

March 17, 1942.

H. GIBSON

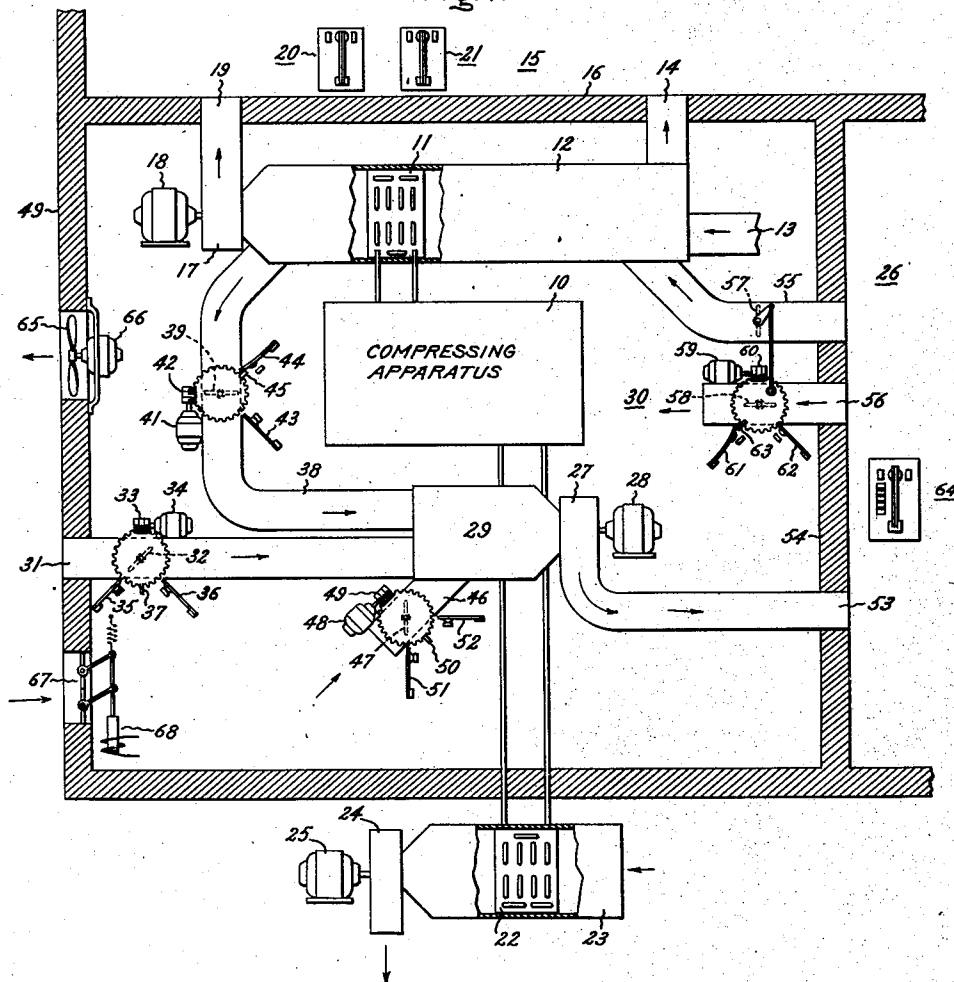
2,276,835

AIR CONDITIONING SYSTEM

Filed Aug. 1, 1939

2 Sheets-Sheet 1

Fig. 1.



