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(54) Improvements relating to ventilators.

(57) An opening flap ventilator for buildings has pneumatic opening springs (13) and electric motor-gear drive mechanism (14) operable to close the ventilation flap (11). The mechanism has an electrically energised clutch (54) interposed in the gear drive chain (24, 26, 28, 48, 46) (see Fig. 2). On de-energisation of the clutch (54), which may be automatic in response to the detection of a fire condition occuring, the ventilation flap (11) is automatically opened. The flap (11) is subsequently closed by operation of the motor which drives a winch pulley (20) for winding in a single operating cable (76) in opposite directions from a location between its ends. A fused fire prop is provided to prop the flap (11) open in the event of a fire as a safety measure.

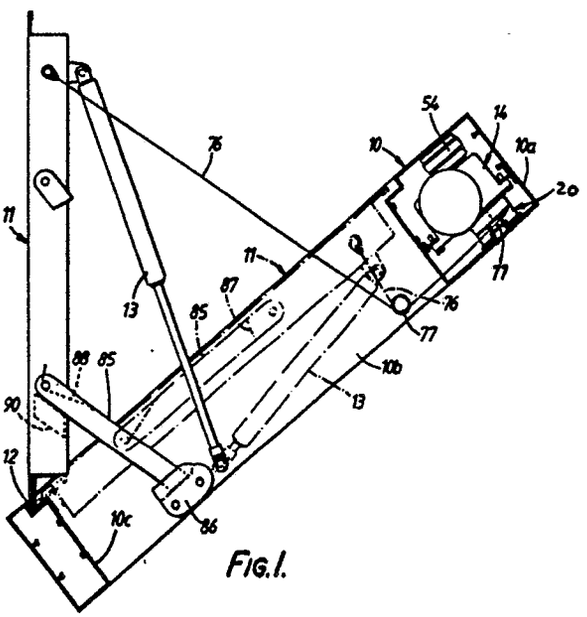

FIG.1.

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IMPROVEMENTS RELATING TO VENTILATORS

The present invention comprises improvements relating to ventilators and concerns controllable ventilators which are required to open to exhaust heat, smoke and fumes from a building in the event of a fire and to close to conserve heat in the building under normal conditions.

According to the present invention, such a ventilator comprises an opening flap ventilator for buildings having a frame defining a ventilation opening, a hinged ventilation flap for closing the opening, and springs for opening the ventilation flap characterized by a fused fire prop pivotally mounted on the flap to swing round to engage an abutment on the frame to prop the flap open in the event of a fire which might otherwise cause failure of the springs.

With this arrangement, the ventilator may be opened by its springs in the event of a fire, and this may be done automatically in response to the onset of a fire condition using a suitable fire and/or smoke detector.

The fused prop then acts as an additional safety measure to prevent reclosing of the flap.

A specific embodiment of ventilator in accordance with the present invention will now be described by way of example, and not by way of limitation, with reference to the accompanying drawings in which :-

FIG. 1 is a cross-section of a ventilator in accordance with the present invention in an inclined mounted position and shown in its open and closed positions;

FIG. 2 shows an electric motor-gear drive mechanism of the ventilator with its gearbox housing in cross-section; and

FIG. 3 is a view from the right hand end in Fig. 2.

With reference now to the accompanying drawings, the ventilator has a hollow frame 10 and a single, bottom hung, outwardly hingeing ventilator flap 11 to provide for day-to-day and for fire ventilation hinged to the frame at 12. Gas springs 13, one at each side, are provided for opening the flap 11, the flap then assuming its substantially vertical position as shown in Fig. 1. An electric motor-gear drive mechanism 14 is installed inside a hollow, top frame member 10a of the ventilator about midway between the side frame members 10b of the frame 10. The bottom frame member is indicated at 10c. The unit 14 comprises an electric motor 15 and a gear drive mechanism 16 housed in a gear box housing 17 adapted for flange mounting at 18 inside the ventilator top frame member 10a. The unit 14 has an output drive in the form of a winch pulley generally indicated at 20 and disposed laterally to one side of the unit which is generally elongated to fit within the hollow top frame member 10a. The pulley 20 is fixedly carried by an output drive shaft 22 which also carries the final gear 24 of a spur gear set 24, 26, 28 contained within the housing 17. The gears 26 and 28 of the spur gear set are mounted on further drive shafts 30, 32. The drive shafts 22, 30 run in ball races 34 and 36 carried by the housing 17. The drive shaft 32 runs at one end in a ball race 38 carried by the housing 17, the shaft 32 also being rotatably supported concentrically within a hollow drive shaft 40 which runs in a ball race 42 carried by the housing 17. The motor shaft 44 fixedly carries a worm 46 which drives a worm wheel 48 fixedly carried by the shaft 40. The shafts 32, 40 carry laterally outside the housing 17, on the side opposite the winch pulley 20, the two elements 50 and 52 respectively of an electromagnetic clutch 54. The clutch 54, when energised, drivably engages the drive shaft 40 with the drive shaft 32 and operation of the motor 15 in one direction or the other drives the pulley 20 to open or close the ventilator.

