

[54] **VENTILATOR**
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49/74, 87, 88, 90

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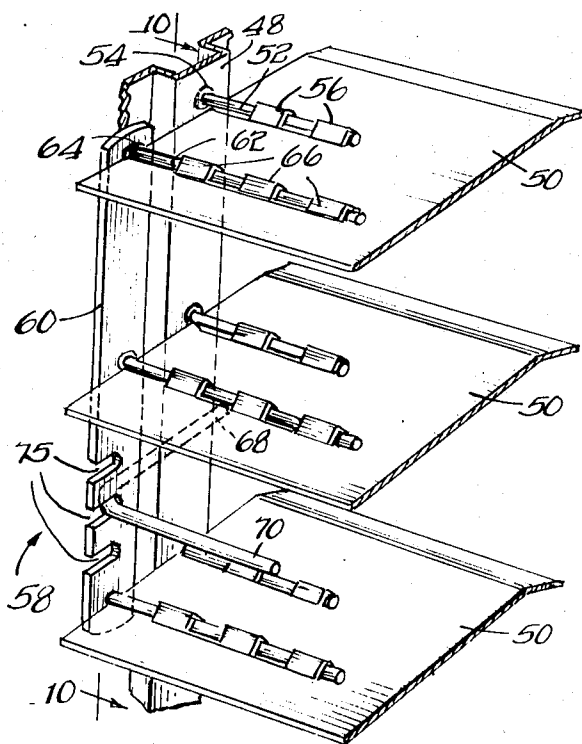
