United States Patent

White

[15] **3,669,350**

[45] **June 13, 1972**

[54] AUTOMATIC TEMPERATURE CONTROL APPARATUS FOR POULTRY HOUSES AND THE LIKE

[72] Inventor: **Billy C. White,** 511 West Sypert Street, Nashville, Ark. 71852

[22] Filed: **Dec. 11, 1970**

[21] Appl. No.: **97,111**

[52] **U.S. Cl.** **236/49,** 98/29

[51] **Int. Cl.** **F24f 11/02**

[58] **Field of Search** 236/49, 76

[56] **References Cited**

UNITED STATES PATENTS

1,952,350	3/1934	Armstrong	236/76
1,983,521	12/1934	Cooke	236/49
2,740,626	4/1956	Hall	268/125
2,314,937	3/1943	Hannon	236/76 UX
2,499,544	3/1950	Vancil	236/49 X

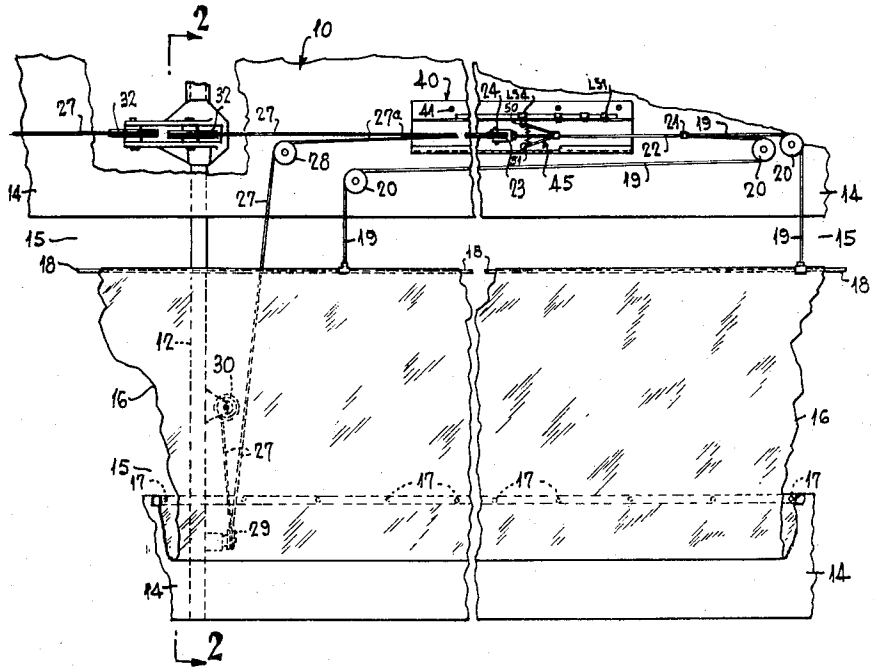
Primary Examiner—Edward J. Michael
Attorney—Robert Brown, Jr.

[57] **ABSTRACT**

Temperature control apparatus for a building having a ventilation opening therein over which a closure is movable in opposite directions to vary the opening size and wherein a series of temperature ranges of a multi-stage thermostat correspond respectively to stationary positions of the closure. When the temperature in the building rises or falls beyond any of the ranges, the direction of closure movement is electromagnetically selected, followed by movement of the closure toward and adjacent stationary position corresponding to the next temperature range.

The invention is characterized by the provision of a limit switch individual to each directional movement in each temperature range, and a trolley-type switching hog roller movable with the closure and adapted to travel back and forth across these switches. During this travel, the switch corresponding to the next stationary position the curtain is to occupy will be actuated to arrest the closure in the latter position.

