July 30, 1940. L. M. PERSONS 2,209,610

BLOWER CONTROL

Filed July 3, 1936

Fig. 1.

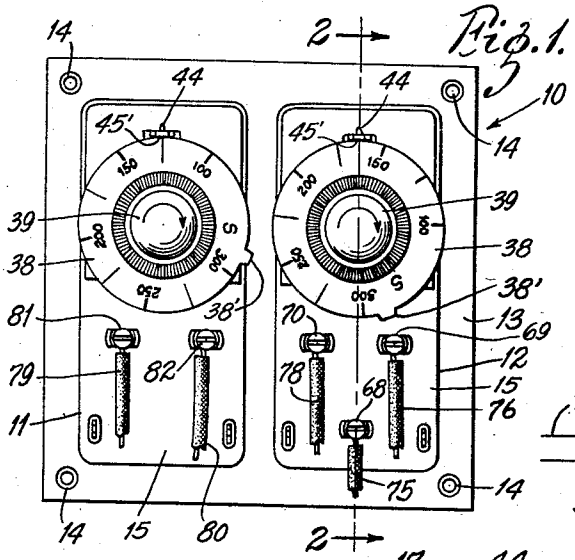


Fig. 3.

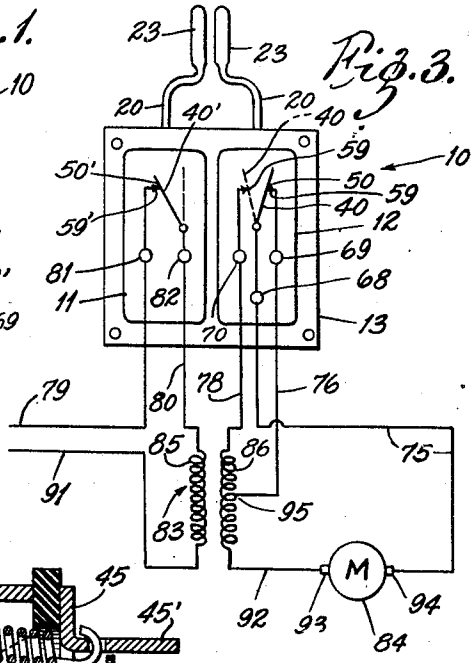
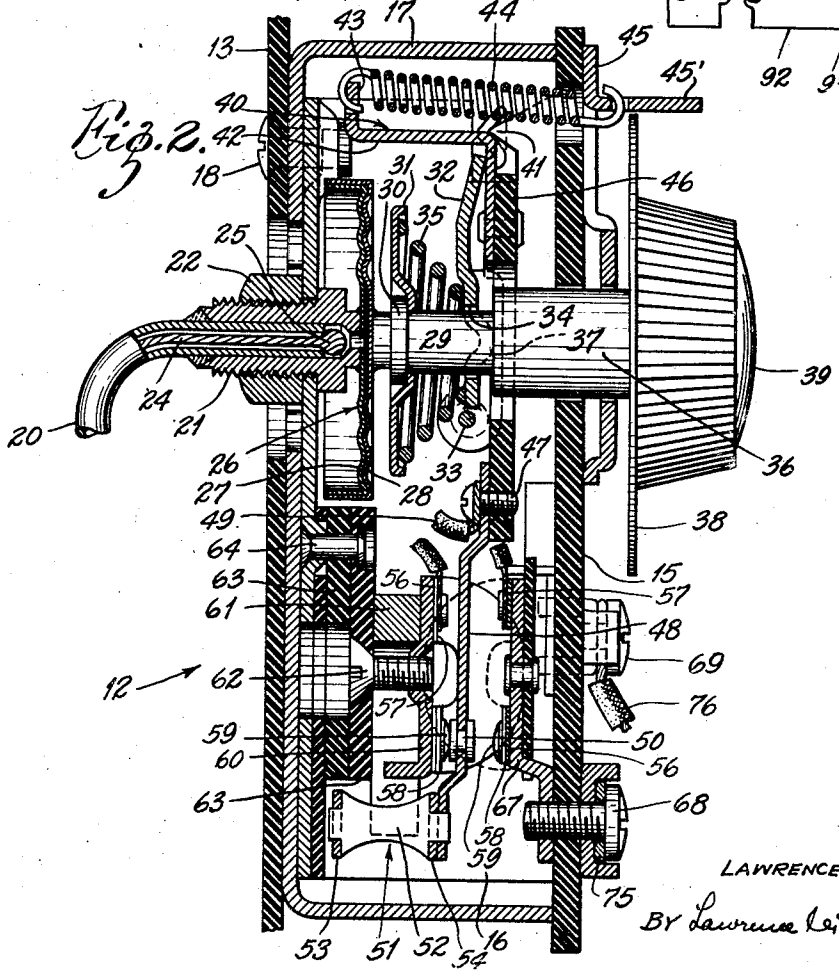


Fig. 2.



