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ADJUSTABLE THERMAL LIMIT SWITCH

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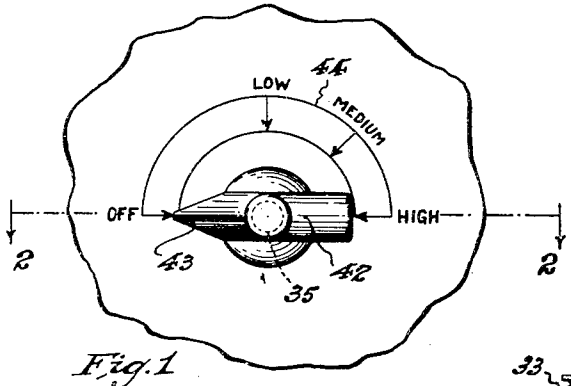


Fig. 1

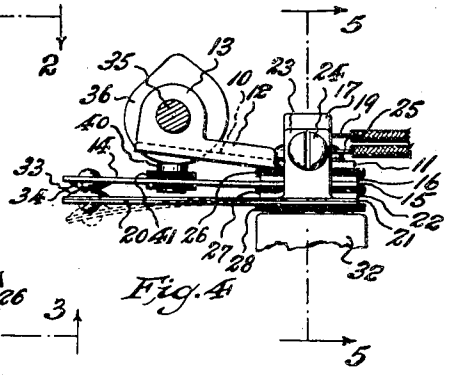


Fig. 4

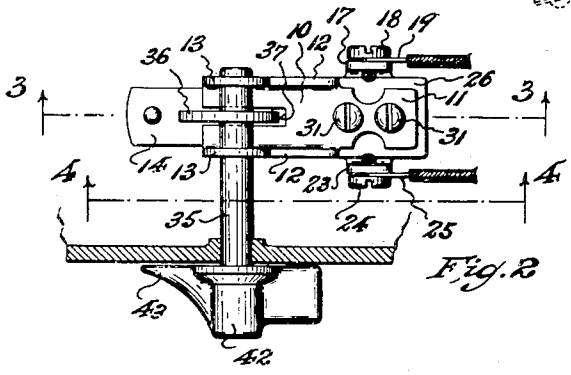


Fig. 2

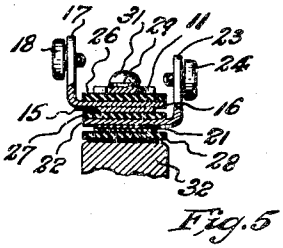


Fig. 5

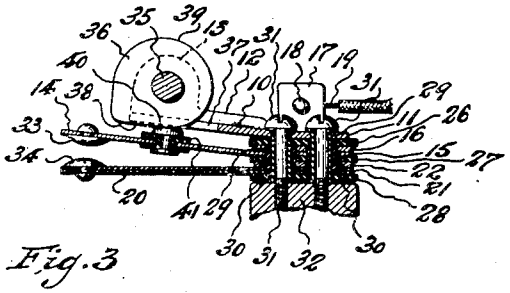


Fig. 3

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ADJUSTABLE THERMAL LIMIT SWITCH

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1 Claim. (Cl. 200—138)

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This invention relates to improvements in adjustable electrical switches of the thermal limit type adapted to automatically open when temperature of a device or at a location served thereby exceeds a selected limit to which the switch is adjusted.

The invention has for an object to provide a novel electrical switch including a pair of relatively movable contact devices one of which comprises a bi-metallic element which is responsive to temperature rise, and manipulatable means operable to engage and disengage said contact devices to manually close and open the switch, and also adapted to relatively adjust said contact devices in switch closing engagement subject to be automatically opened by the response of said bi-metallic element to temperature of a selected predetermined degree.

The invention has for another object to provide a novel switch, characterized as above stated, wherein the contact device opposed to that comprising the bi-metallic element consists in a resilient contact arm, said switch having a stationary support above said resilient contact arm, a rotative control cam journaled in said support and adapted to operatively engage said resilient contact arm, and means to actuate said cam.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which:

Fig. 1 is an elevational view of the manipulating means of an adjustable thermal limit switch according to this invention; Fig. 2 is a sectional view, taken on line 2—2 in Fig. 1, but showing the switch in top plan elevation; Fig. 3 is a vertical longitudinal sectional view, taken on line 3—3 in Fig. 2, the switch being shown in open or off condition; Fig. 4 is a sectional view, taken on line 4—4 in Fig. 2, but showing the switch is adjusted closed or on condition; and Fig. 5 is a transverse vertical sectional view, taken on line 5—5 in Fig. 4.