In the closed condition of the ventilation flap in which the flap assumes its inclined condition as seen in Fig. 1, the motor is de-energised but the electromagnetic clutch 54 remains energised by means of a separate electrical circuit. The ventilation flap is secured closed when in its closed condition by the worm gear set 46, 48 which is of a gear ratio which is incapable of being back driven. Thus, the gear drive mechanism 16 cannot be overhauled by tensioning the cable whilst the clutch 54 is energised.

In one arrangement, the clutch 54 is incorporated in a separate electrical circuit, controlled by automatic fire response means, which maintains the clutch energised so long as a power supply is available and no fire response is required, so that in the event of a power failure, the ventilator opens automatically and cannot fail to function as a fire ventilator under such conditions. In the present example, the electrical circuit of the clutch 54 includes a smoke or fire detecting device operable to de-energise the clutch to release the ventilation flap for automatic opening by its gas-springs in the event of a fire being detected. However, the clutch may be incorporated in the electrical circuit of the motor so that the clutch remains energised so long as an electrical power supply is available to operate the motor and open the ventilator in response to the operation of a smoke or fire detecting device. With this arrangement the clutch operates

simply as a fail safe device.

For day-to-day ventilation purposes, the ventilator may be opened by its gas-springs 13, upon de-energisation of the clutch 54, and closed by operation of the motor 15, the clutch 54 then being energised. Alternatively the ventilator may be opened and closed by operation of the motor.

In accordance with the invention, a fused fire prop 85 (see Fig. 1), pivotally mounted on the frame of the flap 11 swings downwardly to engage an abutment 86 on the frame 10 to prop the flap 11 open in the event of a fire which might otherwise cause the gas-springs 13 to buckle. The prop 85 is formed in two sections normally soldered together as at 87. The prop sections may be joined together with a separate fusible joint mechanically fastened to the sections of the prop. A spring 88 may be provided to swing the prop downwardly and the flap 11 may carry a stop 90 to arrest the prop in its operative position.

In the example described with reference to the drawings, the electric motor 15 has an operating voltage of 24V DC, an output of 80 watts and a normal operating speed of 3,200 r.p.m. The clutch 54 has an operating voltage of 24 volts DC. The output torque of the gear drive mechanism 16 is 50 Nm at a speed of approximately 7 r.p.m. The worm gear set has a gear ratio of 48 to 1 and the spur gear set a gear ratio of 10 to 1. The cable 76 is 2 mm diameter stainless steel wire.

It will be appreciated that the electric motor-gear drive units 14 which has been described may be incorporated in other kinds of controllable ventilators used for fire ventilation purposes, the cable 76 being connected to close, and to control the opening of, e.g. a pair of hinged, oppositely opening ventilation flaps in a roof mounted ventilator to close, and to control the opening of, the louvres of a controllable louvred ventilator by spring action.

Claims

1. An opening flap ventilator for buildings having a frame (10) defining a ventilation opening, a hinged ventilation flap (11) for closing the opening, and springs (13) for opening the ventilation flap (11) characterized by a fused fire prop (85) pivotally mounted on the flap (11) to swing round to engage an abutment (86) on the frame (10) to prop the flap (11) open in the event of a fire which might otherwise cause failure of the springs (13).

2. A ventilator as claimed in claim 1, characterized in that the opening springs (13) are gas springs extendible to open the flap (11).

3. A ventilator as claimed in claim 1 or 2, characterized in that the ventilation flap is hinged along its bottom edge and adapted to be opened into a substantially vertical position from an inclined, closed position.

4. A ventilator as claimed in claim 1, 2 or 3, characterized in that the prop (85) is formed in two sections normally soldered together (as at 87).

5. A ventilator as claimed in claim 1, 2 or 3, characterized in that the prop is formed in two sections fixed together with a separate fusible joint mechanically fastened to the sections of the prop.

