May 28, 1957 L. HOPE ET AL 2,793,580

VENTILATING DEVICE

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Fig. 1.

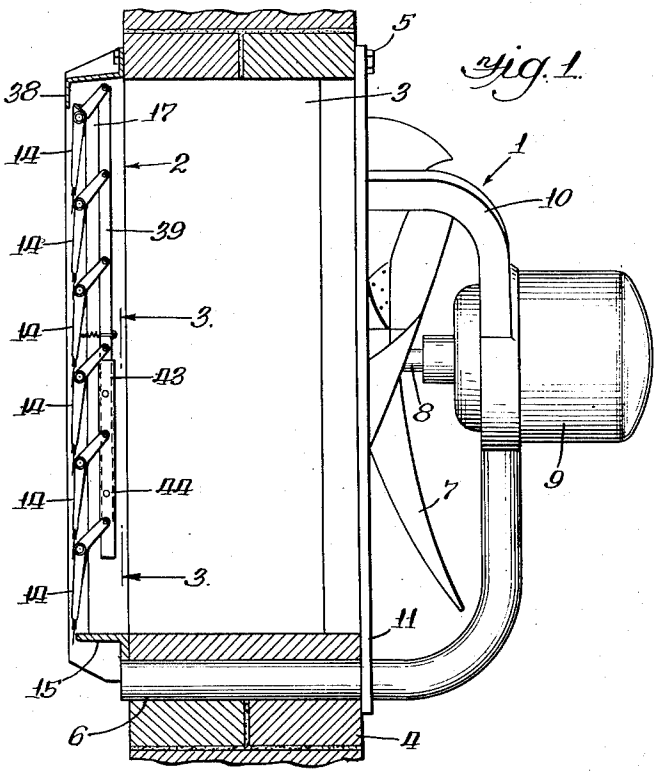
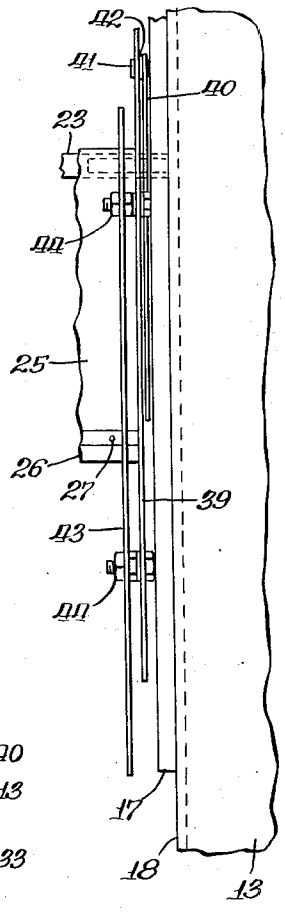


Fig. 3.



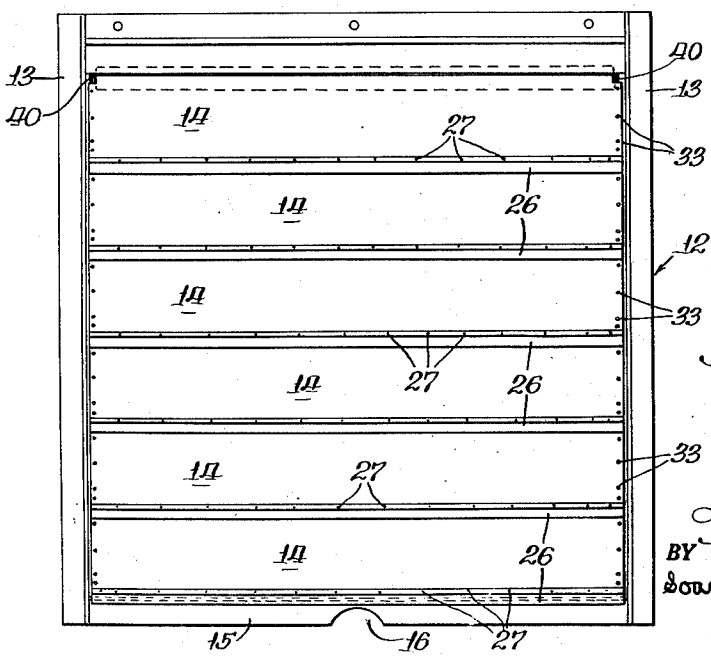


Fig. 2.