Similar characters of reference are employed in the hereinabove described views, to indicate corresponding parts.

The switch structure of this invention comprises a stationary supporting plate 10 having a butt portion 11 integral therewith. Said supporting plate 10 is of rigid inflexible character, and, to assure such rigidity, is provided with means to stiffen the same against bending, such e. g. as stiffening flanges or ribs 12 disposed to project

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angularly from the plane thereof along its longitudinal margins. At the outer free end of the supporting plate 10, the stiffening flanges or ribs 12 thereof terminate in upstanding, transversely aligned, perforate bearing ears 13, the purpose of which will be hereinafter disclosed.

Underlying said supporting plate 10, in suitably spaced apart relation thereto, is an electrically conductive resilient contact arm 14 having a butt portion 15 which underlies the butt portion 11 of said supporting plate 10. Superposed upon said butt portion 15 of said contact arm 14, so as to be in electrical contact therewith, is a pole piece 16. Said pole piece 16 is provided with an exteriorly extending angular binding post lug 17, through which is threaded a binding screw 18 operative to mechanically and electrically connect thereto, and thus to said pole piece 16 and contact arm 14, a conductor 19 comprising one side of an electrical circuit desired to be controlled by the switch.

Underlying said contact arm 14, in suitably spaced apart relation thereto is an electrically conductive bi-metallic element 20 which constitutes the thermostatic or thermoresponsive member of the switch. Said bi-metallic element 20 is also provided with a butt portion 21 which underlies the butt portion 15 of said contact arm 14. Superposed upon said butt portion 21 of said bi-metallic element 20, so as to be in electrical contact therewith, is another pole piece 22, which is provided with an exteriorly extending angular binding post lug 23, through which is threaded a binding screw 24 operative to mechanically and electrically connect thereto, and thus to the pole piece 22 and bi-metallic element 20, a conductor 25 comprising the opposite side of the electrical circuit to be controlled by the switch.

Interposed between the butt portion 11 of the supporting plate 10 and the underlying engaged pole piece 16 and butt portion 15 of the contact arm 14 is a separator piece or plate 26 of suitable electrical insulation material. In like manner, interposed between the butt portion 15 of the contact arm 14 and the underlying engaged pole piece and butt portion 21 of the bi-metallic element 20 is a similar separator piece or plate 27 of suitable electrical insulation material. Underlying the butt portion 21 of said bi-metallic element 20 is another piece or plate 28 of suitable electrical insulation material.

To secure the butt portions of the described switch parts and associated electrical insulation material in assembled relation, and thereby said switch parts in cooperative relation, suitable

fastening means is passed through the assembly. A preferable form of fastening means comprises one or more hollow rivets 29, the same being insulated from electrical contact with the conductive parts of the switch by surrounding sleeves 30 of electrical insulation material. Said hollow rivets 29 provide passages through which may be passed fastening screws 31, whereby to secure the butt or heel of the swtch to a support 32 provided in connection with the device or at the location to be served by the switch.

Said contact arm 14 is provided, adjacent to its free end to project from its under face, with a contact element 33. In like manner, said bi-metallic element 20 is provided, adjacent to its free end to project from its upper face, with a similar contact element 34 adapted to be engaged by said contact element 33 of the contact arm 14, whereby to bring said contact arm and bi-metallic element into circuit completing relation when the switch is closed.

Said resilient contact arm 14 is biased by its inherent tension so as to be yieldably urged away from the bi-metallic element 20 and toward the supporting plate 10.

Journaled in and between the bearing ears 13 of the supporting plate 10 is a rotatable shaft 35 of suitable length. Affixed to said shaft 35, so as to be turnable thereby, is a control cam 36. Said supporting plate 10 is provided with a slot 37 through which the periphery of the cam 36 extends so as to be directly opposed to the underlying resilient contact arm 14. The periphery of said cam 36 is provided with a low section 38 of preferably straight or flat conformation, and a high section 39, leading from said low section, which is of progressively increasing radius. The resilient contact arm 14 is provided with an abutment stud 40, electrically insulated therefrom by suitably arranged insulation material 41. Said abutment stud 40 is opposed to and is engaged by the cam 36. Due to its bias toward the supporting plate 10 and cam 36, the resilient contact arm 14 is yieldably urged against the latter. When the cam is positioned to oppose its low section 38 to the abutment stud 40, the contact arm 14 will be moved by its tensional bias away from the bi-metallic element 20, and thus to switch open or off position (see Fig. 3).

