

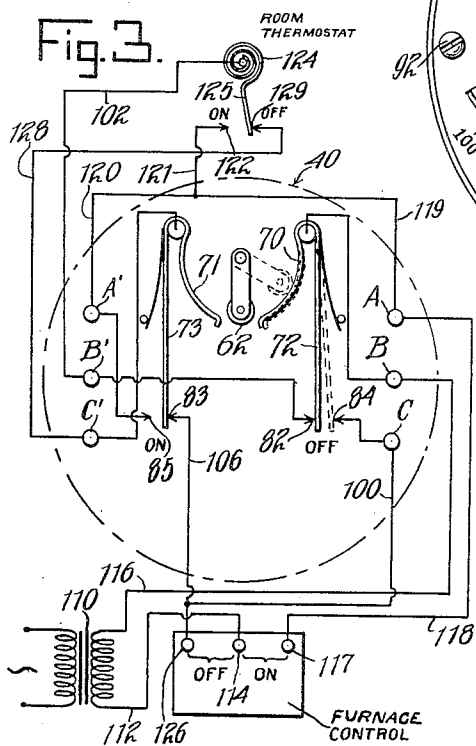
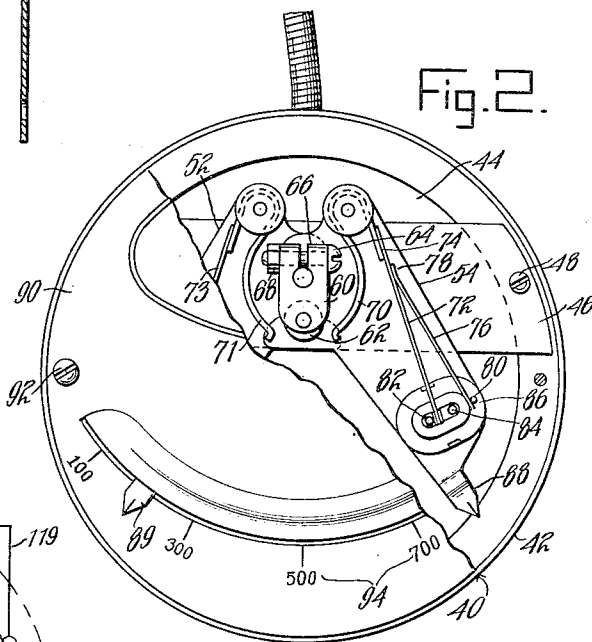
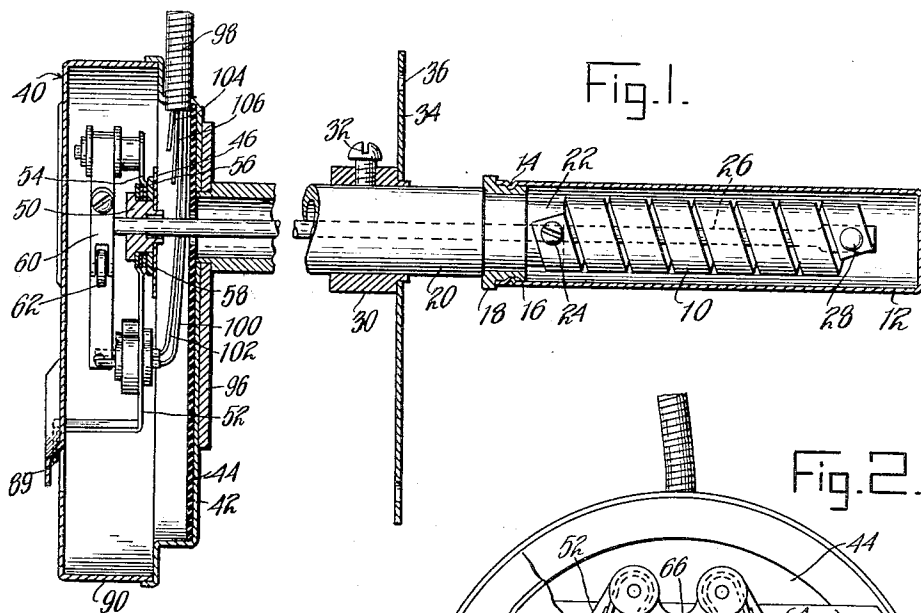
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SWITCHING MECHANISM

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SWITCHING MECHANISM

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This invention relates to an improved switching mechanism and more specifically is directed to a thermostatically controlled switching device.

An object of this invention is the provision of a switching mechanism embodying certain improvements and advantages over those now known in the prior art.

Another object of this invention is the provision of an improved thermostatically controlled switching device.

