March 2, 1954

W. STELZER ET AL

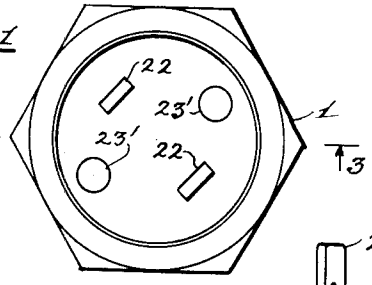
2,671,143

THERMOSTATIC CONTROL SWITCH

Filed Sept. 11, 1952

2 Sheets-Sheet 1

Fig. 1



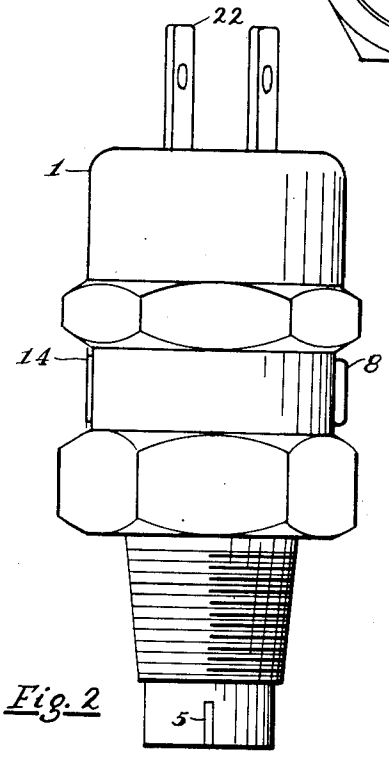


Fig. 2

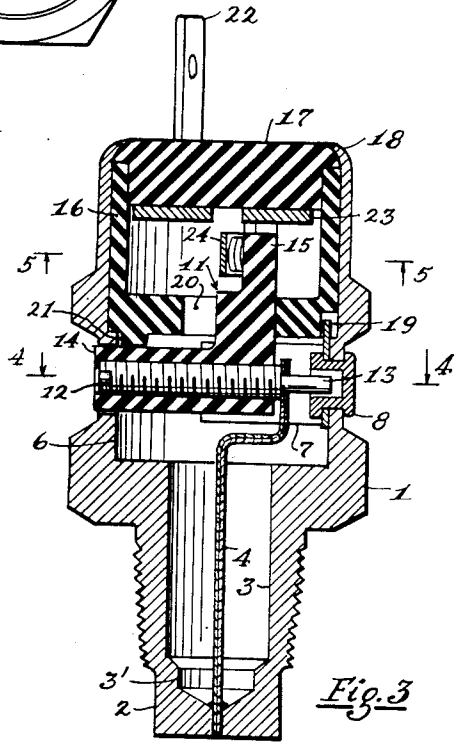


Fig. 3

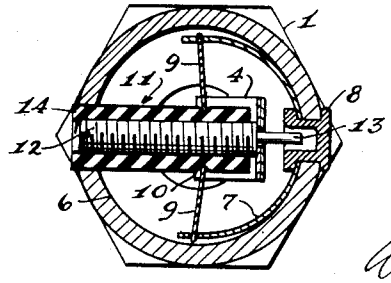


Fig. 4

INVENTORS.