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Fig. 4.

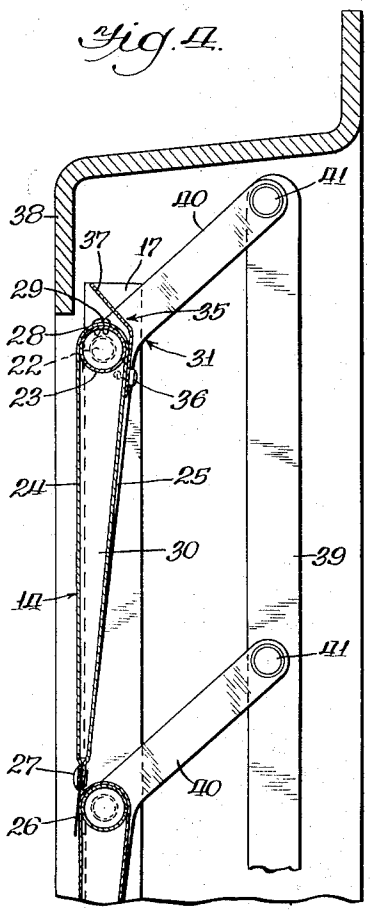


Fig. 5.

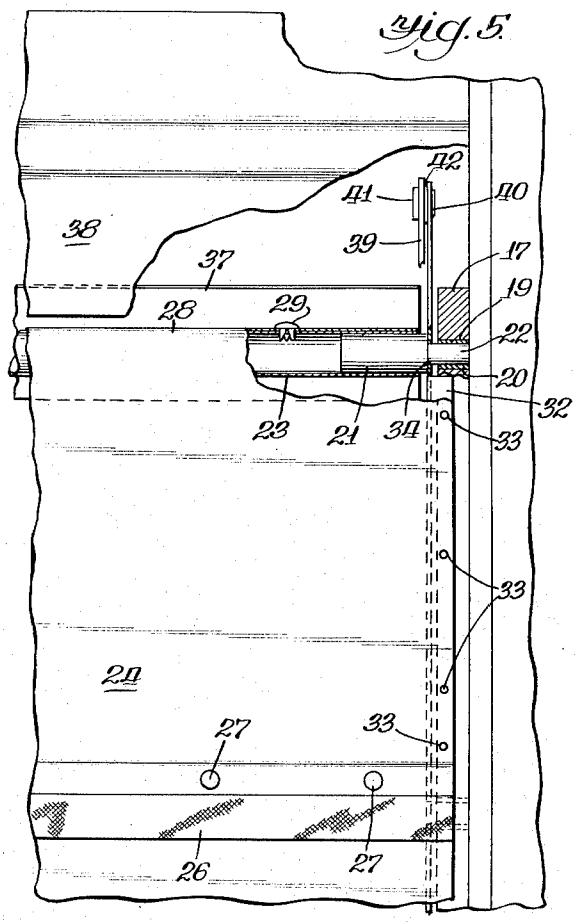
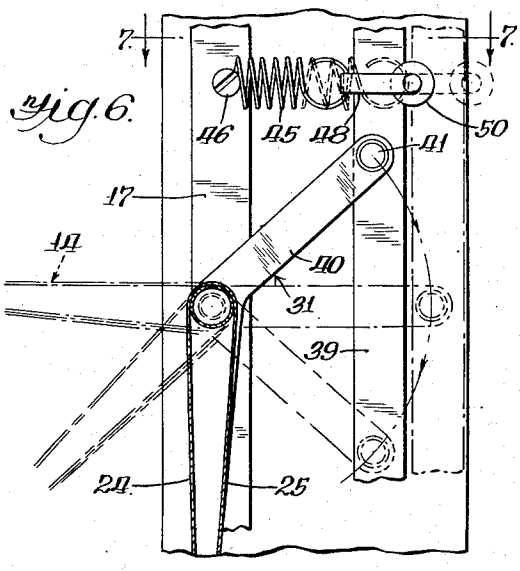


Fig. 6.