6 Claims, 7 Drawing Figures



PATENTED JUN 13 1972

3,669,350

SHEET 1 OF 3

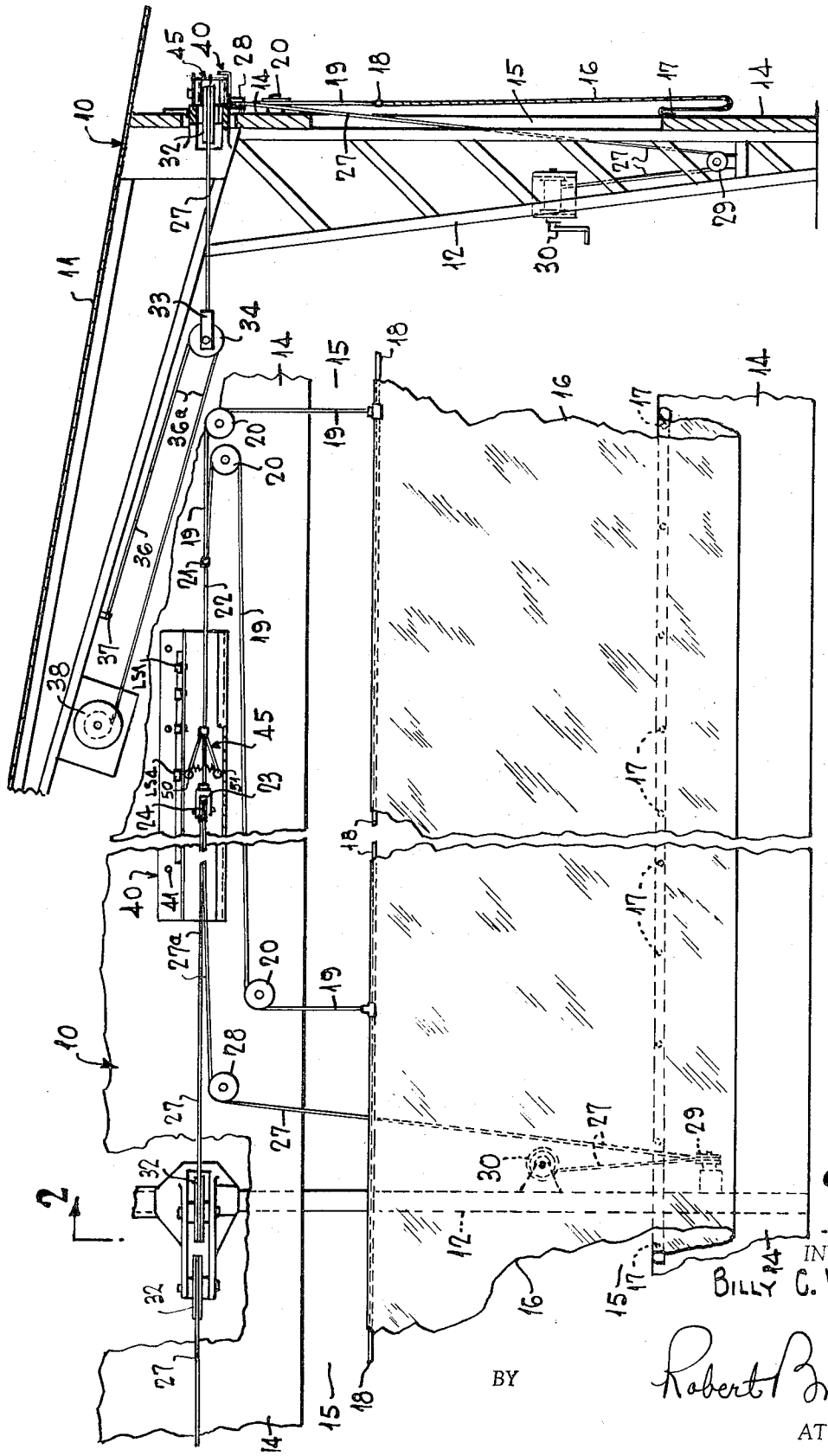


FIG. 2

FIG. 1

INVENTOR:
BILLY C. WHITE

BY

Robert L. Broaddus Jr.
ATTORNEY

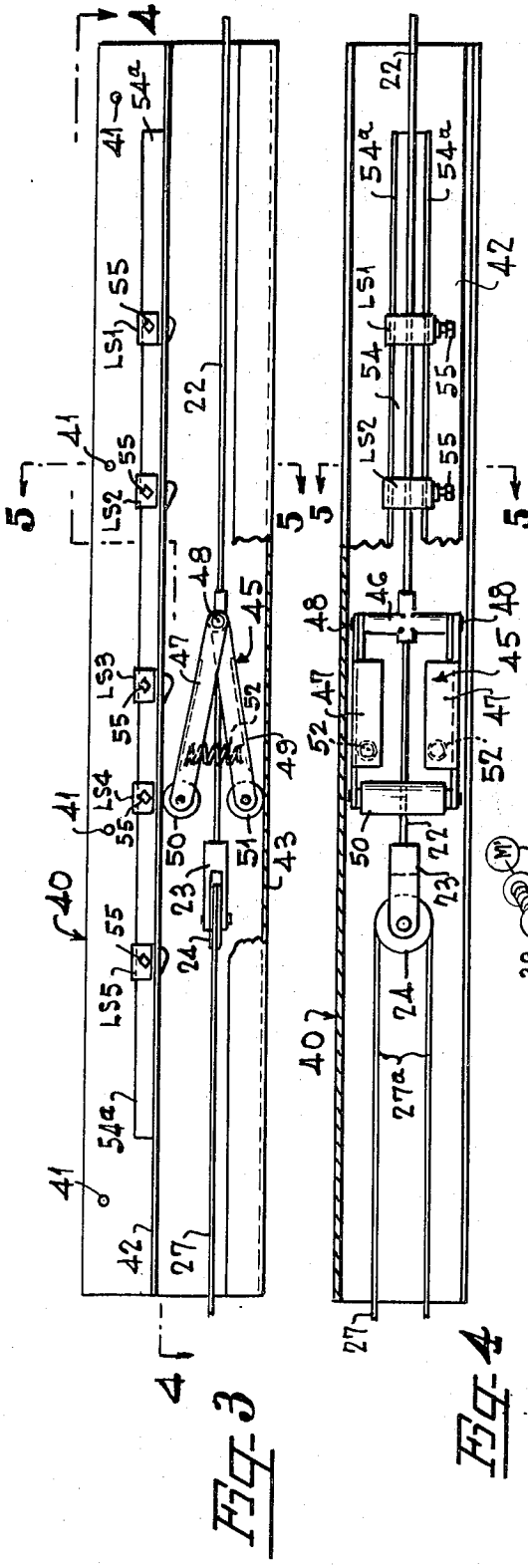


FIG-3

FIG-4

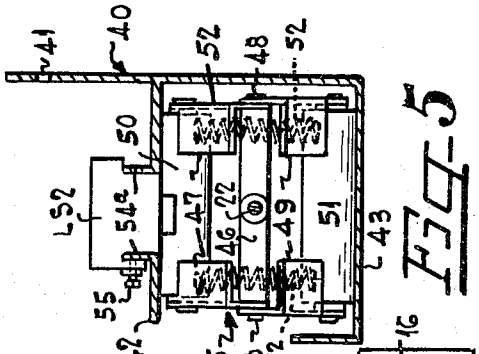


FIG-5

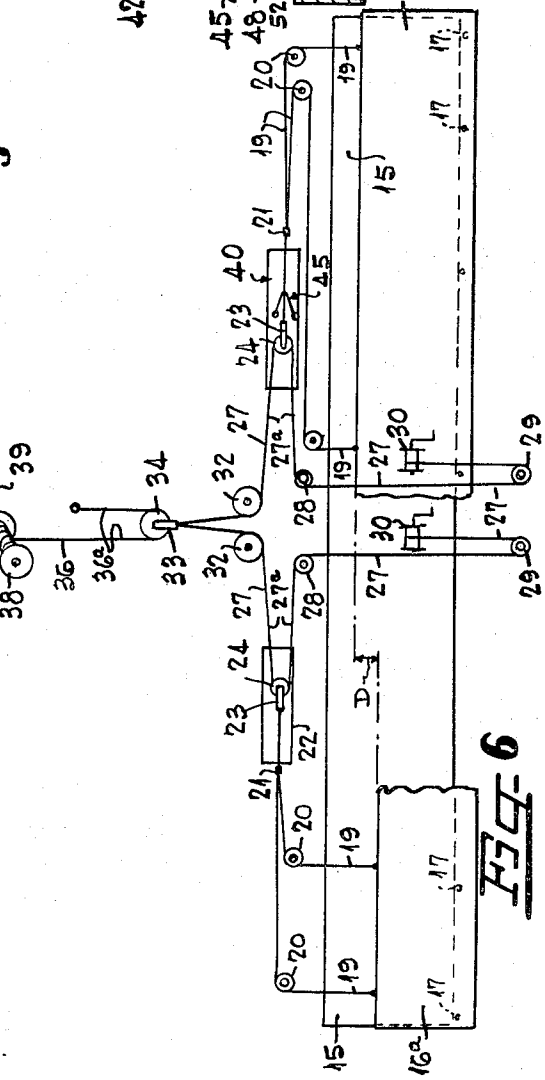


FIG-6

INVENTOR:
BILLY C. WHITE

BY Robert L. Brown Jr.
ATTORNEY

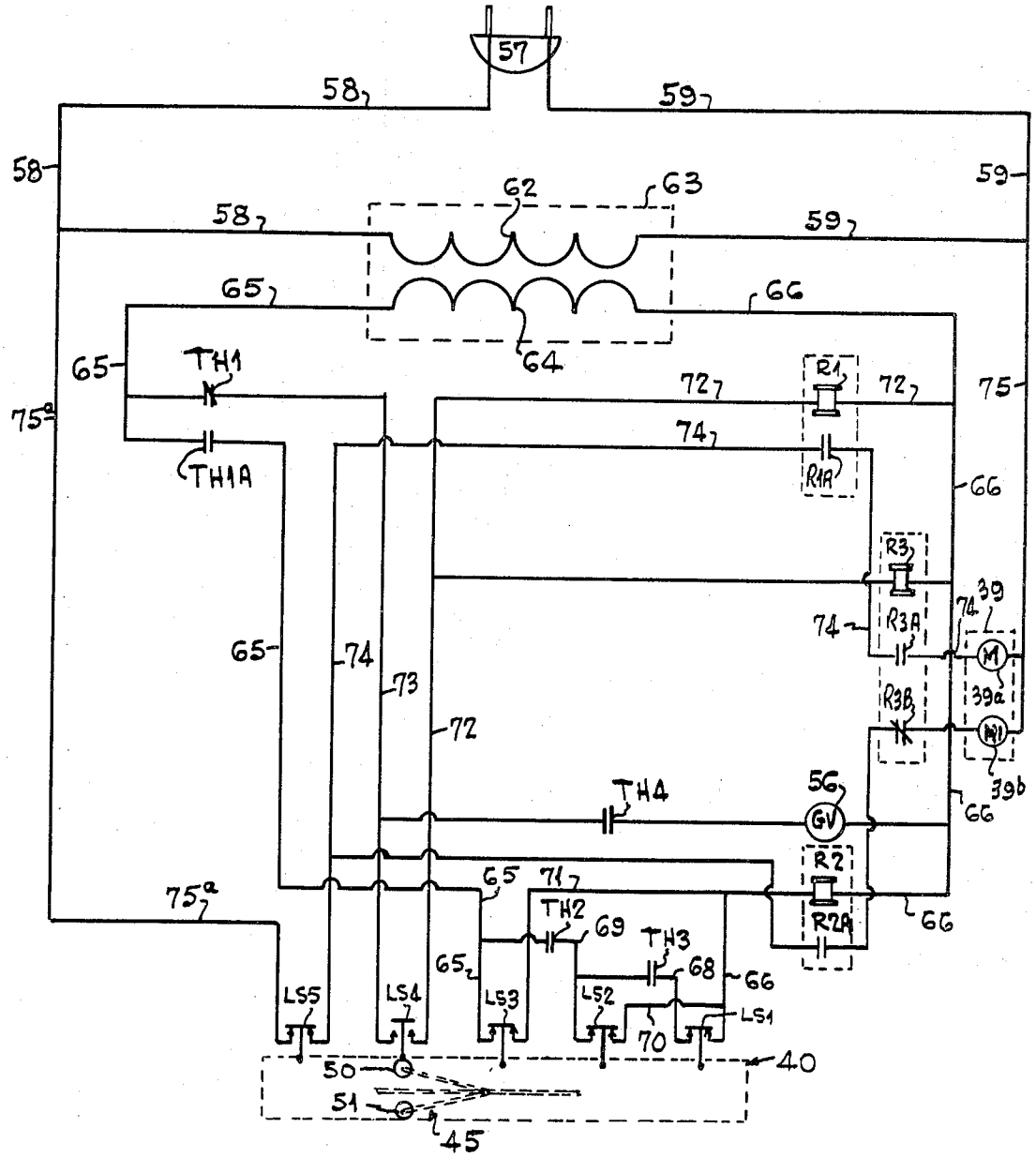


Fig. 7

INVENTOR:
BILLY C. WHITE

BY Robert Brown Jr.
ATTORNEY

AUTOMATIC TEMPERATURE CONTROL APPARATUS FOR POULTRY HOUSES AND THE LIKE

This invention relates to temperature responsive control apparatus and more specifically to arrangements for automatically varying the size of a ventilation opening of buildings such as poultry houses, commodity storage bins, and drying barns in response to temperature variations within the buildings.

In poultry raising, for example, it is of critical importance to maintain the environment within prescribed temperature ranges to protect the fowls against ailments such as colds, bronchitis and roup. Likewise in storage bins and drying barns, the commodity may be severely damaged or completely spoiled by excessive temperature variations.