William Stelzer

Martin J. Brown

March 2, 1954

W. STELZER ET AL

2,671,143

THERMOSTATIC CONTROL SWITCH

Filed Sept. 11, 1952

2 Sheets-Sheet 2

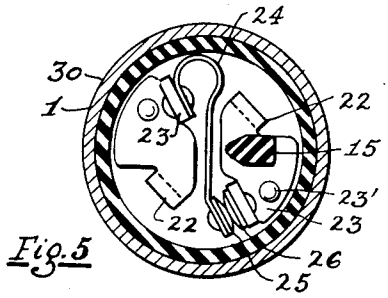


Fig. 5

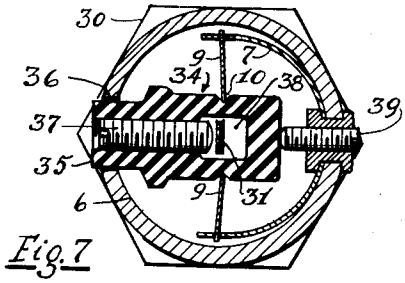


Fig. 7

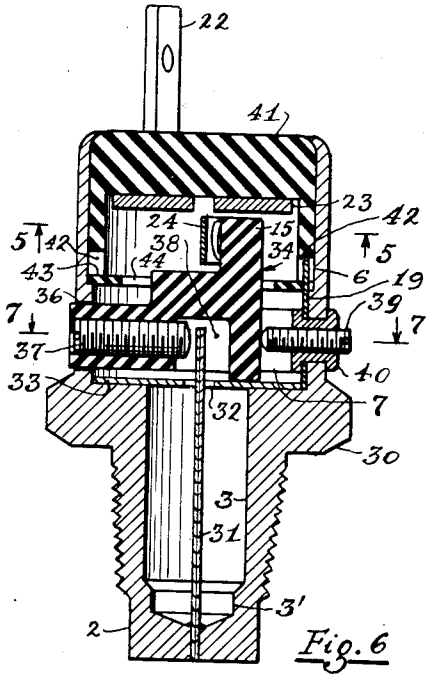


Fig. 6

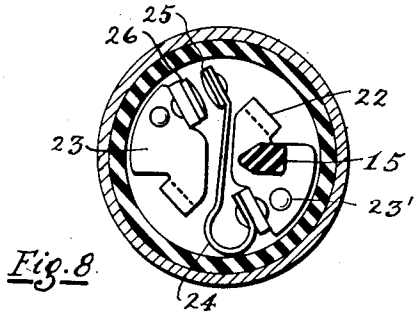


Fig. 8

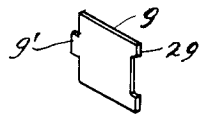


Fig. 9

INVENTORS

William Stelzer

Martin H. Simmons

Patented Mar. 2, 1954

2,671,143

UNITED STATES PATENT OFFICE

2,671,143

THERMOSTATIC CONTROL SWITCH

William Stelzer, Summit, and Martin V. Groves, Hillside, N. J., assignors to Economy Faucet Company, Newark, N. J.

Application September 11, 1952, Serial No. 309,014

8 Claims. (Cl. 200—139)

1

The invention relates to thermostatic control switches and more particularly to a thermostatic control device using a bimetallic element and a manually reset snap action mechanism releasable by said bimetallic element to actuate an electric switch.

Thermostatic control switches or cutouts used to protect equipment against overheating are well known since there are numerous different constructions in use today, where improvements are usually of a minor nature. The present invention contributes several improvements in devices for the purpose mentioned, resulting in a better construction as well as improved performance.

The object of the invention is primarily to provide a very compact design so that the device can be used with small or cumbrous equipment where the switch must be confined to a small space, as for instance with electric motor-driven hydraulic pumps where the thermostatic control switch serves to protect the pump against overheating that may have resulted from operation without pumping liquid, by interrupting the electric circuit of the motor after a certain temperature has been reached.

Another object of this invention is to improve the sensitivity of the device or to decrease the temperature range within which the switch is operated.

A further object is to provide a snap action mechanism for instant operation of the switch and to incorporate means to preset such mechanism so that it can be released or tripped in trigger fashion by the bimetallic element to operate the switch.

Yet another object is to provide adjusting means not only for tripping the snap action mechanism at a certain temperature, but also to set the snap action mechanism and to hold it in a position where a minimum force is necessary to spring the device.

