Dec. 17, 1935. L. M. PERSONS 2,024,385

HEATER-COOLER THERMOSTAT

Filed Oct. 29, 1934

Fig. 1.

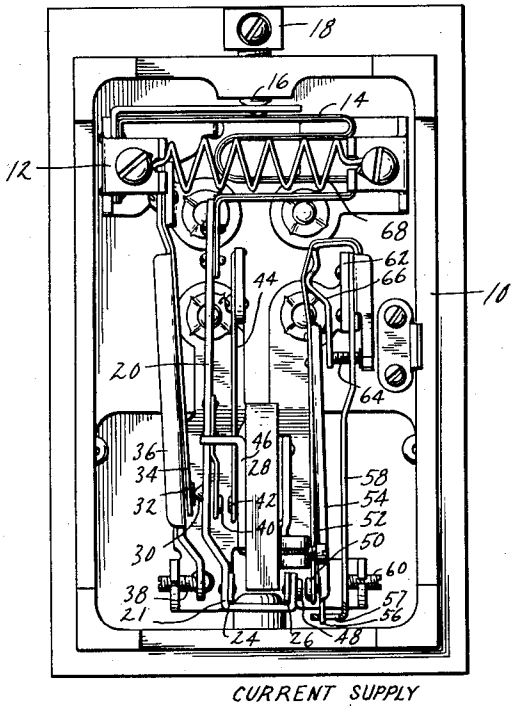


Fig. 2.

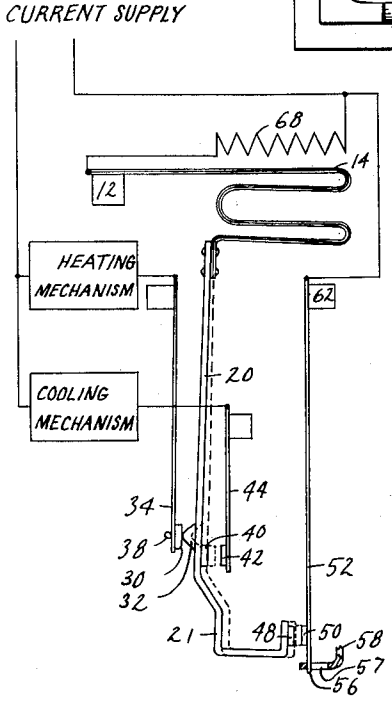
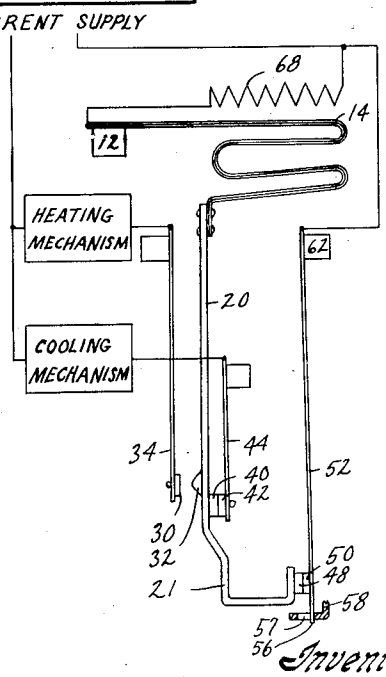


Fig. 3.



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Patented Dec. 17, 1935

2,024,385

UNITED STATES PATENT OFFICE

2,024,385

HEATER-COOLER THERMOSTAT

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Application October 29, 1934, Serial No. 750,493

11 Claims. (Cl. 236—1)

An object of my invention is to provide a simple controller adaptable to control both heating and cooling mechanisms without the necessity of having a separate thermostat for each mechanism.

Still a further object is to provide a thermostat especially designed to use an "anticipating heater" such as described in the Shafer Patent No. 1,583,496, dated May 4, 1926, effective when the controller controls the heating mechanism but ineffective when it controls the cooling mechanism, a certain arrangement of switch contacts being utilized for this purpose.

More particularly it is my object to provide a room thermostat having a heater or other type of anticipating feature with contacts which are operable to control heating mechanism with current flowing through the anticipating heater when the heating mechanism is energized and other contacts for controlling the cooling mechanism and for shunting the heater out of the circuit so that it is ineffective when the thermostat operates to control the cooling mechanism.

With these and other objects in view my invention consists of the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawing, in which:

Figure 1 is a front elevation of a thermostat embodying my invention, the cover thereof being removed.

Figure 2 is a diagrammatic view showing the controller in position for energizing heating mechanism; and

Figure 3 is a similar view showing it in position for energizing the cooling mechanism.

On the drawing the reference numeral 10 indicates generally a switch housing. Within the housing 10 a bracket 12 is provided with which one end of a bimetal element 14 is connected. The range of the bimetal element may be adjusted by a coarsely threaded adjusting screw 16 having a handle 18.

