

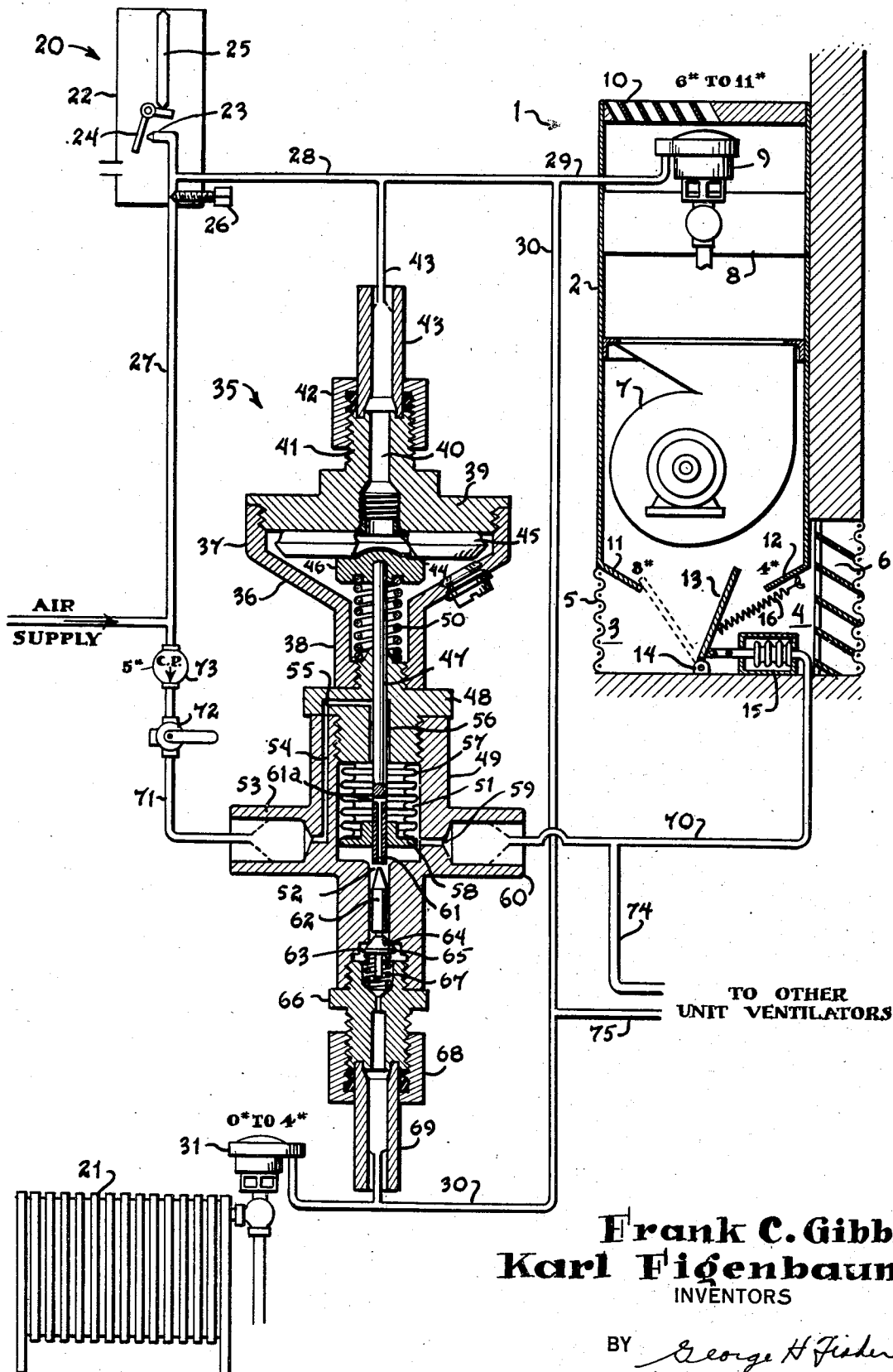
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CONTROL APPARATUS

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Frank C. Gibbs
Karl Figenbaum
INVENTORS

BY *George H. Fisher*
ATTORNEY

UNITED STATES PATENT OFFICE

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CONTROL APPARATUS

Frank C. Gibbs, Oak Park, and Karl Figenbaum,
Chicago, Ill., assignors to Minneapolis-Honey-
well Regulator Company, Minneapolis, Minn.,
a corporation of Delaware

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This invention relates in general to automatic controls, and is more particularly concerned with automatic controls for controlling air conditioning apparatus.