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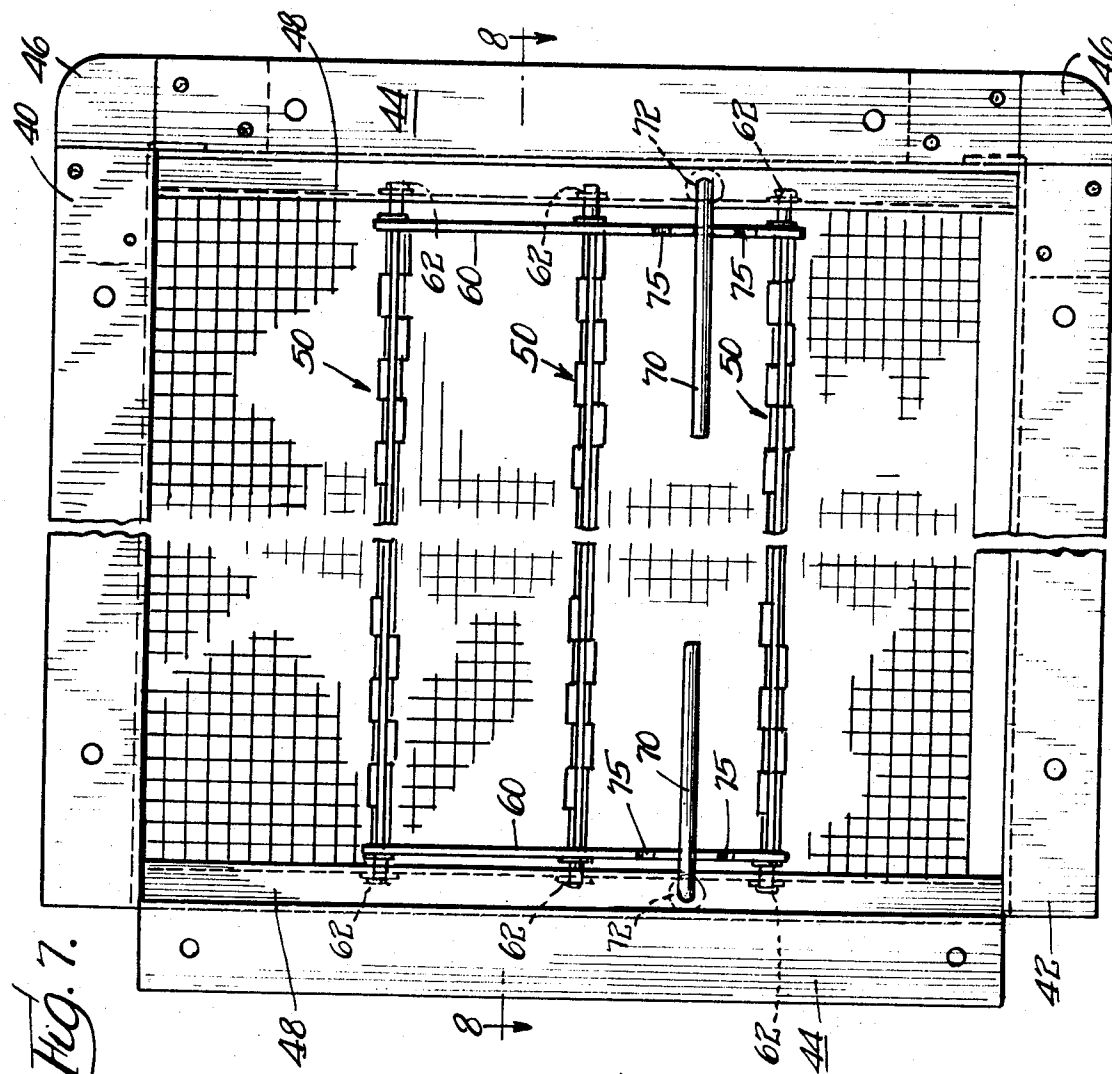
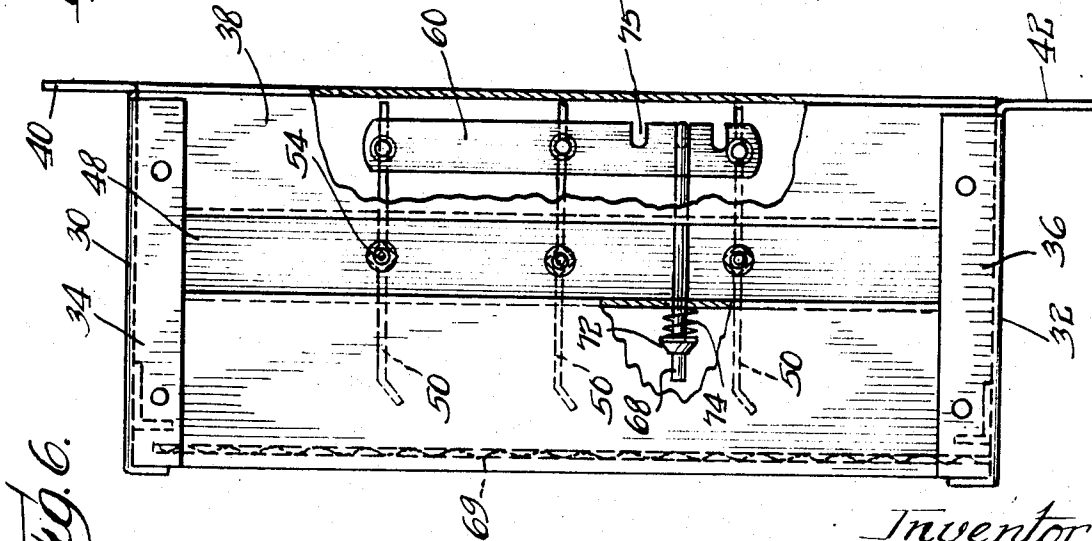
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[57] **ABSTRACT**

