June 12, 1951 L. F. BIRD 2,556,957

THERMOSTAT CONTROL CIRCUIT

Filed July 26, 1947

Fig. 1

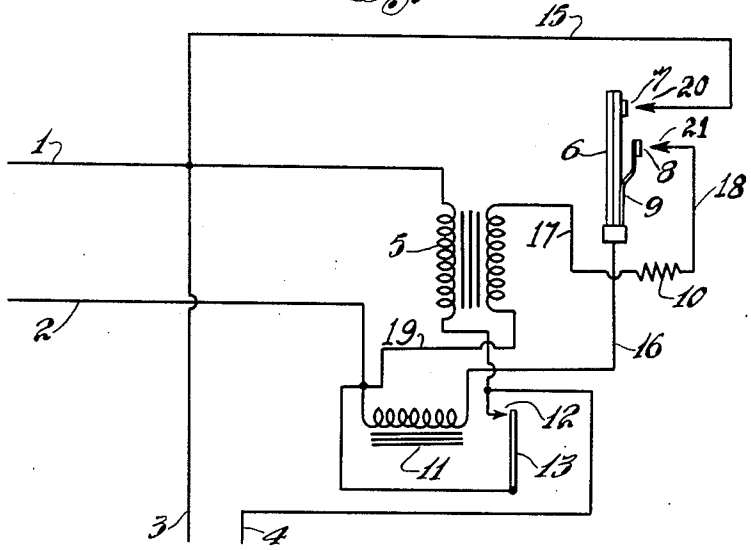
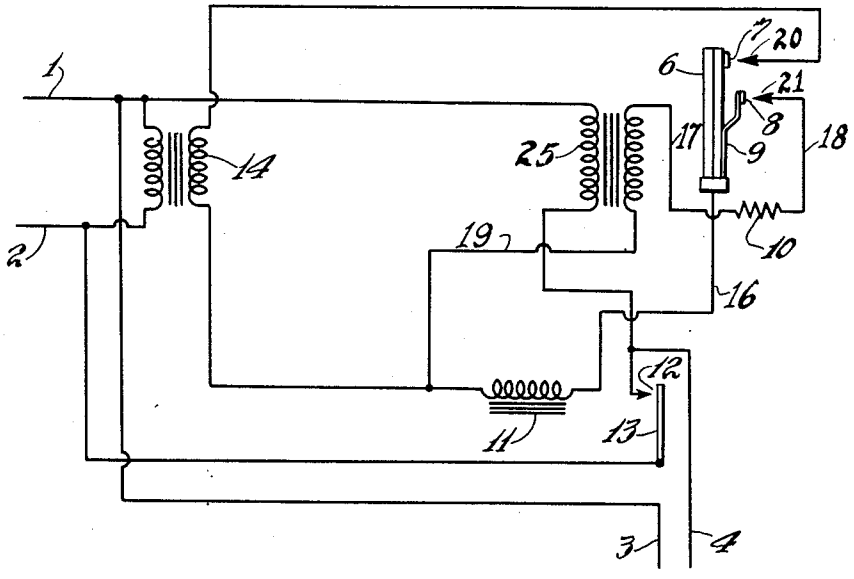



Fig. 2

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## THERMOSTAT CONTROL CIRCUIT

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1 Claim. (Cl. 175—320)

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This invention relates to an improvement in thermostat control circuits such as used to control space heating and cooling generators.

The principal object of my invention is to simplify the electrical parts required to operate the controls on a room or other thermostat so that a simple contactor may be employed as the major power control element without the use of more than a single contact on it. Another object is to secure chatter proof operation of the contacts to prevent false closing due to external vibrations. Still another object is to provide for a definite temperature change between the closing and the opening of the controls and for the incorporation of a temperature change anticipation circuit to reduce the temperature changes required for the operation of the control.

Other objects will be apparent from the description which follows. Heretofore, control circuits of this kind have employed a plurality of contacts or expensive power contactors together with special connections and extra wiring. This has been costly and the more complex circuits have been exposed to greater chance of failure in operation.

I overcome these disadvantages and achieve my objects, basically by the use of a holding circuit auxiliary to the main control circuit, so that prolongation of the power circuit closure is maintained until a sufficient physical change has occurred in the temperature responsive unit to fully separate the main control circuit contacts following which a momentary opening of the auxiliary circuit will decisively open the power circuit.