5 In the heating and ventilating art, it has become common to heat and ventilate large spaces such as school rooms or auditoriums by devices known as unit ventilators. These unit ventilators usually consist of a casing enclosing a heating
10 element, and a fan for causing air to pass through the heating element and out into the space being heated. These ventilators are also provided with two air inlets, one inlet allowing air from the room (recirculated air) to pass into the casing,
15 and the other inlet allowing air from outside the building (fresh air) to flow into the casing. Usually some form of damper arrangement is provided for controlling the mixture of fresh air and recirculated air taken into the casing, and it has
20 become common to vary the mixture of fresh and recirculated air in accordance with temperature conditions within the space, in order to prevent overheating in mild weather and to avoid excessive heating loads in severe weather.

25 In many cases, a plurality of such unit ventilators are installed in a single room or space and both the heating elements and the fresh and recirculated air damper mechanism of all of the units are controlled by a single thermostat responsive to the temperature of the space being
30 conditioned. While the specific sequence of operation of the heating elements and damper mechanism may take several forms, in general, the thermostat controls the heating element in a
35 manner to gradually place it out of operation as the space temperature increases above a predetermined value, and controls the damper mechanism in a manner to increase the supply of fresh air as the space temperature increases.
40 Thus when the space temperature is too high, all fresh air will be supplied to the unit, and the heating element will be placed out of operation. As the space temperature falls, however, the heating element will be gradually placed in operation,
45 and the supply of fresh air will be reduced. When the space temperature falls to a predetermined low value, the heating element will be in full operation, and the damper mechanism will be positioned so as to prevent any fresh air at all
50 from being supplied to the unit in order to avoid an excessive heating load.

In some localities, however, local statutes require that the fresh air supply shall not be reduced below a predetermined minimum whenever the space is occupied. It is thus necessary

in installations in these localities to provide an arrangement for preventing the damper mechanism from closing off the fresh air damper even though the temperature of the space may be too low. Such an arrangement alone, however, is
5 not fully satisfactory, for it is desirable for economy reasons to close off the fresh air supply when the space is not being occupied. It is therefore necessary to provide an arrangement which limits the movement of the damper for maintaining a minimum fresh air supply during periods
10 of occupancy, and which permits the fresh air supply to be closed off during periods of non-occupancy.

One manner in which this result has been
15 achieved in the past has been by utilizing two separate motors for controlling the damper mechanism of each unit, one motor being under the control of the thermostat, and the other being manually controlled by a switch line, this second
20 motor acting to prevent the damper mechanism from completely closing off the fresh air supply when energized and to permit the first motor to completely control the damper mechanism when the second motor is deenergized.
25

While such arrangements are somewhat satisfactory in operation, they are not entirely desirable for the reason that the provision of each unit with an extra motor materially increases the cost of the control equipment, where a large number
30 of units is being controlled.

It is therefore an object of our invention to provide a novel control arrangement for unit ventilator damper mechanism which utilizes but one damper motor for each unit and which permits said damper mechanism to be controlled
35 from a thermostat in a manner to prevent the supply of fresh air from being reduced beyond a predetermined minimum by said thermostat during one period of time while permitting complete closing off of the fresh air supply by the thermostat at other periods of time.
40

While the primary object of our invention is to provide a control system for unit ventilators, our invention is not limited to such apparatus.
45 Other objects of our invention will become apparent from the following description and the appended claims.