Heretofore, attempts have been made to automatically control the temperature within poultry houses by varying the size of a curtained window opening in response to inside temperature variations, as disclosed in the patent to Dubie et al., issued July 3, 1962. So far as I am aware, however, the prior art does not disclose a building provided with a temperature control apparatus comprising a thermostat operable over a series of temperature ranges each of which correspond to a separate stationary position of a closure for a ventilation opening, in combination with means including an electrical circuit responsive to a temperature variation outside any of the ranges corresponding to the particular closure position for selecting the direction of closure movement and for moving it toward an adjacent stationary position, and a trolley-type switching hog assembly movable with the closure and adapted to stop it at the adjacent position.

It is therefore an object of this invention to provide an apparatus of the type specifically described in the immediately preceding paragraph.

It is another object of this invention to provide a temperature control apparatus for poultry houses and the like having a heating source operable to increase the temperature, and having a curtained ventilation opening capable of being opened or closed intermittently in response to temperature variations from one range to another whereby the heating source and ventilation opening may be alternately manipulated to complement one another.

It is a further object of this invention to provide a temperature control apparatus for poultry houses having a heating source within and ventilation openings in the walls thereof with curtains movable over the openings in response to a series of temperature range variations, in combination with a switching panel for automatically stopping the curtain after it has moved a predetermined distance in response to a variation.

It is yet another object of this invention to provide in combination with a ventilation opening having a curtain closure movable thereover to vary the opening size, interconnected manual and automatic power sources which are selectively operable for changing the position of the curtain.

Some of the objects of invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which,

FIG. 1 is a fragmentary outside elevation of a portion of a building embodying the invention;

FIG. 2 is a transverse sectional view taken along line 2—2 in FIG. 1;

FIG. 3 is an enlarged elevational view of the limit switch assembly shown in the upper central portion of FIG. 1;

FIG. 4 is a sectional plan view taken along line 4—4 in FIG. 3;

FIG. 5 is a transverse sectional view taken along lines 5—5 in FIGS. 3 and 4;

FIG. 6 is a schematic view illustrating the cooperative relationship of the various elements of the invention, and

FIG. 7 is a schematic electrical wiring diagram of the invention.

Referring more particularly to the drawings, the numeral 10 denotes broadly a building such as a poultry house which comprises roof rafters 11, columns 12 and side wall 14, said wall having a window or ventilation opening 15 therein with a closure or curtain 16 movably mounted thereover.

The lower marginal edge of curtain 16 (FIGS. 1 and 2) is secured to the outside face of wall 14 at points 17 adjacent the lower side of opening 15; and the upper marginal edge of the curtain has secured thereto a rod 18 to which is attached at spaced intervals the lower ends of suspension cables 19. Cables 19 each pass over pulleys 20 secured to the outside face of wall 14 and above the opening 15, said cables having the other ends thereof connected as at 21 to one end of horizontally extending cable 22 which, in turn, has its other end connected to a pulley bracket 23 in which pulley 24 is mounted.

