

- [54] **VENTILATOR CONTROL SYSTEM**
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Related U.S. Application Data

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 [52] U.S. Cl. **98/41 SV**, 49/67, 49/73, 49/95, 98/110, 98/121 A. 160/37
 [51] Int. Cl. **F24f 3/02**
 [58] Field of Search 49/51, 62, 37, 73, 95; 160/1, 37; 98/110, 121, 41 SV

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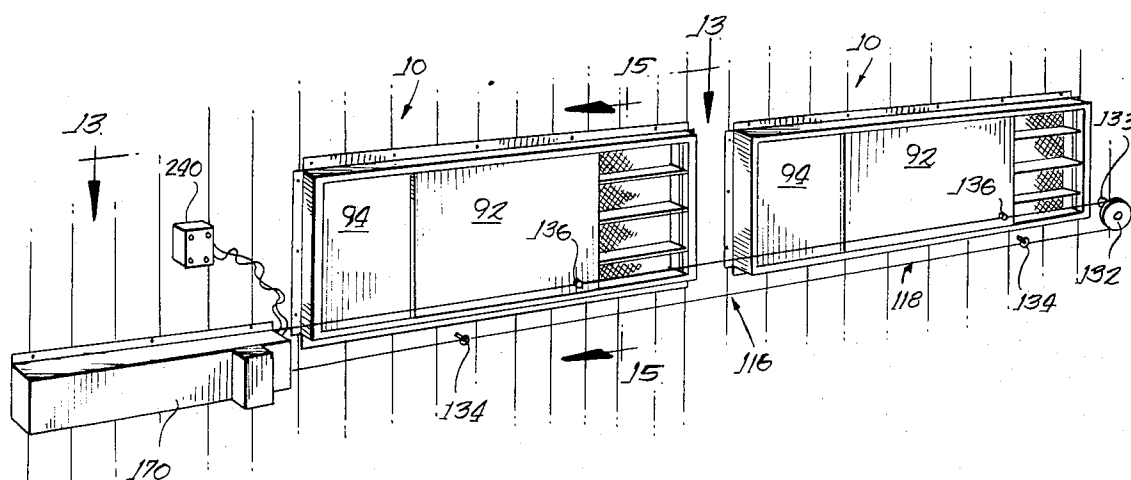
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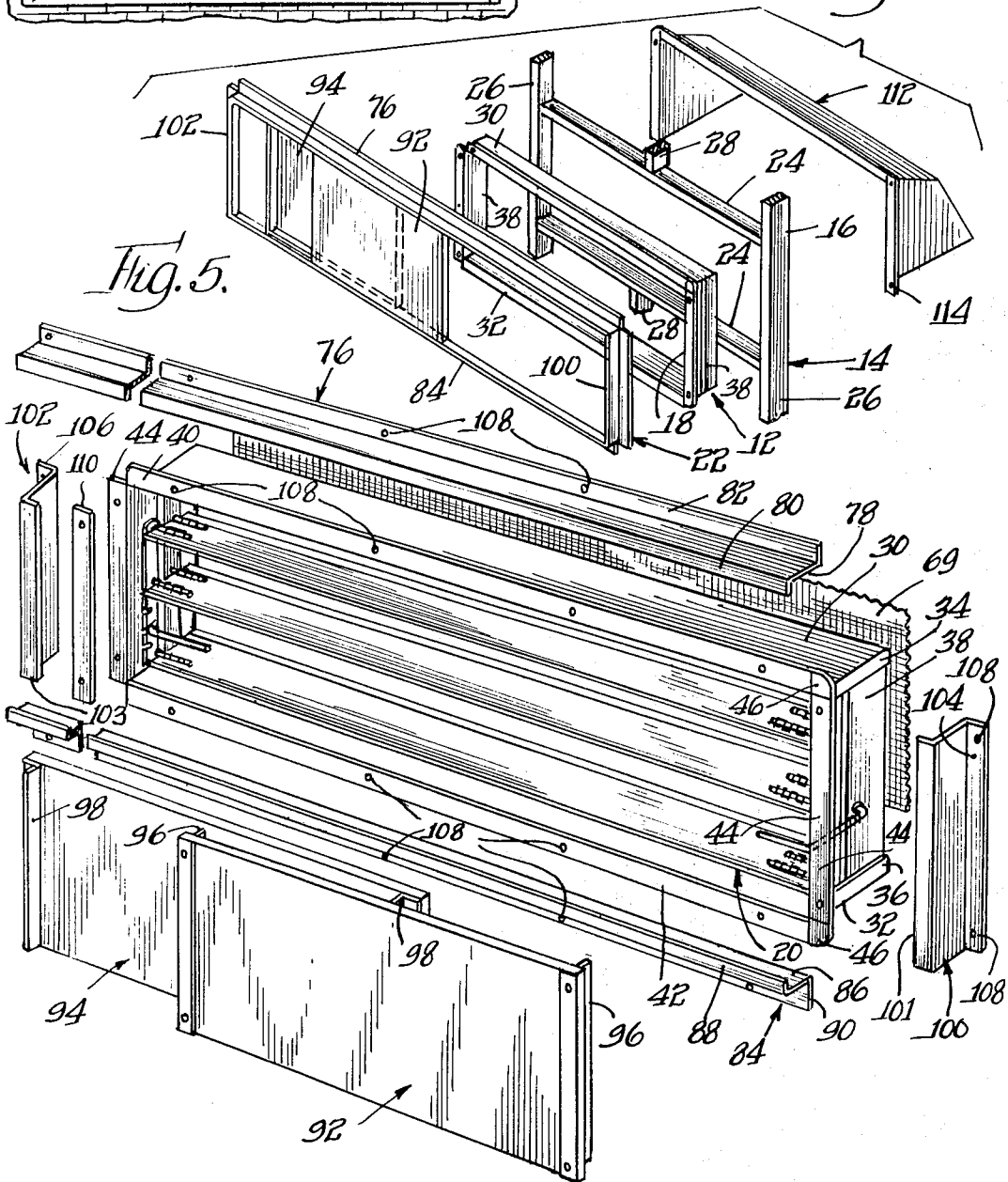
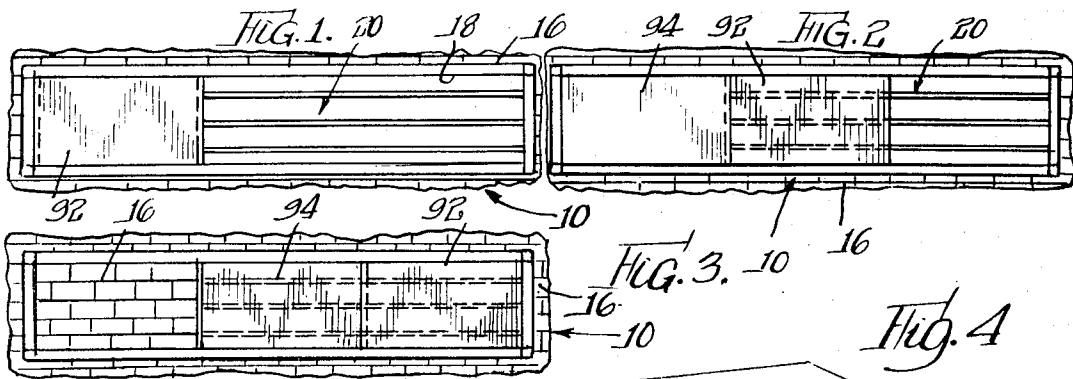
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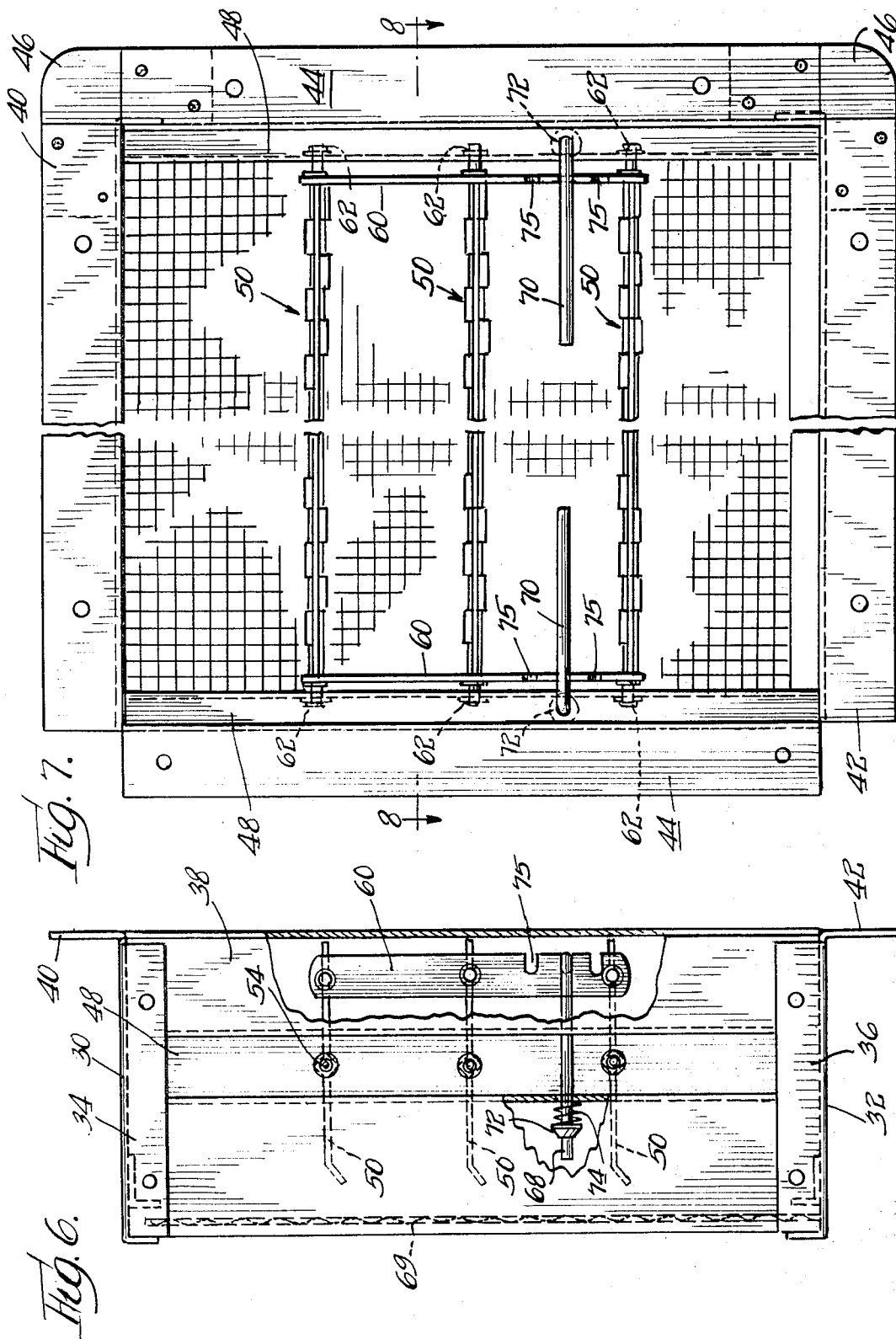
[57] ABSTRACT