For a full description of our invention, reference is made to the following detailed description and
50 to the accompanying drawing, the single figure of which shows in elevation a device embodying the principles of our invention and which shows diagrammatically the various elements forming a unit ventilator control system.
55

Referring to the drawing, reference character 1 indicates generally a unit ventilator which consists of a casing 2 having a recirculated air inlet 3 and a fresh air inlet 4. The recirculated air inlet 3 may be provided with the usual grill 5 while the fresh air inlet 4 is in communication with an opening 6 through the wall of the space being heated. Located within the casing 2 is the usual fan 7 and an air fin type of heating coil 8. The flow of steam or other heating medium into the heating coil 8 may be controlled by a pneumatic control valve 9 of known construction. Above the heating element 8 is an outlet 10 for allowing the heated air to be discharged into the space being conditioned. As shown, the casing 2 is provided with inwardly extending baffles 11 and 12 which cooperate with a damper 13 pivoted at 14, for controlling the flow of fresh and recirculated air into the device. The damper 13 is actuated by a suitable pneumatic damper motor 15 which may be of any desired type. This damper motor is shown as comprising a bellows which is connected by a suitable link to the damper 13. Upon an increase in pressure within the bellows, said bellows will expand thereby causing movement of the damper 13 towards the baffle 11 thereby restricting the flow of recirculated air into the casing and increasing the flow of fresh air thereinto. Upon a decrease in pressure within the bellows, the bellows will contract under the action of a spring 16 thus moving the damper 13 in a direction to increase the flow of recirculated air and to decrease the flow of fresh air.

Both the damper motor 15 and the steam valve 9 may be controlled by means of a thermostat 20 which is responsive to the temperature of the space being heated by the unit ventilator 2. Also if desired, direct radiation as indicated at 21 may be provided for supplementing the heating effect of the unit ventilators, and this direct radiation may also be controlled by the thermostat 20. The thermostat 20 may be of any desired type and is shown herein diagrammatically as comprising a temperature responsive tube 22 within which is located a bleed port 23 cooperating with a flapper valve 24. The valve 24 may be actuated by a rod 25 formed of non-expansible material. It will be understood that as the temperature within the space increases, the tube 22 will increase in length, this causing an upward movement of the rod 25 thereby permitting the flapper valve 24 to approach the port 23. Upon a decrease in temperature, the opposite action will take place, namely, the valve 24 will be moved away from the bleed port 23. The bleed port 23 is connected through a restriction 26 to an air supply line 27. The bleed port in addition is connected to a branch line 28, said branch line 28 including a portion 29 leading to the unit heater valve 9 and a portion 30 which leads to the valve 31 for the direct radiation 21. Both the valve 9 and the valve 31 are of the direct acting type, this type of valve being arranged to close off the steam supplied as the pressure applied hereto increases. The valve 31, if desired, may be arranged to assume a wide open position when no air pressure is applied thereto, and to assume a fully closed position when the air pressure applied to said valve is raised to four pounds per square inch. The unit heater valve 9, however, may be arranged so as to remain open until the air pressure applied thereto reaches six pounds and to become com-

pletely closed when the air pressure is raised to eleven pounds.

With this arrangement of the valves, they will operate sequentially. Thus when the space temperature is low enough to cause the bleed port valve to be wide open (for instance 68° F.) no pressure will be applied to either steam valve and hence both steam valves will be wide open. As the space temperature increases to 68.5°, however, the thermostat will bleed off less air thereby causing the branch line pressure to be increased to four pounds per square inch which causes the valve 31 for the direct radiation to become closed. Upon further increase in temperature, the branch line pressure will be further increased which will begin closing off the unit heater valve when the branch line pressure has been increased above six pounds per square inch. It will be seen, therefore, that upon rise in room temperature the direct radiation is first cut off and then the flow of steam to the unit heater is gradually cut off. The arrangement thus far described is common in the art and forms no part of our invention.

