May 30, 1939. E. ZURCHER 2,160,634

THERMOSTATIC SWITCH MECHANISM

Filed Feb. 15, 1937

Fig. 1.

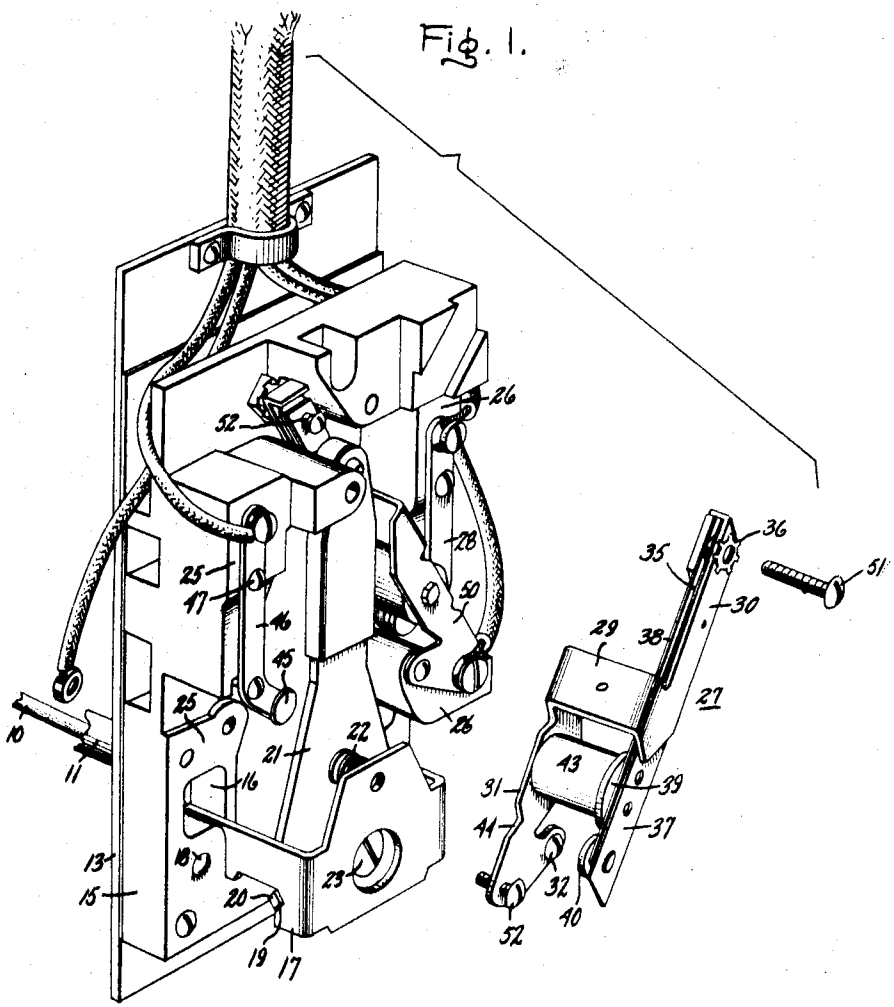
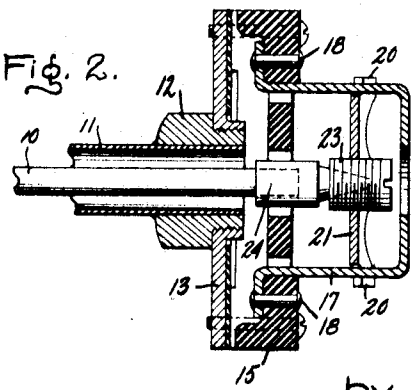


Fig. 2.



Inventor:
Ernest Zurcher,
by Harry E. Dunham
His Attorney.

Patented May 30, 1939 2,160,634

UNITED STATES PATENT OFFICE

2,160,634

THERMOSTATIC SWITCH MECHANISM

Ernest Zurcher, Knoxville, Tenn., assignor to General Electric Company, a corporation of New York

Application February 15, 1937, Serial No. 125,872

8 Claims. (Cl. 200—137)

This invention relates to switch mechanisms, particularly to switch mechanism operated automatically in accordance with variations in a predetermined condition such as temperature or the like. The invention is of particular advantage in thermostatic control switches of the rod and tube actuated type.

One of the objects is to provide an improved form of snap action switch mechanism capable of being mounted on a base in either of two reversed operating relations with respect to an operating arm which is actuated in accordance with the variations in temperature or other predetermined condition. This permits the switch mechanism to be used either to open or to close a circuit upon a predetermined variation in the temperature or other condition.

A further object is to provide improved means for adjustment of the differential of the snap action switch mechanism as well as adjustment of the value of temperature or other condition at which the switch mechanism is to be either opened or closed.

A still further object is to provide an improved form of double switch mechanism for snap action operation at different selected values of temperature or other condition and having a reversed criss-cross operating relation with a single operating arm actuated by means responsive to temperature or other conditions. This enables the entire device to be of minimum size without sacrificing sensitivity and at the same time provides for ready adjustment of and electrical connection with the switch mechanisms to be made.