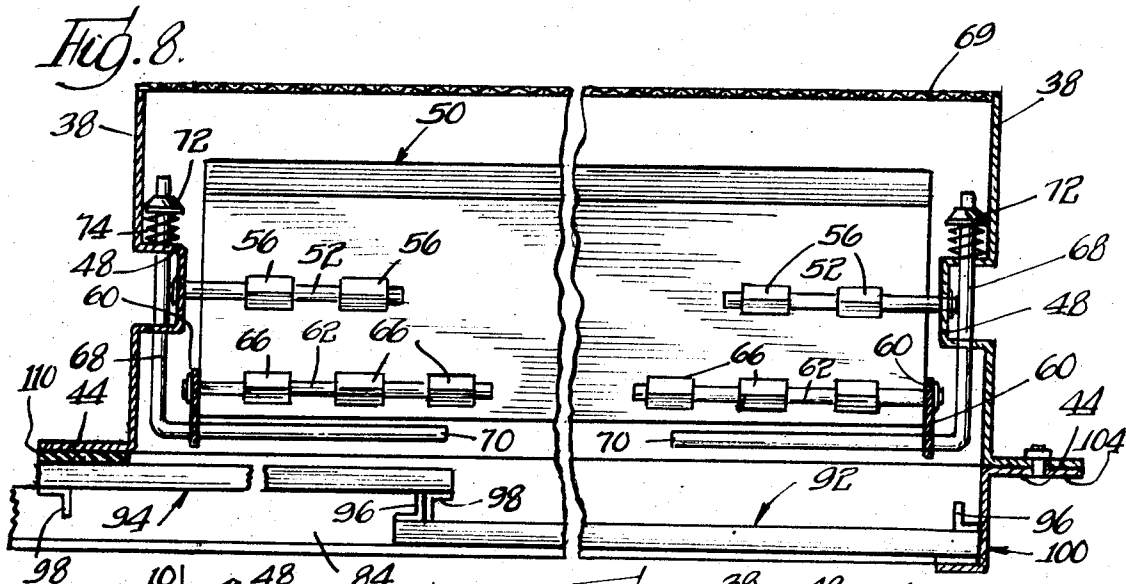
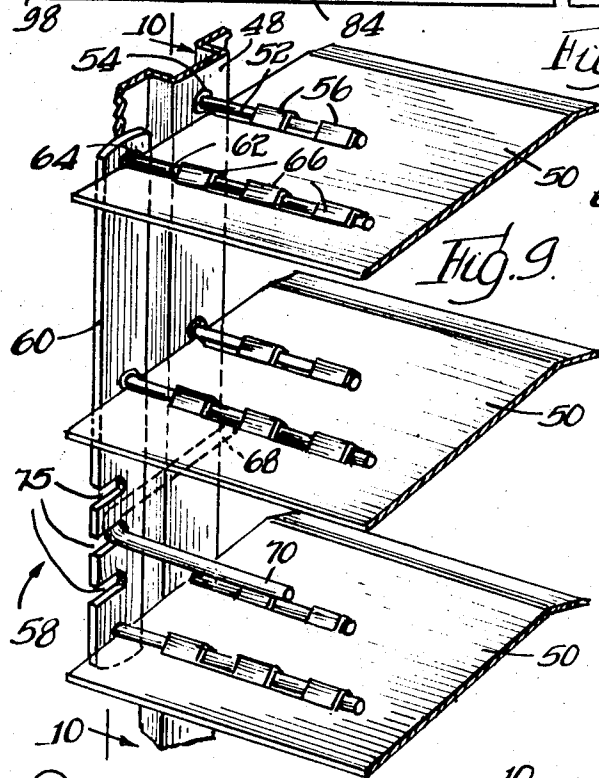
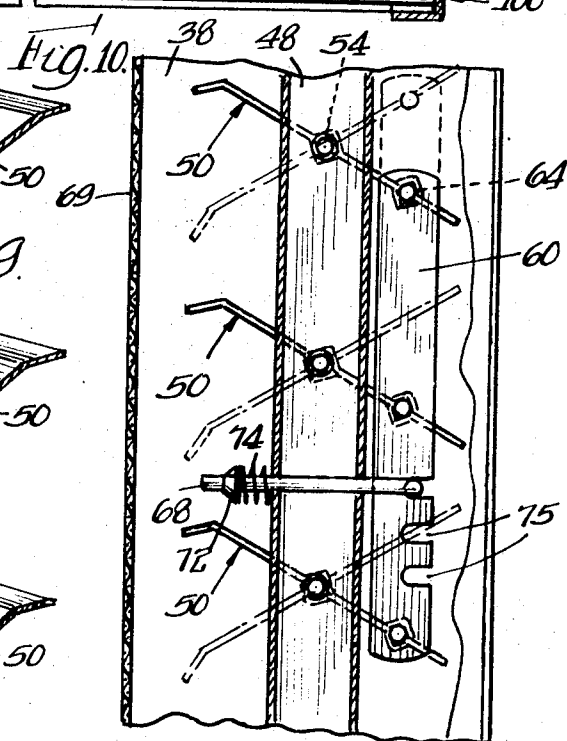
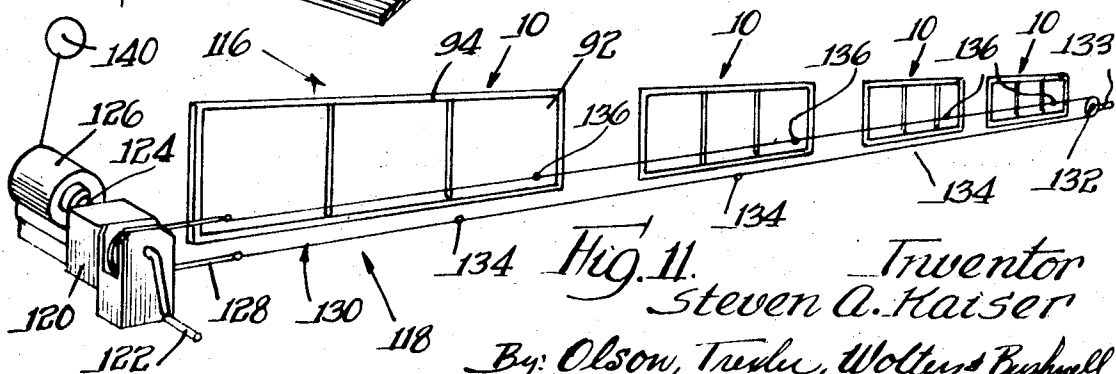
A unit for ventilating an enclosure such as a poultry or livestock house is disclosed and claimed herein and includes a rectangular frame mountable within a framed opening in a wall of the enclosure for defining an air inlet opening. Negative pressure is created within the enclosure by suitable exhaust fans mounted therein and causes the flow of fresh air to pass through the inlet opening. The direction of this fresh air is controlled by a plurality of elongated adjustable louvers mounted to the frame, while a sliding door assembly independently controls the amount of air which passes through the inlet opening.

