condition, and under other circumstances will be the open condition. Thus the torque actuator is arranged so that the spring moves the panel into whichever of the two end positions is the "safe" position. Thus the admission of air under pressure to the torque actuator moves the panel away from the "safe" position but if, for any reason, there is an interruption in the air supply, then the panel moves under the influence of the spring means into the "safe" position.

In a first embodiment of the invention the first horizontal axis is located at or near the lower edge of the panel, and in this case the said one end of each first arm will be pivotally connected to the frame at a point which is in the vicinity of the upper horizontal edge of the frame.

In a second embodiment of the invention the first horizontal axis is located at or near the upper horizontal edge of the panel, and in this case the one end of each of the first arms is connected to the frame in the vicinity of the lower edge thereof. As in the case of the first embodiment, the main weight of the panel will be applied by the first arms to the frame, but in this case the first arms will be in compression instead of in tension as in the case of the first embodiment.

A ventilator in accordance with the first embodiment of the invention may be used, for example, as a smoke vent in a fire safety system of the kind described and claimed in Patent Specification No. 1 326 112. It will be understood that in this case the panel will be arranged to open outwardly of the building when air is allowed to escape from the torque actuator As the panel swings outwardly, the first horizontal axis rises and provides an opening at the foot of the frame for clean air to enter the building from outside. At the same time an opening for the egress of smoke is provided above the panel. Preferably the dimensions are arranged so that, when the ventilator is fully open, the panel projects from the building at an angle of approximately 45 degrees.

It is to be understood that when the ventilator is used in the manner described in the preceding paragraph, the torque actuator is controlled by a smoke detector located in the building so that the ventilator is maintained closed by air pressure applied to the torque actuator so long as no smoke is detected. If smoke is detected in the building, air is released from the torque actuator and the panel swings outwardly under the influence of the spring in the torque actuator Preferably the dimensions are arranged so that, once the panel has started to swing outwardly, the weight of the panel assists in its continued rotation. The system is arranged so that, once smoke has been cleared from the building, the air pressure can be reapplied under manual control to the torque actuator, thus closing the ventilator.

One particular use for a ventilator in accordance with the second embodiment of the invention is to provide ventilation for a building at a high level. In this case the air supply to the torque actuator may be manually controlled so that the open or closed condition of the ventilator may be selected at will even

though the ventilator is normally inaccessible. Yet another use for a ventilator in accordance with the second embodiment of the invention is in the case in which ventilation is normally required in a building, but in which the ventilators must be automatically closed if a noxious gas is detected outside the building. In this case, of course, the spring in the torque actuator will be arranged to close the ventilator and, providing there is clean air outside the building, the ventilators will normally be held open by means of the air pressure applied to the actuator.

It is to be understood that the air supply to the actuator may be controlled by means of a spool valve which is electrically operated, or is operated by a secondary source of air under pressure.

In most instances, the arrangement will be such that when the ventilator is open the panel projects outwardly of the building and no part of it projects inwardly. However, under certain circumstances it may be that there is no space outside the building for the panel to move into as it opens, and under these circumstances the arrangement will be such that, when the ventilator is open, the panel projects into the building.

Preferably a ventilator in accordance with the invention includes two second arms and two third arms, one mounted on each side of the panel. The ventilator may also include a second torque actuator for controlling the additional third arm. Aiternatively the said other end of the additional third arm may be rotatable in a bearing fitted to the frame, and the additional third arm may be controlled by means of a shaft extending across the frame from a single torque actuator.

In a particular fire safety system, two ventilators in accordance with the present invention are provided, one above the other In this case the upper ventilator is in accordance with the first embodiment of the invention and the lower ventilator is in accordance with the second embodiment of the invention. Both the panels move outwardly when smoke is detected, and the lower ventilator provides a particularly efficient inlet for the air, and the upper ventilator provides an efficient exit for the smoke. Preferably both ventilators would be controlled by a smoke detector, but in certain circumstances it may be desirable to provide for manual control of the air supply to the actuators either in addition to, or instead of, the automatic control.

Methods of performing the invention will now be described with reference to the accompanying diagram matic drawings, in which:

Figure 1 is a side view of a first embodiment of the invention showing the ventilator closed;

Figure 2 is a side view of the ventilator illustrated in Figure 1 in the open position; and

Figure 3 is a side view of a second embodiment of the invention with the ventilator in the open position.

