

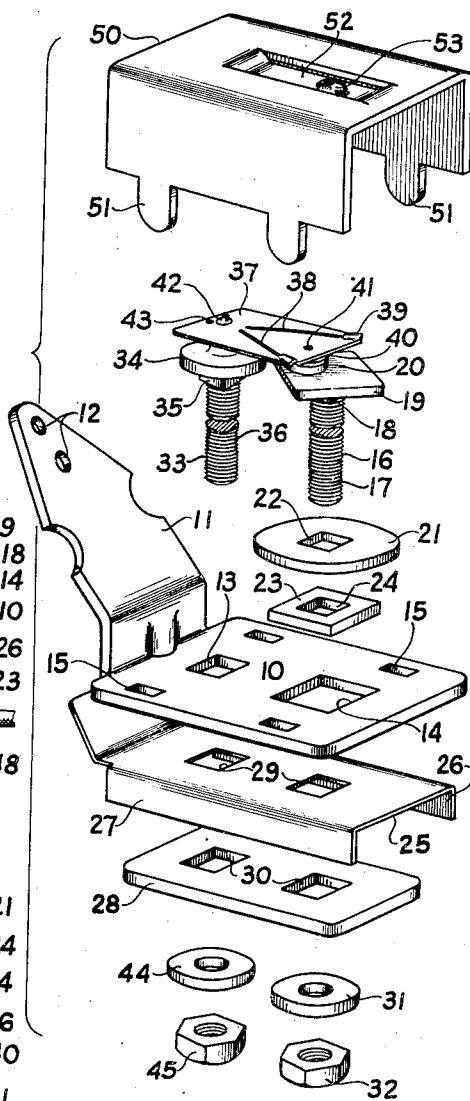
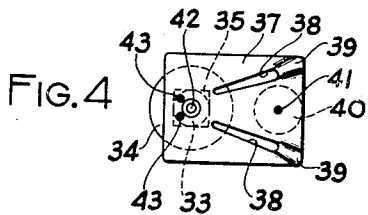
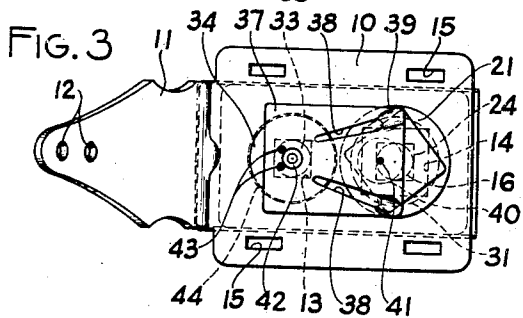
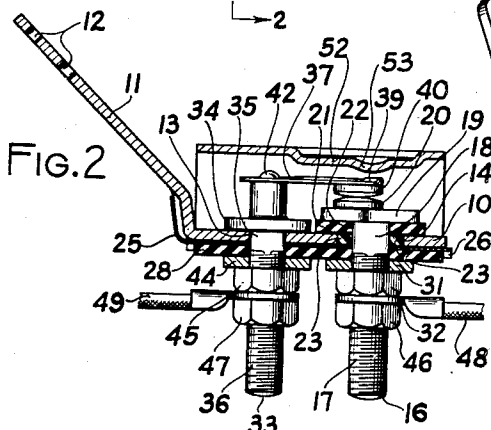
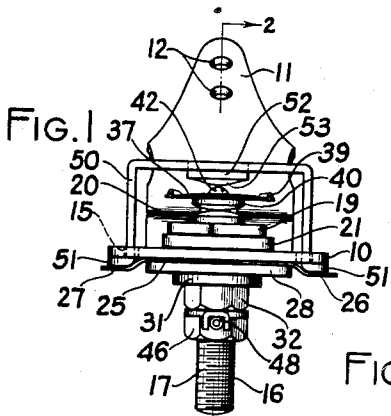
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THERMOSTATIC SWITCH DEVICE

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THERMOSTATIC SWITCH DEVICE

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The present invention relates to a thermostatic switch device and more particularly to a simple and rugged construction for a snap-acting thermostatic switch.