3 Claims, 11 Drawing Figures





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VENTILATOR

SUMMARY AND OBJECTS OF THE INVENTION

This invention relates generally to ventilators and more specifically to a ventilator which independently controls the direction and amount of air which passes therethrough.

A general object of the present invention is to provide a new and improved ventilator unit which is designed primarily for use with all types of livestock and poultry houses but which may readily be used with enclosures of all types.

Another general object of the present invention is to provide a new and improved ventilator unit which is rapidly and easily mountable within an opening in a building wall for defining an air inlet opening.

Yet another general object of the present invention is to provide a ventilating unit which is designed to conserve wall space.

A more specific object of the present invention is to provide a ventilating unit of the above described type which is adapted to independently vary the direction of air passing therethrough without changing the inlet opening size and therefore the amount of air that passes therethrough.

Still another object of the present invention is to provide a ventilating assembly of the above described type which is adapted to independently change the inlet opening size for varying the amount of air passing therethrough without changing the air direction.

Yet another object of the present invention is to provide a new and improved ventilating system which utilizes a plurality of units of the above described type such that the inlet opening size of all of said units may be simultaneously varied.

These and other objects and features of the present invention will become more apparent from a reading of the following descriptions.

In order to achieve the aforesaid objects, a ventilating unit, constructed in accordance with the present invention, is disclosed and claimed herein. The ventilating unit includes a rectangular frame or wall insert mountable within a framed opening of a building wall for defining an air inlet opening. Opposite sides of the insert rotatably support a plurality of vertically aligned elongated louvers which provide direction to a flow of air passing through the inlet opening. In order to rotate all of the louvers in unison and thereby uniformly change the direction of airflow, at least one elongated locking bar is connected to common ends of the louvers. This locking bar includes a plurality of slots which are adapted to receive a pin element for locking the louvers in a fixed position.

The amount of air that flows through the inlet opening is controlled by varying the size of the opening. This is accomplished by a pair of vertically aligned and horizontally extending tracks which are mounted to the wall insert and which support two doors for movement between first positions for closing the inlet opening and second positions for substantially completely opening the inlet opening. These doors, each of which is approximately half the size of the inlet opening so as to minimize required wall space, are initially mounted to the tracks in stacked relationship. When the doors are in the first or closed positions, they are in edge-to-edge relationship with respect to each other. The tracks include additional portions which extend horizontally be-

yond one side of the wall insert a distance approximately equal to one-half the horizontal length of the insert for receiving the doors in stacked relationship when the latter are in their second or opened positions.

The two doors are interconnected so that upon moving only one thereof between said first and second positions, both will so move. In this manner, a plurality of such ventilating units may be used in a system whereby the size of their inlet openings may be simultaneously varied.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIGS. 1 to 3 are front elevational views of a ventilator unit constructed in accordance with the present invention, each view showing the unit in a different operating position;

FIG. 4 is an amplified perspective exploded view of the ventilator unit showing various components thereof;

FIG. 5 is a further amplified perspective view of a portion of the ventilator unit of FIG. 4;

FIG. 6 is a side elevational view of the ventilating unit with a portion of the sidewall thereof broken away;

FIG. 7 is a front elevational view of the ventilating unit;

FIG. 8 is a sectional view taken generally along the line 8—8 in FIG. 7;

FIG. 9 is a perspective broken away view of a portion of the ventilating unit, specifically showing the louver assembly used therewith;

FIG. 10 is a side elevational view taken generally along the line 10—10 in FIG. 9 with the louver assembly repositioned; and

FIG. 11 is a perspective view showing a plurality of ventilating units constructed in accordance with the present invention so as to form a ventilating system.

DETAILED DESCRIPTION

Referring now to the drawings, wherein like parts are indicated by like reference numerals throughout the various figures, a ventilating unit constructed in accordance with the present invention is generally indicated by the reference numeral 10 as illustrated best in FIGS. 1-3. The unit, which is designed primarily for use with a livestock or poultry house, but which may readily be used with any other type of enclosure for ventilation purposes, comprises a rectangular wall insert or frame 12 (FIG. 4) adapted to be mounted to and within a similarly shaped wooden opening support 14. The opening support 14 comprises part of a wall construction 16 of the poultry house or other enclosure and, along with frame 12, defines an air inlet opening 18 extending through the wall construction.