Still another object of this invention is the combination of a switching device controlled by a bi-metallic thermostatic element, said switching device being so constructed and arranged that movement of the switch beyond its contact making position imposes no strain upon the bi-metallic element.

A fourth object of this invention is the construction of a thermostatically actuated switch mechanism in which the switch actuating device is permitted to rotate beyond the normal switch contacting position without imposing any substantial further strain upon the thermostatic actuating element.

A more specific object of this invention is the provision of an improved thermostatically actuated stack control switch.

With these and incidental objects in view, the invention consists in certain novel features in construction and combination of parts which are set forth in the appended claims and a preferred form of embodiment whereof is hereinafter described with reference to the drawing which accompanies and forms part of the specification, wherein:

Fig. 1 is a longitudinal view, partly in cross-section, of my combined switch mechanism and the actuating device therefor;

Fig. 2 is a front view of the switch mechanism, partially cut away; and

Fig. 3 is a diagrammatic view of a system embodying my improved switch device.

Referring to Figs. 1 and 2 showing a preferred form in which my switching device can be constructed, a thermostatic element such as a bi-metallic member 10 in the form of a helix is mounted within a stackwell 12. This thermostatic element may be, by way of illustration, mounted within the stack (not shown) of a furnace to be controlled in one or more of several known ways.

The stackwell 12 is preferably provided with an inwardly projecting annular groove 14 adapted, for the purposes of mounting the stackwell, to fit into an annular recess 16 of a ring 18 of a

stack tube 20. One end of the thermostatic member is adapted to be connected to a projecting portion 22 of the stack tube 20 by suitable means such as a screw 24. The other end of the bi-metallic element is operatively attached to one end of the actuating rod 26 in any desirable manner, illustrated in this case as by a rivet 28. The stack tube is held in position by means of a plate collar 30 and set screw 32 attached to a mounting plate 34 which, in turn, through holes 36 therein, may be fastened in any desired manner to the stack to be controlled.

The switch shown generally at 40 is built up from a flanged casing 42 having an inner backing of insulation shown at 44. A sub-base 46 for the switching elements is attached to the flanged portion of the casing, as for example, by screws 48. A switch lever bearing 50 mounted upon the actuating shaft 26 serves as the support for the switch arms 52 and 54 and by means of washers 56 and 58 holds them in a firm but rotatable manner. The switch arms 52 and 54 are adapted to be turned about the bearing 50 for purposes hereinafter described.

In order to transmit the motion imparted by the thermostatic element 10 to the driving shaft 26, a roller cam 60 is attached at the other end of this shaft. The said cam 60 has a small wheel 62 journaled thereon, and is fastened against relative rotation to the shaft 26 in any suitable manner, illustrated in the present embodiment of this invention as by means of cooperating bolt 64, lock washer 66, and nut 68. Upon rotation of the roller cam, it is adapted to engage the spring arm 70 connected in turn to the switch lever 72 as at 74. The members 70 and 72 are mounted in any suitable manner for movement relative to the switch arm 54 shown, by way of example only, as pivoted about a stud on this arm. A spring member 76 is attached to the switch arm 72 as at 78 and is used to bias the switch arm through its springing reaction against the stop member 80. The switch lever 72 forms electrical contact with either one or the other of contacts 82 or 84 mounted upon an insulating base 86 which, in turn, is attached to the main switch arm 54. In order to indicate the position at which the roller cam will actuate the switch lever or, in other words, the setting of the switch, the switch arm 54 has a pointer 88 projecting through an opening in the face of the switch cover 90 and cooperating with suitable indicia shown at 94 as imprinted or otherwise placed thereon.

The other switch arm 52 has a spring actuat-

ing member 71 with which the roller cam is adapted to cooperate and indicating pointer 89, and in all other respects is similar to arm 54.

For mounting the switch casing on the stack tube 20, means such as a back plate 96 may be used. A flexible conduit 98 is a convenient manner for conducting the electrical lead wires such as 100, 102, 104, and 106, to the switch contacts.

In order to clearly describe the operation of my improved thermostatic switch, it has been illustrated, by way of example, in a stack control system diagrammatically shown in Fig. 3. From a suitable source of power (indicated, but not shown) current is preferably drawn through a transformer 110. A conductor 112 connected to one side of the transformer leads, in turn, to a neutral terminal 114 of the furnace control. Since the specific form of means for controlling the furnace, whether it be by controlling the drafts, blowers, dampers, or any other part thereof, is immaterial for the purpose of illustrating this invention, this control has merely been indicated. From the other side of the transformer 110, a conductor 116 is connected through a terminal B of a terminal block (not shown) to the switch 72.