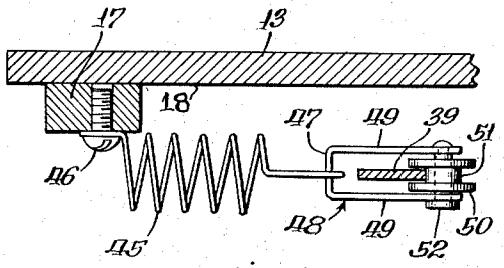


Fig. 7.

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2,793,580

VENTILATING DEVICE

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Application August 10, 1954, Serial No. 448,883

5 Claims. (Cl. 98—116)

This invention relates to ventilating devices which are adapted for use in discharging gases and foul air through an opening in an external wall of a building. Ventilating devices of this type are illustrated in the following patents of the United States, issued to Ilg Electric Ventilating Co.: No. 1,482,398, dated February 5, 1924; No. 1,525,649, dated February 10, 1925; No. 1,917,340, dated July 11, 1933; No. 2,272,928, dated February 19, 1942; and No. 2,339,363, dated January 18, 1944.

Such ventilating devices usually include an electrically driven fan mounted on the inner face of the wall of a building at one side of an appropriate vent, and a plurality of pivoted shutter blades or vanes mounted on the other side of the vent for closing the latter against the ingress of rain, snow, or cold air when the fan is idle.

Various means are provided for actuating the shutter blades in the prior art ventilating devices. In some, the shutter blades are opened or closed by electrical actuating means, in others by mechanical actuating means, and in others the blades are opened by the blast of the fan and closed by gravity when the fan is idle.

It is quite usual for such ventilating devices to make a considerable amount of noise due to vibration or fluttering of their movable elements, and to the friction or impact between various of their elements during operation of the ventilating devices.

The design and fabrication of the shutter blades used in the ventilating devices is of particular importance. The shutter blades should be relatively light so as to be readily pivoted between open and closed positions during use, and at the same time they should be sufficiently rigid so as to maintain their shape without becoming warped or twisted. In addition, the shutter blades should be so constructed and mounted as to operate in a relatively silent manner.

The principal objects of the present invention are to provide a ventilating device which is relatively quiet or noiseless; to provide an improved control means for a ventilating device which holds the shutter blades closed when the fan is idle, aids in holding the blades in open position when the fan is running, and prevents the shutter blades and associated elements from vibrating or fluttering; to provide a ventilating device with novel, lightweight, rigid shutter blades; to provide a novel ventilating device having adjustable shutters which will not rattle or otherwise make any appreciable noise during use; to provide such ventilating devices which are simple in construction, economical to manufacture, and efficient for their intended use.

An illustrative embodiment of the present invention is shown in the accompanying drawings wherein:

Figure 1 is a vertical section of a portion of a building wall on which is supported an improved ventilating device in accordance with the present invention, the shutter vanes being shown in closed position;

Figure 2 is a front elevational view of the ventilating device illustrated in Figure 1;

Figure 3 is a partial rear elevational view as seen along the line 3—3 of Figure 1, showing particularly the counterbalancing means in the improved shutter blade control mechanism;

Figure 4 is an enlarged vertical section of the upper portion of the improved ventilating device illustrated in the previous figures;

Figure 5 is an enlarged front elevational view, partially in section, of an upper portion of the improved ventilating device;

Figure 6 is an enlarged sectional view of the portion of the ventilating device showing the biasing means of the shutter blade control mechanism, the biasing means and adjacent shutter blade being illustrated in various positions; and

Figure 7 is an enlarged sectional view taken on the line 7—7 of Figure 6.