6. A ventilator as claimed in any preceding claim including a spring (88) to swing the prop downwardly and the flap (11) carries a stop (90) to arrest the prop in its operative position.

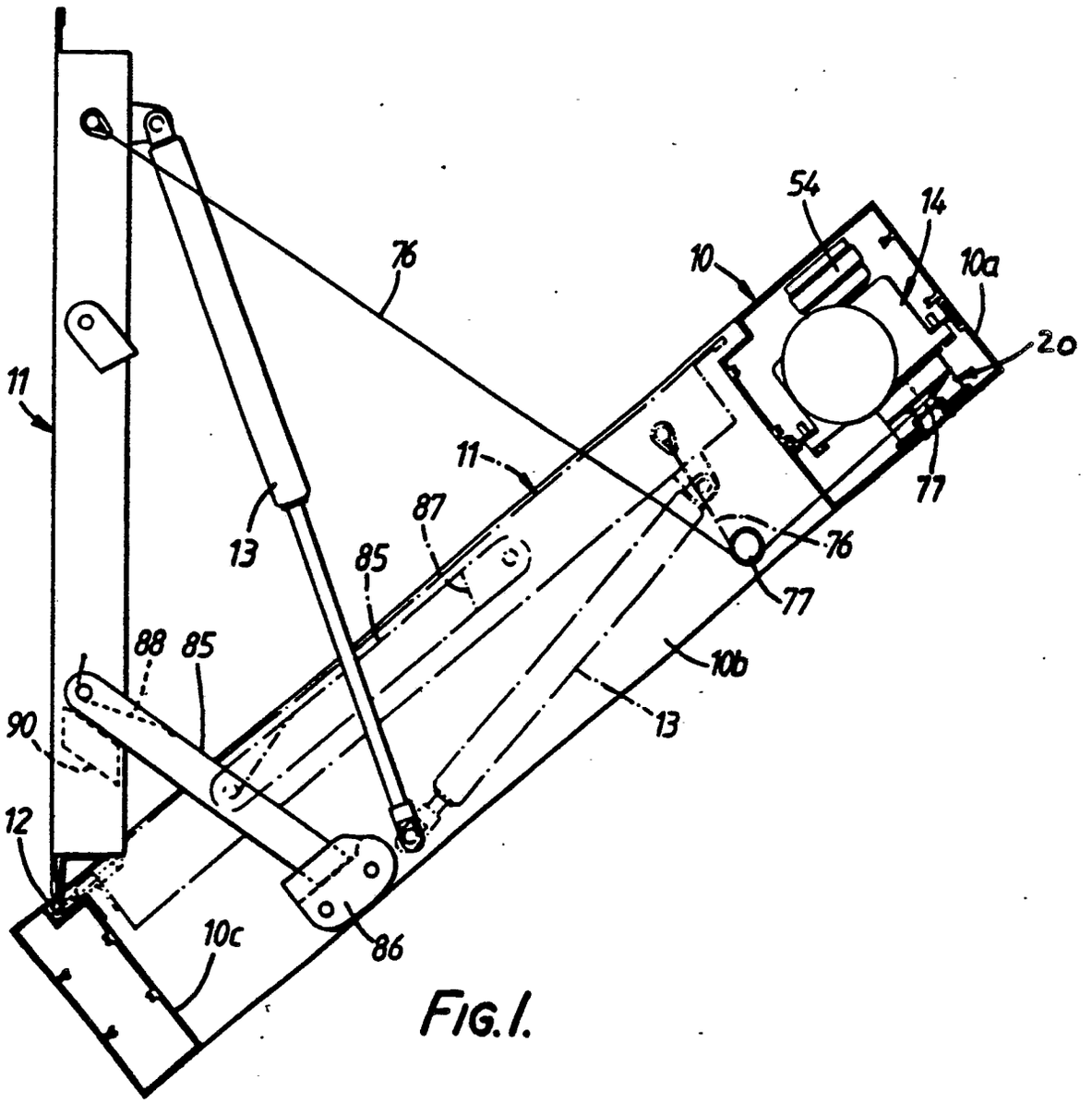

FIG. 1.