In the drawings in which the same numbers refer to the same or similar parts:

Figure 1 is a circuit embodying my invention which utilizes supply line voltage throughout and employs a single transformer.

Figure 2 is a similar circuit which utilizes stepped down supply line voltage and employs two transformers.

Referring to Figure 1, power is supplied to the circuit at supply line voltage through conductors 1 and 2, and it leaves the circuit at the same voltage through conductors 3 and 4 upon the closing of contactor 13 on contact 12.

Controlling the closing and opening of contactor 13 is bi-metallic element 6 which is provided with two contacts 7 and 8. Contact 7 is fixed at the movable end of bi-metallic element 6 while contact 8 is carried on yieldable resilient arm 9 extending from bi-metallic element 6 and which is designed to close on contact 21 before contact 7 closes on contact 20.

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Bi-metallic element 6 is connected at its fixed end with conductor 16, magnet 11 and conductor 2. When contacts 7 and 20 close, a closed circuit at supply line voltage is formed through conductors 1 and 15, bi-metallic element 6, conductor 16, magnet 11 and conductor 2. This is hereinafter referred to as the thermostat control circuit.

When contacts 8 and 21 close, a closed circuit is formed through conductor 18, suitable resistance 10, conductor 17, the secondary coil of transformer 5, conductor 19, magnet 11 and conductor 16. This latter circuit is hereinafter referred to as the holding circuit. Transformer 5, which is a part of the power circuit as well as the holding circuit, is a one to one transformer, or approximately so, no change in voltage being intended by its use.

The action of this system is as follows. When bi-metallic element 6 responds to a drop in temperature, contacts 8 and 21 close first but no part of the control circuit is energized since in this posture the holding circuit will be energized only if current passes through the primary coil of transformer 5. As the temperature continues to fall, bi-metallic element 6 responds further without appreciable resistance from resilient arm 9, and closes contacts 7 and 20. Upon this occurrence two circuits are at once energized and the energizing of a third made possible; the thermostat control circuit through magnet 11 which in turn closes contactor 13 on contact 12 thus closing the power circuit, which then puts a potential on the primary coil of transformer 5, which in turn may energize the holding circuit.

The value of my circuit becomes apparent when the bi-metallic element 6 reverses its direction. The first contacts to separate are 7 and 20. When this occurs, contactor 13 continues to be held on contact 12 by magnet 11 since the holding circuit is still closed and energized by transformer 5. Resistance 10 functions as a temperature rise anticipation element by slightly heating bi-metallic element 6 above the ambient temperature, thus preventing overheating of the surrounding space. As a further temperature rise occurs, contacts 8 and 21 separate and once they do so, even momentarily, the holding circuit is decisively broken and cannot be restored until contacts 7 and 20 again close. When the holding circuit is opened, contactor 13 opens and the entire control circuit is deenergized and ready for another cycle.

In Figure 2 the same principle is employed but the circuit is adapted for household or other use, where low, safe voltages are desired. Trans-

formers 14 and 25 are step down transformers to provide current at 24 volts or some other safe voltage to be passed through the circuits of which bi-metallic element 6 is a part, namely the thermostat control circuit and the holding circuit. The power circuit through conductors 1 and 3, and conductors 2 and 4 and contacts 12 and 13 operates on supply line voltage.

With circuits embodying my invention the ambient temperature may be held within close limits, as desired, by the selective design of the several parts.

Instead of a yieldably mounted contact on the bi-metallic element, sliding contacts may be used to function in the same manner, bearing out that what I have shown is illustrative only and many modifications may be employed without departing from the scope of my invention.

What I claim is:

A temperature responsive electrical system for controlling a circuit including a single contact switch, comprising a closed power circuit connected with the same source of supply as the controlled circuit and having in it the primary coil of a step down transformer; the primary coil of a second step down transformer connected in parallel with the first transformer through the



said single contact switch; an ambient temperature responsive conductor equipped with two contacts adapted to be sequentially moved to closed position and in inverse order to be sequentially moved to open position with adjacently located contacts; a thermostatic control circuit including the secondary coil of the first transformer, an electromagnetic coil operably connected with the said single contact switch and the said ambient temperature responsive conductor through the last to close and first to open of its contacts; and a holding circuit including the secondary coil of the second transformer, the said electromagnetic coil and the said ambient temperature responsive conductor through the first to close and last to open of its contacts.

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## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 2,170,310 | Shivers | Aug. 22, 1939 |