In accordance with our invention, the damper 13 is also controlled by the thermostat 20 and during periods of occupancy of this space, the fresh air damper 13 is prevented from completely shutting off the flow of fresh air, while during periods of non-occupancy the thermostat 20 is allowed to completely shut off the flow of fresh air into the space. In order to achieve this result, a relay generally indicated as 35 is provided. Relay 35 comprises an upper housing member 36 having an enlarged upper portion 37 and a reduced lower portion 38. The enlarged upper portion 37 is provided with a closure member 39 which is screw threaded into said portion 37 as shown. The closure member 39 is provided with an air passage 40 and is also provided with a screw threaded extension 41 which cooperates with a union nut 42 for securing a pipe 43 in communication with the air passage 40. The pipe 43 communicates with the branch line 28 as shown. The air passage 40 is enlarged at the lower end of the closure member 39 and is screw threaded to receive a nipple 44 which secures thereto an expansible cell 45 which is located within the enlarged portion 37 of the upper housing member 36. The expansible cell 45 abuts a plunger head 46 which is secured to a plunger 47 which leads through an intermediate connecting member 48 into a lower housing member 49. As shown, the intermediate connecting member 48 is screwed threaded to the upper housing member and into the lower housing member, and provides a support for a spring 50 which abuts against the lower side of a plunger head 46.

The lower housing member 49 is hollowed out to provide a chamber 51 which communicates with a smaller bored out portion 52. Member 49 is also provided with an air inlet opening 53 which communicates through a passage 54 in the member 49 with a coinciding passage 55 in the intermediate portion 48, this passage 55 leading inwardly to the plunger 47. The plunger guide in the intermediate member 48 is enlarged as at 56 to provide for air flow from the passage 55 around the plunger 47 into the chamber 51. Attached to the lower face of the intermediate connecting member 48 is a sealing bellows 57, this bellows being attached at its lower end to a bellows head 58 which is sealed to the plunger

47. The bellows 57 and the bellows head 58, therefore, prevent leakage of air from the enlarged passage 56 into the chamber 51. The chamber 51 is also provided with an outlet passage 59 which communicates with an outlet connection 60.

The lower end of the plunger 47 is provided with a longitudinal bore 61 which communicates with a lateral bore 61a within the plunger 47. These bores provide a passage from the interior of the bellows 57 to the exterior thereof. The lower end of the plunger 47 is formed as a valve seat which cooperates with a double valve member 62 which is located within the passage 52. The lower end of the passage 52 is enlarged at 63 to form a valve chamber having a valve seat 64 which cooperates with a valve element 65 which forms the other element of the double valve member 62. As shown, the chamber 63 is provided with a closure member 66 having a portion housing a spring 67 which urges the valve member 62 upwardly so that the valve element 65 engages the valve seat 64. The closure member 66 is also arranged to form part of a union connection including a union nut 68 for connecting a pipe 69 into communication with the valve chamber 63. The pipe 69 may be connected to the branch pipe 30. It will be seen, therefore, that both the pipe 43 and the pipe 69 are connected to the branch line from the thermostat 20.

Due to the action of the spring 50 in holding the plunger head 46 against the expansible cell 45, the plunger 47 will move longitudinally upon movements of the expansible cell 45 due to changes in pressure therein. The spring 50 is so designed relative to the area of the expansible cell 45 that when the air pressure within the expansible cell is below 5 lbs. per square inch, said spring will urge the plunger 47 upwardly a distance sufficient to disengage its end from the valve member 62 as shown. This will permit a flow of air from the inside of the sealing bellows 57 to the exterior thereof. Also at this time, the spring 67 will urge the valve member 62 upwardly for causing the portion 65 thereof to engage the valve seat 64. When the pressure within the expansible cell 45 is increased above 5 lbs. per square inch, however, the expansible cell will cause movement of the plunger 47 against the action of the spring 50 sufficiently to cause engagement of the lower end of passage 61 with the valve member 62, this preventing flow of air from the interior of the sealing bellows 57 to the exterior thereof, and also causing the valve portion 65 to be moved away from the valve seat 64.