In the form shown, the ventilating device comprises a fan assembly 1 and shutter assembly 2 disposed on opposite sides of a vent 3 formed in an external building wall 4. The fan assembly 1 and shutter assembly 2 may be connected together by suitable bolts 5 which extend through the wall 4, or each assembly may be individually attached to the wall 4 by individual bolts. In the form shown, a vent pipe 6 extends through the building wall 4 between the two assemblies.

The fan assembly 1 includes a fan 7 mounted on the shaft 8 of an electric motor 9 which is supported on the arms 10 of a frame 11 which is secured to the building wall 4.

The shutter assembly 2 includes the usual rectangular metal shutter frame 12 fabricated from suitable structural members such as angle bars. Between the side members 13 of the frame 12 are journalled a plurality of horizontally extending shutter blades 14 which are movable between the generally vertical, closed position shown in Figures 1 and 2 to an open position wherein the shutter blades 14 extend outwardly at an angle approaching 90° from the vertical. The open position of one of the shutter blades 14 is indicated in Figure 6. The lower member 15 of the shutter frame 12 may have a portion cut away as indicated at 16 to accommodate the vent pipe 6.

A vertically extending metal support bar 17 is attached by suitable means (not shown) to the inwardly facing surface 18 of each of the side members 13 of the rectangular shutter frame 12 adjacent the forward margins thereof. The support bars 17 are provided with aligned, vertically spaced-apart, cylindrical passageways 19 within which are supported bushings 20 formed of nylon or other similar material. The shutter blades 14 are each provided with suitable spindles 21, the outer ends 22 of which have a reduced diameter and are journalled within horizontally aligned bushings 20 in the opposed support bars 17. Since the bushings 20 are formed of material such as nylon, the noise which usually accompanies the rotation of the shutter spindles 21 is eliminated.

The shutter blades 14 in the shutter assembly 2 are of generally identical construction. Each shutter blade has a hollow body structure including an upper horizontally extending hollow rod or tube 23 formed of a relatively rigid, resistant material such as stainless steel. A thin sheet of light metal such as aluminum snugly curves around the upper portion of the hollow rod 23 and forms a pair of generally flat walls 24 and 25 which extend downwardly in converging relationship from the lower end of the hollow rod 23. The upper margin of a rectangular facing strip 26 formed of nylon or other similar material extends between the lower margins of the walls 24 and 25 and is fixedly positioned therebetween by suitable rivets 27 which extend between the walls 24 and 25. The central portion 28 of the metallic sheet which extends around the hollow rod 23 is fastened thereto by means such as fasteners 29. The hollow rod 23, the

central portion 26 of the metallic sheet, and the rear wall 25 of the shutter blade 14 have a width slightly less than the distance between the support bars 17 whereas the forward wall 24 of the shutter blade and the nylon or nylon-like facing strip 26 have a width slightly greater than the distance between the support bars 17 so as to overlap the same. A shutter spindle 21 extends partially into each end of the hollow rod 23 and is fixedly positioned therein by means such as welding or brazing.

The sides of the shutter blade 14 are suitably closed by the lower arm sections 30 of suitable bell crank levers 31. The lower arm sections 30 include flanges 32 which extend along and connect through suitable rivets 33 with outer margins of the forward wall 24 of the shutter blade 14. The reduced diameter portions 22 of the shutter spindles 21 extend through passageways 34 in the bell cranks 31. If desired, added strength may be given to the shutter blade 14 by welding or brazing the shutter spindles 21 to the bell cranks 31.