Another cable 27 has formed therein a U-shaped loop 27*a* passing over pulley 24 (FIGS. 4 and 6). One end portion of cable 27 is an extension of a leg of U-shaped loop 27*a* and also passes therefrom to pulley 28 attached to the upper outer face of wall 14, then downwardly to pulley 29 attached to column 12, and then upwardly to hand winch 30 attached to the column. The opposite end portion of cable 27 extends horizontally from the other leg of U-shaped loop 27a to pulley 32 mounted on the outside face of wall 14, and then to bracket 33 in which pulley 34 is mounted. A U-shaped loop portion 36*a* in a cable 36 is engaged by the pulley 34, one end portion of cable 36 extending from one leg of said U-shaped loop to a fixed point 37, and the other cable end portion extending from the other leg to a winch 38 operated by reversible motor 39.

From the above description, it will be observed that when winch 38 rotates in a direction to wind cable 36 thereon, the cables 27, 22 and 19 will be moved to raise the upper edge of curtain 16 to reduce the size of opening 15; and when winch 38 rotates in the opposite direction, the curtain 16 will be lowered to increase the opening size. In the event it should be necessary to manually adjust the position of curtain 16 independently of the power-operated winch 38, the winch 30 can be turned. Thus, the winches 38 and 30 may be operated selectively and independently to vary the respective positions of the curtain over the opening.

A separate curtain 16*a* is suspended over another area of opening 15 (FIG. 6) by substantially an identical cable arrangement as described above for curtain 16. Accordingly, curtains 16 and 16*a* will rise and fall at the same time and at the same rate of travel when power winch 38 is operated. However, since curtain 15a has a separate hand winch 29 and cable suspension system, the top edges of the curtains may be adjusted to reflect a difference D in height to cause one curtain to run behind the other when power-operated winch 38 is used. This differential adjustment of the curtain positions facilitates cross-ventilation and serves to control dust and ammonia build-up inside the poultry house as the fowls get larger in cold weather.

A multi-stage thermostat having contacts TH1, TH1A, TH2, TH3 and TH4 (FIG. 7) is installed inside the poultry house. As described more fully hereinafter, these contacts respond to a series of inside temperature ranges which, in turn, correspond respectively to separate stationary positions of curtain 16 over opening 15. The various stationary curtain positions are controlled by limit switches LS1, LS2, LS3, and LS4, which switches are spaced in switching panel 40 according to the height of curtain 16 with respect to the opening 15, that is, switch LS1 corresponds to the bottom position, LS2 and LS3 the intermediate, and LS4 the top.

Switching panel 40 is secured to the outside of wall 14 as at 41, said panel being provided with a horizontally extending plate 42 for supporting limit switches LS1 through LS5 in alined spaced positions thereon. A parallel U-shaped track portion 43 is disposed below plate 42; and between members 42 and 43, a switching hog assembly 45 is adapted to move back and forth in response to changes of temperature ranges to thereby contact a selected limit switch and stop the curtain in a predetermined position over the side wall opening 15.

Limit switches LS 1 through LS4 are spaced apart distances respectively equal to corresponding vertical distances between the stationary positions of the curtain with respect to opening 15. In order to vary the spacing of the stationary curtain positions, the plate 42 is provided with a longitudinal slot 54 therein, said slot having upstanding flanges 54*a* integral

with its proximate longitudinal edges (FIGS. 3–5). The limit switches LS1 through LS4 are adjustably spaced upon these flanges by set screws 55. Limit switch LS5 which controls the flow of current to switches LS1-LS4 and their associated circuits is adjustably mounted upon the flanges by the same means.

The switching hog assembly 45 consists of: a cross bar 46 fixedly secured to the cable 22 (FIGS. 3–5); a pair of upwardly inclined arms 47, one end of each being pivotally secured as at 48 to the bar 46; a pair of downwardly inclined arms 49 each being similarly pivoted as at 48 to bar 46; a roller 50 for actuating the limit switches LS1–LS5, said roller being mounted between the upper free ends of arms 47; a track engaging roller 51 mounted between the lower free ends of arms 49; and compression springs 52 between the free ends of arms 47 and 49 to yieldingly urge the rollers 50 and 51 respectively against the proximate surfaces of switch supporting plate 42 and track 43.