An exhaust assembly comprising suitable fan means (not shown) is mounted within the enclosure for producing negative air pressure therein which causes a flow of fresh air to pass through the air inlet opening 18 and into the enclosure. A louver assembly 20, which is mounted within and to inlet or frame 12, as illustrated generally in FIG. 5, is provided for independently controlling the direction of airflow as it passes through inlet opening 18.

A sliding door assembly 22 is positioned within the building or enclosure and mounted partially to wall insert or frame 12 and partially to wall construction 16. As will be seen hereinafter, sliding door assembly 22 is

provided for independently changing the size of air inlet opening 18 which varies the amount of air passing therethrough. In this manner, either the amount of air which passes through inlet opening 18 or the direction in which it takes can be readily changed without regard to the other.

Opening support 14 preferably comprises two vertically spaced and horizontally extending standard 2 x 4 inch wooden beams 24 which are connected at their ends by two laterally spaced and vertically extending standard 2 x 4 inch wooden beams 26 so as to define inlet opening 18. Opening support 14 is mounted within wall construction 16 and is preferably part of the overall beam structure which supports the wall, opening 18 being provided for during initial design thereof. Various other beams, which support wall 16 are shown and generally indicated by the reference numeral 28.

It is to be understood that, while a framed opening utilizing a support structure such as support 14 is preferred, any suitable framed opening which is adapted to receive and support ventilating unit 10 may be provided. In addition, in the event that the particular enclosure utilizes aluminum siding or other such wall which is not capable of supporting such an opening support, a support stand (not shown) similar to that of opening support 14 may be provided for supporting the ventilating unit in a manner identical to that described hereinafter.

Referring now to FIG. 5, wall insert or frame 12, which is preferably constructed of galvanized sheet steel, includes vertically spaced, substantially rectangular and elongated top and bottom panels 30 and 32, respectively. Each of the panels 30 and 32 is formed, at opposite lateral edges, with perpendicular flanges 34 and 36 which are welded or otherwise suitably secured to the lateral edges of the rectangular and elongated side panels 38. The inside longitudinal edges of top panel 30, bottom panel 32 and side panels 38 are formed with integral and perpendicular flanges 40, 42 and 44, respectively, for defining a rectangular shoulder adapted to engage the inside surface of opening support 14 in a manner to be described hereinafter. As noted in FIG. 5, the right-hand corners of wall insert or frame 12 are closed by two angle irons or other such means 46 which are welded or otherwise suitably secured to the adjacent ends of flanges 40, 42 and 44. In addition, each of the side panels 38 includes a substantially rectangular and integrally formed ridge or shoulder 48 which is best illustrated in FIG. 9. This ridge or shoulder extends the entire elongated length of side panel 38 in substantially the center thereof and projects inwardly for supporting louver assembly 20 in a manner to be described hereinafter.

Turning to FIGS. 6-10, louver assembly 20 is shown to include three horizontally extending and equally vertically spaced longitudinal louvers 50. A cylindrical head pin 52, which is preferably a foundry nail, is provided at each end of each louver 50 and acts as a louver axle for rotatably mounting the louvers to side panels 38. Specifically, each head pin is inserted through a cooperating aperture 54 in ridge or shoulder 48 and thereafter enters a plurality of spaced apart apertured flanges 56 integrally formed with the surface of each louver 50 and along the louver's longitudinal axis, as illustrated best in FIG. 9. The diameter of aperture 54 is slightly greater than the cross-sectional diameter of head pin 52 for rotatably receiving the head pin while

the apertures of flanges 56 have diameters slightly less than that of the head pin for rigidly affixing that portion of the head pin to the louver. In this manner, while some force is required to engage the head pins within the apertured flanges 56, the louvers may freely rotate about the longitudinal axes of their respective head pins. While three louvers are illustrated, it is to be understood that any reasonable number thereof are contemplated by this invention.

Louver assembly 20 further includes two locking assemblies 58 positioned at opposite ends of louvers 50 for causing the louvers to rotate in unison and for locking the same in a predetermined fixed position. Each assembly 58 includes an elongated and vertically extending locking bar 60 (FIG. 6) which is positioned against common ends of louvers 50 and which is laterally spaced a substantial distance away from head pins 52. Cylindrical connecting pins 62, similar to head pins 52, are provided for rigidly securing the locking bar to the louvers. Specifically, each connecting pin is inserted through a cooperating aperture 64 in the locking bar and thereafter rigidly enters a plurality of spaced apart apertured flanges 66, which are formed in a corresponding louver and which are substantially identical to flanges 56, for securing the louver to the locking bar. In this manner, as any one of the louvers 50 is rotated about its corresponding head pin 52, locking bar 60 causes the remaining louvers to rotate in unison therewith.