The nylon or nylon-like bushings 20 within the support bars 17 are suitably spaced apart so that the nylon or nylon-like facing strip 26 of each shutter blade 14 except the lowermost shutter blade overlaps the upper curved portion 28 of the next lowermost shutter blade when the shutter blades 14 are in closed position. The bushings 20 which support the lowermost shutter blade 14 are positioned so that the facing strip 26 of the lowermost shutter blade overlaps the outer edge of the bottom member 15 of the shutter frame 12 when the lowermost shutter blade is in closed position.

In order to seal the upper portion of the shutter assembly from the entry of rain, snow, or wind, an angular metallic strip 35 is secured by means such as screws 36 to the upper margin of the rear wall 25 of the uppermost shutter blade 14 so as to provide an upwardly and forwardly projecting blade 37 which extends behind a downwardly extending flange 38 at the top of the shutter frame 12.

The shutter blade construction described above has various advantages which are not present in the prior art shutter blade constructions. The shutter blade 14 is of light weight, yet extremely rigid. It is easily rotated on its spindles 21 without any tendency to twist or warp. In addition, the use of a nylon or a nylon-like facing strip 26 and nylon or nylon-like bushings 19 make the operation of the shutter blade 14 in the shutter assembly 2 noiseless.

To insure simultaneous and uniform opening and closing movements of the several shutter blades 14 in the shutter assembly 2, the shutter blades 14 are interconnected through a pair of links or shift bars 39 which extend vertically on opposite sides of the shutter assembly 2 and rearwardly of the shutter blades 14. The bell cranks 31 previously mentioned each have an arm section 40 which extends rearwardly and upwardly at an angle of about 45° to the vertical when the associated shutter blade 14 is in closed position. One of the shift bars 39 is pivotally connected through pins 41 to the outer ends of the arm sections 40 of the bell cranks 31 which are located at one side of the shutter blades 14 and the other shift bar 39 is pivotally connected through pins 41 to the outer ends of the arm sections 40 of the bell cranks 31 which are located at the other side of the shutter blades 14. A nylon or nylon-like washer 42 is positioned between each of the arm sections 40 and its associated shift bar 39 in order to obtain a freely movable yet noiseless connection therebetween.

The weight of the shutter blades 14 may be partially counterbalanced by attaching weighted members, such as the bars 43, to the lower ends of the shift bars 39. In the embodiment of the invention illustrated in the drawings, the weighted bars 43 are attached to the shift bars 39 through screw, washer, and nut assemblies 44.

In order to prevent fluttering between the shift bars 39 and the bell cranks 31, to assist the blast when the fan 7 is running to hold the shutter blades 14 in open position, and to hold the shutter blades 14 in closed position when the fan 7 is idle, each of the shift bars 39 is biased towards the shutter blades 14 by a horizontally extending coil spring 45. The spring 45 associated with each shift bar 39 is connected at one end to the center of the adjacent support bar 17 through a screw 46 and and at the other to the base portion 47 of a U-shaped bracket 48 which has legs 49 extending horizontally on opposite sides of the shift bar. A nylon or nylon-like roller or wheel 50 which has a central reduced diameter portion 51 is supported on a pin or stud 52 between the ends of the legs 49 of each of the brackets 48 with the reduced diameter portion 51 of each wheel 50 in rotatable engagement with the rearward edge of its associated shift bar 39. The wheels 50 permit the shift bars 39 to be biased toward the shutter blades 14 without requiring a change in the horizontal position of the springs 45 when the shift bars 39 move in a vertical direction.