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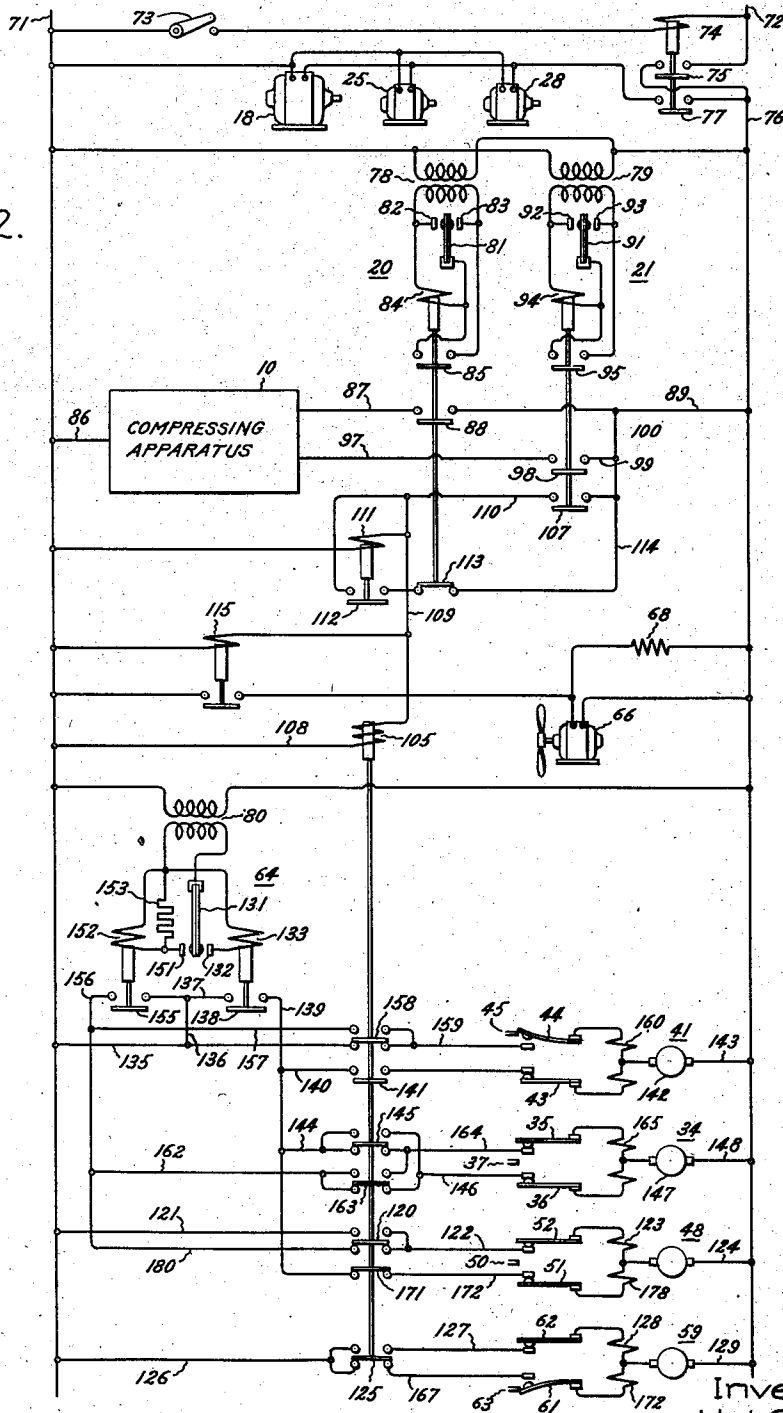
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2 Sheets-Sheet 2

Fig. 2.



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UNITED STATES PATENT OFFICE

2,276,835

AIR CONDITIONING SYSTEM

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Application August 1, 1939, Serial No. 287,762

13 Claims. (Cl. 257—3)

My invention relates to systems for conditioning the air within rooms or enclosures and particularly to such systems which utilize motor driven refrigerating machines, such as of the reversible type supplying both heating and cooling mediums.

Many buildings equipped with reversed cycle air conditioning systems have certain rooms, in the basement or elsewhere, containing machinery or other apparatus which in operation radiate a considerable amount of heat in excess of the need for that particular room. For example, a considerable amount of power consumed by the motor driven refrigerating machines of the air conditioning system is dissipated in the form of heat losses to the ambient atmosphere. When the rooms or enclosures of the building are to be heated, the air heated in this manner may be mixed with the air circulated through the air conditioning system and supplied to the various rooms. However, because of the fact that the heated air rising from the machinery is likely to contain vapors or fumes which may be more or less obnoxious, it may be undesirable to mix such heated air with the main supply circulated to the major portions of the building. Accordingly, it is an object of this invention to provide a new and improved air conditioning system which utilizes the air heated by the heat losses of the air conditioning apparatus during the heating operation thereof, or by other means for heating certain secondary enclosures.

It is a further object of this invention to provide a new and improved air conditioning system for an enclosure embodying a reversed cycle refrigerating machine and an arrangement for modifying the operation of such machine during one cycle of its operation for utilizing air conditioned by means other than the evaporator-condenser unit of the machine.

It is a still further object of this invention to provide a new and improved air conditioning system including a reversed cycle refrigerating machine and a control arrangement therefor whereby the machine during one cycle of its operation conditions only certain enclosures while certain other enclosures are conditioned by supplemental means, and during another cycle of operation the machine conditions the air for all enclosures.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed

out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention, reference may be had to the accompanying drawings in which Fig. 1 shows diagrammatically the arrangement of the air conditioning apparatus, while Fig. 2 illustrates the electrical control system for the apparatus shown in Fig. 1.

Referring to Fig. 1 of the drawings, 10 represents the compressing apparatus of a main air conditioner which may comprise a reversed cycle refrigerating machine, of any suitable form, connected to one or more evaporator-condenser units 11 arranged within a duct 12 for either heating or cooling the air circulated there-through. The duct 12 may be provided with a fresh air inlet 13 and a recirculated air inlet 14 communicating with a main or primary enclosure 15 and passing through a wall 16 thereof. Air is circulated through the duct 12 by operation of a fan 17 driven by a suitable motor 18 and is discharged into the enclosure 15 through a duct 19 passing through the wall 16. One or more outdoor evaporator-condenser units 22 may be connected to the compressor and arranged within a duct 23. Outdoor air may be circulated over the units 22 by means of a fan 24 driven by a suitable motor 25.