In order to lock the louvers into a fixed position, locking assembly 58 includes an L-shaped locking pin which comprises cylindrical leg portions 68 and 70 and which may be positioned between any two louvers 50 as illustrated in FIG. 9. Referring to FIG. 8, leg portion 68 is slidably mounted within two aligned apertures extending through opposite sides of ridge or shoulder 48 of an associated side panel 38. In addition, an apertured flange 72 is formed on leg portion 68. A spring 74 is positioned around the portion of leg 68 which extends between apertured flange 72 and one side of ridge or shoulder 48 and biases the locking pin in the position shown in FIG. 8. With the locking pin so biased, leg portion 70 extends inwardly from its associated side panel and engages one of three longitudinally spaced slots 75 which are formed in locking bar 60 and which represent three distinct positions of louvers 50.

As illustrated in FIG. 9, leg portion 70 is positioned within the middle slot and fixes the louvers in a substantially horizontal plane so that air passing through air inlet opening 18 is directed in a substantially horizontal direction. On the other hand, as it will be seen hereinafter, it is quite often desirable to have the airflow directed either downwardly or upwardly depending upon the season. For example, air may be directed downwardly by manually pulling leg portion 70 out of middle slot 75 and holding it in that position so that the louvers may be freely rotated to a position indicated by dotted lines in FIG. 10. Thereafter, leg portion 70 is allowed to snap back to its biased position and enter the top slot 76 which is now appropriately positioned for receiving the leg portion. In like manner, the louvers may be fixed in an upwardly extending position as indicated by dotted and dashed lines in FIG. 10 so that airflow passes upwardly through inlet opening 18. In this case, leg portion 70 engages the lowermost slot.

It is to be understood that while only three slots representing three louver positions are shown, the in-

vention is not limited thereto but rather contemplates any reasonable number of such slots and corresponding louver positions. In addition, while a locking assembly 58 is provided at each end of the louvers, this is only necessary where extremely long louvers are contemplated. With short louvers, only one locking assembly may be required.

Returning to FIGS. 4 and 5, sliding door assembly 22, which is shown in exploded perspective view and which is also preferably constructed of galvanized sheet steel, includes a horizontally extending elongated track member 76 which, as will be seen hereinafter, is approximately $1\frac{1}{2}$ times the length of insert 12. Track member 76 includes a substantially flat and horizontally extending track surface 78, one lengthwise edge of which is formed within a downwardly extending shoulder guide 80. The opposite lengthwise edge of track surface 78 is formed with a perpendicular and upwardly extending flange portion 82 which is adapted to engage flange 40 of wall insert 12, in confronting relationship, for mounting both to the top beam 24 of opening support 14 in a manner to be described below.

A lower track member 84, which is identical to and vertically aligned with upper track member 76, is also provided by assembly 22 and includes a flat horizontally extending lower track surface 86 formed with an upwardly extending shoulder guide 88 and downwardly extending flange portion 90. Like flange portion 82, flange 90 is adapted to engage flange 42 in confronting relationship so that both may be secured to the lower beam 24 of opening support 14.

In order to vary the size of air inlet opening 18, sliding door assembly 22 includes a rectangular outer sliding door 92 and an identical inner sliding door 94, both of which are preferably constructed of heat insulating material. These doors, each of which is dimensioned to encompass an area approximately one-half the size of inlet opening 18, are slidably supported, in stacked relationship on respective track surfaces 78 and 86 of track members 76 and 84 when the latter are assembled to wall insert 12. Outer sliding door 92 includes two vertical guide members 96 which are mounted to opposite ends of the sliding door and which extend the entire vertical length thereof. In like manner, inner sliding door 94 includes identical guide members 98 which are mounted to opposite ends thereof and which extend toward members 96.

Track stops 100 and 102 are positioned at opposite ends of the track members and prevent doors 92 and 94 from sliding off the ends of track members 76 and 84. Track stop 100 includes an integrally formed flange portion 104 which is mountable in confronting relationship to flange 44 of the right-hand side panel 38 as viewed in FIG. 5. Track stop 102 includes an identical flange portion 106 which, because of the overall length of track members 76 and 84, is mountable to a portion of wall construction 16. Both track stops include additional flange formations 101 and 103 which act as seals in a manner to be described below.