Other objects will be pointed out in the description of the accompanying drawing in which Fig. 1 is a perspective view of a preferred form of thermostatic switch mechanism embodying the improvements of the present invention with certain parts cut away or exploded for the sake of clarity, and Fig. 2 is a view showing the details of construction of the rod and tube thermostatic operating mechanism.

As illustrated the improved switch mechanism of the present invention is operated by a thermostat of the rod and tube type. The rod 10 may be formed of pyrex glass or quartz or other relatively non-expansible material and is carried inside of the tube 11 which is formed of nichrome steel or other relatively expansible material. The tube 11 is secured to the nut 12 which is removably threaded into the plate 13 carrying the switch mechanism. The base 15 of the switch mechanism is preferably formed of molded insulating material and provided with openings 16 through which the feet of the bracket 17 may be inserted and secured in position on the base by suitable fastening means such as the rivets 18. The bracket 17 is provided with spaced apart bearing notches 19 in which the knife edge pivots 20 of the operating member 21 are movably mounted. The bracket 17 and the operating arm 21 have suitable shoulders formed thereon for maintaining the biasing spring 22 in operating relation therebetween.

The operating arm 21 carries an adjustable screw threaded plug 23 which engages with the point of the cap 24 carried upon the end of the rod 10. By rotating the screw threaded plug 23, the position of the operating arm 21 may be adjusted so as to extend in spaced relation with the base 15 and substantially parallel therewith.

The base 15 is provided with suitable seats 25 and 26 on opposite sides of the operating arm 21 upon which the snap action switch mechanism 27 may be mounted in reversed operating relation with the operating arm 21. This permits the switch to be used with either a single switch mechanism 27 mounted either for circuit opening or circuit closing duty upon a predetermined temperature change or used with double switch mechanisms 27 and 50, one on each side of the operating arm 21 for both circuit opening and circuit closing duty upon predetermined temperature variations as will be pointed out more fully hereinafter.

The switch mechanism 27 is of the magnetic snap action type. It consists of a supporting arm having a central channel portion 29 with the arms 30 and 31 extending in opposite direction from the legs of the channel. The end of the leg 31 is provided with suitable mounting openings for receiving the fastening screw 32 whereby the end of the arm 31 is fixedly mounted upon the base 15.

At the end of the supporting arm 30, the resilient switch arm 35 is mounted by means of the rivet 36. The resilient arm 35 preferably is formed in two superposed sections with the section 37 of greater resilience than the section 38. Both sections of the arm 35 extend through the channel portion of the support 29 and the magnetic armature 39 is carried upon the section 38 and the contact 40 is carried upon the section 37 with the stem of the contact 40 extending through a suitable opening formed in the end of the section 38. The permanent magnet 43 is mounted upon the arm 31 in snap action cooperating relation with the magnetic armature 39.

It will be observed that the section of the arm 31 is weakened adjacent the mounting end thereof by provision of the weakening notches 44 which

are located in substantial alignment with the contact 40. The contact 45 is arranged to be adjustably mounted on the base 15 so as to extend between the contact 40 and the arm 31 in substantial alignment with the weakening notches 44. The contact 45 is carried upon the arm 46 which is provided at the end thereof with suitable openings for receiving the securing screws which mount the contacts in reversed position on one of the seats 25 or 26 with the end of the supporting arm 28 mounted upon the other one of the seats 25 or 26.

The switch mechanism 50 is identical in construction with that of the switch mechanism 27 as just described.

With the two switch mechanism 27 and 50 mounted in reversed position on the base 15, the two switch arms 35 thereof extend in spaced apart criss-cross relation on opposite sides of the free end of the operating arms 21 in operating relation therewith. By adjusting the screw 51, the supporting arm 31 may be flexed about the section weakened by the notches 44 so as to adjust the switch arm 35 to a desired position in the path of the operating arm 21.

Since the contacts 40 and 45 are in substantial alignment with the section weakened by notches 44, this adjustment of the arm 31 does not materially vary the operating relationship between the magnet 43 and the armature 39 and the contacts 40 and 45. Thus with the contact 45 adjusted to provide the desired differential in the snap action of the switch arm 35, this adjustment is not materially disturbed.

By similar adjustment of the screw 52, the position of the switch arm 35 of the switch mechanism 50 may be varied so as to be engaged and disengaged by the operating arm 21 at different values of temperature.

The operation of the thermostatic switch shown in Fig. 1 is as follows. Upon increase in temperature, the tube 11 lengthens without, however, any appreciable lengthening of the rod 10. This permits the spring 22 to move the operating arm 21 toward the base 15. By suitable adjustment of the switch mechanism 27, the movement of the operating arm 21 towards the base 15 may be made to close the contacts thereof at a desired value of temperature and with a snap action. As the movement of the operating arm 21 towards the base 15 continues, the switch mechanism 50 may be adjusted so as to open the contacts thereof at a desired value of temperature and with a snap action.

