Dec. 16, 1941. W. A. DANIELSON 2,266,009

VENTILATING DEVICE

Filed May 24, 1939

Fig. 1.

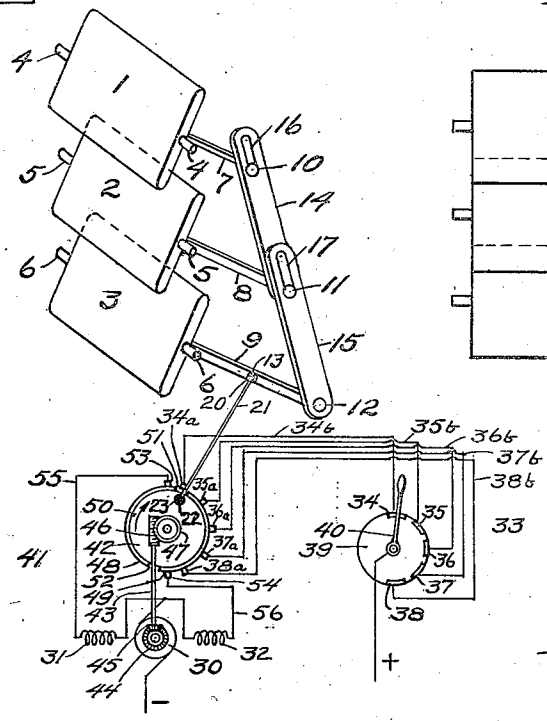


Fig. 2.

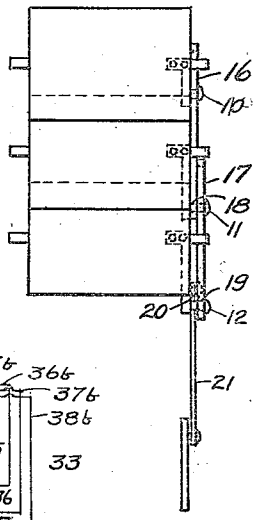
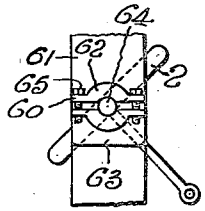


Fig. 6.



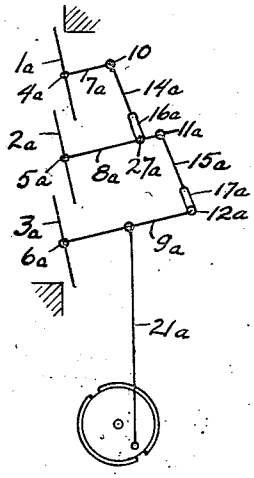


Fig. 3.

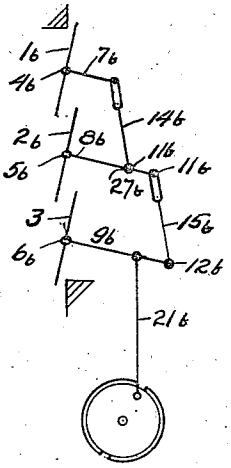


Fig. 4.

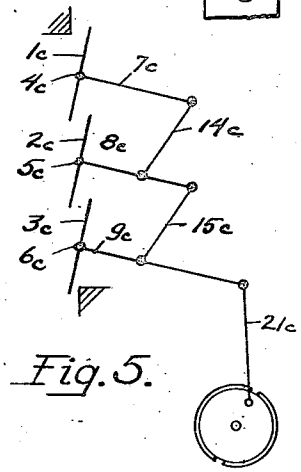


Fig. 5.

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UNITED STATES PATENT OFFICE

2,266,009

VENTILATING DEVICE

Wilmot A. Danielson, Fort Knox, Ky.

Application May 24, 1939, Serial No. 275,430

5 Claims. (Cl. 98—110)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates generally to ventilators, but more particularly to apparatus for operating ventilators composed of a multiplicity of rotatably movable shutters.

One object of the invention is to provide an apparatus by which said shutters may be opened and closed in a predetermined sequence to permit gradual increase or decrease in ventilation over a desired area of the ventilator structure.

Another object of the invention is to provide a simple and inexpensive mechanism for uniformly and successively opening any desired number of shutters.