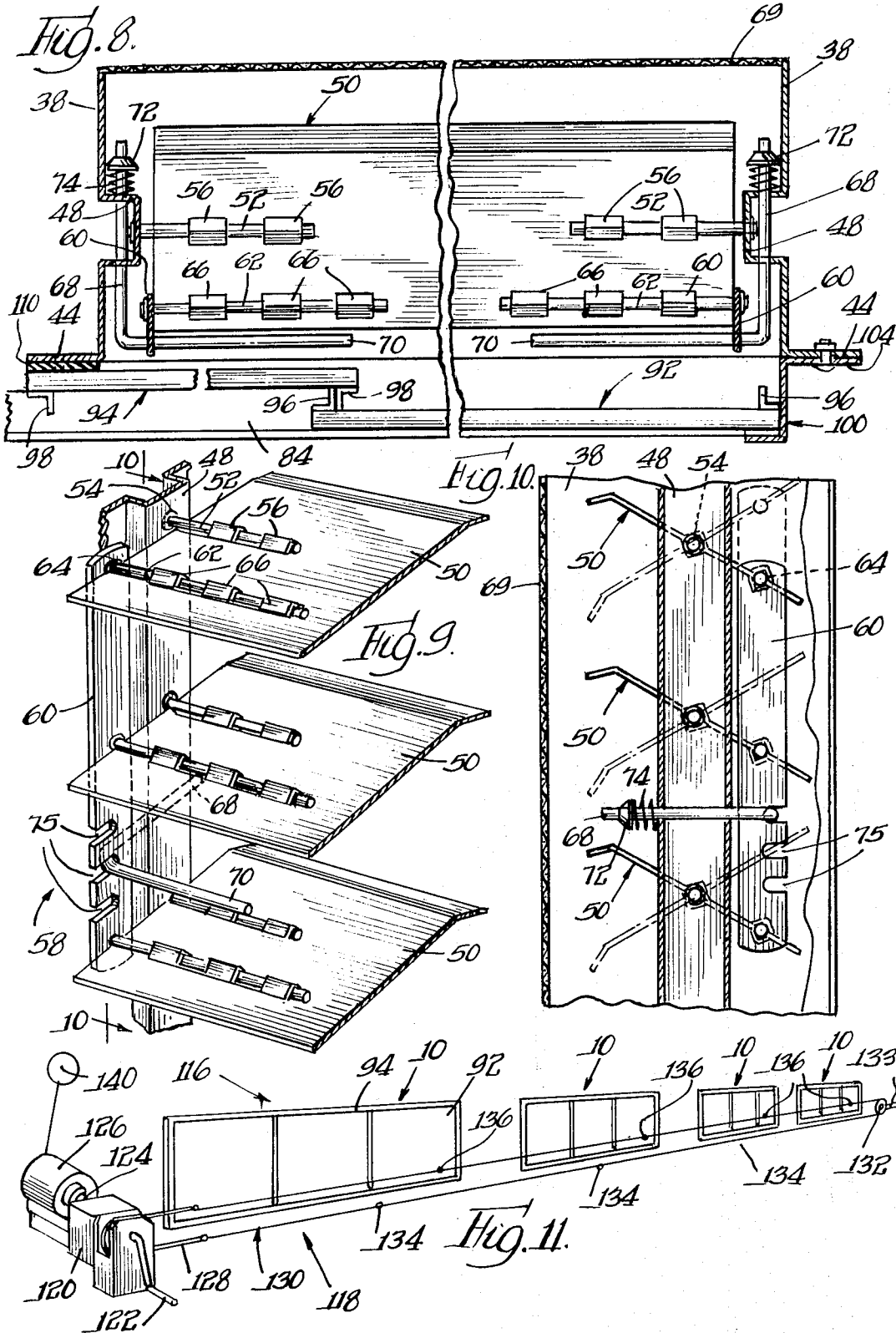
A system for controlling the ventilation of an enclosure such as a poultry or livestock house is disclosed. The system includes a ventilator mounted in a wall of the enclosure. Pressure difference between the inside and outside of the enclosure created by suitable fans, causes a flow of air to pass through the ventilator. A sliding door assembly controls the amount of air which passes through the ventilator; the sliding door assembly is operated by a pressure-sensitive actuator switch. When the pressure difference exceeds a preset pressure range, the sliding door inlet assembly is opened slowly until the pressure difference drops within the preset pressure range at which point the sliding door inlet assembly is halted. When the pressure difference drops below the preset pressure range, the sliding door inlet assembly is closed slowly until the pressure difference rises into the preset pressure range at which point the sliding door inlet assembly is once again halted. Limit sensing switches are also provided to halt operation of the door-operating mechanism at the fully opened or fully closed positions.