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Patented July 30, 1940 2,209,610

UNITED STATES PATENT OFFICE

2,209,610

BLOWER CONTROL

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Application July 3, 1936, Serial No. 88,715

5 Claims. (Cl. 236—10)

The present invention relates generally to automatic blower control mechanism, and more specifically to an automatic blower control mechanism which includes two independently adjustable thermostats inter-related to obtain low and high speed performance of the blower.

An object of the present invention is to provide an automatic blower control mechanism adapted to be used with furnaces and the like.

Another object is to provide a blower control mechanism which includes two independently adjustable thermostat units adapted to provide high and low speed blower control.

Another object is to provide blower control mechanism which includes means for actuating a blower at low speed for one furnace casing temperature, and at high speed for another furnace casing temperature.

Another object is to provide blower control mechanism which includes means for changing the speed of the blower from low to high at a predetermined temperature of the furnace casing.

It will be understood that the invention is of broader application than solely to the control of furnace blowers. It is, therefore, an object to provide a plurality of inter-related but independently adjustable controls operable in response to changes in physical conditions to provide variable operation of some suitable operated mechanism.

Other objects and advantages will appear from the following description, taken in conjunction with the accompanying drawing, in which—

Fig. 1 is a front view of two inter-related thermostats employed in a preferred embodiment of the present invention mounted on a common support.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a diagrammatic view showing the wiring hook-up between two thermostats, as disclosed in Fig. 1, a transformer, and a motor of a furnace blower.

Referring more particularly to the drawing by reference numerals, 10 indicates generally a pair of thermostats mounted as a unit and adapted to automatically control the speed of a motor of a furnace blower in a set-up contemplated by the present invention. A single contact or single-throw thermostat 11 and a double contact or double-throw thermostat 12 are mounted, as a unit, on a base 13 which, in the present instance, is shown as a flat, preferably non-conductive, plate. The base 13 has openings 14 therein, by means of which the unit may be fixed upon a support. The thermostats shown and used in the present embodiment of my invention are like the one which is described in detail in my copending application Serial No. 80,990, filed May 21, 1936, now Patent No. 2,145,950, dated Feb. 7, 1939.

In Fig. 2, there is shown a central section through the thermostat 12, which includes a plate 15 of non-conductive material, and a U-shaped member 16 between and to which the operating parts of the thermostat are enclosed and connected. A cover 17 serves to surround the U-member, and is fastened to the plate. The thermostat assemblage is mounted on the base 13 by screws 18, or the like, which extend through cooperating holes in the base, the cover and the U-member. A tube 20 containing a thermally-sensitive fluid is connected to the U-member 16 by means of an externally threaded sleeve 21 which is held in place by a nut 22. The tube 20 has a bulb 23 at an end remote from the thermostat and encloses, at the end adjacent the thermostat, a wire 24 having a head 25. A double diaphragm 26 is fixed to the sleeve 21 and is adapted to receive between its elements 27 and 28 the thermally-sensitive fluid. A stud 29 is fixed to the element 28 and includes a circumferential flange 30 which is adapted to receive, against one face, the washer 31. A primary lever 32 is pivoted to the U-member 16 at 33 and includes an opening 34 by means of which it is adapted to surround, for free movement, the stud 29. Between the washer 31 and the primary lever 32 there is disposed a stiff spring 35. A sleeve 36 is threaded onto the stud 29 at the end remote from the diaphragm 26 and abuts, for adjustable relation, projections 37 on the primary lever 32. An associated dial 38 and an operating knob 39 are fixed to the sleeve 36. The dial 38 has a projection 38' adapted to abut an outstanding portion 45' of a bracket 45, described below, to prevent complete rotation of the dial.

A secondary lever, generally indicated 40, is pivoted on the U-member 16 at 41. The secondary lever 40 includes a pivot portion 42 which has an offset 43. A tension spring 44 is connected at one end to the offset 43 and at the other end to a bracket 45 connected to the external face of the plate 15. The secondary lever 40 further includes an intermediate non-conductive portion 46 to which is connected, by a screw 47, or the like, a switch blade 48. The screw 47 serves as a terminal to which the switch lead 49 is connected. The switch blade carries a double contact 50, and at the end remote from

the screw 47 supports an armature, generally indicated 51, which includes a relatively non-permeable element 52 and relatively permeable elements 53 and 54.