Still another object of the invention is to provide an apparatus by which the shutters may be actuated simultaneously and opened in progressive or varied amounts to suit the required conditions of ventilation.

Other objects relating to the details of construction, combination and arrangement of parts, will hereinafter appear in the description to follow.

Referring more particularly to the accompanying drawing in which corresponding parts are indicated by similar reference characters:

Fig. 1 is a perspective and diagrammatic view showing the shutters and one type of lever mechanism in which the interconnecting links are slotted at their upper ends and connected to intermediate shutter levers by a common link pin, and a step-by-step remotely controlled shutter operating mechanism;

Fig. 2 is a front plan view of the shutters and lever operating mechanism shown in Fig. 1;

Fig. 3 is a diagrammatic view showing the shutters and a modified form of lever operating mechanism in which the connecting links are slotted at their lower ends;

Fig. 4 is a diagrammatic view showing the shutters and a modified form of lever operating mechanism in which the interconnecting links are slotted at their upper end and connected to intermediate shutter levers by separate pins; and

Fig. 5 is a diagrammatic view showing the shutters and a modified form of lever operating mechanism in which the interconnecting links are pivotally connected to adjacent shutter levers.

Fig. 6 is a side view showing a portion of the shutter support, a shutter, and an adjustable friction bearing.

The ordinary ventilator or damper operates so that the shutters open or close in unison and by equal amounts, so as to allow a uniform passage of air between them, which so often causes draughts and prevents suitably modified ventilation.

In the ventilating apparatus which forms the subject matter of this invention, the shutters are rotated either in succession or simultaneously by varying or progressive amounts.

Referring to Fig. 1, the numerals 1, 2 and 3 indicate shutters of a ventilator provided respectively with trunnions 4, 5 and 6, which are rotatably mounted in adjustable friction bearings 60 attached to a frame 61, as illustrated in Fig. 6. Each of said shutters 1, 2 and 3 is provided respectively with lever or crank arms 7, 8 and 9 which may be of increasing lengths as shown, and each provided with link pins 10, 11 and 12, the lower lever 9 having an additional link pin 13.

Links 14 and 15 are provided respectively with slots 16 and 17 for slidable engagement with the link pins 10 and 11 and circular openings 18 and 19 for pivotal engagement with the link pins 11 and 12, as shown in Figs. 1 and 2.

The adjustable friction bearing shown in Fig. 6, comprises complementary upper and lower journal members 62 and 63 between which the shaft 64 of a shutter is rotatably mounted. The lower member 63 is formed as a bracket which is attached to the shutter supporting frame 61, and the upper journal member 62 is adjustably attached to the lower member by means of the screws 65. The adjustment of the screws 65 controls the degree of friction and resistance to rotary movement of the journaled shaft 64.

The link pin 13 of the lower lever 9 is pivotally engaged by the circular opening 20 in a link 21. The link 21 is also provided with another circular opening 22 by which it pivotally engages a link pin 23 located adjacent the circumference of the circular disc 50 of the step-by-step control mechanism, such as shown in the patent granted to Christian Kramer, October 29, 1912, No. 1,042,692, which may be used to control a shutter actuating motor from a remote point. In this connection it is to be understood that any other step-by-step mechanism may be utilized if desirable. Fig. 1 shows this type of apparatus connected to the lever 9 by a link 21. In this figure, in which the remote control apparatus is shown diagrammatically, the numeral 30 represents the armature, and 31 and 32 the two fields of motor (not shown), either one of which may be in circuit to drive the motor in the forward or reverse direc-

tion. This motor is controlled from a remote point by a transmitting device 33 consisting of a plurality of contacts 34, 35, 36, 37 and 38, mounted on an insulating base 39 and a controlling contact arm 40 which is moved over the contacts by the operator. The receiving device 41 consists of the controller 42 driven by the motor in any suitable manner as for instance, through the shaft 43 and appropriate gears 44, 45, 46, and 47, as shown. The controller consists of two conducting segments 48 and 49 mounted upon a circular disc of insulating material 50 and separated from each other at their extremities by air spaces designated by the numerals 51 and 52, said disc being operatively connected for rotative movement by the motor through the shaft and gearing mentioned above. Cooperating with these conducting segments are a plurality of brushes 34*a*, 35*a*, 36*a*, 37*a* and 38*a* connected respectively by conductors 34*b*, 35*b*, 36*b*, 37*b* and 38*b* with the contacts on the transmitting device having corresponding reference characters, and brushes 53 and 54 which are connected respectively through conductors 55 and 56 to the fields 31 and 32 of the motor. These brushes are of less width than the space between the segments 48 and 49, so that when either of the insulating spaces 51 and 52 arrives opposite any of the brushes 34*a*, 35*a*, 36*a*, 37*a* and 38*a*, the circuit will be broken through the fields 31 and 32 which are connected with the segments 48 and 49 by the brushes 53 and 54 and the conductors 55 and 56.

