

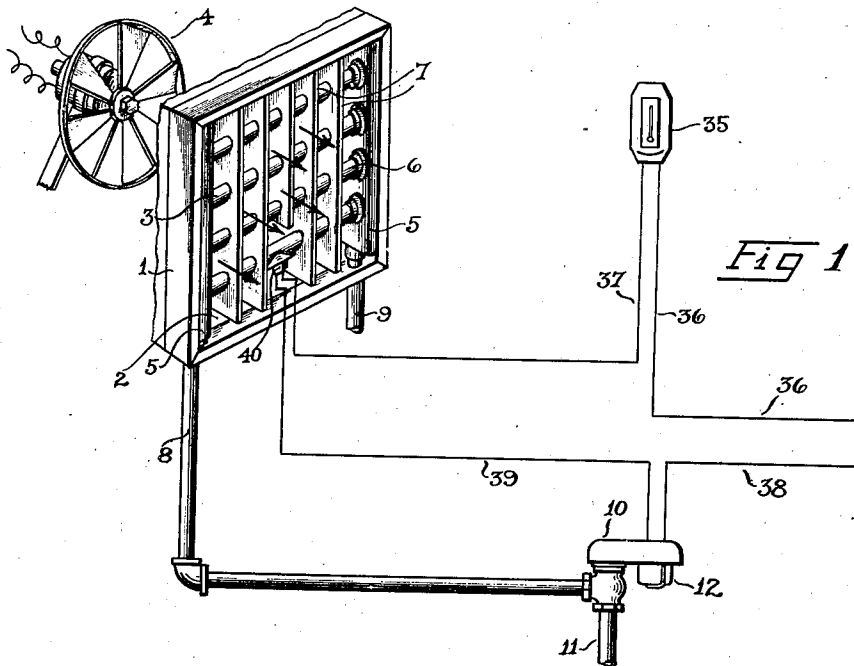
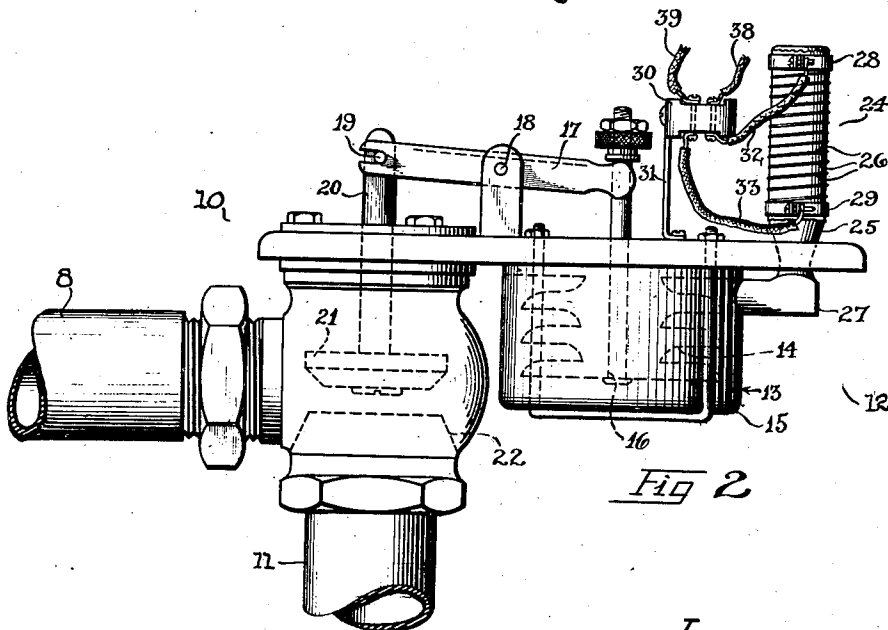
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MODULATED RADIATOR CONTROL

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MODULATED RADIATOR CONTROL

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This invention relates to a modulated radiator control adapted for use in air conditioning systems designed to furnish relatively uniform room temperature.