The switch blade 48 is adapted to move between identical switch plates, each of which is generally indicated 56 and each of which includes a fixed portion 57 and a relatively movable portion 58 carrying a contact 59 adapted to cooperate with the double contact 50. As disclosed in Fig. 2, the left switch plate 56 is supported by a switch backing plate 60 which rests on a permanent magnet 61, between the legs of which the armature 51 is adapted to move. The magnet 61, the switch backing plate 60 and the switch plate 56 are mounted, as a unit, in insulating relation to the U-member 16 by means of the screw 62, the insulation 63 and the brad 64. The right switch plate 56 is supported by a switch backing plate 67 which is connected to the plate 15 by a screw 68. The screw 68 serves as a terminal for one of the leads to the thermostat. Besides the screw terminal 68, the thermostat has screw terminals 69 and 70, located as shown in Fig. 1. Leads 75, 76 and 78 connect with the screw terminals 68, 69 and 70, respectively. The thermostat 11 is a duplicate of the thermostat 12, except for the fact that it includes but one set of contacts, inasmuch as, for the present purpose, it is necessary for this switch to close in only one direction. Having only one set of contacts, but two leads are connected to this thermostat, indicated at 79 and 80, which make contact at the screw terminals 81 and 82, respectively.

In Fig. 3, there is shown, in diagrammatic form, the electrical relation between the thermostats 11 and 12, a transformer generally indicated 83, and a blower motor 84. The thermostat 11 is connected with the primary coil 85 and the thermostat 12 with the secondary coil 86 of the transformer. The circuits are clearly shown in Fig. 3. In the primary circuit, one side 79 of the main line leads to the terminal 81, while the other side 91 of the main line leads to one side of the primary coil 85, the other side of the primary coil being connected by the lead 80 to the terminal 82. The circuit is completed through the switch of the thermostat.

In the secondary circuit, the lead 78 is connected at one end to the terminal 70 and at the other to one side of the secondary coil 86. A lead 92 connects the other side of the secondary coil 86 with one motor terminal 93. The other motor terminal 94 is connected by the lead 75 to the terminal 68. The lead 76 is connected at one end to the terminal 69 and at the other in series with half of the coil windings of the secondary coil 86 at 95. Thus, the secondary includes two parallel circuits which are selectively closed by the secondary lever 40 of the thermostat alternately engaging one of the contacts 59.

Operation

The control mechanism 10 may be installed in any convenient place within the furnace room or within a room above the basement. But the further removed from the furnace the device is placed, the longer must be the tubes 20, inasmuch as the bulbs 23 must be disposed for intimate association with the furnace casing so that the furnace heat may be transferred to the bulbs for operation of the thermostats.

In the illustration of the drawing, the thermostat 11 is set to close at a temperature of 125° while the thermostat 12 is set to shift from the left to the right contact (Fig. 2) at 163°. Thus, (Fig. 3) when the heat of the furnace casing reaches 125°, the fluid in the bulb 23 and the tube 20 of the thermostat 11 will have expanded to such a point that the secondary lever 40' will close the contacts 50' and 59' to complete the main circuit through the primary coil 85 of the transformer 83. The energization of the primary coil 85 results in the energization of the coil 86 of the secondary in the manner to be described.

At the temperature of 125° at which the thermostat 11 closes, the secondary lever 40 of the thermostat 12 will be in a position in which the contact 50 engages the left contact 59 (Fig. 2) and the circuit energized will be through half of the windings of the secondary 86 (Fig. 3), which will operate the blower motor at low speed. This position of the secondary lever 40 is shown in Fig. 3 in full lines. The circuit has been traced in detail above and, therefore, it is unnecessary to retrace it now.

When the temperature of the furnace casing reaches 163°, then the thermally-responsive fluid in the bulb 23 and the tube 20 of the thermostat 12 will have expanded to a point to shift the secondary lever 40 to the right (Fig. 2) so that it closes the contact 50 with the right hand contact 59. This position is shown in dotted lines in Fig. 3. In this position of the secondary lever 40 of the thermostat 12, the secondary circuit is through the full windings of the secondary coil 86 of the transformer, which operates the motor of the blower at high speed. The circuit is traced above and, likewise, will not be retraced here.