Other objects and advantages of this invention will be apparent from the following description considered in connection with the accompanying drawings submitted for the purpose of illustration and not to define the scope of the invention, reference being had for that purpose to the subjoined claims. In the drawings, wherein similar reference characters refer to similar parts throughout the several views:

Fig. 1 is a plan view of the novel thermostatic control switch;

Fig. 2, an elevation thereof;

Fig. 3, a section taken on lines 3—3 of Fig. 1;

2

Fig. 4, a section taken on lines 4—4 of Fig. 3;

Fig. 5, a section taken on lines 5—5 of Fig. 3;

Fig. 6, a sectional elevation showing a modified form of the invention;

Fig. 7, a section taken on lines 7—7 of Fig. 6;

Fig. 8, a modification of Fig. 5, where the contacts are ordinarily open whereas in Fig. 5 they are ordinarily closed; and

Fig. 9, a perspective view of one of the links of the snap action mechanism.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practised or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not limitation.

Describing Figs. 1–5, the thermostatic control switch comprises a metallic casing 1 having a threaded plug portion 2 for attachment to the particular equipment for which the control switch is intended, this type of connection being shown by way of example. A central bore 3 accommodates a bimetallic element or leaf 4 soldered or otherwise rigidly secured and supported in slot 5, the width of element 4 being smaller than the diameter of hole 3 and slightly smaller than the diameter of bore 3' near the point of attachment to prevent free movement of element 4 in bore 3 in response to changes in heat transmitted from casing 1 to element 4. The upper portion of casing 1 has a stepped bore 6 in the lower part of which is housed a snap action switch operating mechanism and in the upper part an electric switch operatively connected by the switch operating mechanism. The latter comprises a toggle action snap mechanism consisting of a semi-circular leaf spring 7 riveted or otherwise secured at its central portion to casing 1 by means of a hollow rivet 8, a pair of toggle links 9 pivotally held by the ends of leaf spring 7 and engaging vertical grooves 10 in the main body portion of operating member 11 of dielectric material having a tapped hole containing a central adjusting screw 12 engaging the upper offset movable end of bimetallic element 4. The latter has a hole in which stud 13 extending from screw 12 is slideable. Thus operating member 11 at one end is carried by the bimetallic element and at the other by casing 1 as the button portion 14 of operating member 11 passes through and is slideable in a hole in casing 1 diametrically opposite of hollow

rivet 8. Toggle links 9 at their outer extremeties have tabs 9' engaging a corresponding slot in the ends of spring 7, while the inner ends which form the knee of the toggle may be provided with tabs 29 which do not engage groove 10 but extend above and below member 11 to keep the links in place. An upwardly pointing finger 15 forms another extension of operating member 11 and serves to operate the electric switch mechanism. The elements of the latter are encased in an insulating socket 16 seated on the step of bore 6 and an insulating cap 17 fitting inside of socket 16 and retained by the upper edge of casing 1 where it is peened over at 18 to firmly hold the cap in the desired position and prevent it from rotation. Socket 16 is held in the proper position by a short tab 19 extending from the central portion of spring 7 into a small recess or slot in socket 16. The latter has a rectangular opening 20 through which finger 15 passes and in which it is guided, the end walls of the opening serving to limit the movement of operating member 11 in the direction of the axis of adjusting screw 12. While the button portion 14 is guided in the hole in casing 1 in which it slides, an additional bearing 21 extending from socket 16 may be provided.

The selection and construction of the electric switch is depending on and dominated by the different applications which occur in practice; thus for instance it may be desired to open an electric circuit when a certain temperature is exceeded to disconnect a motor or other equipment, or a circuit may be closed to put an alarm system into operation. By way of example, an ordinarily closed switch is illustrated in Fig. 5, and a switch having the same elements but with the contacts ordinarily open is shown in Fig. 8. Insulator cap 17 supports a pair of spaced electrically conducting connector blades 22 adapted to be plugged into a conventional connector for connection with an electric circuit or device. The base portions of these connector blades are formed into brackets 23 secured to plug 17 by means of rivets 23'. One of the brackets has secured to it a contact spring 24 carrying at its free end a contact point 25 positioned to contact another contact point 26 extending from the other bracket, contact spring 24 being biased into a contacting position where contact 25 is pressed against 26. Finger 15 of operating member 11 is positioned a certain distance away from spring 24 so that when operating member 11 is tripped it can be accelerated by the force of spring 7 to provide a hammer action against spring 24 and thereby break the contact instantly. In Fig. 8 cap 17 has been rotated 180 degrees so that operating member 11 when tripped acts to close the contacts. Spring 24 is slightly bent back so that the contacts are ordinarily open, as shown.