With wall insert or frame 12 and sliding door assembly 22 constructed in the aforementioned manner, ventilating unit 10 is assembled in the following manner. The wall insert is placed into opening support 14 from within the enclosure so that flanges 40, 42 and 44 rest against beams 24 and 26. Thereafter, flange portions 82 and 90 of respective track members 76 and 84 are positioned against flanges 40 and 42. The track mem-

bers and wall insert can then be rigidly secured to opening support 14 by a plurality of ring-shank nails or other suitable fastening devices (not shown) which are inserted into the wood support through a plurality of aligned apertures 108 extending through the various aligned flanges as indicated in FIG. 5. It should be noted that since each track member is greater in length than insert 12 and support 14, a portion of the track member will be mounted to wall 16. After this has been accomplished, and sliding doors 92 and 94 have been positioned in stacked relationship on track members 76 and 84, track stops 100 and 102 are similarly secured to flange 44 and wall construction 16, respectively, for closing the ends of the track members. A sealing strip 110 is positioned against the otherwise free flange 44 and both are mounted to one of the beams 26 in the same manner as described above. It should be noted, that with wall insert 12 and sliding door assembly 22 positioned in the aforementioned manner, the entire ventilating unit 10 extends inwardly only approximately two inches from wall 16.

The operation of sliding door assembly 22 for changing the size of air inlet opening 18 and thereby the amount of air that passes therethrough is exemplified best in FIGS. 1 to 3. For example, in FIG. 3, assembly 22 is shown completely closing the inlet opening. This is achieved by positioning outer sliding door 92 and inner sliding door 94 in substantially edge-to-edge relationship such that the left-hand guide member 96 of sliding door 92, as viewed in FIG. 5, is positioned adjacent the right-hand guide member 98 of sliding door 94. As stated above, each door is dimensioned to encompass approximately one-half of the area of inlet opening 18 for minimizing required wall space. Therefore, with the sliding doors positioned as stated above, the entire inlet opening is closed.

In order to increase the size of opening 18, outer sliding door 92 is moved to the left, as viewed in FIGS. 1 to 4. Eventually, when approximately half of the inlet opening is exposed and the sliding doors are in substantially stacked relationship with respect to each other, guide members 96 of sliding door 92 engage aligned guide members 98 of sliding door 94. Additional movement of sliding door 92 to the left causes sliding door 94 to move in like manner until both doors are positioned to the extreme left-hand end of track members 76 and 84, as illustrated in FIG. 1, for entirely exposing air inlet opening 18.

As stated above, track members 76 and 84 include portions which, as viewed in FIGS. 1 to 4, extend beyond the left-hand end of wall insert 12 a distance approximately one-half that of the horizontal length of the insert for receiving the sliding doors. Because two sliding doors, having the above described dimensions, are used and are positioned on track members 76 and 84 in stacked relationship, the length of each of the last mentioned portions is minimized. For example, if only one door is provided, the length of these portions would have to equal the horizontal length of wall insert 12. If desired, the over-all length of the unit can be further reduced by utilizing three or more doors with, of course, appropriate modification of the tracks.

The size of air inlet opening 18 may be decreased by slidably moving outer door 92 to the right as viewed in FIG. 1 until both doors are in substantially edge-to-edge relationship, as illustrated in FIG. 2. In this position, the left-hand guide member 96 of sliding door 92

(FIG. 5) engages right-hand guide member 98 of sliding door 94. Thereafter, continued movement of sliding door 92 to the right causes sliding door 94 to move in like manner until both doors are again positioned as illustrated in FIG. 3 for completely closing the inlet opening.

It should be noted, that with sliding doors 92 and 94 positioned as illustrated in FIG. 3 for closing air inlet opening 18, a seal for preventing air from leaking therethrough is created. The negative pressure created within the enclosure draws the sliding door 92 against shoulder guides 80 and 88 of track members 76 and 84, respectively, and flange portion 101 of track stop 100 for substantially sealing the right-hand end (as viewed in FIG. 5) of the ventilating unit. The left-hand end of the unit is sealed by sealing strip 110, which as stated above, is mounted to the left-hand flange 44 of wall insert or frame 12.

In order to reduce the effect of wind on the building's ventilating system, and to prevent the environmental elements from entering through air inlet opening 18, a hood 112 may be mounted to the opening support 14 and positioned outside of the enclosure. Specifically, hood 112, which opens downwardly and outwardly from opening support 14, includes an inverted U-shaped flange portion 114 which is mountable to vertically extending beams 26 and upper horizontally extending beams 24 in a manner similar to that described above. In addition, a rectangular screen 69 is appropriately mounted to the externally facing surface of insert 12 and completely covers opening 18 for preventing insects or other such pests from entering therethrough.

