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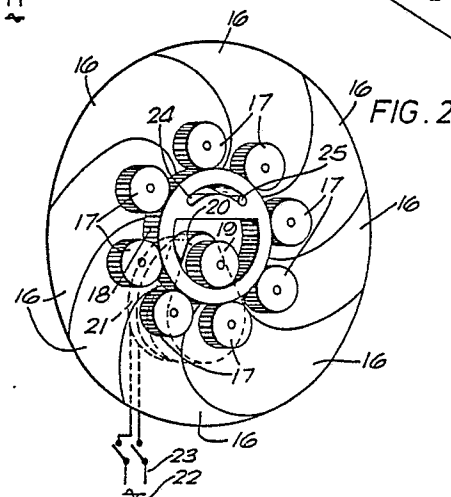
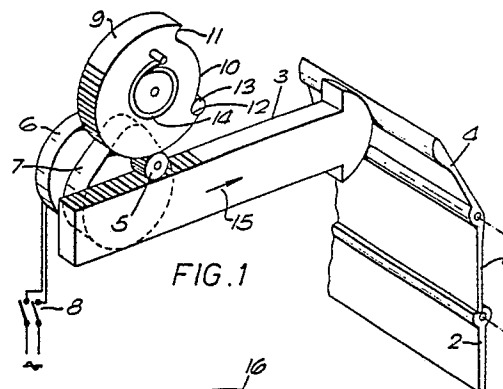
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54 Shutter mechanisms.

57 A shutter mechanism for a ventilation fan comprises a number of blades (1,2,16) forming a louvre shutter or an iris shutter, which blades are movable between closed and open positions by a linear or rotary actuator (3,17,18). The actuator includes a spring (14) which urges the blades into the closed position. A synchronous motor (6,21), when energised, causes the actuator to open the blades and to maintain them open against the action of the spring. In the open position of the blades, the motor operates in the stalled condition, and can operate in that condition for indefinite periods of time.



EP 0 365 343 A2

Shutter Mechanisms

This invention relates to shutter mechanisms, and particularly, but not exclusively, to shutter mechanisms for use in ventilating fans.

Ventilating fans which extract air from a room and exhaust it into the open air are usually provided with shutters which are open when the fan is operative but which are closed when it is inoperative in order to prevent a reverse flow of air through the fan which would create a draught in the room.

Such "back draught" shutters are conventionally opened and closed mechanically by the act of pulling a cord which also operates an on/off switch for the fan motor.

It is an object of the present invention to provide an electrically-operated shutter mechanism which will open and close in response to the switching on and off of an electricity supply, such as a fan motor supply.

According to the invention there is provided a shutter mechanism comprising at least one shutter member which is movable between first and second positions in one of which the shutter is open and in the other of which it is closed; resilient means to urge the or each shutter member towards said first position; and a synchronous electric motor which is energisable to move the or each shutter member to said second position and to maintain it in said second position against the action of the resilient means.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawing, in which

Figure 1 is a schematic pictorial view of a louvre shutter mechanism in accordance with the invention, and

Figure 2 is a schematic pictorial view of an iris shutter mechanism in accordance with the invention.

Referring to Figure 1, a shutter mechanism for a fan (not shown) comprises louvre shutter blades 1, 2 which are mechanically linked so that they open and close simultaneously, in response to longitudinal movement of an actuator rack 3 which makes contact with an upward extension 4 of the blade 1. The shutter blades 1 and 2 are arranged to pivot about axes at their upper ends.

The rack 3 is driven by a pinion 5 mounted on the output shaft of a speed-reduction gearbox 7 which is driven by a free-running synchronous motor 6. The motor is energisable from an a.c. supply via a switch 8. The supply can also be connected to the fan motor (not shown) via the switch 8.

A forward and reverse travel limiting gear 9 also meshes with the pinion 5. The gear 9 has a

reduced-diameter segment 10 having end shoulders 11, 12 which, at respective ends of the travel, engage with a stop pin 13. A return spring 14 urges the gear 9 in the anticlockwise direction, so that the shoulder 12 contacts the pin 13, as shown in Figure 1. This is in the closed position of the shutter blades.

When the switch 8 is closed, the motor 6 rotates the pinion 5 in an anticlockwise direction, moving the rack 3 in the direction of an arrow 15 and thereby opening the blades. At the same time the fan motor is energised. The rotation of the pinion 5 causes the gear 9 to rotate clockwise, winding up the spring 14, until the shoulder 11 butts against the pin 13 at the fully-open position of the blades. The motor 6 is thereby stalled, but it is so designed that it can operate continuously in this stalled condition. The blades are therefore held open, despite the action of the spring 14, which would tend to retract the rack.