The various positions which may be assumed by one of the shutter blades 14 during operation of the ventilating device is illustrated in Figure 6. As therein illustrated, the end of the arm section 40 of the bell crank 31 reaches an inner maximum position when the shutter blade 14 extends outwardly at an angle which is approximately 45° from the vertical. Since the shift bars 39 are connected to the outer ends of the arm sections 40, the shift bars 39 will be at a maximum distance from the support bars 17 when the shutter blades are at an angle of approximately 45° from the vertical and at a minimum distance from the shift bars 39 when the shutter blades are in either closed or fully open position. Starting from closed position, as the shutter blades 14 begin to open, the shift bars 39 will move rearwardly away from the support bars 17 until the shutter blades are on an angle of approximately 45° to the vertical. As the shutter blades 14 move beyond this point, the shift bars 39 will again move towards the support bars 17. Since the springs 45 bias the shift bars 39 toward the support bars 17, the springs will resist the opening of the shutter blades until the shutter blades are opened beyond a 45° angle to the vertical, after which the springs will aid in the further opening of the shutter blades. As the shutter blades 14 move toward closed position, the reverse action takes place, that is, the springs 45 will resist the closing of the shutter blades until the shutter blades are on an angle of about 45° to the vertical, after which they will aid in the closing of the shutter blades.

The weight of the shutter blades 14 are such that when they are in open position and the fan 7 is turned off, it will slightly exceed the weight of the shift bars 39, counterbalancing weights 43, and the biasing force of the springs 45 so that the shutter blades 14 will slowly move toward closed position. When the shutter blades 14 pass beyond the 45° angle, the biasing force of the springs 45 help to snap the shutter blades into closed position and to retain them in this position irrespective of the variations in the external pressure or wind. When the fan 7 is turned on, the force of the fan blast plus the weight of the shift bars 39 and counterbalancing weights 43 are sufficient to overcome the weight of the shutter blades 14 plus the biasing force of the springs 45, thereby causing the shutter blades to move toward open position. The force on the shutter blades 14 produced by the fan blast diminishes as the shutter blades move toward a horizontal position. The force of the fan blast, however, remains sufficiently strong to cause the shutter blades to move beyond a 45° angle to the vertical and thereafter, the force of the biasing springs 45 aids in the further opening movement of the shutter blades. Normally, the force of the fan blast, the counterbalancing weights 43 and springs 45 are such as to permit the shutter blades 14 to move to an open postion which is just less than 90° to the vertical.

Since the shift bars **39** are always under the biasing action of the springs **45**, they constantly press against the pivot pins **41** and connecting bell crank arm sections **40**, thereby eliminating any fluttering or vibration between these members. This feature is very important in maintaining the noiseless action of the ventilating device.

Variations and modifications in the described details may, of course, be resorted to within the purview and scope of the claims.

We claim:

1. A ventilating device comprising a frame having a vent therein, a fan for causing air to flow through said vent, a plurality of spaced, parallel shutter blades pivotally mounted on said frame and movable between an open and a closed position, each of said shutter blades having an arm extending upwardly and rearwardly therefrom, a vertically extending link pivotally connected to the outer end of each of said arms for simultaneously moving said arms, said link having a straight rearward edge, a roller in rotatable engagement with the rearward edge of said link approximately centrally thereof, a horizontally extending spring connected between said frame and said roller for biasing said roller and engaged link toward said shutter blades so as to prevent free play between said link and said arms, to urge said shutter blades to closed position when the fan is idle, and to urge the shutter blades to open position when the fan is operating, and a weight attached to said link for counterbalancing a portion of the weight of said shutter blades.

2. A ventilating device comprising a frame having a vent therein, a fan for causing air to flow through said vent, a plurality of horizontally extending, vertically spaced shutter blades mounted on said frame for controlling the passage of air through said vent, said shutter blades being pivotally journalled in non-metallic bushings on said frame, each of said shutter blades having an arm extending upwardly and rearwardly therefrom at an angle of approximately 45°, a vertically extending link pivotally connected to the outer end of each of said arms for obtaining simultaneous movements thereof, said link having a straight rearward edge, a non-metallic washer positioned between said vertically extending link and said arms which are pivotally connected thereto, a non-metallic roller in rotatable engagement with the rearward edge of said link approximately centrally thereof, a horizontally extending spring connected between said frame and said roller for biasing said link toward said shutter blades so as to prevent free play between said link and said arms, to urge said shutter blades to closed position when the fan is idle, and to urge said shutter blades to open position when the fan is operating, and a removable weight attached to said link for counterbalancing a portion of the weight of said shutter blades.