The outlet connection 60 of the relay 35 is connected by a pipe 70 to the damper motor 15 located within the unit ventilator. The air inlet 53 for the relay 35 may be connected by a pipe 71 to a three-way valve 72, this valve in turn being connected to the outlet of a pressure reducing valve 73 which is connected to the main air supply line as indicated. This pressure reducing valve 73 may be set to maintain five pounds per square inch pressure. The three-way valve 72 is of usual construction and is arranged so that it can connect the outlet of the pressure reducing valve to the inlet 53 of the relay or to disconnect the inlet 53 from the reducing valve and connect said air inlet to atmosphere.

Operation

If desired, the damper motor 15 and the spring 16 may be so designed that when the pressure applied to the damper motor is below four pounds per square inch, the damper 13 will be held by the spring 16 against the baffle 12, thereby preventing any flow of fresh air into the space being heated. When, however, the pressure applied to motor 15 is raised above four pounds per square inch, the damper 13 will be moved away from the baffle 12 a distance proportionate to the pressure applied, and when the pressure applied is raised to eight pounds per square inch, the damper 13 will engage the baffle 11 thus preventing any flow of recirculated air into the casing and permitting the device to take in all fresh air.

With the parts in the position shown, the space temperature is below 68° F., as indicated by the flapper valve 24 being shifted away from the bleed port 23. There is therefore no pressure whatsoever in the branch line 28 and accordingly the unit heater valve 9 and the direct radiation valve 31 will be wide open. Also at this time, the damper 13 would be positioned against the baffle 12 to prevent any fresh air supply were it not for the action of relay 35. Referring to the relay 35, the expansible cell 45 is collapsed due to the lack of air pressure therein, this causing the lower end of plunger 47 to disengage valve member 62, thereby permitting the valve portion 65 to engage the seat 64. As shown, the three-way valve 72 is positioned to permit the flow of air at a pressure of five pounds per square inch from the reducing valve 73 through the pipe 71 to the inlet 53 of relay 35. This air passes from inlet 53 through passages 54, 55, and 56 into the interior of the sealing bellows 57, and from there flows through the passages 61 and 61a to the exterior of the bellows and through passage 59 to the outlet 60 of the relay, from which it flows through pipe 70 to the damper motor 15. Air at five pounds pressure per square inch is therefore being supplied to the damper motor 15, and accordingly the damper 13 has assumed a position permitting a minimum fresh air supply. Therefore, even though the thermostat 20 would normally cause the damper 13 to be positioned for stopping all fresh air supply, the relay 35 will act to cause the damper 13 to be positioned for supplying a predetermined minimum amount of fresh air to the space. At this time, it should be noted that valve portion 65 is engaging the valve seat 64, this preventing the flow of air at five pounds pressure through pipe 69 into the branch line from the thermostat. This therefore prevents the five pounds pressure which is being supplied to the damper motor from being supplied to the steam valves 9 and 31, and also prevents this air at five pounds pressure from being applied to the bleed port of the thermostat, thereby avoiding excessive leakage of air through said bleed port.

If now should the space temperature begin rising, the flapper valve 24 of the thermostat 20 will be caused to approach the bleed port 23, which causes a rising pressure within the thermostat branch line 28. Thus, as the temperature rises from 68° F. to 68.5° F. the branch line pressure will be increased from zero to four pounds per square inch, which will cause closing of the direct radiation control valve 31 without affecting the unit ventilator valve 9, due to the fact that

valve 9 is adjusted so as to remain wide open until the branch line pressure rises above six pounds per square inch. As the space temperature continues to increase, and increases above five pounds per square inch, the expansible cell 45 will expand sufficiently to cause the end of plunger 47 to engage valve 62, thus closing the passage 61 and also causing the valve portion 65 to disengage the valve seat 64. This will permit the branch line pressure to flow through pipe 69 past the valve portion 64 into the chamber 51, and from this chamber through passage 59 to outlet 60 from which it flows to the damper motor 15 through pipe 70. Due to the closing of the passage 61, the constant five pounds per square inch pressure supplied by the reducing valve 73 will be cut off from the damper motor 15, and due to the valve portion 65 disengaging seat 64, the branch line pressure will be supplied to the damper motor. Thus, when the thermostat causes the branch line pressure to rise above five pounds per square inch, the relay 35 in response to this action will disconnect the constant pressure supply from the damper motor and place the damper motor under the control of the thermostat 20.