Since switching hog assembly 45 is fastened to cable 22 which, in turn, supports closure or curtain 16, any movement of the switching hog relative to limit switches LS1 through LS5 will be accompanied by a like movement of the curtain.

The electrical wiring diagram in FIG. 7 illustrates the relationship between tne normally closed limit switches LS1–LS5 and the associated control elements, namely, the thermostatic contacts Th1, TH1A, TH2, TH3 and TH4 which are responsive to the temperature ranges; the reverse windings 39a and 39b of motor 39; the gas valve 56 which supplies fuel for heating the brooder in the poultry house during the heating stage; the relay coils R1 and R3 for running the winch motor 39 in one direction; and the relay coil R2 for running the motor in the opposite direction.

In the present installation, 115 volt alternating current is supplied at plug 57 from whence it passes through conductors 58 and 59 to the primary winding 62 of transformer 63. The secondary winding 64 of the transformer has conductors 65 and 66 leading therefrom. Limit switches LS1–LS5 are connected to the transformer windings and the other electrical components of the apparatus as follows:

One contact of switch LS1 is connected to one side of secondary winding 64 by conductor 66 which includes coil R2; and the other contact of the switch to the other by serially connected conductors 68, 69 and which include contacts TH3, TH2 and TH1A respectively.

One contact of switch LS2 is connected to one side of winding 64 by serially connected conductors 70 and 66; and the other contact of the switch to the other side of the winding by serially connected conductors 69 and 65.

One contact of switch LS3 is connected to one side of winding 64 by serially connected conductors 71 and 66; and the other contact of the switch to the other side of the winding by conductor 65.

One contact of switch LS4 is connected to one side of winding 64 by serially connected conductors 72 and 66; and the other contact to the other side of the winding by serially connected conductors 73 and 65, said conductors 72 and 73 including coil R1 and contact TH1 respectively.

One contact of switch LS5 is connected to the primary winding 62 by serially connected conductors 74, 75 and 59; and the other contact to the other side of the winding by serially connected conductors 75*a* and 58, said conductor 74 including contacts R1A, R3A and reverse motor winding 39*a*.

To illustrate the operation of the apparatus, let it be assumed that a temperature of 90 degrees Fahrenheit is to be maintained by the brooder (not shown) in the poultry house. The thermostat, which is mounted in the center of the building, will be set on 92°. Then when the temperature drops to 88° in the building, the thermostat contacts TH4 will close to turn on gas valve 56. The burners in the brooder will burn until the temperature rises to 90°. Thus, the temperature range for the 90° setting is 88° to 92° or 4°.

It will be observed that the TH4 contacts get power through the TH1 contacts; consequently, the TH1 contacts must be closed before the TH4 contacts will operate gas valve 56. The TH1 contacts control the heating stage of the thermostat and, therefore, the curtain 16 will be in top raised position during this stage. The switching hog roller 50 during the above operation will be on limit switch LS4 to break the contacts thereof (FIGS. 3 and 7).

Now let us assume the temperature continues to rise after the TH4 contacts open to cut off gas valve 56. When the temperature rises to 93°, crossing into the adjacent temperature range, the TH1A contacts will close and the TH1 contacts open, causing relay coil R2 to make up R2A contacts and thereby run power winch 38 which, in turn, will cause switching hog 45 to move off switch LS4 toward switch LS3. Concurrently with this movement to the right in FIGS. 1, 3, 4, 6 and 7, curtain 16 will be lowered to to increase the size of opening 15. Upon arrival of the hog at switch LS3, the contacts thereof will be broken to stop the power winch 38 and arrest the curtain in a stationary position.

Now let us assume the temperature continues to rise after the curtain has opened this far. When the temperature rises to 95°, crossing to the next temperature range, the TH2 contacts will close the circuit to relay coil R2 which, in turn, will close the R2A contacts and again run power winch 38 forwardly while the hog 45 moves toward limit switch LS2 to lower the curtain 15 farther. Switch LS2, when contacted by the hog, will arrest the curtain in another stationary position.