The ventilator illustrated in Figure 1 includes a frame fitted in a wall 1 of a building. The frame includes upper and lower members 2 and 3, and also includes side members (not shown). The ventilator also includes a glazed sash 4. The sash 4 is supported in the frame by means including a pair of arms 5 and a pair of sliding pivots 6. The upper end of each arm 5 is pivotally com ected to the frame, as indicated at 7, and the lower end of each arm is pivotally connected to the sash, as indicated at 8. Each of the sliding pivots 6 includes a shoe 9 slideable in a channel form ed in the respective side member of the frame. Each shoe carries a pivot pin 10 rotatable in a bearing fitted to the sash.

The ventilator illustrated is opened and closed by means of a torque actuator 11. An arm 12 is fitted to the output member 13 of the torque actuator, and a further arm 14 is pivotally connected to the free end of the arm 12. The arm 14 is also pivotally connected to a trunion 15 mounted on the sash. The torque actuator 11 is controlled pneumatically by an air supply 16.

The ventilator illustrated in Figures 1 and 2 is intended for use as a smoke vent and accordingly it is arranged so that, if the air supply 16 is interrupted, the ventilator will be opened by means of a spring provided in the torque actuator. Thus, when air is supplied to the torque actuator, the arm 12 is rotated anticlockwise so that the sash 4 is maintained in the closed position illustrated in Figure 1. If the air supply is interrupted, the spring causes the arm 12 to rotate in a clockwise direction so that the ventilator is moved to the open position illustrated in Figure 2. When the ventilator is open, air is admitted to the building below the sash, as indicated by the arrow 17, and smoke is allowed to leave the building above the sash, as indicated by the arrows 18.

The ventilator illustrated in Figure 3 is generally similar to that illustrated in Figures 1 and 2, but is designed primarily for the admission of air into a building. The ventilator again includes a frame mounted in a wall 31 of a building, and having top and bottom members 32 and 33. The glazed sash 34 is supported in the frame by means of a pair of arms 35 and a pair of sliding pivots 36. Again each of the sliding pivots 36 includes a shoe 39, a pivot pin 40 and a bearing member secured to the sash. In the arrangement illustrated in Figures 1 and 2, the shoes are located adjacent to the lower ends of the respective side members of the frame, while in the arrangement shown in Figure 3, the shoes are arranged to slide in the vicinity of the upper ends of the side members of the

frame.

The arm 35 is pivoted at one end to the frame as shown at 37, and at the other end is pivoted to the sash as shown at 38.

The ventilator illustrated in Figure 3 is opened and closed by means of a torque actuator 41 having an output shaft 43 connected to an arm 42. A further arm 44 is pivotally connected at one end to the free end of the arm 42, and at the other end to a trunion 45 fixed to the sash 34.

Once again, the "failsafe" position of the ventilator is the open position, and accordingly in this case the spring in the torque actuator operates to rotate the arm 42 anticlockwise. Admission of air to the actuator through the line 46 causes clockwise rotation of the arm 42. Thus the spring will move the ventilator to the open position shown in Figure 3 while the air supply moves the ventilator to the closed position.

Both of the embodiments illustrated are shown in vertical walls of buildings. However it is to be understood that the frame may be in an inclined wall or roof, or even in a horizontal flat roof. In the latter case it may be desirable to use ventilators in accordance with the invention in pairs, with their sides aligned and with the outwardly opening ends of the sashes adjacent to one another With such an arrangement, if the wind is blowing in a direction having a component parallel to the sides of the ventilators, a Venturi effect will be created, tending to suck air or smoke out of the building. If, in addition, the ventilators are mounted in a frame spaced upwardly from the roof surface, and if downwardly-inclined deflector plates are provided on both sides of the frame, a Venturi effect will also be provided when the wind has a component perpendicular to the side of the frame.

It is of course to be understood that the control system provided for the ventilators should be designed in such a way that any desired combination of ventilators can be selected for opening.

CLAIMS

1. A ventilator comprising a frame installed in an aperture in a wall of a building, a panel mounted to pivot about a first horizontal axis which is slideable along a vertical path defined in said frame, a pair of first arms, one end of each of which is pivotally connected to said frame, and the other end of each of which is pivotally connected to said panel at a point below its centre of gravity, a second arm, one end of which is pivotally connected to said panel at a point above the connections of said first arms, a third arm, one end of which is pivotally connected to the other end of said second arm, and the other end of which is rotatable about a second horizontal axis by means of a pneumatic torque actuator to cause said panel to open and close said aperture.

2. A ventilator as claimed in Claim 1, wherein the torque actuator operates to move the panel to one of its two end positions when air under pressure is admitted to the actuator, and operates under the influence of spring means to move the panel to its other end position when air is allowed to escape from the actuator.

3. A ventilator as claimed in Claim 1 or Claim 2, wherein the first horizontal axis is located at, or near, the lower edge of the panel and the said one end of each first arm is pivotally connected to the frame at a point which is in the vicinity of the upper horizontal edge of the frame.