When the space temperature rises further to, for instance 69° F., the branch line pressure will be increased by the thermostat to six pounds per square inch, which will cause the damper motor 15 to position the damper 13 for supplying equal quantities of fresh and recirculated air to the unit ventilator. At this time, the unit heater valve 9 will remain wide open. Upon further increase in space temperature, however, the valve 9 will be gradually closed and also the damper 13 will be positioned to supply increasing amounts of fresh air to the space. Thus, when the space temperature rises to 69.5° F. the branch line pressure will be equal to eight pounds per square inch and the damper 13 will be positioned against baffle 11, this causing all fresh air to be supplied to the space and also causing the steam supply valve 9 to be half-closed. Upon further rise in temperature above 69.5° F., the valve 9 will be gradually closed and will assume fully closed position when the air supply is increased to eleven pounds per square inch, as will occur when the space temperature rises to 70° F.

Upon falling temperature, it will be apparent that just the reverse action from the above described will take place. Thus, first the unit ventilator valve will be gradually opened to half-open position while the damper 13 remains in position to supply all fresh air to the space. Upon further fall in temperature, both the unit ventilator valve 9 will be further opened, and the damper 13 will be gradually positioned to supply smaller and smaller quantities of fresh air to the space. As the temperature falls to such a value that the branch line pressure from the thermostat is reduced below five pounds, the relay 35 will cause the damper motor 15 to be disconnected from the thermostat branch line and to be connected with the constant pressure supply line 71, thus supplying the constant air supply to the damper motor for maintaining a minimum supply of fresh air to the space.

The action as above described occurs when the three-way valve 72 is positioned for supplying constant pressure to the inlet 53 of the relay 35. When the space being heated is unoccupied, it is desirable to permit the fresh air damper to become completely closed in order to conserve on operating expenses of the system. At this time,

the three-way valve 72 will be positioned for cutting off the supply of air at five pounds per square inch pressure to the relay, and for causing the pipe 71 to be opened to atmosphere. If at this time the thermostat branch line pressure is below five pounds per square inch, the lower end of plunger 47 will be disengaged from valve 62, thereby permitting the air to flow from the damper motor 15 through pipe 70, passage 59 and passages 61 and 61a into the interior of the sealing bellows 57, from which it flows through passages 56, 55, and 54 and pipe 71 to atmosphere. This will cause the damper 13 to be positioned for cutting off all supply of fresh air to the space. As the space temperature increases, the branch line pressure of the thermostat will be increased and when it increases above five pounds per square inch, the lower end of plunger 47 will engage valve 62 for preventing flow of air through passage 61 and also the valve portion 65 will be disengaged from the valve seat 64 which permits the thermostat branch line pressure to be applied to the damper motor 15. Upon further increase in temperature, the thermostat branch line pressure will increase and consequently the pressure applied to the damper motor 15 will likewise increase for causing more fresh air to be supplied to the space. When the valve 72 is positioned for venting the pipe 71, therefore, the damper 13 instead of being controlled to maintain at least a minimum fresh air supply, is actually caused to close off the fresh air supply when the space temperature is below a predetermined value. When, however, the space temperature is above a predetermined value, such as 68.5°, the control of the damper 13 is again returned to the thermostat 20. This arrangement provides for complete closing of the fresh air damper when the space temperature is too low and further provides for preventing overheating of the space by supplying fresh air there-to.