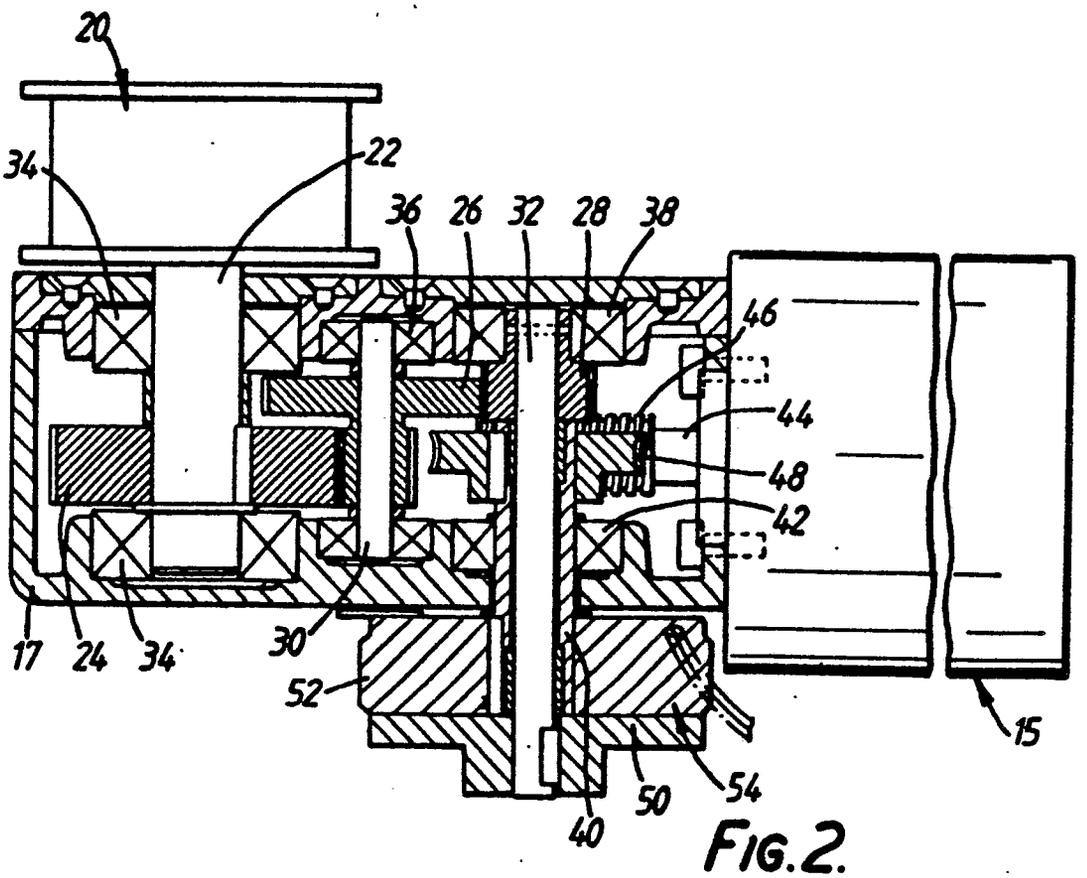
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FIG. 2.

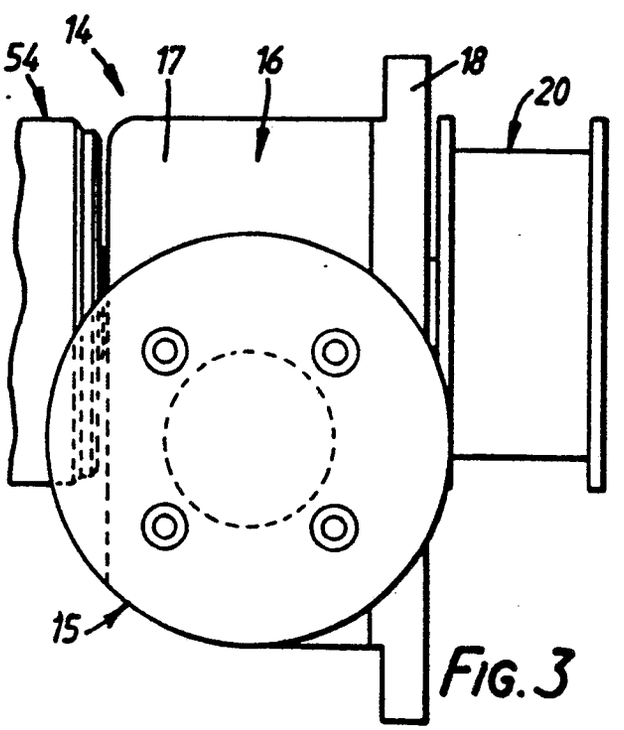
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FIG. 3