While thermostatic and snap-acting thermostatic switches are well known, they are in general of complicated design and costly construction or are unreliable in operation or in maintaining constancy of operating characteristics.

The primary object of the present invention is the provision of a thermostatic switch of simple and inexpensive construction but which is reliable in operation and of constant and uniform calibration in spite of variations in ambient temperature or long intervals between operation of the switch.

Another object of the invention is the provision of a thermostatic switch comprising a base, a contact assembly, a switch assembly, and a cover member, all of which can be easily and rapidly assembled to constitute a switch of uniform and definite operating characteristics.

A further object is the provision of a switch assembly including a terminal stud with a non-circular portion and a switch arm on said stud and welded thereto in predetermined relation to the non-circular portion thereof.

Still another object is the provision of a contact assembly including a terminal stud with a non-circular portion and a head thereon, and a contact fastened to said head preferably by welding, in eccentric relation to said stud and in predetermined relation to the non-circular portion thereof.

A still further object of the invention is the provision of a thermostatic switch comprising a base provided with a pair of non-circular openings adapted to receive and co-operate with the non-circular portions of the terminal studs of the respective switch and contact assemblies whereby said assemblies may be readily mounted on said base in proper relation to each other and whereby the spacing between said terminal studs is greater than the length of the switch arm.

Another object is the provision of a thermostatic switch assembly including a snap-acting switch arm normally engaging a contact and a cover member having an abutment for limiting the snap movement of said switch arm away from said contact.

A further object of the invention is the provision of a switch assembly including a dish and slotted snap-acting thermostatic element which has one or more relatively inert portions

at which said element is welded to the terminal stud and/or to a contact thereon.

Other and further objects of the invention will be mentioned or will be apparent to those skilled in the art by the following description.

The aforementioned and other objects of the invention are embodied in a thermostatic switch device comprising a base plate provided with a pair of spaced non-circular openings, one of which is larger than the other, a switch arm assembly including a terminal stud fastened to said base plate and having a non-circular portion within the smaller non-circular opening in said base plate and including a snap-acting thermostatic switch arm fastened at one end to said stud and having a contact on its other end, a contact assembly including a terminal stud having a head carrying a contact eccentrically located with respect to said stud and having a non-circular portion within and spaced from the larger opening in said base plate, an insulating bushing around said non-circular portion of said contact assembly and within the larger opening in said base plate, and a cover member fastened to said base plate and having an abutment extending toward the contact carrying end of said switch arm to limit the snap-acting movement thereof.

Reference is now made to the accompanying drawing wherein similar reference characters designate similar elements and wherein:

Fig. 1 is an end view of the thermostatic switch device according to the invention.

Fig. 2 is a vertical cross-section of said thermostatic switch device taken on the line 2—2 of Fig. 1.

Fig. 3 is a plan view of the thermostatic switch device with the cover member removed.

Fig. 4 is a plan view of the switch assembly of my thermostatic switch device.

Fig. 5 is an exploded perspective of the switch device of the present invention.

In the illustrated embodiment of the invention, the thermostatic switch device comprises a base, a contact assembly, a switch assembly, and a cover member all of which will be specifically described hereinafter but which, except for the essential features defined in the claims, may vary considerably in details of construction.

The base may comprise a metallic base plate 10 having an angular bracket portion 11 which is provided with holes 12 and by means of which the switch device may be mounted in any suitable position. Said base is provided with a pair of non-circular openings in which the contact and switch assemblies are mounted. As shown,

the metallic base plate 10 is provided with a square opening 13 and with a larger square opening 14 spaced therefrom. Base plate 10 may also be provided along its margins with apertures 15 for a purpose to be later described.

The contact assembly comprises a terminal stud 16 having a threaded portion 17, a non-circular or square portion 18, and a head 19 and also includes a contact 20 which is fastened to said head 19, preferably by welding, in a position which is eccentric to said stud 16.