From the foregoing description, it should be apparent that we have provided a novel control arrangement by which a fresh air damper may be controlled from a thermostat which also controls other controllers, our arrangement preventing the thermostat from completely closing the fresh air damper when the space is occupied, and permitting the thermostat to completely close off the fresh air supply when the space is unoccupied. Furthermore, by our invention only one damper motor is necessary for securing this result. While we have shown but one unit ventilator being controlled, it will be understood that as many unit ventilators as desired may be controlled by the thermostat 20 and the relay 35, these additional ventilators being connected to the pipes 74 and 75. Also, while we have shown an arrangement in which the control of the fresh air damper is returned to the thermostat during periods of unoccupancy when the space temperature increases above a predetermined value, it will be understood that if desired, suitable valves may be employed for causing said damper to completely close off the fresh air supply at such times. Furthermore while in describing our invention, we have stated a specific sequence of operation of the steam valves and the damper, it will be understood that the particular sequence may be modified in many manners without departing from the scope of our invention.

While our invention is primarily concerned with controllers for unit ventilators, certain features of our novel control apparatus is of broader

application and may be used for controlling many other types of equipment. As many modifications of our disclosure which are within the scope and spirit of our invention will be obvious to those skilled in the art, we desire to be limited only by the scope of the appended claims as construed in the light of the prior art.

We claim as our invention:

1. In a system of the class described, in combination, a controller movable from one position to another, motor means for actuating said controller, condition responsive means for gradually controlling the operation of said motor means for causing said controller to assume various positions depending upon the value of the condition to which said condition responsive device responds, and means for disconnecting said condition responsive means from said motor means when the value of the condition to which said condition responsive device responds varies beyond a predetermined value.

2. In a pneumatic control system, in combination, a controller movable from one position to another, pressure actuated motor means for said controller operable to position said controller in accordance with the pressure applied to said motor means, a condition responsive device for varying the pressure applied to said motor means upon change in value of the condition to which said device is responsive to thereby cause the position of said controller to be varied in accordance with said condition, means operable to control the pressure to said motor means independently of said condition responsive device for causing said controller to be positioned at least a predetermined distance from one limit of its movement, and means controlled by said condition responsive means for connecting either said condition responsive means or said last recited means to said motor means.

3. In a pneumatic control system, in combination, a controller movable from one position to another, pressure actuated motor means for said controller operable to position said controller in accordance with the pressure applied to said motor means through a control line, a condition responsive device for varying the pressure in said control line upon change in value of the condition to which said device is responsive to thereby cause the position of said controller to be varied in accordance with said condition, means operable to control the pressure in said control line independently of said condition responsive device for causing said controller to be positioned at least a predetermined distance from one limit of its movement and valve means for preventing the pressure exerted upon said motor means by said last mentioned means from affecting said condition responsive device.

4. In a pneumatic control system, in combination, a controller movable from one position to another, pressure actuated motor means for said controller operable to position said controller in accordance with the pressure applied to said motor means through a control line, a condition responsive device for varying the pressure in said control line upon change in value of the condition to which said device is responsive to thereby cause the position of said controller to vary in accordance with said condition, and means for normally preventing the pressure in said control line from varying beyond the value necessary for causing said controller to be positioned at least a predetermined distance from one limit of its movement.

5. In a pneumatic control system, in combination, a controller movable from one position to another, pressure actuated motor means for said controller operable to position said controller in accordance with the pressure exerted upon said motor means, a condition responsive device for applying varying pressures upon said motor means for different values of the condition to which said device is responsive to thereby cause the position of said controller to be varied upon change in value of said condition, means for controlling the pressure applied to said motor means for causing said motor means to position said controller at least a predetermined distance from one limit of its movement, and means controlled by said condition responsive means for controlling said pressure controlling means.

6. In a pneumatic control system, in combination, a controller movable from one position to another, pressure actuated motor means for said controller operable to position said controller in accordance with the pressure exerted upon said motor means, a condition responsive device for applying varying pressures upon said motor means for different values of the condition to which said device is responsive to thereby cause the position of said controller to be varied upon change in value of said condition, and means controlled by said condition responsive device for normally rendering said condition responsive device inoperative to vary the pressure applied to said motor means beyond a predetermined value.