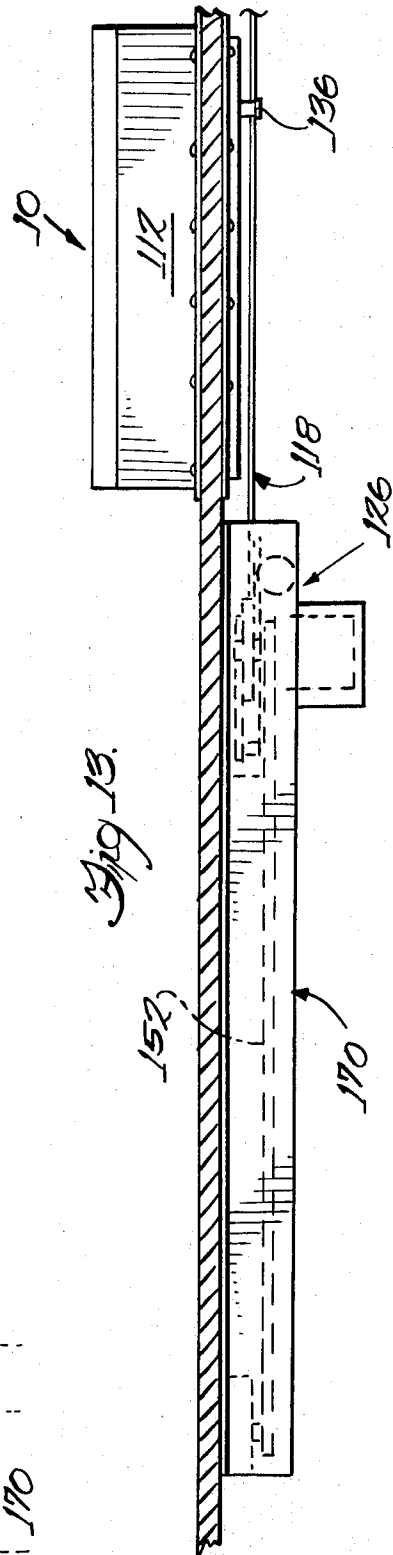
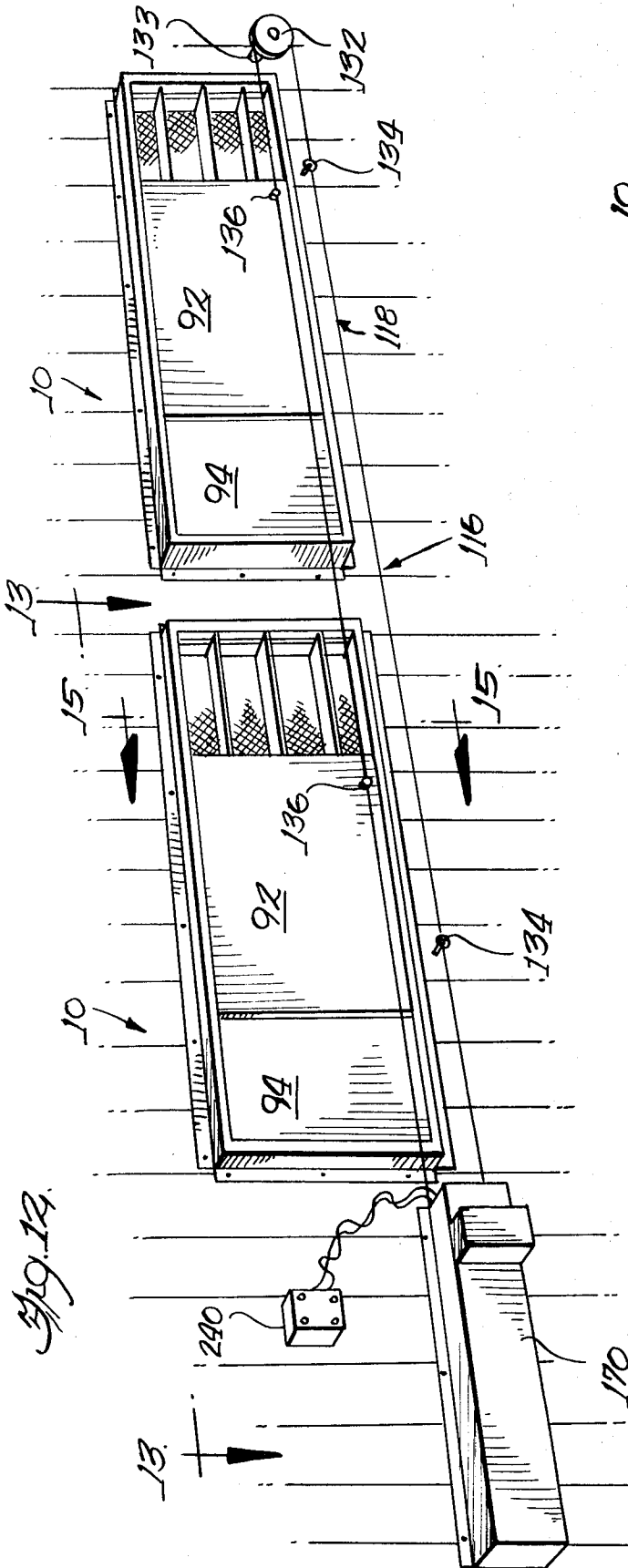
7 Claims, 20 Drawing Figures