From another contact 117 on the furnace control, a circuit is completed to switch contact 85 through conductor 118, terminal A, and conductors 119 and 120. Another circuit from the same furnace control terminal 117 is completed to the switch contact 122 of a room thermostat 124 through conductor 118, terminal A, and conductors 119 and 121.

From a third terminal 126 on the furnace control the conductor 106 completes a circuit to contact 83 of the switch arm 52 and the conductor 100 completes the circuit to the contact 84 of the switch arm 54 through terminal C. A wire 128 through terminal C' interconnects the switch lever 73 with the contact 129 of the room thermostat 124. The latter, in turn, is connected by conductor 102 through terminal B' to the switch contact 82 of the switch arm 54.

As shown in Fig. 3, all parts are in their neutral or normal positions, the switch arms 72 and 73 being biased against the contacts 82 and 83, respectively, and the room thermostat to the off position.

If the temperature of the room falls and more heat is therefore desired, the switch arm 125 of the room thermostat 124 will make contact with point 122. A circuit is then completed which may be traced from the terminal 114 of the furnace control through conductor 112, transformer 110, conductor 116, terminal B, switch lever 72, contact 82, terminal B', conductor 102, room thermostat 124 with its arm 125 and contact 122, conductors 121 and 119, terminal A, and conductor 118 to terminal 117 of the furnace control. This will accordingly energize the "ON" position of the stack control. No circuit will be established through the conductor 120 and switch contact 85 as the switch lever 73 is biased away from this latter contact. Assuming that the stack thermostat also calls for the "ON" position of the furnace control, the resulting circuits will not be altered or interrupted but the stack control will remain in its "ON" position.

If, however, the heat within the stack becomes too great, even though the room thermostat may be in the "ON" position, when the switch lever 72 is moved to contact point 84, the circuit through the room thermostat will be interrupted and the furnace control will be turned to the

"OFF" position through the circuit now established from terminal 114, conductor 112, transformer 110, conductor 116, terminal B, switch lever 72, contact 84, terminal C, conductor 100, back to terminal 126.

Reversely, if the room temperature rises so that the switch arm 125 of the thermostat 124 moves to the contact 129, a circuit will then be established from neutral terminal 114 of the furnace control, conductor 112, transformer 110, conductor 116, terminal B, switch lever 72, contact 82, terminal B', conductor 102, switch lever 125, contact 129, conductor 128, terminal C', switch lever 73, contact 83, and conductor 106, to the "OFF" terminal 126 of the furnace control. But again the stack thermostat has the power to countermand the order of the room thermostat. If the stack temperature is too low, indicating that there is danger of the fire going out, the switch lever 73 will then move over to establish contact with the point 85. This not only interrupts the circuit to the "OFF" terminal 126 of the furnace control but establishes another circuit which may be traced from the terminal 114 through conductor 112, transformer 110, conductor 116, terminal B, switch lever 72, contact 82, terminal B', conductor 102, switch lever 125, contact 129, conductor 128, terminal C', switch lever 73, contact 85, terminal A', conductors 120 and 119, terminal A, and conductor 118 to the "ON" terminal 117 of the furnace control. It will thus be seen that in the system described, while both the room thermostat and the stack thermostat are able to effect the desired stack control, nevertheless it is always the stack thermostat which has the final authority.

The purpose of such a system is that it is at all times desirable, no matter what the room temperature thermostat may wish, both to prevent overheating of the flue and to prevent the fires from going out altogether.

My improved type of thermostatic switch, while capable of many uses, is admirably adapted to operate in the foregoing system. Upon a slight variation in stack temperature, the thermostatic element 10 will either contract or expand to rotate the shaft 26 and with it the roller cam 60. This cam, in engaging either of the arms 70 or 71, will accordingly actuate the corresponding switch mechanism. In the usual case however, the thermostatic element tends, because of an excess increase or decrease in temperature, to turn further than necessary for the desired actuation of the switch. In many switches heretofore known in the art when, by way of example, some switch actuating mechanism, such as applicant's roller cam 60, acts to operate the switch mechanism, it comes against an abutment in one form or another and can turn no further. Because of this, due to the tendency of the thermostatic element to expand or contract further, strains are imposed thereon which in a short time give such a thermostatic element a permanent set, thereby ruining its accuracy in operation. However, by designing the arms 70 and 71, with which the roller cam 60 comes in contact in my improved switch, to have, upon bending, an arc substantially equal to the radius of the roller cam, the latter may then turn within comparatively large limits without any increase in opposing resistance and, as a result, without placing any strain whatsoever upon the actuating thermostatic element. In other words, after the switch arm 70 or 71 has been initially moved to actuate the electrical contacts, there is provided a dwell

which therefore permits the further unobstructed movement of the roller cam. The position of the switch arm 73 and the roller cam 60 have been shown, by way of example, in an extreme position in dotted lines in Fig. 3. The arcuate shape which the member 70 takes after its initial movement is clearly shown in this illustration.