5 More particularly, this invention relates to a modulated radiator control adapted for use in air conditioning systems wherein forced drafts are utilized to bring fresh air into the room, the fresh air being first heated as it passes through a radiator. It will be understood, however, that the invention is not limited to air conditioning systems utilizing fresh air to heat the room but may be used in ordinary heating systems employing the usual radiator located anywhere in the room.

In air conditioning systems, as heretofore provided, it has been customary to locate the room thermostat at a remote point with respect to the radiator so that all parts of the room will be heated before the thermostat acts to cut off the heat. In air conditioning systems, forced drafts are utilized to bring fresh air into the room, but this air is preferably first heated by being passed through the radiator. The distance between the radiator and the room thermostat is, in the case of passenger coaches of railroad cars, and other large rooms, relatively great, and consequently, the time required to lower the temperature of that portion of the room having the thermostat to cause the thermostat to supply heat is relatively too long to prevent chilling of the room in the immediate vicinity of the radiator. When the heat is cut off at the radiator, the fresh air will enter the room and rapidly chill the radiator. The fresh air will continue to flow in without being heated. It will be apparent, therefore, that this unheated fresh air will appreciably affect the convenience and comfort of the individuals in this vicinity. This inconvenience and discomfort and duration thereof will be in direct proportion to the size of the room and the outside weather conditions.

An object of the invention resides, therefore, in the provision of a modulated radiator control of the type mentioned designed to maintain the radiator above a predetermined temperature to prevent the admission of fresh air from chilling of the room adjacent the radiator while the room thermostat is awaiting a drop in temperature in its vicinity before again operating to call for heat.

A further object of the invention resides in the specific form of modulated radiator control of the type mentioned having two thermostats, one of which is influenced by the room temperature,

and the other of which is influenced by the radiator, so that after the room thermostat is satisfied and no longer calling for heat, the second thermostat operates to supply sufficient heat to the radiator to prevent the cold blast of fresh air from unduly cooling the radiator and chilling that portion of the room.

It will be noted that one of the broad objects of the invention resides in providing a modulated radiator control allowing a continuous circulation of fresh air in the room to prevent stratification, and yet obtaining a relatively uniform heating throughout without chilling the vicinity admitting the cold blast of fresh air, although the room thermostat remains in a position not calling for heat for a considerable period of time.

Other objects and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawing which forms a part hereof.

In the drawing:

Figure 1 illustrates a modulated radiator control diagrammatically shown embodying the invention; and

Fig. 2 is an enlarged detail view of an electrically operated valve which may be employed as a part of the modulated radiator control.

Referring now to the drawing in detail, 1 represents the front frame of a duct providing a ventilator opening 2 having a radiator 3 fixed therein through which a cold blast of fresh air is furnished by a fan 4.

Radiator 3 is illustrated in conventional form. As shown, radiator 3 comprises the headers 5 having transverse tubes 6, there being any suitable radiating means for distributing the heat, such as the fins 7. Headers 5 are connected with the intake and outlet pipe connections 8 and 9.

Radiator 3 may be heated by any suitable medium, which may be in this case, steam or hot water, although it will be understood that my invention may be incorporated in an air conditioning system employing various kinds of heating mediums, this depending, of course, upon the type of system used.

As specifically shown, an electrically operated valve 10 is disposed in intake pipe 8 to control the flow of the heating medium to radiator 3. Pipe 11 connecting to the intake side of valve 10 represents any suitable source of heating medium that may be employed.

An electric motor 12 is shown to operate valve 10. Although various forms of electric motors may be used, a heat motor is specifically shown comprising a chamber 13 defined by a flexible wall

14 and a rigid wall 15 for carrying a suitable volatile fluid, such as benzol or toluene, capable of expanding and compressing the flexible wall 14 to raise rod 16 and tilt lever 17 about its pivot 18. One end of lever 17 is connected at 19 to valve rod 20 having a valve member 21 adapted to move against seat 22 for discontinuing the flow of the heating medium from source 11 to pipe 8 and radiator 3. Cooling of the volatile fluid in chamber 13 allows flexible wall 14 to expand and to tilt lever 17 in a direction lifting valve member 21 off its seat 22.