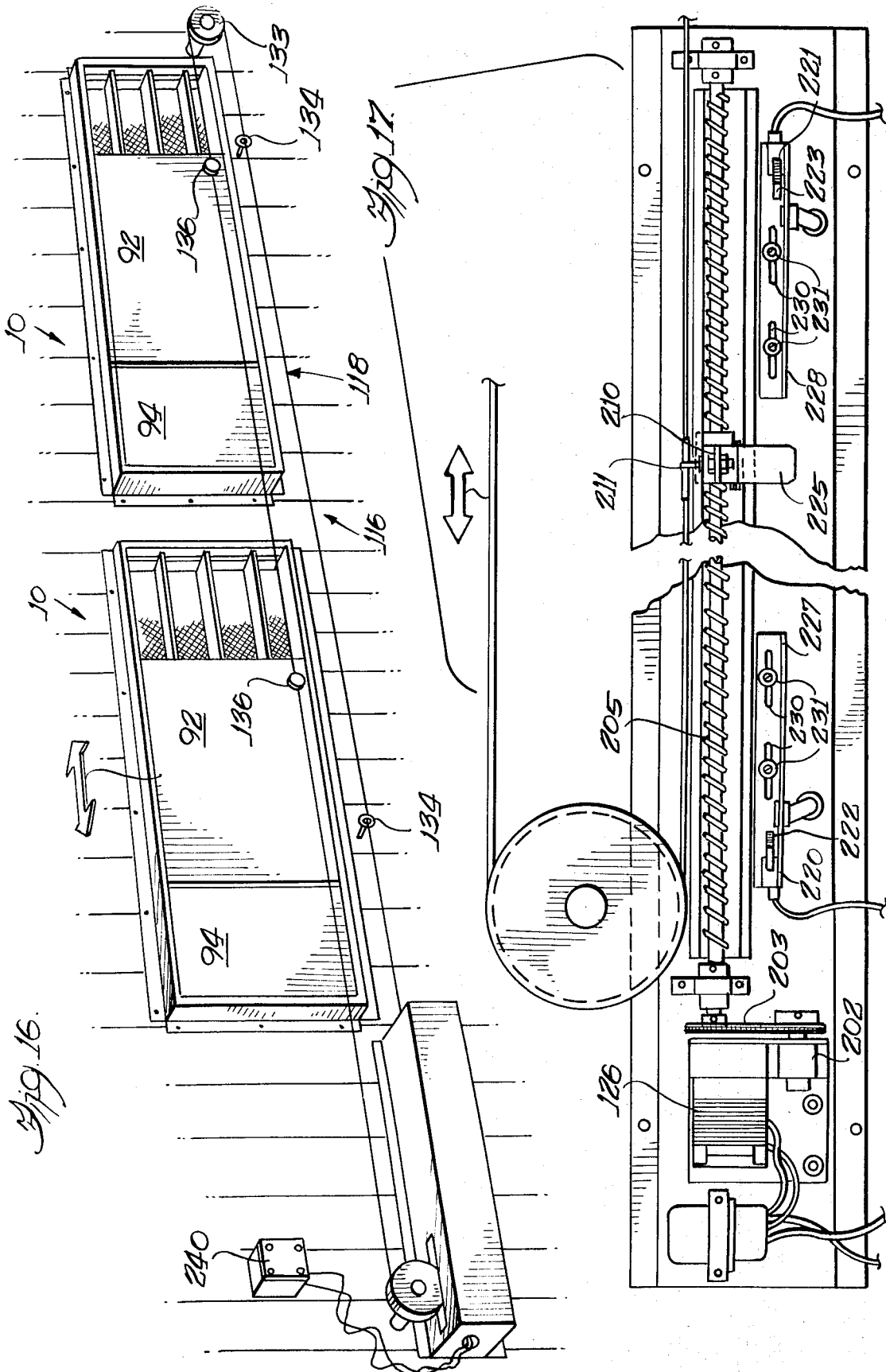


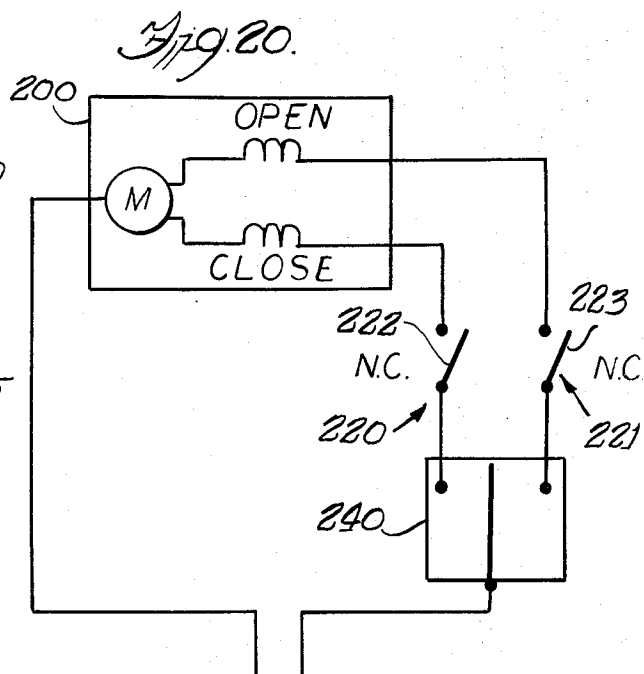
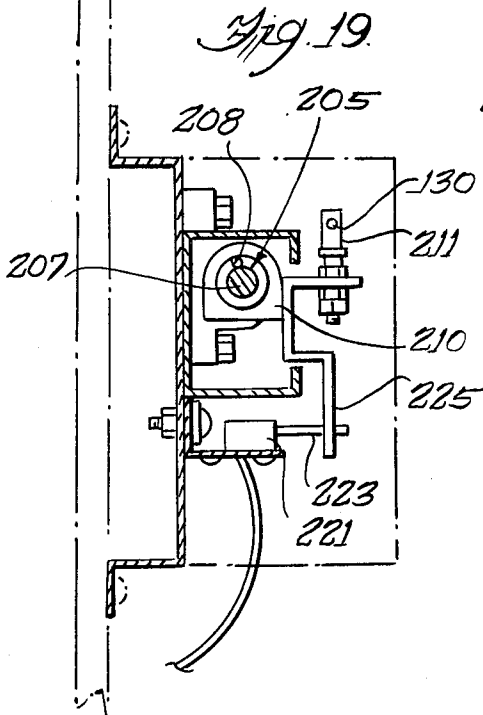
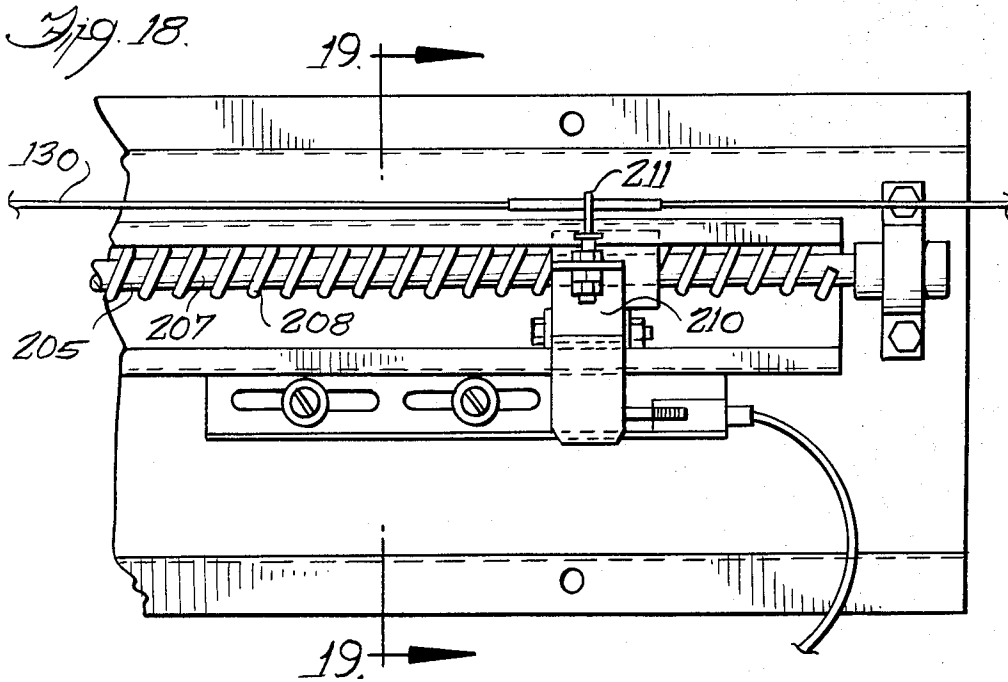