Affixed to an exterior end of said cam shaft 35 is a finger piece 42 for rotatively actuating the cam 36. This finger piece 42 includes an indicator projection or pointer piece 43 which is adapted to cooperate with an adjacently located and suitably fixed scale 44 calibrated to indicate positions of the control cam which condition the switch for thermal limit operation when influenced by selected temperature conditions, as e. g. by low heat, medium heat or high heat within a desired range of minimum and maximum temperature for which a given switch is designed to respond.

In the use of the switch, by turning the control cam 36 in clockwise direction, the low section 38 is moved away from the abutment stud 40 of the resilient contact arm 14, and the high section 39 of said cam is moved toward the latter, thereby depressing the resilient contact arm 14, against its tensional stress, and thus swing down the same so that its contact element 33 engages the contact element 34 of the bi-metallic element 20, and thereby closes the switch (see Fig. 4). For operative circuit breaking response of the bi-metallic element 20 to relatively low temperature,

turning of the cam 36 is limited to an amount which is sufficient to bring the contact elements 33 and 34 together, with substantially little downward deflection of the bi-metallic element 20 (see Fig. 4). When the switch is thus closed, upon a desired minimum rise of temperature effective upon the bi-metallic element 20, the latter will be downwardly warped, whereby to promptly separate the contact element 34 from the contact element 33, thus automatically opening the switch to interrupt the circuit controlled thereby (see broken line delineation of the bi-metallic element shown in Fig. 4), until a sufficient drop in influencing temperature occurs, whereby to permit said bi-metallic element 20 to contract to normal condition, and thereby again automatically close the switch.

By turning the cam 36 beyond mere switch closing position, the degree of down swing of the resilient contact arm 14 is increased to an extent sufficient to produce an accompanying downward flexing of the bi-metallic element 20. Under such circumstances, initial heat induced warping of the bi-metallic element 20 will not separate the contacts 33 and 34 until such warping first balances the mechanical deflection of the bi-metallic element induced by the downward pressure of the resilient contact arm 14, and then continues beyond such balance, whereupon the switch will automatically open. It will be obvious that under these circumstances a higher degree of temperature must influence the bi-metallic element before automatic opening of the switch by the latter will be effected. From this it will be understood that the more the cam 36 is advanced, whereby to increasingly depress the resilient contact arm 14 and mechanically deflect the bi-metallic element 20, the higher will be the temperature required to influence the bi-metallic element for automatic switch opening effect, until, by application of the high section 39 of the cam to the resilient contact arm and bi-metallic element, the switch will be conditioned to automatically open only when influenced by a maximum degree of temperature rise.

From the above it will be apparent that a very simple and efficient adjustable thermal limit switch is provided by the instant invention. I am aware that changes could be made in the above described switch structure without departing from the scope of this invention as defined by the following claim. It is therefore intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

An adjustable thermal limit switch comprising an upper plate, a lower bi-metallic arm, and an intermediate flexible arm disposed in spaced apart superposed relation, the same having fixed end portions, means to insulate said fixed end portions one from another, said plate having stiffening flanges along its side margins perpendicular to the plane thereof, said flanges including, at the free end portion of said plate, transversely aligned bearing ears, a rotatable transverse shaft journaled in said bearing ears, a cam on said shaft disposed to oppose said flexible arm at a point intermediate its fixed end portion and free end whereby to adjust the relation of said flexible arm to said bi-metallic arm, said flexible arm having an abutment stud affixed thereto in opposition to said cam, means to in-

sulate said abutment stud from flexible arm, the free end portion of said flexible arm having a contact element, the free end of said bi-metallic arm having a contact element opposed to the contact element of said flexible arm, and said flexible arm and said bi-metallic arm being each provided with means for connecting the same in an electrical circuit to be controlled by the switch.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,857,906	Wolcott et al.	May 10, 1932
1,985,100	Kuhn et al.	Dec. 18, 1934
2,190,276	Smith	Feb. 13, 1940
2,203,509	Siedle et al.	June 4, 1940
2,278,629	Winning	Apr. 7, 1942
2,286,266	De Lancey	June 16, 1942
2,321,338	Ulanet	June 8, 1943