It will be seen that with the parts in the position shown, no current can flow to the fields of the motor, since the contact 34*a* is in off position. If however, the arm 40 of the transmitting device 33 is moved to contact 35 then the circuit will be completed from the positive side of the line through the contact arm 40, contact 35, conductor 35*b*, brush 35*a*, segment 49, brush 54, conductor 56 and thence to field 32, motor armature 30 and to the negative side of the line. This will cause the motor to rotate the controller disc 50 and sectors 48 and 49 in a direction indicated by the arrow, until the insulating space 51 is opposite the brush 35*a*, whereupon the motor will stop. In like manner if the contact arm 40 is moved to the contact 36 the controller will be rotated by the motor until the space 51 between the segments is opposite the brush 36*a* and the circuit is opened. If now the contact arm is moved in a counter-clockwise direction into engagement with the contact 35 or 34 the controller will be moved in the opposite direction by the energization of the field 31. It will be observed that in this device only five positions or stopping points in the movement of the controller are available. The number of such stopping points depends on the number of contacts on the transmitter and brushes on the controller, which may be increased or decreased in the design of the apparatus to suit the purpose for which it is used.

In the operation of the form of lever mechanism shown in Figs. 1 and 2, when disc 50 imparts a rotary clockwise movement to the shutter 3 through the link 21 and shutter lever 9, the shutter 3 starts to open, and after opening a distance sufficient to allow the top of the slot 17 to engage the pin 11, shutter 2 starts to open. Shutters 2 and 3 are now moving toward their open positions simultaneously. When the top of slot 16 engages pin 10, shutter 1 starts to open and then all three of the shutters are moving toward their open positions which they reach at the same time. In closing the shutters, the shutter 3 starts to close first. When the bottom of slot 17 engages pin 11, shutter 2 starts to close. Then 2 and 3 are moving toward their closed positions simultaneously. When the bottom of slot 16 engages pin 10, shutter 1 starts to close and then all three of the shutters are moving toward their closed positions and reach their closed positions at the same time.

By suitable proportionment relative to the decrease in the length of the lever arms of the successively moved shutters, their initial rotative movement can be made to equal substantially the same arcuate distance.

It will be noted that the construction shown in Fig. 3, the interconnecting slotted links effect an initial and final movement in opening or closing all but the end shutters. Rotary movement is not transmitted to the intermediate shutters until after a predetermined movement of the lowermost shutter. The uppermost shutter opens or closes only with the simultaneous movement of all the other shutters.

Throughout the modified forms, shown in Figs. 3, 4 and 5, all of which have the general construction to the form shown in Figs. 1 and 2, like elements to those described in Figs. 1 and 2 are indicated by similar reference characters which are differentiated by the subletters *a*, *b*, and *c*.

In the modification shown in Fig. 3, the construction differs from that shown in Fig. 1, in that the shutters open by movement in a counter-clockwise direction, the links 14*a* and 15*a* are provided with slots at their lower extremities and are coupled to the intermediate lever 8*a* by separate link pins 11*a* and 27*a*.

In the operation of this form of the device, after the shutter 3*a* has been opened a predetermined amount by action of the motor operated link 21*a* on the lever 9*a*, the pin 12*a* reaches the top of the slot 17*a* in the link 15*a* and transmits movement of lever 9*a* through the link 15*a* to the lever 8*a* to open shutter 2*a*. The link 14*a* transmits movement of the lever 8*a* to the shutter 1*a* in the same manner.

It will thus be seen that the successive opening and closing of the shutters depend on the movement of the slotted interconnecting links as in the type shown in Figs. 1 and 2.