A control arm 20 is connected with the bimetal element and is provided with a pair of armature elements 24 and 26. These are adapted to move toward and away from the poles of a horse shoe magnet 28, an edge view of which is shown in Figure 1, the poles being at the lower end of the magnet. The action of the magnet on the armature elements 24 and 26 is to provide snap action for the contacts which will later be described.

My switch includes three sets of contacts, one set being a contact 30 mounted on the control arm 20 and a contact 32 mounted on a leaf spring 34. The leaf spring is carried by a rigid bar 36 constrained to engage an adjusting screw 38 whereby the differential of operation of the contacts 30 and 32 may be adjusted by the relative position between the armature element 26 and the magnet 28.

A second set of contacts is illustrated at 40 and 42, the contact 40 being carried by the arm 20 and the contact 42 being carried by a leaf spring 44. The spring 44 normally retains the contact 42 engaged with a bracket 46 which acts as a stop therefor.

The third set of contacts is indicated at 48 and 50. The contact 48 is carried by the arm 20 and the contact 50 is carried by a leaf spring 52. The leaf spring 52 constrains the contact 50 to engage a rigid bar 54, the upper end of which is supported by the leaf spring 52.

The bar 54 has an extension 56 adapted to engage one end of a slot 57 in an adjusting blade 58. The blade 58 is constrained to engage an adjusting screw 60 provided for the purpose of varying the differential of operation of the contacts 40 and 42 by regulating the proximity of the armature element 24 to the magnet 28 when the switch is in the position of Figure 3.

The upper ends of the leaf spring 52 and the blade 58 are carried by a bracket 62. An adjusting screw 64 and a blade 66 are provided for regulating the tension of the extension 56 of the bar 54 against the left end of the slot 57 which it normally engages.

In proximity to the bimetal element 14 a heater 68 is provided for the purpose of generating heat and modifying the action of the bimetal element when current flows through the heater. This heater is for the purpose of anticipating a rise in room temperature when the heating mechanism controlled by the thermostat is energized so as to prevent over-runs in the room temperature, as fully explained in the Shafer patent heretofore referred to.

Practical operation

In Figure 2 the electric circuit is outlined. It will be noted that with the switch in the position shown current flows through the heater 68, through the bimetal element 14 and through the switch arm 20 to the contact 30. The current then flows to the contact 32 through the "heating mechanism" thus energizing it to cause it to deliver heat to the room. The heating mecha-

nism may be an oil burner, a gas furnace, or the like. The contacts 30 and 32 will become engaged of course when the temperature falls below a predetermined degree at which the switch is set so that the heating mechanism will then raise the temperature of the room to keep it substantially even. Heat will be radiated from the heater 68 to cause the bimetal element 14 to open the contacts 30 and 32 before the room temperature, which also affects the bimetal element, would otherwise do so, so that due to the heating mechanism delivering heat after it is de-energized, this heat will cause the temperature of the room to coast up to the desired temperature rather than overrun beyond that temperature.

In installations where it is desirable even during the same period of twenty-four hours, as for instance in the western part of the United States, to have cooling or air conditioning mechanism operate during the hot portions of the day time and the heating mechanism to operate during the cold periods of the night time to maintain the temperature of a house or room substantially uniform, it is desirable to have the same switch which controls the heating mechanism to also control the cooling mechanism. However, when an anticipating type of thermostat is used, it is not desirable to have the heater 68 operate when the cooling mechanism is energized, as it would have a tendency to retain the contacts engaged longer rather than separate them sooner than where such a heater is not used. Therefore I provide the contacts 48 and 50 which, it will be noted, shunt the heater 68, the bimetal element 14 and the control arm 20 so that when the thermostat assumes the dotted line position of Figure 2, the contacts 48 and 50 are in position to shunt out these three elements of the thermostat from the circuit when the cooling contacts 40 and 42 subsequently engage as in Figure 3. Accordingly, the circuit in Figure 3 is traceable through the contacts 48 and 50, the lower end of the control arm 20 (which is designated as 21 on the drawing), the contacts 40 and 42, the blade 44 and then through the cooling mechanism without any current flowing through the elements 68, 14, and 20.

It will be noted, as shown in Figure 2 by dotted lines, that the contacts 48 and 50 close before the contacts 40 and 42 close when the thermostat responds to a sufficiently high temperature to operate the cooling mechanism. After the contacts 48 and 50 close, the leaf spring 52 and the bar 54 are merely carried along by the arm portion 21 and the tension of the spring 52, adjusted by the screw 64 is used to resist the action of the thermostat, thus widening the differential so that the cooling contacts do not operate until some ten or fifteen degrees above the temperature at which the heating mechanism operates. This is done in order to obviate the necessity of providing an excessive travel of the arm 20 between the temperatures at which the heating mechanism and the cooling mechanism are to be controlled.