The compressing apparatus 10 may be controlled for heating the air circulated through the duct 12, as during winter operation, by the heating thermostat 20 suitably arranged within the enclosure 15, while during summer operation the main air conditioner may be controlled for cooling the air circulated through the duct 12 by means of the cooling thermostat 21.

The main air conditioner usually includes one or more compressor driving motors and miscellaneous pieces of motor driven auxiliary apparatus, such as oil pumps, water pumps, and air circulating fans. The heat losses dissipated from the external surfaces of these various pieces of apparatus during operation may be utilized when there is a demand for heat by the enclosures, by introducing it into the air circulating systems either for the main enclosure, or for a secondary enclosure. In accordance with this invention, I prefer to utilize such heat generated by the apparatus in the machinery room 30 for heating a secondary enclosure 26 which, for example, may be certain basement or storage rooms. Air may be circulated through the secondary enclosure 26 by means of a suitable fan 27 driven by an electric motor 28. The fan 27 draws air through a chamber 29 having a suitable filtering and

humidifying apparatus arranged therein. Connected to the chamber 29 is a fresh air inlet 31 having a damper 32 arranged therein adapted to be adjusted in various opened positions through suitable gearing 33 by a suitable motor 34. Means are provided for deenergizing the motor 34 upon the damper 32 being moved to either the fully opened or fully closed position, which as indicated, may comprise limit switches 35 and 36 adapted to be engaged by stop 37 which is movable with the damper 32. A duct connection 38 is provided between the chamber 29 and the duct 12 after the heat exchanger units, as regards the direction of air flow therethrough, a suitable damper 39 being arranged for controlling the flow of air therethrough. The damper 39 is adapted to be positioned by an electric motor 41 through suitable gearing 42, limit switches 43 and 44 and a cooperating stop 45 being provided for deenergizing the motor 41 upon the damper 39 being moved to either its fully opened or fully closed position. Air may be drawn into the chamber 29 from the machinery room 30 through the inlet 46. A damper 47 is provided in the inlet 46 for controlling the flow of air therethrough, which damper is adapted to be adjusted by means of an electric motor 48 through suitable gearing 49. Limit switches 51 and 52 and a cooperating stop 50 are provided for effecting the deenergization of the motor 48 upon the damper 47 being moved to either its fully opened or fully closed position. The fan 27 exhausts air into the secondary enclosure 26 through the discharge outlet 53 extending through the enclosure wall 54. Air is adapted to be withdrawn from the secondary enclosure 26 either through the duct 55 communicating between the enclosure 26 and the duct 12 ahead of the heat exchanger units therein or through the duct 56 communicating between the enclosure 26 and the machinery room 30. Interconnected dampers 57 and 58 are provided in the ducts 55 and 56, respectively, and are adapted to be positioned oppositely with respect to each other either in the fully opened or fully closed position by means of an electric motor 59, through suitable gearing 60. Limit switches 61 and 62 and a cooperating stop 63 are provided for effecting the deenergization of the motor 59 upon the dampers reaching either of their fully operated positions.

It is understood that the fan motor 28 is adapted to be continuously driven while the temperature of the secondary enclosure 26 is regulated by means of a suitably arranged thermostat 64 which controls the relative positions of the dampers admitting hot and cold air to the blower 27. When the system is conditioned for heating as during winter operation, the dampers are in some such position as shown in which the damper 57 is closed and damper 58 is opened to pass air from the secondary enclosure 26 into the machinery room 30. Damper 39 is closed to prevent the passage of air from the cut 12 to the chamber 29 while the dampers 32 and 47 are oppositely adjusted to proportion the amount of fresh and heated air supplied to the enclosure 26 under the control of the thermostat 64. If the temperature within the enclosure 26 rises above a predetermined value, the damper 47 is moved to the more closed position while damper 32 is opened wider to increase the relative proportion of fresh air from outdoors. Conversely, if the temperature within the room 26 drops below a predetermined value, the damper 32 will be moved toward the closed position and damper 47 opened

thereby increasing the proportion of heated air.

During summer or cooling operation, the heated air of the machinery room is discharged to outdoors through an opening in the wall thereof by means of a suitable fan 65 driven by motor 66. When fan 65 is in operation, fresh air from outdoors may be admitted to the machinery room through suitable louvers 67 adapted to be actuated to the opened position by a solenoid 68 which is energized simultaneously with fan motor 66. The damper 58 is completely closed, while damper 57 is opened so that the air is withdrawn from the secondary enclosure 26 into the main air conditioning duct 12 where it is cooled. The damper 47 is also closed at this time, while the temperature of the enclosure is regulated by controlling the relative positions of the dampers 39 and 32 varying the proportions of fresh and cooled air supplied thereto.