If, as shown, the base plate 10 is metallic or of an electrical conducting material, the mounting of said contact assembly or said switch assembly on the base must also insulate at least one of such assemblies from the base. For instance, the contact assembly is insulated from the base by an insulating washer 21 which is placed on the stud 16 or square portion 18 thereof between the head 19 and the base plate 10 and which may be provided with a square opening 22. A non-circular insulating member has an outer contour corresponding to the non-circular opening in the base and is provided with an opening complementary to the non-circular portion of the stud of the contact assembly. Such an insulating member may be a square insulating bushing 23 which fits into the larger opening 14 in base plate 10 and which is provided with a square opening 24 for receiving the square portion 18 of terminal stud 16. An insulating paper sheet 25 with flaps 26 and 27 and an insulating plate 28 complete the insulation, are placed adjacent the other side of base plate 10, and are provided respectively with spaced holes 29 and 30 through which the terminal studs of the contact and switch assemblies extend. A washer 31 and nut 32 are placed upon the terminal stud 16 and the nut 32 is tightened to secure the contact assembly to the base. It should be noted that portions or the corners of head 19 extend beyond the larger square opening 14, see Fig. 3, so that when nut 32 is tightened the pressure of said head is at least partially exerted directly upon the base plate 10 and the insulating washer 21 is under a compressive stress rather than shear and insulating bushing 23 is not compressed.

The switch assembly comprises a terminal stud and a switch arm fastened thereto. Such a terminal stud 33 has a flange 34, a non-circular or square portion 35 adjacent thereto, and a threaded portion 36. The switch arm may be of any known thermostatic type or such as to move as the temperature thereof changes. Preferably such switch arm is of the snap-acting type so as to minimize arcing when contact is broken and may be composed of bimetallic material. As shown, the bimetallic switch arm 37 is rectangular in outline and is dished to be concave on the side of the metal having the greater coefficient of expansion. Said switch arm 37 is provided with two diverging slots 38 and is gathered to form the crimped portions 39 at the end of each slot and at the corners of the arm 37. Said crimped portions 39 in the bimetallic arm 37 give the same its concave formation so that, when heated to a predetermined temperature, said switch arm 37 abruptly reverses its curvature in a well understood manner.

When the switch arm 37 is formed in the manner just described, there are one or more points thereon which are relatively inert or which may be called "dead spots." One such relatively inert portion of switch arm 37 is located between said crimped portions 39 and another occurs at the

opposite end of arm 37 centrally thereof. A contact 40 is fastened to arm 37 at one of such inert portions preferably by a spot weld 41. The switch arm 37 is also mounted upon the terminal stud 33 at another such dead spot. The end of terminal stud 33 may be turned down to a ferrule which is inserted through arm 37 and spun over to form a rivet 42. A pair of spot welds 43 are made between switch arm 37 and terminal stud 33 adjacent rivet 42 and such welds 43 prevent arm 37 from rotating with respect to stud 33 around the rivet 43 and also increase the conductance or decrease the millivolt drop between said switch arm 37 and terminal stud 33. Furthermore, since the spot welds 41 and 43 are in relatively inert portions of switch arm 37, any loss of temper or strains set up in arm 37 by the welding do not affect the operation or operating characteristics of said thermostatic switch arm 37.

The terminal stud 33 of the switch assembly extends through the non-circular or square opening 13 in the base plate 10 and also through the holes 29 and 30 in paper sheet 25 and insulating plate 28. A washer 44 and nut 45 are placed over the threaded portion 36 of stud 33 and the nut 45 is tightened to fasten said switch assembly upon the base with said contact 40 normally or at room temperature engaging said contact 20 of said contact assembly.