7. In an air conditioning system, in combination, a conditioning chamber, means for causing air to be conditioned to flow through said conditioning chamber, a condition changer in said conditioning chamber for changing the condition of the air as it flows therethrough, means including a damper for supplying fresh air to said conditioning chamber and for controlling the flow of said fresh air, pressure actuated motor means for controlling said damper, other pressure actuated motor means for controlling the condition changer, said motor means being arranged so that an equal change in pressure applied to both of said motor means has a different effect upon one motor means than upon the other, condition responsive means for varying the pressure applied to both motor means and applying equal pressures to both motor means, means for normally preventing said condition responsive device from varying the pressure applied to the damper motor means beyond a predetermined value to maintain a minimum opening of said fresh air damper, and means for placing said last named means into or out of operation.

8. In an air conditioning system, in combination, means for supplying fresh air to a space, damper means for controlling the fresh air supply, pressure actuated motor means for positioning said damper means, said motor means being actuated by pressure fluid applied thereto through a control line, a condition responsive device for varying the pressure in said control line upon change in value of the condition to which it responds to thereby position said damper means in accordance with the value of said condition, and means for normally preventing said condition responsive device from varying the pressure in said control line beyond the value necessary for causing said fresh air damper to assume a predetermined minimum flow position, for thereby maintaining at least a predetermined flow of fresh air to said space.

9. In an air conditioning system, in combination,

tion, means for supplying fresh air to a space, damper means for controlling the fresh air supply, pressure actuated motor means for positioning said damper means, said motor means being 5 actuated by pressure fluid applied thereto through a control line, said motor means comprising a chamber having a movable wall adapted for movement in response to change in pressure applied thereto, a condition responsive device for 10 varying the pressure in said chamber upon change in value of the condition to which it responds to thereby position said damper means in accordance with the value of said condition, and means for normally preventing said condition responsive device from varying the pressure 15 in said chamber beyond the value necessary for causing said fresh air damper to assume a predetermined minimum flow position, for thereby maintaining at least a predetermined minimum 20 flow of fresh air to said space.

10. In an air conditioning system, in combination, means for supplying fresh air to a space, damper means for controlling the fresh air supply, pressure actuated motor means for positioning said damper means, said motor means 25 being actuated by pressure fluid applied thereto through a control line, said motor means comprising a chamber having a movable wall adapted for movement in response to change in pressure applied thereto, a condition responsive device for varying the pressure in said chamber 30 upon change in value of the condition to which it responds to thereby position said damper means in accordance with the value of said condition, and means for supplying pressure to said 35 chamber independently of said condition responsive means, said last recited means supplying the necessary pressure to said chamber to maintain said damper in at least a predetermined minimum 40 flow position.

11. In a system of the class described, in combination, a control device movable from one position to another, a single motor for actuating said control device, means including a first control 45 means actuated by a condition responsive device

and constructed and arranged for gradually positioning said motor in accordance with variations in the condition to which said condition responsive device responds, means including a 5 second control means for also controlling said motor, said last mentioned means being constructed and arranged to cause said motor to assume a position intermediate its range of movement and at least a predetermined distance from 10 one limit of its range of movement independently of said first control means, and means actuated when said first control means causes movement of said motor beyond said predetermined distance for disconnecting said second control means 15 from said motor to thereby place said first control means in control of said motor without interference from said second control means.

12. In a system of the class described, in combination, a control device movable from one position to another, a single motor for actuating 20 said control device, means including a first control means actuated by a condition responsive device and constructed and arranged for gradually positioning said motor in accordance with variations in the condition to which said condition responsive device responds, means including 25 a second control means for also controlling said motor, said last mentioned means being constructed and arranged to cause said motor to assume a position intermediate its range of movement and at least a predetermined distance 30 from one limit of its range of movement independently of said first control means, and means disconnecting said first control means from the motor and connecting the second control means 35 thereto when the condition to which the condition responsive means responds varies to one side of a predetermined value and for disconnecting said second control means from the motor and connecting the first control means thereto 40 when said condition varies to the other side of said predetermined value.

FRANK C. GIBBS.
KARL FIGENBAUM.