VENTILATOR CONTROL SYSTEM

SUMMARY AND OBJECTS OF THE INVENTION

This application is a continuation-in-part of co-
pending U.S. application Ser. No. 76,158, filed Sept.
28, 1970 now U.S. Pat. No. 3,741,102.

The present invention relates generally to ventilating
systems and more specifically to a system in which the
size of the fresh air inlet is automatically adjusted in re-
sponse to sensed pressure differential.

The general object of the invention is to provide a
ventilating system which insures a good circulation of
fresh air to all parts of a ventilated poultry house or like
building.

A more specific object of the invention is to provide
a ventilating system which generates relatively low at-
mospheric pressure within the ventilated building or en-
closure, and then utilizes the generated low pressure to
provide good circulation of the entering fresh air.

It is another specific object to provide a ventilating
system wherein the direction of air entering the build-
ing can be adjusted, and wherein the velocity of enter-
ing air is automatically controlled by opening and clos-
ing the air inlet in response to a sensed pressure differ-
ential between the inside and the outside of the build-
ing.

Another object of the present invention is to provide
a new and improved ventilating system wherein the
inlet openings of all of the ventilating units are simulta-
neously adjusted in an automatic manner, in response
to a change in the pressure differential between the in-
side and the outside of the building. Such pressure dif-
ferential changes occur in ventilating systems when ex-
haust fan operation is altered.

Yet another object is to provide a ventilating system
which takes up little space and which can be conveni-
ently mounted, as on the building walls.

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 ventilat-
ing unit, constructed in accordance with the present in-
vention, is disclosed and claimed herein. The ventilat-
ing system inlet 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 verti-
cally 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 open-
ing is controlled by varying the size of the opening. This
is accomplished by a pair of vertically aligned and hori-
zontally 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 ap-
proximately 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 in-
clude additional portions which extend horizontally be-
yond one side of the wall insert a distance approxi-
mately equal to one-half the horizontal length of the in-
sert 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 mov-
ing only one door between said first and second posi-
tions by other apparatus, both doors will be so moved.
In this manner, a plurality of such ventilating units may
be used in a system whereby the size of the unit inlet
openings may be simultaneously varied.

The door positions, and the corresponding size of the
inlet openings are varied by attaching one door of each
ventilator to an endless pulley, which may be operated
by a drive motor device. A limit switch is also con-
nected to the drive motor means for halting operation
of the drive motor and the door-operating pulley when
the doors are moved to fully opened or fully closed lim-
its. Also connected to the drive motor is a pressure-
differential sensing switch, which is installed to sense
and compare pressures inside and outside the poultry
house. When the house exhaust fans are energized,
their suction creates a relatively negative pressure
within the house, as compared to the outside. When this
negative pressure differential is sensed by the sensing
switch, the drive motor is actuated to open the doors
of the inlet opening.

As one or more of the exhaust fans are slowed down
the pressure differential between the inside and outside
of the house decreases. When this condition is sensed
by the pressure sensing switch, the drive motor is again
actuated, this time for operation in the opposite direc-
tion, thereby closing the inlet doors. Manual override
means are provided to locate the inlet doors in any de-
sired position, irrespective of the sensed pressure dif-
ferential.

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 inven-
tion, 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 assem-
bly repositioned;

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

FIG. 12 is a perspective view showing in further detail a plurality of ventilating units forming the ventilating system.

FIG. 13 is a sectional view taken substantially in the plane of line 13—13 in FIG. 12 showing in further detail the ventilating system parts shown in FIG. 12;

FIG. 14 is an exploded view in perspective showing the position limiting and sensing mechanism;

FIG. 15 is a sectional view taken substantially in the plane of line 15—15 in FIG. 12 showing the arrangement of hood, louvers, doors, and door-operating system parts.