In the modification shown in Figs. 6 and 7 the improved thermostatic control switch comprises a casing 30 similar to casing 1 of the construction that already has been described. A straight bimetallic element 31 soldered or brazed in slot 5 extends upwardly through a clearance hole 32 in plate 33 seated at the bottom of bore 6 and serving as a bearing for operating member 34 whose button portion 35 slides in hole 36 of casing 30 and contains an adjusting screw 37 extending into a cavity 38 so it can engage the upper and free end of element 31, the latter being reduced in width to have ample clearance in hole 32 and cavity 38. Another adjusting screw 39 is held in a centrally threaded rivet 40 securing toggle spring 7, the toggle links 9 being similar to the ones described. Adjusting screw 39 serves as an abutment for operating member 34 so that the latter can be set in a fixed position where the toggle links 9 are nearly in alignment with each other and where the mechanism can be tripped with a light and predetermined force exerted by bimetallic element 31. This eliminates any movement of member 34 except to operate the switch, and element 31 is free to move in response to any fluctuation in temperature within the normal and safe range. The elimination of the movements of member 11 and toggle links 9 eliminates wear in grooves 10, and consequently eliminates a change in the setting of the device so that it will always be tripped at exactly the same temperature.

The component parts of the electric switch are similar to those already described so that Figs. 5 and 8 also may be referred to, though cap 17 is replaced by a slightly different insulating cap 41 designed to eliminate socket 16. Cap 41 is keyed to tab 19 of spring 7 fitting into slot 42 in the skirt of cap 41. There is another such slot diametrically opposite so that cap 41 can be rotated 180 degrees depending on whether a make or break switch is required. A thin insulating disc 43 with a rectangular hole 44 is held between cap 41 and the recess of bore 6, hole 44 serving as a guide for operating member 34 and limiting its movement after it has been tripped.

The operation of the thermostatic control device is self-explanatory. Adjustment of adjusting screw 12 or 37 in a clockwise direction causes tripping of the toggle mechanism at a lower temperature, while turning the screw in the opposite direction to be further away from the bimetallic element causes release at a higher temperature. After release and after the temperature of the bimetallic element has fallen below maximum, the device may be reset by pushing in button 14 or 35 until the toggle links are reversed as shown in Fig. 4 or 7.

In the set position of the snap action means, as shown in Figs. 4 and 7, toggle links 9, whose outer ends are urged together by spring 7, have their inner portions which form the knee of the toggle pointing in a direction urging the operating member into a holding position. Assuming now that casing 1 or 30 is heated beyond the permissible maximum, the upper end of the bimetallic element acts against and moves adjusting screw 12 or 35 and the operating member to straighten out the toggle and then move it over its dead center whence the toggle snaps into a reverse position due to the force of spring 7, causing the operating member to move rapidly towards the left, and to thereby operate the switch through figure 15. The button portion of the operating member then extends out of hole 36, giving a visual indication that the switch has been tripped.

It is obvious that the thermostatic control device can also be used to make or break a circuit when a certain minimum temperature is reached. For this it is merely necessary to turn bimetallic element 4 or 31 around 180 degrees so that the action relative to the toggle mechanism is reversed.