A heating element 24 in the form of a vertical tube 25 having a resistance coil 26 wrapped there-
15 around furnishes sufficient heat to effect the expansion of the volatile fluid in chamber 13. Tube 25 is closed at its upper end and communicates at its lower end with chamber 13 by means of a coupling 27. Suitable terminal bands 28 and 29 encircle vertical tube 25 and receive opposite
20 ends of resistance coil 26. A terminal block 30 may be supported by a bracket 31 for receiving wires 32 and 33 connected to terminal bands 28 and 29. Wires 32 and 33 may be connected in the circuit of a room thermostat by means of
25 said terminal block 30 to which wires 38 and 39 run.

It will be noted that valve member 21 is adapted to be seated when the current flows through resistance coil 26 to expand the volatile fluid and the chamber 13. A portion of the volatile fluid normally extends upwardly in vertical tube 24 so as to be influenced by the heat effects of the current flow through resistance coil 26 whereby
30 the level of the volatile fluid may be depressed out of the heating zone to limit the expanding action of chamber 13. Consequently, the current may continuously flow through resistance coil 26 without further effecting the expansion of the
35 volatile fluid after the volatile fluid has been depressed out of the heating zone.

Valve member 21 will accordingly unseat when the current ceases to flow through the circuit. While I have described in detail the construction
40 and operation of electric motor 12, it is apparent to those skilled in the art that any type of motor may be used to operate valve member 21.

A suitable room thermostat 35 is connected in the circuit of motor 12 by means of wires 36 and
45 37. Wire 36, together with wire 38, leads to a suitable source of current supply. Wire 38 may be connected to terminal block 30, as shown in Fig. 2. Wire 37, together with a wire 39, connects a second thermostat 40 in the circuit of motor 12
50 and room thermostat 35.

Room thermostat 35 may be of any suitable construction which will close the circuit upon a predetermined rise of temperature, and which will open the circuit upon a predetermined drop in
55 temperature.

A thermostat 40 is disposed in a position to be influenced by the temperature of radiator 31, as illustrated in Fig. 1. It may be of any suitable construction, but preferably of the type which will
60 close the circuit upon a predetermined rise of temperature and which will open the circuit upon a predetermined drop in temperature.

It will now be apparent from the foregoing description that the improved modulated radiator control shown will operate as follows: Assume
65 that room thermostat 35 disposed in a vicinity remote to ventilator opening 2 is calling for heat and the circuit is open. Chamber 13 will contract and hold valve member 21 open. The heating medium will flow from source 11 through pipe 8 and
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through the transverse coils 6 of radiator 3. The cold blast of fresh air furnished by fan 4 will pass between coils 6 and vertical fins 7 and be heated before entering the room. The fresh heated air will circulate throughout the room until it reaches the vicinity of room thermostat 35, whereupon this thermostat will be satisfied and the circuit will be closed. It will be understood, of course, that the temperature of radiator 3 will be sufficiently high to hold thermostat 40 closed. Current will then flow through the circuit and energize resistance coil 26 to cause the vapor motor to expand and close valve member 21. Fan 4, continuing to operate, will continue to blow a cold blast of air through ventilator opening 2 and chill
15 radiator 3. When the temperature of radiator 3 drops, say below 130° Fahr., as by example only, the thermostat 40 will immediately open the circuit and cause motor 12 to open valve member 21. The heating medium will again flow through radiator 3 to raise its temperature. This action will occur notwithstanding the fact that room thermostat 35 has not yet acted to open the circuit by a drop in room temperature. Thus the temperature of radiator 3 is maintained above a predetermined degree to prevent its cooling and thus prevent the cold blast of air furnished by fan 4 to enter the room unheated. Radiator thermostat 40 may act to open and close the circuit a number of times to maintain the temperature of radiator 3 at a point just sufficient to heat the cold blast of air entering ventilator opening 2 and prevent undesirable chilling of the room in the vicinity of this ventilator before room thermostat 35 is influenced sufficiently to call for heat by a drop of room temperature in its vicinity.