4. A ventilator as claimed in Claim 3, used as a smoke vent in a fire safety system as claimed in Patent Specification No. 1 326 112.

5. A ventilator as claimed in Claim 4, wherein the panel is arranged to open outwardly of the building when air is allowed to escape from the torque actuator so that, as the panel swings outwardly, the first horizontal axis rises and provides an opening at the foot of the frame for clean air to enter the building from outside, while at the same time an opening for the egress of smoke is provided above the panel.

6. A ventilator as claim ed in Claim 5, wherein the dimensions are arranged so that, when the ventilator is fully open, the panel projects from the building at an angle of 45 degrees.

7. A ventilator as claimed in any of Claims 4 to 6, wherein the torque actuator is controlled by a smoke detector located in the building, so that the ventilator is maintained closed by air pressure applied to the torque actuator so long as no smoke is detected, whereas if smoke is detected in the building, air is released from the torque actuator so that the panel swings outwardly under the influence of the spring in the torque actuator

8. A ventilator as claimed in Claim 7, wherein the dimensions are arranged so that, once the panel has started to swing outwardly, the weight of the panel assists in its continued rotation.

9. A ventilator as claimed in any of Claims 4 to 8, wherein the system is arranged so that, once smoke has been cleared from the building, the air pressure can be reapplied under manual control to the torque actuator, thus closing the ventilator

10. A ventilator as claim ed in Claim 2, wherein the first horizontal axis is located at, or near, the upper horizontal edge of the panel and wherein the one end of each of the first arms is connected to the frame in the vicinity of the lower edge thereof.

11. A ventilator as claim ed in Claim 10, wherein the aperture is located in a position which is normally inaccessible and wherein

the air supply to the torque actuator is manually controlled so that the open or closed condition of the ventilator can be selected at will.

12. A ventilator as claimed in Claim 10, used in a system for detecting noxious gas outside the building.

13. A ventilator as claimed in Claim 12, wherein the spring in the torque actuator is arranged to close the ventilator and wherein, providing there is clean air outside the building, the ventilator is held open by means of the air pressure applied to the actuator

14. A ventilator as claimed in any of the preceding Claims, wherein the air supply to the actuator is controlled by means of a spool valve which is electrically operated.

15. A ventilator as claimed in any of Claims 1 to 13, wherein the air supply to the actuator is controlled by means of a spool valve which is operated by a secondary source of air under pressure.

16. A ventilator as claimed in any of the preceding Claims, wherein the arrangement is such that, when the ventilator is opened, the panel projects outwardly of the building and no part of it projects inwardly.

17. A ventilator as claimed in any of Claims 1 to 15, wherein the arrangement is such that, when the ventilator is open, the panel projects into the building and no part of it projects outwardly.

18. A ventilator as claimed in any of the preceding Claims, wherein there are two second arms and two third arms, one being mounted in each case on each side of the panel.

19. A ventilator as claimed in Claim 18, including a second torque actuator for controlling the additional third arm.

20. A ventilator as claimed in Claim 18, wherein the said other end of the additional third arm is rotatable in a bearing fitted to the frame, and the additional third arm is controlled by means of a shaft extending across the frame from a single torque actuator

21. A fire safety system including two ventilators, one above the other, wherein the upper ventilator is as claimed in Claim 3 and the lower ventilator is as claimed in Claim 10.

22. A fire safety system as claimed in Claim 21, wherein both panels move outwardly when smoke is detected.

23. A fire safety system as claimed in Claim 21 or Claim 22, wherein both ventilators are controlled by a smoke detector and wherein manual control of the air supply to either or both, actuators is provided in addition to control by the smoke detector.

24. A modification of the ventilator as claimed in any of Claims 1 to 20, wherein the aperture is located in an inclined wall or pitched roof of the building.

25. A modification of the ventilator as claimed in any of Claims 1 to 20, wherein the aperture is located in a flat roof of the building.

26. A ventilation system comprising a pair of ventilators as claimed in Claim 25, wherein the sides of the two ventilators are aligned, wherein both panels project upwardly from the flat roof in the open position and wherein the two projecting ends of the panels are adjacent to one another

27. A ventilator substantially as hereinbefore described with reference to Figures 1 and 2 or Figure 3 of the accompanying diagrammatic drawings.

28. A fire safety system including a ventilator substantially as hereinbefore described with reference to Figures 1 and 2 or Figure 3 of the accompanying diagrammatic drawings.

29. A ventilation system including a pair of ventilators, each of which is substantially as hereinbefore described with reference to any of the accompanying diagrammatic drawings.

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