Referring now to Fig. 2, the control for the air conditioning system will be described. In this diagram the same reference characters will be used to identify corresponding elements shown in the diagrammatic arrangement of Fig. 1. Power is supplied to the system from a suitable source of supply through the lines 71 and 72. To put the system into operation, the control switch 73 is first closed, which connects relay 74 across the supply lines 71 and 72. As the relay 74 picks up, its contact arm 75 connects the supply line 72 with the conductor 76 which, with line 71, supplies power to the remainder of the system. The arm 77 of relay 74 simultaneously connects the fan motors 18, 25, and 28 directly across the supply lines 71 and 76, to start circulation of air through the duct systems. At the same time, the primary windings of the transformers 78, 79, and 80 are energized for supplying power to the heating and cooling thermostats 20 and 21, respectively, and the secondary enclosure thermostat 64. The heating control thermostat 20 comprises a thermostatic element 81 and a pair of fixed contacts 82 and 83. During the operation of the main air conditioning system when there is a demand for heating by the enclosure 15, the element 81 will bend to the right engaging contact 83 thereby completing an energizing circuit for the relay 84, which circuit extends from the right-hand terminal of the secondary winding of the transformer 78, through the contact 83, thermostatic element 81, the winding of relay 84, to the other terminal of the transformer secondary winding. As the relay 84 picks up, a holding circuit is established therefor through its arm 85 paralleling the thermostatic element 81 and fixed contact 83. Another circuit is established upon the closure of the relay 84 for energizing the main air conditioner 10, which energizing circuit extends from the line 71 through line 86, compressing apparatus 10, line 87, contact arm 88 of the relay 84, line 89, to the other supply line 76. The main air conditioner will thereupon be operated with the heat exchanger unit 11 acting as a condenser so as to heat the air being circulated through the duct 12. When the temperature within the enclosure 15 has reached the desired value, the thermostatic element 81 will bend to the left engaging with the fixed contact 82 thereby short circuiting the winding of relay 84 causing it to drop out moving the contact arm 88 to the open circuit position. The main air conditioner will then be stopped until the next call for heat.

Upon a predetermined rise of the temperature within the enclosure 15 above the normal oper-

ating range of the heating control thermostat 20, for example, 5 degrees, the cooling control thermostat 21 comes into operation. The cooling thermostat 21 is similar to the heating thermostat 20 and comprises a thermostatic element 91 and a pair of oppositely arranged fixed contacts 92 and 93. Upon a call for cooling, the element 91 will bend to the right engaging with contact 93 thereby completing an energizing circuit for the relay 94, which circuit extends from the right-hand terminal of the secondary winding of the transformer 79 through the contact 93, thermostatic element 91, the winding of the relay 94, to the other terminal of the transformer secondary winding. As the relay 94 picks up, a holding circuit is established therefor through its arm 95, paralleling the thermostatic element 91 and fixed contact 93. Another circuit is established upon the closure of the relay 94 for energizing the main air conditioner for cooling operation, which energizing circuit extends from the line 71 through line 86, compressing apparatus 10, line 97, contact arm 98 of the relay 94, lines 99, 100, and 89 to the other supply line 76. Upon the closure of the latter circuit, the main air conditioner will be operated with the heat exchanger unit 11 acting as evaporator to cool the air being circulated through the duct 12. When the temperature within the enclosure 15 has decreased to the desired value, the thermostat element 91 will bend to the left thereby short circuiting the winding of relay 94 causing it to drop out thereby deenergizing the main air conditioner.

The dampers are primarily positioned simultaneously with the conditioning of the main air conditioner for either heating or cooling operation by the thermostats 20 and 21. Such positioning of the dampers is effected through the control relay 105 which is energized upon the pick-up of relay 94 of the cooling thermostat 21 to position the dampers for proper operation when the main air conditioner is operating for cooling. Upon the pick-up of relay 94 of the thermostat 20, the control relay 105 is deenergized whereupon the dampers are positioned for proper operation when the main air conditioner is operating for heating.

The damper control system will be described first for the condition in which the main air conditioner is under the control of the cooling thermostat 21. As the relay 94 of the thermostat 21 picks up to energize the main air conditioner 10 for cooling operation, its arm 107 closes an energizing circuit for the relay 105 extending from the supply line 71 through conductor 108, winding of relay 105, lines 109, 110, arm 107 of the relay 94, lines 100 and 89, to the other supply line 76. Another circuit is simultaneously completed for the relay 111 the winding of which is connected in parallel with the winding of relay 105. As the relay 111 picks up, it locks itself in and maintains the energizing circuit for the relay 105 until the control of the main air conditioner is taken over by the heating control thermostat 20. This circuit extends from the line 110 through arm 112 of the relay 111, normally closed arm 113 of the relay 84, lines 114, 100, and 89, to the other supply line 76.

During the normal operation of the system it is understood that whenever the control of the main air conditioner is taken over by the cooling thermostat 21, the outdoor temperature is relatively high, that is, substantially above the temperature within the building or the enclosure 15.