It will be noted, therefore, that thermostats 35 and 40 advantageously function to balance the temperature of the air at opposite ends of the room to obtain a relatively uniform temperature therein at all times. It is found that the present system may be advantageously employed in passenger coaches of railroads where individuals may be compelled to sit in the direct path of the fresh air entering ventilator opening 2. It will be quite apparent that these individuals would be inconvenienced if this air entering the ventilator opening 2 were not heated during the interval the room thermostat awaits a drop in temperature in its vicinity.

It will be understood, however, that the invention may be used anywhere where it is desirable to provide uniform room temperature.

It will be further understood that it is unnecessary to employ the specific form of thermostats and motors shown, inasmuch as the thermostats may open the circuit upon a rise of temperature and may close the circuit upon a drop of temperature to operate the motor, as will be well understood to those skilled in the art.

By the term "fresh air", it will be understood that I intend including air not necessarily taken directly into the building, but also air which may be recirculated, the main purpose of the invention being to control the temperature of air passing through the radiator, or, on the other hand, to control the temperature of air being circulated in the room and by means of the thermostatic control to maintain a relatively uniform temperature in the room.

Without further elaboration, the foregoing will so fully explain the gist of my invention that others may, by applying current knowledge, readily adopt the same for use under varying conditions of service, without eliminating certain fea-
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tures which may properly be said to constitute the essential items of novelty involved, which items are intended to be defined and secured to me by the following claims.

5 I claim:

1. In an air conditioning system, the combination with a radiator, a source of heating medium for said radiator and a valve for controlling the flow of the heating medium, of an electric circuit
10 having means therein for operating said valve, a thermostat connected in said circuit and adapted to be influenced by the temperature of the room to be heated, and a second thermostat connected in said circuit and adapted to be influenced by the temperature of said radiator,
15 said second thermostat controlling said circuit after the room thermostat has been satisfied whereby said operating means will actuate said valve to maintain said radiator above a predetermined temperature.

2. In an air conditioning system, the combination with a radiator, a source of heating medium for said radiator and a valve for controlling the flow of the heating medium, of an electric circuit
25 having a motor therein for operating said valve, a thermostat connected in said circuit and adapted to be influenced by the temperature of the room to be heated, said thermostat closing said circuit upon a rise of room temperature to operate said motor and to close said valve and a second thermostat connected in said circuit and adapted to be influenced by the temperature of said radiator, said second thermostat opening said circuit upon a drop in temperature at said radiator below a predetermined degree to cause said
30 motor to open said valve.

3. In an air conditioning system, the combination with a radiator and a duct for admitting air through said radiator to a room, a source of heating medium for said radiator, and a valve for controlling the flow of the heating medium to said radiator, of electrically operated means for actuating said valve, an electric circuit therefor, a thermostat connected in said circuit and adapted
45 to be influenced by the temperature of the room at a point remote from the location of said radiator for controlling said valve actuating means, and a second thermostat connected in said circuit and adapted to be influenced by the temperature of said radiator, said second thermostat operating said valve actuating means upon cooling of said radiator below a predetermined temperature by the air entering said duct while said room thermostat remains satisfied.

4. In an air conditioning system, the combination with a radiator and a duct for admitting air through said radiator to a room, of means for heating said radiator, and means to control said heating means to maintain the room at a relatively uniform temperature including thermostatically controlled means adapted to be influenced by the temperature of said radiator and by the temperature of the room at a distance remote from said radiator, said control means continuing
60 to control said heating means to maintain the room at a relatively uniform temperature after the temperature of the room at a distance remote from said radiator has reached a predetermined degree.

5. In an air conditioning system, the combination with a radiator and a duct for admitting air through said radiator to a room, of means for maintaining the room at a relatively uniform temperature including a heat conducting medium
75 adapted to be circulated through said radiator,

electrically operated means for controlling the circulation of said heat conducting medium, and two independent thermostatically controlled devices adapted to be influenced by the temperature of said radiator and by the temperature of the room at a distance remote from said radiator, one of said thermostatically controlled devices continuing to be influenced by the temperature of said radiator after the room temperature has been satisfied whereby to maintain the radiator at a predetermined temperature.