When the switch 8 is opened to terminate the operation of the fan, the motor 6 is deenergised, and the spring 14 turns the gear 9 anticlockwise, causing the rack 3 to retract so that the blades close. The gear 9 comes to rest when the shoulder 12 contacts the pin 13.

The mechanism therefore provides a simple and positive means for opening and closing the shutter in response to the switching on and off of the fan.

The mechanism could alternatively be used alone, i.e. not incorporated in a fan, in any location where an aperture has to be selectively opened or closed. For example, the mechanism might be used to open and close an outlet of a duct.

Referring to Figure 2, a second type of shutter mechanism in accordance with the invention comprises a number of iris shutter segments 16, each of which is rotatable by a respective planet wheel to which the segment is fixed. The planet wheels are journaled at equal spacings round a fixed annular plate, which for the sake of clarity of the figure is not shown.

The planet wheels 17 all mesh with a sun wheel 18, which in turn meshes with a pinion 19 on the output shaft of a speed reduction gearbox 20. The gearbox is driven by a free-running synchronous motor 21, which is energised from an a.c. supply 22 via a switch 23. Again, the switch 23 may also control a motor of a fan to which the iris shutter is attached. The motor 21 or the sun wheel 18 is provided with a return spring (not shown) which urges the blades towards the closed position as shown in Figure 2.

In operation of the shutter mechanism, closure

of the switch 23 causes the motor 21 to rotate the sun wheel 18 in an anticlockwise direction as viewed in Figure 2, so that the blades 16 rotate clockwise and the shutter opens. The blades continue to open until the wall at the end of an arcuate slot 24 in the sun wheel 18 makes contact with a stop pin 25. Alternatively, if the slot and pin are not provided, the blades may make contact with the inner surface of the fan housing (not shown). The motor is thereby prevented from rotating further, and it remains in the stalled condition, holding the blades against the action of the return spring which is tending to close them.

When the switch 23 is opened, the motor no longer restrains reverse rotation of the sun wheel, and the blades therefore close under the action of the spring. The closing action ends when the wall at the other end of the arcuate slot 24 makes contact with the stop pin 25, i.e. in the position shown in Figure 2. Alternatively, if the slot and pin are not provided, the closing action will end when adjacent blades make contact with each other.

Again, the iris shutter mechanism might be used in other applications besides the above-described use in a ventilating fan.

Claims

1. A shutter mechanism, characterised by at least one shutter member (1,2; 16) which is movable between first and second positions in one of which the shutter is open and in the other of which it is closed; resilient means (14) to urge the or each shutter member towards said first position; and a synchronous electric motor (6; 21) which is energisable to move the or each shutter member to said second position and which is operative in a stalled condition to maintain it in said second position against the action of the resilient means.

2. A mechanism as claimed in Claim 1, characterised by actuator means (3; 17,18) coupled to the motor (6; 21) and movable thereby to cause said movement of the or each shutter member (1,2; 16) to said second position.

3. A mechanism as claimed in Claim 2, characterised in that the actuator means comprises a rack member (3) arranged for linear longitudinal displacement to cause said movement.

4. A mechanism as claimed in Claim 3, characterised by a gearbox (7) coupled to the motor (6), and a pinion (5) driven by the gearbox and meshed with the rack member (3).

5. A mechanism as claimed in Claim 4, characterised by a gear wheel (9) meshed with the pinion (5) and including stop means (11-13) for defining the extent of travel of the rack member (3).

6. A mechanism as claimed in any preceding

claim, characterised in that the resilient means comprises spring means (14).

7. A mechanism as claimed in Claim 5, characterised in that the resilient means comprises spring means (14) which urges the gear wheel (9) in that direction of rotation which corresponds to movement of the or each shutter member (1,2) to said first position.

8. A mechanism as claimed in any preceding claim, characterised in that the or each shutter member comprises a louvre shutter blade (1,2).

9. A mechanism as claimed in Claim 1, characterised by a plurality of said shutter members (16) together forming an iris shutter.

10. A mechanism as claimed in Claim 9, characterised in that each shutter member (16) is rotatable towards said second position by a respective planet wheel (17); and each planet wheel is driven by a sun wheel (18) which is common to the planet wheels.

11. A mechanism as claimed in Claim 10, characterised in that the sun wheel (18) is driven by a pinion (19) which is coupled to the motor.

12. A mechanism as claimed in Claim 11, characterised in that the pinion (14) is driven by the motor (21) via a speed-reducing gearbox (20).

13. A mechanism as claimed in any one of Claims 9-12, characterised by stop means (24,25) for defining the extent of the rotation of the shutter members (16).

14. An electric ventilating fan incorporating a shutter mechanism as claimed in any preceding claim.