During such conditions of outdoor temperature there is no advantage obtainable by utilizing the air heated in the machinery room and accordingly, it may then be discharged to the outdoors by means of the exhaust fan 65. Relay 115 is energized simultaneously with relays 105 and 111 which picks up to connect the fan motor 66 across the supply line. Solenoid 68 is also energized to open the louver 67 to admit fresh outdoor air into the room 30 when the fan 65 is in operation.

As the control relay 105 is energized, its various contact arms move to the uppermost position connecting damper motors 41 and 34 for control by the secondary enclosure thermostat 64, while the damper motors 48 and 59 are connected directly across the supply line for moving the associated dampers 47 and 58 to the fully closed position and damper 57 to the fully opened position. As the arm 120 of the relay 105 picks up, an energizing circuit is established extending from the supply line 71 through line 121, contact arm 120, line 122, limit switch 52, directional winding 123 of the motor 48, line 124, to the other supply line 76. Motor 48 will thereupon drive the damper 47 in the closing direction until the stop 50 engages with the limit switch 52 opening the same and deenergizing the motor. The stop 50 is so adjusted that the limit switch 52 will be opened upon the damper 47 reaching the fully closed position. Similarly, the contact arm 125 of the control relay 105 in its upper position will establish an energizing circuit for the motor 59 extending from the supply line 71 through line 126, contact arm 125, line 127, limit switch 62, directional winding 128 of the motor 59, line 129, to the other supply line 76. Damper 58 will be driven in the closing direction and damper 57 in the opening direction until the stop 63 engages with the limit switch 62 moving it to the open circuit position and deenergizing the motor 59. In this position the damper 58 will be fully closed and the damper 57 fully opened. Air will be withdrawn from the secondary enclosure 26 through the duct 55 and passed into the duct 12 of the main air conditioner system. Air will be supplied to the secondary enclosure 26 through the fresh air inlet 31 and the cooled air duct 38, while the temperature of the enclosure will be regulated through thermostat 64 controlling the relative positions of the dampers 32 and 39.

As will become apparent as the description proceeds, when the control of the main air conditioner is first taken over by the cooling control thermostat 21, damper 32 will be in its substantially fully opened position from operation during the preceding cycle. So that at the beginning of this cycle, while damper 39 is initially in its fully closed position, the damper 32 will be in its substantially fully opened position. Now assume that the outdoor temperature continues to rise and that due to the fact that fresh air alone is supplied to the secondary enclosure 26, the temperature therein rises above a predetermined desired value. Should the temperature of the enclosure 26 rise above a predetermined desired value for any other reason, the same operation to be described will follow. The element 131 of the enclosure thermostat 64 will bend to the right engaging with the fixed contact 132, thereby completing an energizing circuit for the relay 133. This energizing circuit extends from the right-hand terminal of the secondary winding of the transformer 80 through the thermostatic element 131, fixed contact 132, winding of relay 133, to the other terminal of the transformer

secondary winding. As the relay 133 picks up, one circuit will be completed for energizing the motor 41 to adjust the damper 39 to a somewhat more opened position. This circuit extends from the supply line 71 through lines 135, 136, 137, arm 138 of relay 133, lines 139 and 140, arm 141 of the relay 105, limit switch 43, the directional winding 142 of the damper motor 41, line 143, to the other supply line 76. Simultaneously the damper motor 34 will be energized to adjust the damper 32 to a somewhat more closed position. The energizing circuit therefor will extend from the energized line 139 through line 144, arm 145 of relay 105 in its upper position, line 146, limit switch 36, directional winding 147 of the damper motor 34, line 158, to the other supply line 76. It is understood that both damper motors 43 and 34 are of the slow speed type or are connected to the damper through suitable speed reduction gearing so that the dampers associated with each are driven at such a rate so that the enclosure thermostat 64 will follow relatively closely the changing of the damper adjustments. As soon as the temperature within the enclosure 26 reaches a desired predetermined value, the element 131 of thermostat 64 will leave the contact 132 to deenergize both motors 41 and 34. If the enclosure thermostat does not move to the open circuit position before the dampers reach their respective fully operated positions, the motors 41 and 34 will be deenergized by stops 45 and 37 actuating the limit switches 43 and 36, respectively, to the open circuit positions.

Now assume that the temperature within the enclosure 26 drops below a predetermined value and that thermostat 64 calls for heating. The thermostat element 131 will then bend to the left engaging with the fixed contact 151 establishing an energizing circuit for the relay 152 and the parallel connected preheater 153. This energizing circuit extends from the right-hand terminal of the secondary winding of transformer 80 through the thermostat element 131, fixed contact 151, the winding of relay 152 and the preheater 153 connected in parallel to the other terminal of the secondary winding of the transformer. As the relay 152 picks up, the damper motors 41 and 34 are connected for rotation in the opposite direction to that previously described to readjust the damper position for supplying warmer air to the enclosure 26.