The modified form of the device shown in Fig. 4 differs from that shown in Fig. 1, in that the connecting links 14*b* and 15*b* are connected to separate link pins 11*b* and 27*b* located on the intermediate lever 8*b*.

The operation of this form of the device is practically the same as that shown in Figs. 1 and 2, with the exception that a lower link has a greater movement than the link immediately above it, which is due to the greater distance of their pivotal points on the intermediate shutter levers, from the fulcrum or axial line of the shutter operated by said levers. This feature is also found in the type illustrated in Fig. 3, in which it will be noted that pin 11*b* is further from the axis of the shutter than the pin 27*b*.

The modification illustrated by Fig. 5 shows a construction in which links 14*c* and 15*c* are pivoted at each end to the levers 7*c*, 8*c*, and 8*c*, 9*c*, respectively.

In this type of construction as illustrated, the levers in conjunction with their interconnecting links impart a simultaneous movement to the

shutters and effect a progressive opening and closing of the same. The relative amounts by which the shutters are opened and closed depend on the distances of the pivotal points of the links from the axis of rotation of the shutters. In the design shown the shutter 3c opens a greater amount than the shutter 2c, and the shutter 2c opens a greater amount than the shutter 1c. If in the design of the ventilator it is necessary to increase or decrease the amount of opening of one or more of the shutters in the modified form of construction, as shown in Fig. 5, this can be accomplished by changing the points of attachment of its interconnecting links.

Having described my invention, what I claim as new and wish to secure by Letters Patent is:

1. A ventilating mechanism comprising a series of pivotally mounted parallelly arranged overlapping shutters, levers projecting from said shutters, link pins projecting from said levers, means for restraining the free rotative movement of said shutters, and slotted overlapping links pivotally and slidably connected to the link pins of adjacent levers, whereby rotative movement imparted to one of said shutters is transmitted through said links to the next adjacent shutter in successive order after partial completion of said movement in each.

2. A ventilating mechanism comprising a series of pivotally mounted parallelly arranged overlapping shutters, means comprising friction bearings for restraining the free rotation of said shutters, levers projecting from said shutters, link pins projecting from said levers, means for imparting a rotative step-by-step movement to one of said levers, and longitudinally slotted links pivotally and slidably connected to the link pins of adjacent levers, whereby rotative movement imparted to one of said shutters is transmitted through said links to the next adjacent shutter in successive order after partial completion of said movement in each.

3. A ventilating mechanism comprising a series of pivotally mounted parallelly arranged overlapping shutters, levers of increasing lengths projecting from said shutters, link pins projecting from said levers, means for imparting a rotative step-by-step movement to one of said shutters, means comprising adjustable friction bearings for restraining the free movement of said shutters, and links provided with a central longitudinal slot pivotally and slidably connected to the link pins of adjacent levers to permit a limited independent movement of said links, whereby rotative movement imparted to one of said shutters is transmitted through the connecting links to the next adjacent shutter in successive order after partial completion of said movement in each.

4. A ventilating mechanism comprising a series of pivotally mounted parallelly arranged overlapping shutters, means comprising adjustable friction bearings for restraining the free movement of said shutters, means for imparting a rotative step-by-step movement to one of said shutters, levers of decreasing lengths projecting from said shutters for effecting a relative increase in velocity in the rotative movement of said shutters, and links having longitudinally extending slots pivotally and slidably connected to adjacent levers to permit a limited independent movement therebetween, whereby rotative movement imparted to one of said shutters is transmitted through the connecting links to the next adjacent shutter in successive order throughout the series, after the partial completion of said movement in each.

5. A ventilating mechanism comprising a series of pivotally mounted parallelly arranged overlapping shutters, lever arms of decreasing lengths projecting from said shutters, link pins projecting from said lever arms, a link connected with a source of power and pivotally connected with the longest of said levers adapted to effect the partial rotation of the shutter connected therewith, and longitudinally slotted connecting links pivotally connected to the link pins of the longer of adjacent levers and slidably connected to the shorter of adjacent levers adapted to transmit rotary movement thereto when the end of the slot therein contacts the link pin to which it is slidably fitted, and thereby effect a successive movement of the shutters in opening and closing the same.

WILMOT A. DANIELSON.