FIG. 16 is a perspective view similar to FIG. 12 showing a plurality of ventilating units used in the ventilating system and the mechanism by which the ventilators are opened and closed;

FIG. 17 is an elevational view showing in further detail the mechanism of FIG. 16 by which the ventilating units are opened and closed;

FIG. 18 is a fragmentary elevational view of a portion of the mechanism shown in FIG. 17 showing in yet further detail the screw member and screw follower used to operate the ventilating units;

FIG. 19 is a sectional view taken substantially in the plane of line 19—19 in FIG. 18 and showing further details of the ventilating unit operating mechanism; and

FIG. 20 is a schematic diagram showing a typical electrical circuit used to operate the ventilator adjusting mechanism.

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, together 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 moves can be readily changed without regard to the other.

Opening support 14 preferably comprises two vertically spaced and horizontally extending standard 2 × 4 inches wooden beams 24 and vertically extending standard 2 × 4 inches wooden beams 26 so as to define inlet opening 18. However, any suitable framed opening adapted to receive and support ventilating unit 10 may be provided.

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, and perpendicular flanges 34 and 36 which are welded or otherwise suitably secured to elongated wide panels. 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. Each of the side panels 38 includes a substantially rectangular and integrally formed ridge or shoulder 48 which is best illustrated in FIG. 9.

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, provided at each end of each louver 50 acts as a louver axle for rotatably mounting each respective louver to side panels 38. 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.

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, a flange 72 is formed on the free end of leg portion 68. A spring 74 is positioned around the portion of leg 68 which extends between 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.

In accordance with the invention, the direction of air flow through the ventilator can be closely controlled. For example, 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.

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 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 and 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 to 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.

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 a 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 overall length of the unit can be further reduced by utilizing three or more doors with, of course, appropriate modification of the tracks.

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. 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.

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 a sealing strip 110, which is mounted to the left-hand flange 44 of wall insert or frame 12.

Referring to FIGS. 11-15, other components of the system 116 for ventilating an enclosure such as a livestock or poultry house are shown. They include 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.

The Winch assembly 118 includes a winch 120 which may be either manually operated by a hand crank 122 (not shown in FIGS. 12-15) or mechanically operated by a shaft 124 which is driven by a reversible drive 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 32 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.

For limiting the movement of the winch 118 and the consequent movement of the inlet doors 92 and 94, a limit assembly 150 is provided. In the illustrated embodiment, the limit assembly 150 includes an endless belt 152, here embodied as a roller chain, which is connected on a common shaft 124 with the winch assembly 118. A limit switch 154 is positioned adjacent the endless belt 152 so that its sensors 156, 158 may be actuated by appropriate tabs or fingers 160, 162, respec-

tively. Thus, as the drive motor assembly 126 operates the winch assembly 118 to open or close the doors 92 and 94, the limit assembly belt 152 undergoes motion corresponding to the motion of the winch 118. The limit switch tabs 160 and 162 are located upon the belt 152 in positions such that, when the doors 92 and 94 have reached either a fully opened or a fully closed position, the corresponding tab 160 or 162 contacts the associated limit switch sensor 156 or 158, thereby actuating the limit switch 154. Actuation of the limit switch 154 deenergizes the drive motor 126, and halts operation of the inlet adjusting mechanism.

In the illustrated embodiment, the endless belt or roller chain 152 is conventionally mounted upon sprockets 166 and 168, and a cover 170 is provided to exclude dirt and other foreign material from the winch-operating mechanisms.

An alternate embodiment of the invention is shown in FIGS. 16-20, wherein an alternate winch assembly drive mechanism is used. As illustrated, the winch cable 130 is connected to a plurality of suitable fastening devices 136, each of which is connected in turn to the outer sliding door 92 of an individual ventilating unit 10, in an arrangement similar to the embodiment illustrated in FIG. 12. The cable 130 is looped around a pulley 133, the bottom portion of the cable 130 extending through a plurality of horizontally spaced screw eyes 134 or other retainers which maintain the cable in proper vertical plane alignment.

As illustrated in FIG. 17, a bi-directional motor 200, energized as described elsewhere, is coupled by gears 202 and chain drive 203 or other convenient means to drive an elongated screw member 205. This screw member 205 may comprise a cylindrical rod 207 and a smaller wire or bar stock member 208 wrapped around the bar 207 in helical fashion to form threads, as shown in FIG. 19. A screw member follower 210 is attached by any convenient means 211 to the bottom portion of winch cable 130 and is provided with internal guide surfaces (not shown) to engage and traverse the screw member 205. Thus, rotation of the motor 200 and connected screw member 205 in a designated direction causes translational motion of the screw follower 210 and the connected winch cable 130, thereby opening and closing the ventilator doors 92.

In a manner similar to that described in connection with the embodiment shown in FIGS. 12-14, limit switches 220 and 221 are provided to limit the movement of the winch assembly 118 and the consequent movement of the associated ventilator doors 92 and 94.

On each limit switch 220 and 221, corresponding sensors 222 and 223 are located to engage a tab 225 depending from the screw member follower 210. Thus, as the screw member 205 is rotated to open and close the doors 92 and 94, the screw member follower tab 225 is translationally moved with corresponding motion into engagement with the sensors 222 or 223. When the doors 92 and 94 have reached either a fully opened or a fully closed position, the corresponding sensor 222 or 223 is engaged by the tab 225 of the screw member follower 210. Such engagement actuates the associated limit switch 220 or 221 and deenergizes the drive motor 200, thereby halting operation of the inlet adjusting mechanism.