It is thus apparent that the motor is automatically shifted from low to high speed after the temperature of the furnace has reached a predetermined point. It is highly desirable to have the blower motor functioning at low speed when the heat is building up in the furnace, and at high speed after it has attained a substantially maximum heat capacity so that the air transmitted to the room or other place to be heated is of substantially the same temperature. It is evident that the temperature of air maintained for a considerable time in intimate association with a fire of low heat content will be substantially equal to the temperature of air maintained in association with a hotter fire a relatively shorter period of time. This is what is accomplished by the blower operating at a low speed when the furnace is building up and at a high speed after the furnace has reached substantially its maximum heat capacity, thereby providing hot air at the point of delivery of an even temperature. Of course, prior to the time the furnace attains the heat of 125°, the blower will not operate at all, since if it did, it would only force cold air up into the room.

The thermostats in the present invention are capable of individual adjustment and may be set to function at any temperatures. In fact, the same control mechanism may be employed in the summer time to blow air through the house or other place of installation.

When the mechanism is used for the purpose of a cooling system, the thermostat 12 will be set so that the indication S is on the pointer, S indicating some very low temperature or a block point of the thermostat. The thermostat 11 will be used to turn the mechanism on and off. Thus, when the room temperature is 90°, and air circulation is desired, the knob of the thermostat 11 is turned to set the dial at some temperature

reading below 90°, so that the thermostat will function to close the blower circuit. The blower will continue to operate to provide air circulation until the room temperature drops below the dial setting, or until the dial is manipulated to break the circuit.

It is thus apparent that the automatic blower control mechanism disclosed is capable of a variety of uses and attains all of the advantages and objects sought. It is to be understood that the above description and the accompanying drawing are given by way of illustration and example and not as limitation, the invention being limited only by the following claims. In said claims, the term "temperature" is to be considered as illustrative of other analogous physical conditions.

What is claimed is:

1. In a device of the kind described, a transformer having a primary, and a secondary having two taps, a thermostat connected in series with the primary of the transformer, and a second thermostat having its movable member connected in series with a furnace blower motor, and two terminals each being connected to one tap of the secondary coil of the transformer, whereby control of the motor is effected.

2. In a device of the kind described, a first thermostat including a single-throw switch blade, a second thermostat including a double-throw switch blade, each of said thermostats having thermally-sensitive means extending into heat-transferring relation with a furnace casing, a furnace blower motor, a transformer, the primary of the transformer being connected in series with the first thermostat, the secondary of the transformer being connected in series with the motor and the second thermostat, the connection between the coils of the secondary and the second thermostat including parallel leads from opposite terminals cooperating with the double-throw switch to series with half or all of the turns of the secondary, whereby at selected temperatures of the furnace casing the motor operates automatically at low or high speed.

3. In a device of the kind described, a motor for operating an air circulating blower, two independently adjustable thermostats, a transformer, means connecting one of said thermostats with the primary of the transformer to open or close the circuit thereto, means connecting the other thermostat with the secondary of the transformer for temperature selective partial or full energization thereof, and means connecting the motor in series with the second thermostat and the secondary.

4. In a mechanism of the kind described, two independent thermostats each operable to two positions, said thermostats being located to be responsive to the temperatures of an area subjected to heat changes, the first being operable at one temperature of said area, and the second being operable at a different temperature of said area, a device to be operated, a circuit through said device, means in said circuit having connections to vary the electrical energy applied to the device, one of said thermostats connected with said connections, one connection in each of the two thermostat positions, and the other of said thermostats being connected to render the circuit operative or to render the same inoperative independently of the position of the first, whereby the latter thermostat determines whether the device may operate at all, and the former determines the manner of operation.

5. In a mechanism of the kind described, two independent thermostats each operable to two positions and each having a snap-action to affect said operations, said thermostats being located to be responsive to the temperatures of an area subjected to heat changes, the first being operable at one temperature of said area, and the second being operable at a different temperature of said area, a device to be operated, a circuit through said device, means in said circuit having at least two connections to vary the electrical energy applied to the device, one of said thermostats being operable to at least two positions and selectively adapted to be connected upon temperature variation with the connections on said means to put said means in circuit with the device to be operated and thereby to vary the energy by the selection of position of said thermostat, and the other thermostat being connected to cause said circuit to be operative in one position and to cause it to be inoperative to close it in the other, whereby the latter thermostat determines whether or not the device may operate, and the former determines the manner of operation.

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