With ventilating unit 10 constructed, assembled and positioned in the aforementioned manner, it is apparent that adjustable louvers 50 are capable of directing the flow of air passing through inlet opening 18 towards the ceiling, horizontally or towards the floor. This is an important feature when the ventilating unit is used with either live-stock or poultry buildings. For example, in the winter, cold air may be directed towards the ceiling and away from the stock or poultry allowing the air to temper before contact with the animals. In the summer, the air may be directed onto the stock or poultry for providing forced cooling. It is likewise apparent that the amount of air which passes through the inlet opening may be varied independently from the air's direction by the utilization of sliding door assembly 22. The sliding doors are easily positioned to the desired opening size and can be moved individually or with all doors connected together as a system, as will be seen hereinafter. Generally, the inlet opening size should be adjusted to match fan operation, i.e., if fans are operating at full capacity, the sliding doors should be completely opened. If the fans are running at one-half capacity, the sliding doors should only be half opened, etc.

Referring to FIG. 11, a system 116 for ventilating an enclosure such as a livestock or poultry house is shown and includes a plurality of the previously described ventilating units 10 which are laterally spaced and mounted in a common wall and at the same horizontal level. The system further includes a winch assembly 118 which is connected to the sliding doors of all the ventilating units for simultaneously moving these sliding doors and thereby adjusting the unit's respective air inlet openings in unison.

Winch assembly 118 includes a winch unit 120 which may be either manually operated by a hand crank 122

or mechanically operated by a shaft 124 which is driven by a conventional reversible motor assembly 126. A roller chain 128, which is connected to and driven by winch unit 120, is clamped at its free ends to the free ends of a cable 130. As illustrated in FIG. 11, cable 130 extends initially from the top end of roller chain 128 in a horizontal direction past each ventilating unit 10 and is thereafter looped around a pulley 132 and directed back to the lower end of roller chain 128. Pulley 132 is mounted to a wall on the opposite end of the enclosure from that of the winch unit by a screw hook or other suitable fastening means 133. The pulley is positioned so that both the top and bottom portions of cable 130 lie in a vertical plane which is adjacent to and parallel with the wall supporting ventilating units 10. The bottom portion of the cable extends through a plurality of horizontally spaced screw eyes 134 which maintain the cable in proper alignment. The top portion of the cable includes a plurality of suitable fastening devices 136, each of which is connected to the outer sliding door 92 of an individual ventilating unit 10.

Operationally, when either hand crank 122 or shaft 124 is driven in a counterclockwise direction, as viewed in FIG. 11, roller chain 128 and therefore cable 130, are driven in like manner causing connecting means 136 to move to the left. This in turn causes each of the outer sliding doors 92 to move to the left for increasing the size of the air inlet openings 18 of the corresponding ventilating units. As described above, if sliding doors 92 are moved a sufficient distance to the left they will engage and move their corresponding inner sliding doors 94 so as to completely open the air inlet openings. In like manner, the air inlet openings may be closed by turning crank 122 or shaft 124 clockwise as viewed in FIG. 11.

It should be noted that when winch unit 120 is driven mechanically by motor assembly 126, suitable conventional limiting means (not shown) may be provided for automatically de-energizing the motor assembly when the air inlet openings 18 are either completely opened or completely closed. It should be noted that suitable conventional means 140 may be provided for automatically energizing a de-energizing motor assembly 126 for automatically varying the size of inlet openings 18 in accordance with a desired predetermined factor.

While a particular embodiment of the invention has been shown, it should be understood, of course, that the invention is not limited thereto since many modifications may be made. It is, therefore, contemplated to cover by the present application any such modifications as may fall within the true spirit and scope of the appended claims.

I claim

1. A ventilator comprising: frame means mountable within an opening in a building wall for defining an air inlet opening; a plurality of spaced apart elongated louvers, each of which is mounted to said frame means for rotation substantially about its longitudinal axis; interlocking means connected to said louvers for requiring said louvers to rotate in unison; and locking means connected to said frame means for locking said louvers in any one of a plurality of fixed positions; said locking means including at least one L-shaped locking pin having leg portions disposed perpendicularly to one another, a first leg portion being slidably mounted to said frame means, and said second leg portion extending in-

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wardly of said frame means for engagement with said interlocking means to thereby fix said louvers in one of a plurality of pre-designated positions relative to said frame means.

2. A ventilator according to claim 1 wherein said second leg portion is extended to permit manual manipula-

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tion of said L-shaped locking pin.

3. A ventilator according to claim 1 including biasing means engaging said frame means and said first leg of said locking pin for biasing said second leg of said locking pin into engagement with said locking means.

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