When the temperature varies in the opposite direction, the tube 11 shortens and through the agency of tube 10 moves the operating arm 21 away from the base 15. This movement will first close the contacts of the switch mechanism 50 with a snap action and then open the contacts of the switch mechanism 27 with a snap action. In each case the differential between the opening and closing of the switch contacts is determined by adjusting the position of contact 45 to vary the distance between the permanent magnet 43 and the armature 39. This differential adjustment is obtained by means of the adjusting screw 47 which moves the free end of arm 46 carrying contact 45.

With the improved switch mechanism of the present invention all the electrical circuit connections to the switch mechanism may be made by means of conventional conductors and binding screws as illustrated, the terminal parts being readily accessible to facilitate such connections. Likewise, the screw adjustments for differential setting as well as temperature setting of the snap action switches are readily accessible and easily made. Thus the improved switch mechanism may be adapted for various applications in temperature control or regulating work. It is particularly well adapted for warm air furnace control in which one of the switches controls the operation of a motor driven air circulating blower and the other switch serves as an excess temperature safety switch.

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

1. In combination, an automatic device having an operating arm movable in accordance with variations in a predetermined condition, a movable current carrying switch member having a snap action mechanism connected therewith, a separate stationary current carrying switch member for cooperating with said movable switch member to control a circuit, and a base secured to said device and provided with separate means including an adjustable element for mounting each one of said switch members in reversed adjustable positions on opposite sides of said operating arm with said movable switch member in the path of said operating arm and in reversed adjustable operating relation therewith with respect to variations in said predetermined condition.

2. In combination, an automatic device having an operating arm movable in accordance with variations in a predetermined condition and provided with means for adjusting the movement of said arm with respect to said variations, a snap action switch mechanism including a movable switch member having a contact at one end thereof and a current conducting support connected thereto at the other end thereof and extending in opposing relation with the contact end thereof and provided with cooperating snap action magnetic means carried between said switch member and said support and a separate stationary switch member having a contact for cooperating with said first contact to control a circuit, a base secured to said device and provided with separate means for mounting the said stationary member and said support for the movable switch member on each side of said operating arm with said movable switch member in the path of said operating arm and in reversed operating relation therewith, means for adjusting the position of said support to vary the position of said movable switch member with respect to said arm in each relation, and separate means for adjusting the position of the contact of said stationary switch member with respect to the contact of said movable switch member for adjusting the differential of said switch member in each relation.

3. In combination, an automatic device having an operating arm movable in accordance with variations in a predetermined condition, a snap action switch mechanism having an adjustable supporting arm and a movable switch member and a separate contact element mounted in cooperating circuit controlling relation thereon, and a base provided with a pair of spaced apart supports for movably mounting said operating arm therebetween and for separately and reversely mounting said separate contact element and said adjustable supporting arm with said movable switch element on opposite sides of said operating arm in reverse adjustable circuit controlling relation with respect to variations in said predetermined condition.

4. In combination, a base, a pair of duplicate switches reversely mounted on said base and each having an operating member extending in spaced apart criss-cross relation with the operating member of the other, and operating means for said switches including a movable arm having one end thereof extending between the overlapping portions of said switch operating members and in reverse operating relation therewith and the other end thereof movably mounted on said base.

5. A selective circuit controlling switch mechanism having in combination, a base, a pair of duplicate contacts mounted in reverse position on said base and in spaced apart relation, a pair of duplicate switch arms movably mounted in reversed position on said base with the operating portion thereof in opposing spaced apart criss-cross relation and each extending into circuit controlling relation with the corresponding one of said pair of contacts, and operating means for said switch arms having a movable element operating in the space between said first pair of contacts and between the overlapping operating portions of said switch arms and in reverse operating relation therewith.

6. In combination, a base, an automatic condition responsive device having an operating arm mounted adjacent one end of the base and extending in spaced relation with the base, a pair of switch mechanisms mounted on the base on opposite sides of said operating arm and having movable switch arms adjustable in spaced criss-cross relation with said operating arm extending therebetween in operating relation therewith.

7. In combination, an automatic condition responsive device having an operating arm movable in accordance with variations in a predetermined condition, a supporting arm fixedly mounted at one end and provided with a weakened section adjacent said mounting, a resilient switch arm mounted at the other end of said supporting arm and extending through the path of movement of said operating arm in operating relation therewith, means for adjusting the other end of said supporting arm to position said resilient switch arm with respect to said operating arm, cooperating magnetic means carried by said supporting arm and said switch arm for providing snap action operation of said switch arm, and a contact adjustably mounted in alignment with the weakened section of said supporting arm in cooperating relation with said switch arm to determine the differential in the operation thereof.

8. A switch mechanism having in combination, a channel support with a projecting arm extending from each leg thereof and with said arms extending in opposite directions and provided with mounting means at the end of one of said arms and position adjusting means at the end of the other arm, a resilient switch member mounted at the end of said other of said arms and extending through the channel support, cooperating magnetic means carried by said one of said arms and said resilient switch member for providing snap action thereof, an adjustable contact cooperating with said resilient switch member to adjust the differential in the snap action operation thereof, and an automatic device having an operating arm movable in accordance with variations in a predetermined condition and extending into operating relation with said resilient switch member.

ERNEST ZURCHER.