The energizing circuit for motor 41 extends from the supply line 71, through lines 135, 136, 137, the arm 155 of the relay 152, lines 156, 157, arm 158 of the relay 105 in the upper position, line 159, limit switch 44, directional winding 160 of motor 41, line 143, to the supply line 76. The parallel energizing circuit for motor 34 extends from the energized line 156, through line 162, arm 163 of the relay 105 in the upper position, line 164, limit switch 35, directional winding 165 of motor 34, line 148 to the supply line 76. The dampers will be operated in increments due to the action of the thermostat preheater 153 which is energized simultaneously with the winding of relay 153, to prevent overshooting of the temperature within the enclosure 26. Upon the temperature within the secondary enclosure reaching the predetermined desired value, the thermostat element 131 will assume an open circuit position deenergizing the motors 34 and 41.

During the period when the main air conditioner is controlled by the heating thermostat 20, as during winter operation, and the main air conditioner is operated for heating the air

passing through the main duct 12, the damper control relay is deenergized and in the position shown. Relay 94 of thermostat 21 is of course deenergized. As the relay 84 of the thermostat 20 picks up, its contact arm 113 will move to the open circuit position thereby deenergizing the relay 105. Since relay 111 will also be deenergized, relay 105 will remain deenergized until the control of the main air conditioner is taken over again by the cooling thermostat 21. Relay 115 will drop out to stop the fan motor 66 and to deenergize the louver operating solenoid 68. As the contact arm 125 of relay 105 drops to its lowermost position, an energizing circuit will be established for the damper motor 59 whereupon the damper 58 will be moved to its fully opened position and damper 57 to its fully closed position. The energizing circuit for the motor 59 at this time extends from the supply line 71 through line 126, contact arm 125 of relay 105, line 167, limit switch 61, directional winding 166 of the motor 59, line 129, to the other supply line 76. The motor 59 will be maintained energized until the stop 63 engages with the limit switch 61 and moves it to the open circuit position at the fully opened condition of damper 58. Simultaneously, the damper 39 within duct 38 will be moved to the closed position, the motor winding 160 being energized this time through the line 135 and contact arm 158 of the relay 105 in its lowermost position. The winding 160 will be maintained energized until the stop 45 engages with the limit switch 44 to move it to the open circuit position. During such time as the main air conditioner is under the control of the heating thermostat, the secondary enclosure thermostat 64 will regulate the temperature of the enclosure by adjusting the relative positions of the dampers 32 and 47. Assume first that the temperature within the secondary enclosure 26 rises above a predetermined value causing the thermostatic element 131 to bend to the right so as to engage with the fixed contact 132. Upon the pick-up of the relay 133, the damper motors 34 and 48 will be energized to vary the relative positions of the respective dampers to change the proportion of fresh air, which is now relatively cold, and heated air from the machinery room until the correct temperature condition is obtained within the secondary enclosure. One circuit will be established extending from the supply line 71 through lines 135, 136, 137, arm 138 of relay 133, lines 139, 144, arm 145 of relay 105, line 164, limit switch 35, directional winding 165 of the motor 34, line 148, to the other supply line 76. Simultaneously, another circuit will be established extending from the energized line 139 through contact arm 171 of relay 105, line 172, limit switch 51, directional winding 172 of the motor 48, line 124, to the other supply line 76. When the temperature within the enclosure 26 reaches its predetermined desired value, the element 131 will move to the off contact position deenergizing the relay 133 which when it drops out, deenergizes the damper motors 34 and 48. It is understood, of course, that should the dampers 32 and 47 reach their respective fully operated positions before the thermostat moves to the open circuit position, the motors will be deenergized by the stops actuating the respective limit switches to the open circuit position.

Assume next that the temperature within the enclosure 26 drops below a predetermined value and that the thermostat 64 calls for heating. At such time the thermostat element 131 will bend

to the left thereby energizing the relay 152 causing it to pick up. As the relay 152 picks up, energizing circuits will be established for the motors 34 and 48 to reverse the direction of operation thereof, as described above, to readjust the proportions of fresh and heated air from the machinery room. One circuit is established extending from the supply line 71 through lines 135, 136, 137, arm 155 of the relay 152, lines 156, 162, arm 163 of the relay 105, line 146, limit switch 36, directional winding 147 of motor 34, line 148, to the other supply line 76. Another circuit will simultaneously be established extending from the energized line 156 through contact arm 120 of the relay 105, line 122, limit switch 52, directional winding 123 of motor 48, line 124, to the other supply line 76. Motor 34 will thereupon be operated to move the damper 32 to a relatively more closed position, and the motor 48 will move the damper 47 to a more open position in increments due to the action of the thermostat preheater 153 to prevent overshooting of the temperature within the secondary enclosure 26.