Because of the advantageous arrangement of the parts, this type of switch also permits easy adjustment so that the limits of high and low temperatures at which the switch is adapted to operate may readily be varied. All of the switch parts are mounted on rotatable levers 52 and 54, the position of which are indicated by pointers 89 and 88 cooperating with a proper scale. Movement of these levers varies the amount of relative movement necessary before the roller cam engages the arms 71 and 70 and thus the effective temperature at which the furnace control will operate. By means of the illustrated construction, variation may be made in both the "high" and "low" ends of the scale. Furthermore, no matter in what position the levers 52 and 54 may be placed, there can be no strain on the thermostat, as the arms 71 and 70 will, after initial movement, always assume a position to allow further free travel of the roller cam. It is to be noted that while I have shown and described the arms 70 and 71 as made separately from the respective switch levers 72 and 73, these could, of course, be each made as a single piece of spring metal connected in a suitable manner to the respective switch arms 54 and 52.

It will be obvious to any one skilled in the art that my invention is not limited to the specific embodiment disclosed nor is it of any importance or significance in what type of system such a switch can be used. While I have, for the sake of illustration, disclosed a bi-metallic thermostatic element in the form of a helix, it is clear that this invention is applicable to a switch actuated by an element of any other configuration. The particular manner of mounting the various parts, the type of casing, and the details of construction may all be varied without departing from the scope of this invention and such scope is not limited except as defined in the following claims.

I claim:

1. In a thermostatic switch, in combination, a bi-metallic element, a drive shaft, means for holding one end of said bi-metallic element against rotation and means for attaching the other end thereof to said drive shaft, a contact arm mounted for pivotal movement and having an integral curved extension, contact points adapted to cooperate with said contact arm to commutate a circuit, and means fixed to the other end of said drive shaft for engaging the curved extension of said contact arm and thereby actuating the latter.

2. The combination according to claim 1 wherein the radius of curvature of said curved arm extension is equal to the outer radius of rotation of said last means.

3. The combination according to claim 1 in combination with means concentric with said

drive shaft for varying the engagement of said actuating means with said curved arm extension.

4. The combination according to claim 1 in which said bi-metallic element is concentric with said drive shaft.

5. In a switch, a drive shaft, a pair of switch arms rotatably mounted concentric to said drive shaft, a contact arm and at least one cooperating contact mounted on each of said switch arms, an extension on each of said contact arms, and means mounted on said drive shaft for engaging one or the other of said extensions for actuating one or the other of said switch arms, whereby upon rotation of said switch arms the engagement of said actuating means with the contact arms may be varied.

6. The combination according to claim 5 in which said actuating means includes a roller cam.

7. The combination according to claim 5 in which the engaging portions of said extensions are curved concentrically with the drive shaft.

8. The combination according to claim 5 in which said actuating means includes a roller cam, and the engaging portion of said extension has a radius of curvature equal to the outer radius of rotation of said roller cam.

9. The combination according to claim 5 including means for biasing each of said contact arms in a direction to oppose movement thereof by said actuating means.

10. The combination according to claim 5 in combination with thermo-responsive means for actuating said drive shaft.

11. In a thermostatic switch, in combination, a bi-metallic element, a drive shaft, means for holding one end of said bi-metallic element against rotation and means for attaching the other end thereof to said drive shaft, a contact arm having a curved extension, contact points adapted to cooperate with said contact arm to commutate a circuit, and means fixed to the other end of said drive shaft for engaging the curved extension of said contact arm for actuating the latter, the radius of curvature of said curved arm extension being equal to the outer radius of rotation of said last means.

12. In a switch, a base member having a contact, a contact arm mounted on said base member for movement into and out of engagement with said contact, said contact arm including an arcuate portion of substantially constant radius, a pivotally mounted actuating arm for engaging the arcuate portion of said contact arm and moving the latter into engagement with said contact, said actuating arm having substantially the same pivotal radius as said arcuate portion, whereby, after initial engagement with said arcuate portion, said contacting arm may continue its movement without resistance while maintaining engagement of said contact arm and contact, and means for pivoting said base member about the pivotal axis of said actuating arm, whereby the initial engagement of said actuating member and arcuate portion may be varied.

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