The heater 68 is used to give a close operating differential when it is desirable to use the heating mechanism but the naturally wide differential of the switch caused by using the magnet 28 is preferable when the switch controls the cooling mechanism. This is another important reason for rendering the heater inoperative to affect the switch when operating to control the cooling mechanism.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. In a thermostat for heating mechanism and cooling mechanism, a temperature responsive element, a controller member operated thereby, a heater for said temperature responsive element for modifying the action thereof, and switch contacts operated by said controller member and connected with said heating mechanism, cooling mechanism and heater to operate the heating mechanism and pass current through the heater upon a predetermined reduction in temperature affecting said temperature responsive element and operating said cooling mechanism upon a predetermined increase in temperature affecting said temperature responsive element.

2. In a thermostat for heating mechanism and cooling mechanism, a bimetal element, a controller member operated thereby, a heater for said bimetal element for modifying the action thereof and switch contacts operated by said controlling member and connected with said heating mechanism, cooling mechanism and heater to operate the heating mechanism and pass current through the heater and through said bimetal element upon a predetermined reduction in temperature affecting said bimetal element and operating said cooling mechanism upon a predetermined increase in temperature affecting said bimetal element.

3. In a thermostat for heating mechanism and cooling mechanism, a temperature responsive element, a controller member operated thereby, a heater for said temperature responsive element for modifying the action thereof, and three sets of switch contacts operated by said controller member, a first set for controlling the current through said heating mechanism, upon a predetermined reduction in temperature affecting said temperature responsive element, and second and third sets for controlling the flow of current through said cooling mechanism and for shunting said heater out of the circuit respectively upon a predetermined rise in temperature affecting said temperature responsive element.

4. In a thermostat for heating mechanism and cooling mechanism, a bimetal element, a controller member operated thereby, a heater for said bimetal element for modifying the action thereof, and three sets of switch contacts operated by said controller member, a first set for controlling the current through said heating mechanism and through said bimetal element, upon a predetermined reduction in temperature affecting said bimetal element, and second and third sets for controlling the flow of current through said cooling mechanism and for shunting said heater and said bimetal element out of the circuit respectively upon a predetermined rise in temperature affecting said bimetal element.

5. In a thermostat for heating mechanism and cooling mechanism, a temperature responsive element, a controller member operated thereby, a heater for said temperature responsive element for modifying the action thereof, and three sets of switch contacts operated by said controller member, a first set for controlling the current through said heating mechanism, upon a predetermined reduction in temperature affecting said

temperature responsive element, and second and third sets for controlling the flow of current through said cooling mechanism and for shunting said heater out of the circuit respectively upon a predetermined rise in temperature affecting said temperature responsive element, said third set of contacts closing before the second set as the temperature affecting said control member rises.

6. In a thermostat for heating mechanism and cooling mechanism, a bimetal element, a controller member operated thereby, a heater for said bimetal element for modifying the action thereof, and three sets of switch contacts operated by said controller member, a first set for controlling the current through said heating mechanism and through said bimetal element, upon a predetermined reduction in temperature affecting said bimetal element, and second and third sets for controlling the flow of current through said cooling mechanism and for shunting said heater and said bimetal element out of the circuit respectively upon a predetermined rise in temperature affecting said bimetal element, said third set of contacts closing before the second set as the temperature affecting said controlling member rises.

7. In combination, heating mechanism, cooling mechanism and an anticipating thermostat, said thermostat comprising an anticipating heater, a temperature responsive controller member and switch contacts operable by said controller member and connected with said heating mechanism, cooling mechanism and heater to operate the heating mechanism and pass current through the heater upon a predetermined reduction in temperature affecting said temperature responsive element and operating said cooling mechanism upon a predetermined increase in temperature affecting said temperature responsive element.

8. In combination, heating mechanism, cooling mechanism and an anticipating thermostat comprising an anticipating heater, a temperature responsive controller member and three sets of switch contacts operated by said controller member, a first set for controlling the current through said heating mechanism, upon a predetermined reduction in temperature affecting said temperature responsive element, and second and third sets for controlling the flow of current through said cooling mechanism and for shunting said heater out of the circuit respectively upon a predetermined rise in temperature affecting said temperature responsive element.

9. A controller for heating mechanism and cooling mechanism comprising a temperature responsive switch and means for modifying the action thereof to anticipate a rise in room temperature, said switch including contacts operable to control said heating mechanism and said means when a lower than desired temperature affects the thermostat and contacts to control said cooling mechanism and render said means inoperative when the thermostat responds to a higher than desired temperature.

10. A controller for heating mechanism and cooling mechanism comprising a temperature responsive switch and means for modifying the action thereof, said switch including a set of contacts operable to control said heating mechanism when a lower than desired temperature affects the thermostat and a second set of contacts to control said cooling mechanism when the thermostat responds to a higher than desired temperature and means to control said modifying means by said first-mentioned set of contacts to render it inoperative when they are open and operative when they are closed.

11. The combination of a thermostat and means operable when the circuit through the thermostat is closed to hasten the opening thereof with heating mechanism and cooling mechanism controlled by said thermostat and means, said thermostat including contacts for energizing said heating mechanism and rendering said means operative upon a predetermined reduction in temperature of the thermostat and other contacts for energizing said cooling mechanism only, upon a predetermined rise in temperature of the thermostat.

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