While I have described this invention as relating to an air conditioning system in which an auxiliary enclosure is heated by air which is heated in a machinery room in which the principal elements are the apparatus of the air conditioning system, it is obvious that the invention is applicable for utilizing air which is heated in any other manner. The machinery room, for example, may be a transformer vault, an engine room, a boiler room, or one containing any apparatus which in operation radiates a considerable amount of heat to the ambient atmosphere.

Although I have described my invention in connection with a refrigerating machine for conditioning the air within an enclosure, other uses will readily be apparent to those skilled in the art. I do not, therefore, desire my invention to be limited to the particular construction shown and described and I intend in the appended claims to cover all modifications falling within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. An air conditioning system for an enclosure comprising means including a damper for supplying heated air to said enclosure, means including a damper for supplying cooled air to said enclosure, means including a damper for supplying fresh air to said enclosure, means responsive to the temperature within said enclosure, means for closing said heated air damper and conditioning said cooled air damper and said fresh air damper for control by said enclosure temperature responsive means during one period, and means for closing said cooled air damper and conditioning said heated air damper and said fresh air damper for control by said enclosure temperature responsive means during another period.

2. An air conditioning system for an enclosure comprising blower means for supplying a substantially continuous flow of air to said enclosure, an inlet for said blower having a damper arranged therein for supplying heated air thereto, an inlet for said blower having a damper arranged therein for supplying cooled air thereto, an inlet for said blower having a damper arranged therein for supplying fresh air thereto, means responsive to a predetermined relatively low temperature condition externally of said enclosure for effecting the closure of said cooled air

inlet damper, means responsive to a predetermined relatively high temperature condition externally of said enclosure for effecting the closure of said heated air inlet damper, means responsive to the temperature condition within said enclosure for oppositely adjusting said fresh air inlet damper and the damper not closed by said external temperature responsive means.

3. An air conditioning system for an enclosure comprising blower means for supplying a substantially continuous flow of air to said enclosure, air heating means, a heated air inlet for said blower having a damper arranged therein and being connected to receive heated air from said air heating means, air cooling means, a cooled air inlet for said blower having a damper arranged therein and being connected to receive cooled air from said air cooling means, a fresh air inlet for said blower having a damper arranged therein, a duct for passing the air from said enclosure to said cooling means having a damper arranged therein, a duct for passing the air from said enclosure to said air heating means having a damper arranged therein, said last mentioned two dampers being interconnected for simultaneous and opposite adjustment, means responsive to a predetermined relatively low temperature externally of said enclosure for effecting the adjustment of said damper to said cooling means and said damper in said cool air inlet to said blower to the closed position, and means responsive to a predetermined relatively high temperature externally of said enclosure for adjusting said damper controlling the flow of air from said enclosure to said air heating means and said damper in said heated air inlet to said blower means to the closed position and means responsive to the temperature conditions within said enclosure for adjusting said fresh air inlet damper simultaneously and in opposite directions with the other damper not under the control of said external temperature responsive means.

4. In an air conditioning system for an enclosure adapted to utilize heat created in a machinery room containing apparatus operating with heat losses, a blower for supplying a substantially continuous flow of air to said enclosure, an inlet having a damper arranged therein for supplying fresh air to said blower, an inlet having a damper arranged therein for supplying heated air from said machinery room to said blower, a passage having a damper arranged therein for conducting air from said enclosure to said machinery room, means responsive to a predetermined relatively low temperature externally of said enclosure for adjusting said passage damper to the opened position, means responsive to the temperature within said enclosure for adjusting in opposite directions the two blower inlet dampers, means responsive to a predetermined relatively high temperature externally of said enclosure and of said machinery room for effecting the adjustment of said passage damper and said machinery room air inlet damper of said blower to the closed position.

5. An air conditioning system for an enclosure for utilizing air heated in a machinery room containing apparatus operating with heat losses, a blower for supplying a substantially continuous flow of air to said enclosure, an inlet for said blower having a damper arranged therein for supplying air heated by said heat losses thereto, a fresh air inlet for said blower having a damper arranged therein, air cooling means, a cooled air

inlet for said blower having a damper arranged therein and being connected to receive air from said air cooling means, a passage having a damper therein for withdrawing air from said enclosure into the machinery room, means responsive to the temperature within said enclosure, means responsive to a predetermined relatively low temperature externally of said enclosure and said machinery room for adjusting said cooled air inlet damper to the closed position and for conditioning said fresh air and heated air inlet dampers for control by said enclosure temperature responsive means, means responsive to a predetermined relatively high temperature externally of said enclosure and said machinery room for effecting the closure of said passage damper and said heated air damper and conditioning said fresh air and said cooled air inlet dampers for control by said enclosure temperature responsive means.