Having thus described our invention, we claim:

1. In a thermostatic control switch of the class described, a metal casing, a temperature sensitive bimetallic element having a movable end and another end rigidly supported in said casing, an electric switch, a dielectric switch operating

member slideably housed within said casing and having a push button portion extending out of said casing, said operating member having a finger to operate said switch, an adjusting screw threaded into said push button portion into engageable apposition with said movable end of said bimetallic element, said operating member being movable codirectionally with said movable end of said bimetallic element, snap action means comprising a toggle having a pair of toggle links, the knee of said toggle being in engagement with said operating member, and spring means for pivotally securing the outer ends of said toggle links and for resiliently urging them towards each other, said toggle being positioned near dead center to be pushed over dead center by the movement of said movable end of said bimetallic element in response to a maximum temperature change to instantly operate said switch through the force of said spring means.

2. The construction as claimed in claim 1, and an abutment to stop said switch operating member near dead center of said toggle where said knee of said toggle points in a direction opposite the switch actuating movement of said operating member.

3. The construction according to claim 2, where said abutment is manually adjustable to adjust the angularity of said toggle to be very close to dead center and where only a very small force of said bimetallic element is required to push said toggle over dead center and thereby trip said snap action means into operating movement.

4. In a thermostatic control device of the class described, a metallic casing attachable to equipment, a temperature sensitive bimetallic element arranged inside said casing having a movable end and a fixed end, the latter being rigidly supported by said casing, an electric switch, an insulating housing for said switch secured to said casing, a dielectric operating member slideably arranged and guided in said casing to operate said switch, said operating member being movable codirectionally with said movable end of said bimetallic element and comprising a main body portion, a finger extending from said main body portion into proximity of said switch to operate the latter after a certain accelerating movement of said operating member, a push button extending axially from said main body portion through said casing to be manually operable exteriorly of said casing for resetting of said control device after it has been tripped, an adjusting screw threaded into said push button portion and serving as an intermediary between said bimetallic element and said operating member, and spring tended snap action means trippable by the movement of said movable end of said bimetallic element in response to a maximum heat change and operatively connected to said operating member.

5. The construction as claimed in claim 4 where said snap action means comprises a toggle having a pair of links pivoted to said main portion of said operating member to form the knee of the toggle, and spring means pivotally holding the outer ends of said links to be fixed in the direction of movement of said knee and to urge the outer ends of said links towards each other.

6. The construction as claimed in claim 4, and an adjusting screw extending through said casing and arranged to serve as a stop for said operating member in a direction opposite to the direction of movement for actuating said switch.

7. The construction as claimed in claim 5, where said switch has a pair of connector blades insulated from each other, and fixed brackets at the base of said blades, one of said brackets having a stationary contact, the other of said brackets having secured thereto a current conducting spring provided with a second contact in position to make contact with said stationary contact, said switch being operated by said finger striking against said current conducting spring.

8. In a resettable thermostatic control switch of the class described, a metal casing, a temperature sensitive bimetallic element having a free movable end and another end rigidly supported in said casing, an electric switch, a dielectric switch operating member movably housed within said casing and having a manually operable portion extending out of said casing, said operating member being adapted to operate said switch and being movable codirectionally with said movable end of said bimetallic element, adjusting means intermediate said operating member and said movable end of said bimetallic element so that said operating member is in engageable apposition with said movable end of said bimetallic element through the intermediary of said adjusting means, snap action means comprising a toggle having a pair of toggle links, the knee of said toggle being in engagement with said operating member, and spring means for pivotally securing the outer ends of said toggle links and for resiliently urging them towards each other, said toggle being pisitioned near dead center to be pushed over dead center by the movement of said movable end of said bimetallic element in response to a maximum temperature change to instantly operate said switch through the force of said spring means.

WILLIAM STELZER.
MARTIN V. GROVES.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,087,024	Dezotell	July 13, 1937
2,268,445	Drapeau	Dec. 30, 1941
2,394,121	Ulanet	Feb. 5, 1946
2,463,891	Malone	Mar. 8, 1949
2,499,208	Zimmer	Feb. 28, 1950