6. In an air conditioning system, the combination with a radiator and a duct for admitting air through said radiator to a room, of a source of heating medium for said radiator, a valve for controlling the flow of said heating medium, an electrically operated motor adapted to open the valve when the circuit is broken, a thermostat influenced by the temperature of the room to be heated for closing the circuit and said valve when the room temperature rises above a predetermined degree, and a second thermostat influenced by the temperature of said radiator for opening the circuit and said valve upon lowering of the radiator temperature below a predetermined degree whereby to prevent chilling of the room adjacent said radiator by the air entering through said duct.

7. In an air conditioning system, the combination with a radiator and a duct for furnishing forced drafts of air through said radiator to a room to be heated, of means for circulating a heat conducting medium through said radiator, a room thermostat for discontinuing the circulation of said heat conducting medium through said radiator when said room thermostat is satisfied by a predetermined room temperature, and a second thermostat influenced by the temperature of said radiator for continuing the circulation of said heat conducting medium through said radiator whereby to prevent cold blasts of air from lowering the temperature of said radiator and chilling the room within the immediate vicinity of said radiator during the time said room thermostat remains satisfied.

8. In an air conditioning system, the combination with a heating device for a room to be heated, a source of heat, and electrically operated means for controlling said source, of a pair of thermostats, and a circuit in which said thermostats and said electrically operated means are connected for controlling said electrically operated means, one of said thermostats being located in said room adjacent to and influenced by the temperature of said heating device whereby to actuate said electrically operated means and continue the heat at said heating device when the temperature thereof lowers below a predetermined degree, the other thermostat also being located in said room at a point remote to said heating device and said first thermostat for actuating said electrically operated means and discontinuing the heat supply at said heating device when the room temperature at said remote point rises above a predetermined degree.

9. In an air conditioning system, the combination with a heating device in a room to be heated a source of heat and electrically operated means for controlling said source, a thermostat responsive to the variations of room temperature and located in the room at a point remote to said heating device for actuating said electrically operated means to control the temperature of said heating device, and a second thermostat responsive to the variations of temperature conditions of said heating device for maintaining said heating device at a predetermined temperature by controlling the

heat supply thereto after said first thermostat has actuated said electrically operated means to discontinue the heat supply to said heating device.

10. In an air conditioning system, the combination with a radiator for heating a room and a duct for admitting air to be heated through said radiator to said room, a heat conducting medium for said radiator, means to control the flow of said heat conducting medium through said radiator, a thermostat responsive to the temperature of the room for controlling said heat control means, and means to prevent relatively cold blasts of air entering the room through said radiator while said thermostat is satisfied comprising a second thermostat responsive to the temperature of said radiator for independently operating said heat control means to provide a flow of said heat conducting medium through said radiator to maintain said radiator above a predetermined temperature.
11. In an air conditioning system, the combination with a radiator for heating a room and a duct for admitting air to be heated through said radiator to said room, a heat conducting medium for said radiator, electrically operated means to control the flow of said heat conducting medium, a thermostat responsive to the temperature of the room, a second thermostat responsive to the temperature of said radiator, both of said thermostats being in series relation and operable to actuate

said electrically operated means, said second thermostat actuating said electrically operable means to continue the flow of said heat conducting medium to said radiator if the air passing through said radiator should lower the temperature and permit cold blasts of air to enter the room at said radiator while said room thermostat is satisfied.

12. In an air conditioning system, the combination with a radiator formed of a series of spaced tubes between which air is passed to be heated into a room, an intake pipe connected to said radiator, a heat conducting medium adapted to be circulated through said pipe and said radiator tubes, a valve for controlling the circulation of said heat conducting medium, electrically operated means for opening and closing said valve, and two thermostats, one responsive to the temperature of the room and the other responsive to the temperature at said radiator, said thermostats operating to open said valve when the temperature drops below predetermined low limits either in said room or at said radiator, the radiator thermostat opening said valve only when said room thermostat is satisfied and if the temperature of said radiator drops to permit unheated air to enter the room.

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