6. In an air conditioning system for a plurality of enclosures, a reversed cycle refrigerating machine having a compression apparatus and an evaporator-condenser unit for selectively heating or cooling air for said enclosures, means responsive to the temperature within one of said enclosures for conditioning said machine for heating or cooling operation, means for circulating a portion of the air to be supplied to a second of said enclosures through the space occupied by said compression apparatus when said machine is conditioned for heating operation, and means for preventing the passage of air from said evaporator-condenser unit to said second enclosure during the heating operation.

7. In an air conditioning system for a plurality of enclosures including a duct for one of said enclosures, means for circulating air through said duct, a reversed cycle air conditioning apparatus for selectively heating or cooling the air circulated through said duct, means responsive to the temperature within said one enclosure for conditioning said air conditioning apparatus for heating or cooling operation, means for circulating at least a portion of the air from the space occupied by said apparatus externally of said duct through a second of said enclosures when said apparatus is conditioned for heating, and means for circulating the air for said second enclosure through said duct when said apparatus is conditioned for cooling.

8. In an air conditioning system for a plurality of enclosures including a duct, means for circulating air through said duct and into one of said enclosures, air conditioning apparatus for selectively heating or cooling the air circulated through said duct, means responsive to the temperature within said one of said enclosures for conditioning said apparatus for heating or cooling operation, heating apparatus arranged to utilize heat generated by the operation of said air conditioning apparatus and located in a space externally of said duct, means for circulating at least a portion of the air supplied to a second of said enclosures through the space occupied by said heating apparatus externally of said duct when said air conditioning apparatus is conditioned for heating, and means responsive to the temperature within said second enclosure for mixing fresh air with the heated air supplied to said second enclosure.

9. In an air conditioning system for an enclosure including a duct, means for circulating air through said duct and into said enclosure, a reversed cycle refrigerating machine having an

evaporator-condenser unit arranged in said duct for selectively heating or cooling the air circulated through said duct, means for conditioning said machine for heating or cooling operation, means for circulating at least a portion of the air for said enclosure over the machine exclusive of said evaporator-condenser unit when said machine is conditioned for heating, and means responsive to the conditioning of said machine for cooling operation for rendering said last-mentioned means inoperative.

10. In an air conditioning system for a main enclosure including a duct and a secondary enclosure, means for circulating air through said duct and into said main enclosure, a main air conditioning apparatus for selectively heating and cooling the air circulated through said duct, means responsive to the temperature within said main enclosure for conditioning said apparatus for either heating or cooling operation, a source of heated air, means responsive to the conditioning of said apparatus for heating for directing heated air from said source to said secondary enclosure, means for admitting to said duct air from said secondary enclosure, and means responsive to the conditioning of said apparatus for cooling for precluding passage of heated air from said source to said secondary enclosure.

11. In an air conditioning system for a main enclosure including a duct and a secondary enclosure, means for circulating air through said duct, and into at least one of said enclosures, a main air conditioning apparatus for selectively heating or cooling the air circulated through said duct, means responsive to the temperature within said main enclosure for conditioning said apparatus for either heating or cooling operation, means for admitting to said duct air from said secondary enclosure when said apparatus is conditioned for cooling, ducts for circulating the air from said secondary enclosure over the surfaces of said air conditioning apparatus externally of said first-mentioned duct when conditioned for heating operation for heating said secondary enclosure, and dampers arranged in said ducts automatically adjustable to the closed position when said apparatus is conditioned for cooling operation.

12. In an air conditioning system for an enclosure including a duct and a secondary enclosure, means for circulating air through said duct and into at least one of said enclosures, a main air conditioning apparatus for selectively heating or cooling the air circulated through said duct, means responsive to the temperature within said main enclosure for conditioning said apparatus for either heating or cooling operation, blower means for supplying a substantially continuous flow of air to said secondary enclosure, an inlet having a first damper arranged therein for supplying fresh air to said blower means, an inlet having a second damper arranged therein for supplying air from said main air conditioning apparatus to said blower means, an inlet having a third damper arranged therein for supplying air passed over the surfaces of said apparatus externally of said duct to said blower means, means responsive to the conditioning of said apparatus for cooling or effecting the closure of said third damper and means responsive to the conditioning of said apparatus for heating for effecting the closure of said second damper.

13. In an air conditioning system for a main enclosure including a duct and a secondary enclosure, a main air conditioning apparatus for

selectively heating or cooling the air circulated through said duct and for discharging air into at least one of said enclosures, means responsive to the temperature within said main enclosure for conditioning said apparatus for either heating or cooling operation, blower means for supplying air to said secondary enclosure, an inlet having a first damper for supplying fresh air to said blower means, an inlet having a second damper for supplying air from said apparatus to said blower means, an inlet having a third damper for supplying air heated from the surfaces of

said apparatus externally of said duct to said blower means, means responsive to the conditioning of said apparatus for heating for effecting the closure of said second damper, means responsive to the conditioning of said apparatus for cooling for effecting the closure of said third damper and means responsive to the temperature within said secondary enclosure for effecting the adjustment of said first damper and either said second or said third dampers.

HAL GIBSON.