To permit convenient adjustment of the limit switches so as to correspondingly adjust the extreme open or extreme closed positions of the doors 92 and 94, the limit switches 220 and 221 can be mounted upon corresponding limit switch mounts 227 and 228 which are, in turn, provided with elongated mounting slots 230. By loosening the associated screws or other fasteners 231, the mountings 228 and 227 can be moved to correspondingly adjust the limit switch actuation points and the corresponding extreme open and extreme closed positions of the doors 92 and 94.

In further accordance with the invention, the differential between the air pressure outside the enclosure and the negative pressure generated inside the enclosure generated by the exhaust fans is sensed and is used to adjust the ventilator inlet openings. To this end, the system may include a pressure differential sensing switch 240, as illustrated in FIGS. 11 and 12. This pressure differential switch is equipped with a single-pole, double-throw floating contact switch element of known type, such as the Dwyer Model 1640 differential pressure switch, manufactured by the F. W. Dwyer Manufacturing Co., Inc. Pressure sensors (not shown) are appropriately positioned both within and without the building to sense the inside and outside atmospheric pressures.

When ventilating fans located elsewhere within the building are actuated, either singly or together, by a time switch or other known means, the exhausting action of these fans creates a negative pressure or partial relative vacuum within the building. The differential between these inside and outside pressures is sensed by the switch 240. The switch 240 is wired to the drive motor means 126 and motor 200 as illustrated in FIG. 20 or other known matter, to actuate the drive motor means for operation in the direction necessary to open the inlet doors 92 and 94 when this pressure differential is sensed. The doors are thus opened until the pressure differential between the outside and the inside of the building is brought back into a null zone, where the switch 240 halts operation of the winch 118 by the motor drive motor assembly 126. Thereafter, if further exhaust fans are energized, thereby increasing the pressure differential, winch 118 is again actuated and the inlet doors are opened still further.

Thus, a constant, pre-set pressure differential between the outside and the inside of the building is maintained when any of the exhaust fans are operating, thereby insuring a positive flow of air into the building. The induced velocity of the air entering the building insures that the fresh air will be circulated to all parts of the building.

When any of the exhaust fans are de-energized and their motion halted, the pressure differential between the outside and the inside of the building is thereby reduced. Under such conditions, the pressure differential sensing switch 240 is wired as shown, for example, in FIG. 20 to close its contact in an opposite direction, thereby causing the drive motor means to rotate in the opposite direction and close the inlet doors 92 and 94. The drive motor means continues to drive the winch assembly 118 in the direction necessary to close the doors 92 and 94 until the limit switch 154 is actuated, thereby halting the drive mechanism.

If desired, a manual override switch may be wired into the electrical circuit to allow manual positioning of the inlets by the drive motor means 126 regardless of

atmospheric pressures or sensed pressure differentials. It is also within the purview of this invention that any number of drive mechanisms may be operated by the same null switch or the manual override switch. Thus, in large poultry or livestock houses where more than one drive mechanism is required to operate all the ventilator inlets, all drive mechanisms will operate together. It is also within the purview of this invention that inlets of types other than those illustrated herein may be operated by the drive and pressure sensing devices.

The invention is claimed as follows:

1. A system for ventilating a building, comprising a plurality of ventilating devices, each ventilating device including a frame defining an opening in the building, tracks mounted to the frame, a plurality of doors mounted on the tracks in stacked relationship for sliding motion to infinitely vary the effective size of the inlet openings between open and closed positions, a guide member mounted on each door for engaging the guide member on an adjacent door to drag the adjacent door toward an open or closed position when a first door has been moved through a distance toward said open or closed position, a plurality of spaced apart, rotatable louvers, interlocking means for rotating all the louvers in a ventilating device in unison to control the flow of air through the ventilating device; the system further including endless winch means connected to at least one door of each ventilating device, drive motor means for driving the endless winch means to simultaneously open or simultaneously close the ventilator device doors to change the effective size of the inlet openings, limit means for limiting the extent of drive motor means motion, first pressure sensing means for sensing the atmospheric pressure at a first point located inside the building, second pressure sensing means for sensing the atmospheric pressure at a second point located outside the building, means for determining any differential between the sensed atmospheric pressures, and pressure sensitive switch means for energizing the drive motor means when the differential between the sensed inside and sensed outside pressures exceed a pre-set limit.

2. A system according to claim 1 wherein said drive motor means includes means for driving said drive motor means in one direction to open said ventilating device doors, and in the opposite direction to close said ventilating device doors, and wherein said pressure sensitive switch means includes means for energizing said drive motor means to drive the drive motor means in one direction when the sensed pressure differential is less than a pre-set minimum pressure differential limit, and means for energizing said drive motor means to drive said drive motor means in the opposite direction when the sensed pressure differential is greater than a pre-set maximum pressure differential limit.

3. A system according to claim 1 wherein said limit means includes endless belt means connected to said drive motor means and said winch means for motion corresponding with the motion of the winch means.

4. A system according to claim 3 wherein said endless belt means includes a roller chain member.

5. A system according to claim 3 wherein said limit means includes limit switch means positioned for actuation by the endless belt means when a pre-determined limit of motion of the winch means and the endless belt means are reached, said limit switch being connected

11

to said drive motor means for halting operation of said drive motor means when said limit switch means is actuated.

6. A system according to claim 1 wherein said limit means includes screw means driven by said drive motor means and screw follower means connecting said screw means with said endless winch means to drive said winch means with a motion corresponding with the motion of said drive motor means.

12

7. A system according to claim 6 wherein said limit means includes limit switch means positioned for actuation by the screw follower means when a predetermined limit of motion of the winch means are reached, said limit switch means being connected to said drive motor means for halting operation of said drive motor means when said limit switch means is actuated.

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