Now let us assume the temperature again continues to rise with the curtain opened in the last-named position. When the temperature rises to 97°, crossing into the next range, the TH3 contacts will close the circuit to coil R2, closing the R2A contacts to run power winch 38 forwardly while lowering the curtain. When the hog reaches switch LS1, the curtain will be stopped in lowermost or completely open position.

Any time the temperature begins to fall, regardless of how much curtain 16 is open, the TH2 contacts will break; and as the temperature continues to fall, the contacts TH1A will break and the TH1 contacts will close to begin the heating stage, at which time, the circuit to coils R1 and R3 will be completed causing relay contacts R1A and R3A to make up to run power winch 38 reversely and to raise curtain 16 toward closed position. Upon arrival at closed position, the switching hog will break the contacts of switch LS4 corresponding to a temperature of 90°. Therefore, the curtain moves upwardly from any opened stationary position, continuously and without interruption, to the top closed position any time the temperature falls from one range to the adjacent range.

I claim:

1. In an apparatus for controlling the temperature in buildings such as poultry houses, commodity storage bins and drying barns, said buildings having a ventilation opening with a closure movable thereover in opposite directions to vary the opening size, the combination of: a multi-stage thermostat in said building and operable over a plurality of successive temperature ranges; electro-magnetic means responsive to a temperature variation from the respective ranges for selecting the direction of closure movement; means including a cable for moving the closure in the selected direction; a switch individual to the selected direction for stopping the closure movement in a position corresponding to the next temperature range; a track extending longitudinally alongside said cable for supporting said switches in spaced aligned positions; switch actuating means connected to said cable and engageable with said track and its associated switches during said cable movement whereby the switch individual to the selected direction will be actuated to stop the closure movement; a second track extending longitudinally alongside said cable and first track; and means connected to said cable and engageable with said second track for yieldingly pressing said switch actuating means against said first track and its associated switches during said cable movement.

2 Apparatus as defined in claim 1 wherein said closure moving means includes: a power-operated winch, a second cable having one end thereof connected to said winch, the inter-

mediate portion of said second cable having a U-shaped loop therein, a manually operable winch, means connecting the other end of said second cable to the last-named winch, and means connected to said first cable for rollably supporting said U-shaped loop of the second cable, whereby said winches may be operated independently and selectively to vary the position of the closure over the opening.

3. Apparatus as defined in claim 1 wherein said last-named means includes a spring yieldingly pressing said switch actuating means and said track engaging means respectively in opposite directions and against said first and second tracks.

4. Apparatus as defined in claim 1 and further comprising: means individual to each of said switches for adjusting its spacing relative to the adjacent switches.

5. In a temperature control system for buildings such as poultry houses, commodity storage bins and drying barns, said buildings having a ventilation opening with a closure movable thereover in opposite directions to vary the opening size, apparatus for moving said closure to a plurality of stationary opened positions of progressively increased sizes, said positions corresponding respectively to a plurality of successive temperature ranges within the building, comprising: cable means for suspending said closure; a reversible motor for operating said cable means; an electrical circuit including said motor individual to each of said ranges; means responsive to the increase of temperature from each of a plurality of said ranges to its succeeding range for moving said closure toward its next succeeding stationary opened position; a switch in each of said circuits for stopping said moved closure at the stationary position corresponding to its range; means connected to said cable means for actuating said switches, said closure moving apparatus including a power-operated winch, a second cable having one end thereof connected to said winch, the intermediate portion of said secod cable having a U-shaped loop therein, a manually operable winch, means connecting the other end of said second cable to the last-named winch, and means connected to one end portion of said first cable for rollably supporting the U-shaped loop of said second cable whereby said winches may be operated independently and selectively to vary the position of the closure over the opening.

6. Apparatus as defined in claim 5 wherein said building is provided with a second ventilation opening with a second closure movable thereover in opposite directions to vary the opening size, and further comprising: means including a third cable for suspending said second closure over its opening; a fourth cable having a U-shaped loop therein; a second manually operable winch connected to one end of said fourth cable; means connected to one end portion of said third cable for rollably supporting the U-shaped loop of said fourth cable; and means for connecting said fourth cable at its other end to said power-operated winch whereby both of said closures will be raised and lowered in unison and whereby said first and second manually operable winches may be operated independently to effect relative differences in the sizes of the respective openings.

* * * * *