3. A ventilating device comprising a frame having a vent therein, a fan for causing air to flow through said vent, a plurality of spaced, parallel shutter blades pivotally mounted on said frame and movable between an open and a closed position, each of said shutter blades having an arm extending upwardly and rearwardly therefrom at each side thereof, a vertically extending link at each side of said frame pivotally connected to the outer ends of said arms which are located at the adjacent sides of said shutter blades for obtaining simultaneous operation of said shutter blades, said link having a straight rearward edge, a roller in rotatable engagement with the rearward edge of each of said links approximately centrally thereof, a horizontally extending spring connected between said frame and each of said rollers for biasing said links toward said shutter blades so as to prevent free play between said links and the arms which are connected thereto, to urge the shutter blades to closed position when the fan is idle and to urge the shutter blades to open position when the fan is operated, the lower margins of said shutter blades being formed of resilient, non-metallic material, the shutter blades being

vertically spaced apart within said frame so that when they are in closed position the lower resilient margin of each of the shutter blades except the lowermost shutter blade overlaps the upper margin of the next lower shutter blade, and the lower resilient margin of the lowermost shutter blade overlaps the bottom portion of the frame, and a removable weight attached to each of said links for counterbalancing a portion of the weight of said shutter blades.

4. A ventilating device comprising a frame having a vent therein, a fan for causing air to flow through said vent, a plurality of spaced, parallel, hollow shutter blades pivotally mounted on said frame and movable between an open and a closed position, each of said shutter blades having a rounded upper edge and opposed downwardly converging walls of generally equal height formed from a thin metallic sheet folded back upon itself, the rounded upper edge of the shutter blade extending snugly around and being fixedly attached to a hollow support rod, a facing strip of resilient material connected between the lower margins of said converging walls and extending outwardly therefrom, a spindle extending partially into each end of said hollow support rod, the portions of said spindles which extend outwardly of said hollow rod being of reduced diameter and journalled in nylon bushings mounted on opposite sides of said frame, means conecting each of said shutter blades for simultaneous movement thereof, and said shutter blades being suitably spaced within said frame so that when they are in closed position, the facing strip of each of the shutter blades except the lowermost shutter blade overlaps the upper edge of the next lower shutter blade and the facing strip of the lowermost shutter blade overlaps a bottom portion of the frame.

5. A ventilating device comprising a frame having a vent therein, a fan for causing air to flow through said vent, a plurality of horizontally extending vertically spaced hollow shutter blades mounted on said frame for controlling the passage of air through said vent, each of said shutter blades having a rounded upper edge and opposed, downwardly converging walls of approximately equal height formed from a thin metallic sheet folded centrally back upon itself, the upper rounded edge of said sheet extending snugly around and being fixedly attached to a hollow support rod, a nylon facing strip connected between the lower margins of said opposed converging walls and extending outwardly therefrom, a spindle extending partially into each end of said hollow support rod, the portions of said spindles which extend outwardly of said support rod being of reduced diameter and journalled in nylon bushings mounted on opposite sides of said frame, a bell crank at each side of the shutter blade, one arm of each of said bell cranks being attached to and forming a closure for the adjacent side of said shutter blade, the other arm of each of said bell cranks extending upwardly and rearwardly from said shutter blade at an angle of approximately 45°, means at each side of the frame connecting the outer end of each of said upwardly extending arms located at the adjacent side of said shutter blades for obtaining simultaneous operation of said shutter blades, and said shutter blades being suitably spaced within said frame so that the nylon facing strip of each of the shutter blades except the lowermost shutter blade overlaps the upper edge of the next lower shutter blade and the nylon facing strip of the lowermost shutter blade overlaps a bottom portion of the frame.

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