One particular feature of the invention which contributes greatly to the ease of assembling the switch device is the arrangement of the non-circular portions of the terminal studs with respect to the eccentrically located contact 20 of the contact assembly and the switch arm 37 of the switch assembly so that engagement of such non-circular portions of the studs with the non-circular openings in the base readily and precisely locates the two assemblies so that their respective contacts 20 and 40 are in good alignment when the assemblies are mounted upon said base. Also the eccentricity of contact 20 with respect to the terminal stud 16 permits the use of a relatively short snap-acting bimetallic switch arm 37, which is preferable for reasons of cost and operating characteristics, but because of such eccentricity the terminal studs 16 and 33 are spaced sufficiently for ease in manipulation of the respective nuts 46 and 47 to fasten the conductor terminals 48 and 49 to said studs 16 and 33.

While the non-circular openings in the base and the noncircular portions on the terminal studs are shown as square, it must be understood that such openings and stud portions may be of any form to co-operate with each other and definitely locate said contact and switch assemblies in predetermined positions upon the base. Furthermore, the non-circular openings in the base may be of the same size if there is no need of insulating the terminal stud from the base or if the base is made of insulating material.

For the purpose of protecting the switch device from dirt and/or damage, and for providing a back stop for the switch arm, a cover member 50 is placed over the switch device. Such a cover member 50 is channel-shaped and has a plurality of tongues 51 which extend through the apertures 15 in the base plate 10 and which may be bent over as shown in Fig. 1 to fasten said cover member 50 to the base plate 10. An abutment is formed from said cover member 50 as by embossing a strip 52 with a boss 53 from said cover member 50. Said strip 52 extends inwardly of cover member 50 and the boss 53 is located to engage the back of switch arm 37 when it snaps into its reversed

position and to limit the amount of such reversal. By providing such an abutment, the time for re-engagement of the switch can be controlled and said time for re-engagement may be regulated by further deformation of said strip 52 to change the position of boss 53 either nearer to switch arm 37 to shorten the time of re-engagement or farther away from switch arm 37 to lengthen said time of re-engagement.

Since many modifications of said thermostatic switch device may be made without departing from the spirit of the invention, the present disclosure is to be considered as illustrative and the scope of the invention is defined in the appended claims.

I claim:

1. A thermostatic switch device comprising a base, a contact assembly on said base including a contact, a switch assembly on said base and including a thermostatic switch arm having a contact end normally engaging said contact and, when heated to a predetermined temperature, moved out of engagement with said contact, and a cover member on said base and having an integral deformable portion opposite the contact end of said switch arm to limit its movement away from said contact.
2. A thermostatic switch device comprising a base provided with a pair of spaced openings having their centers in spaced relation, a switch assembly including a thermostatic switch arm carrying a contact and having an effective length less than the spacing between the centers of said openings and including a terminal stud extending through one of said openings and fastened to said base, and a contact assembly including a head, a second terminal stud extending through the other of said openings and fastened to said base, and a contact fixed on said head and eccentrically located with respect to said second terminal stud in the direction toward the first mentioned stud with the center of the contact on said head substantially opposite the center of the contact on said switch arm.
3. A thermostatic switch device comprising a base provided with a pair of spaced openings, a contact assembly including a head, a terminal stud having a center line and extending through one of said openings in said base, and a contact on said head and with its center eccentrically located with respect to said center line, and a switch assembly including a terminal stud also having a center line and extending through the other opening in said base and including a thermostatic switch arm on said stud and having a contact point for engaging said contact, the eccentricity of said contact extending toward the stud of said switch assembly so that the spacing of the center lines of said terminal studs is greater than the distance on said switch arm from its contact point to the center line of said terminal stud of said switch assembly.
4. A thermostatic switch device comprising a base provided with a pair of spaced non-circular holes, a contact assembly on said base and including a head, a non-circular portion complementary to one of said holes, and a contact on said head and eccentric to said portion in the direction toward said other hole when said portion is within said one hole, and a switch assembly on said base and including a stud having a non-circular portion complementary to said other hole and a switch arm fastened to said stud in relative position to the portion thereof to extend toward said contact.
5. A thermostatic switch device comprising a base provided with a pair of spaced non-circular holes, and a contact assembly on said base and including a head, a non-circular portion complementary to one of said holes, and a contact on said head and eccentric to said portion in the direction toward said other hole when said portion is within said one hole.
6. A thermostatic switch device comprising a base plate of conducting material and provided with a non-circular hole, a contact assembly on said base and including a head and a non-circular portion complementary to but smaller than said hole, and a non-circular bushing around said portion and within said hole and composed of an insulating material.
7. A thermostatic switch device comprising a base plate of conducting material and provided with a non-circular hole, a contact assembly on said base and including a head and a non-circular portion complementary to but smaller than said hole, a non-circular bushing around said portion and within said hole and composed of an insulating material, and a pair of insulating members on each side of said base plate and larger than said hole therein.
8. A thermostatic switch device comprising a base plate of conducting material and provided with a non-circular hole, a contact assembly on said base and including a head and a stem having a non-circular portion complementary to but smaller than said hole, a non-circular bushing around said portion and within said hole and composed of an insulating material, an insulating washer between said head and said plate and larger than said hole therein, an insulating plate on the opposite side of said base plate and covering said hole therein, and fastening means engaging said stem and for holding said head against said insulating washer.
9. A thermostatic switch device comprising a base plate of conducting material and provided with a polygonal hole, a contact assembly including a head and a stem attached thereto and having a polygonal portion smaller than said hole adjacent said head and having a threaded portion, an insulating bushing having a polygonal periphery complementary to said hole and provided with an opening which is complementary to the polygonal portion on said stem, an insulating washer between said head and said base plate, a nut member on the threaded portion of said stem for drawing said head and washer toward said plate, and an insulating plate between said base plate and nut member.
10. A thermostatic switch device comprising a base plate provided with a non-circular hole, a terminal stud fastened to said base plate and having a non-circular portion complementary to and within said non-circular hole, a thermostatic switch arm, a riveted connection located coaxially of said stud and for fastening said switch arm thereto, and a welded connection between said switch arm and said stud and located to one side of said riveted connection and eccentrically of said stud.
11. A thermostatic switch device comprising a base plate provided with a hole, a terminal stud fastened to said base plate and extending through said hole for attachment to an electrical connection, a dished thermostatic switch arm provided with slots and having portions which reverse their curvature at a predetermined temperature and having a portion displaced from said slots and the area therebetween and which

is relatively unaffected by changes in temperature, and a welded connection between said stud and said unaffected portion of said switch arm.

12. A thermostatic switch device comprising a base plate provided with a hole, a terminal stud fastened to said base plate and extending through said hole for attachment to an electrical connection, a dished and slotted thermostatic switch arm having portions which reverse their curvature at a predetermined temperature and having portions at opposite ends thereof which are relatively unaffected by changes in temperature, a welded connection between said stud and one of said unaffected portions of said switch arm, and a contact welded to the other unaffected portion at the other end of said switch arm.

13. A thermostatic switch device comprising a base plate, a contact mounted upon said base plate, a snap-acting thermostatic switch arm mounted at one end on said base plate carrying at its other end a contact normally engaging said contact, and adapted to separate said contacts rapidly when heated to a predetermined temperature, and a cover member attached to said base plate and having a deformable portion opposite

said contact for abutting the free end of said switch arm to limit its movement away from the first-mentioned contact.

14. A thermostatic switch device comprising a base plate provided with a pair of spaced non-circular openings, one of which is larger than the other, a switch arm assembly including a terminal stud fastened to said base plate and having a non-circular portion within the smaller non-circular opening in said base plate and including a snap-acting thermostatic switch arm fastened at one end to said stud and having a contact on its other end, a contact assembly including a terminal stud having a head carrying a contact eccentrically located with respect to said stud and having a non-circular portion within and spaced from the larger opening in said base plate, an insulating bushing around said non-circular portion of said contact assembly and within the larger opening in said base plate, and a cover member fastened to said base plate and having an abutment extending toward the contact carrying end of said switch arm to limit the movement thereof.

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