Oct. 4, 1949. P. E. WILLMAN 2,483,685

IMPACT THERMOSTATIC SWITCH

Filed May 13, 1947 2 Sheets-Sheet 1

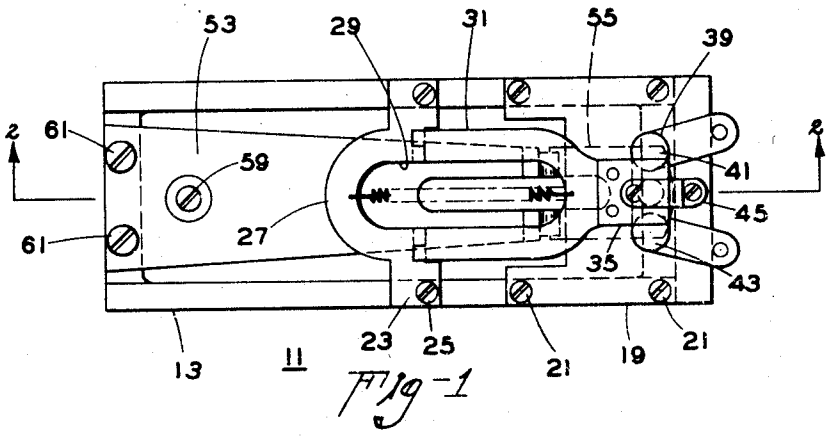

Fig-1

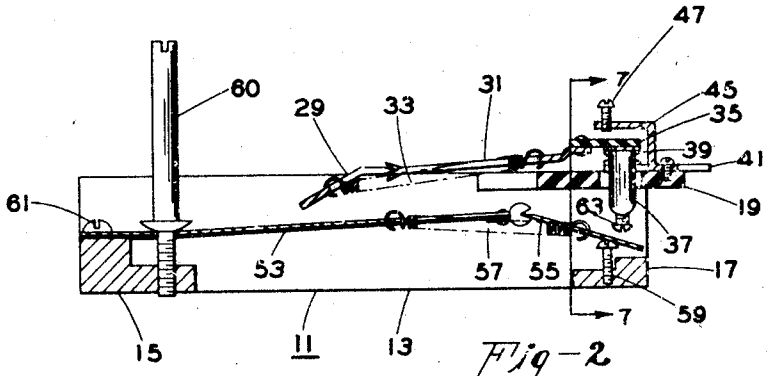

Fig-2

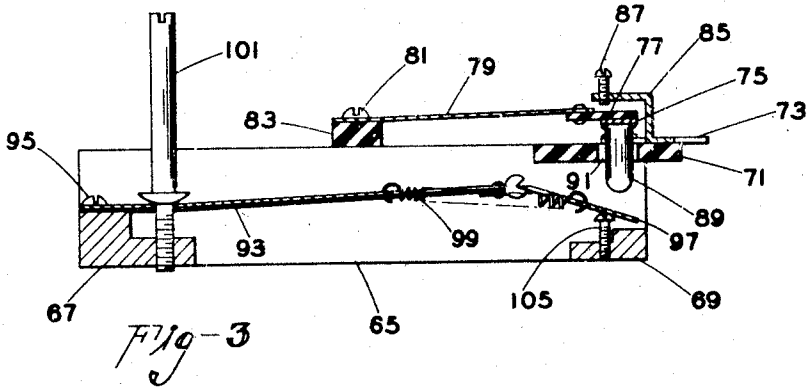

Fig-3

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IMPACT THERMOSTATIC SWITCH

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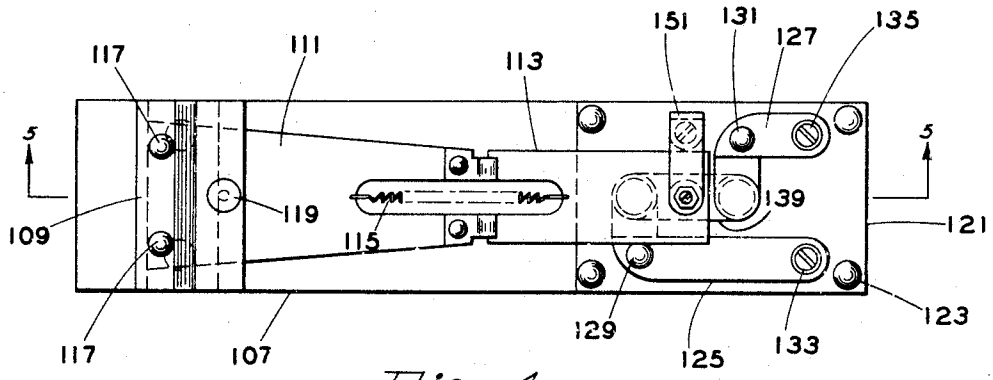

Fig-4

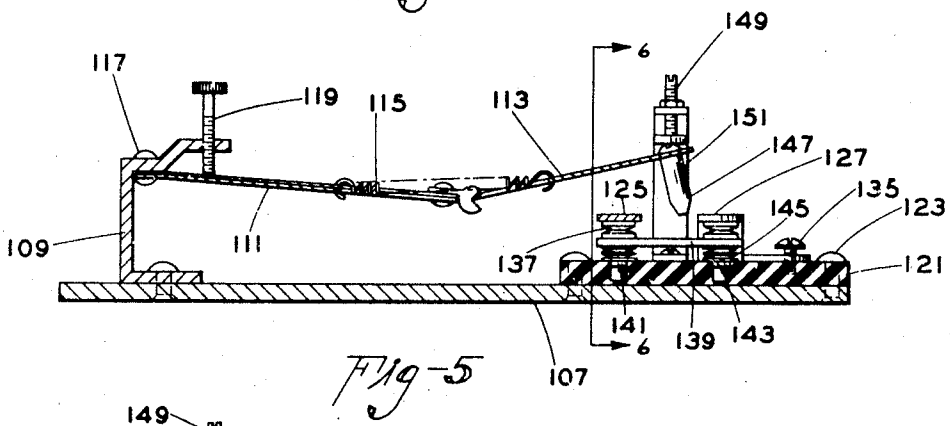

Fig-5

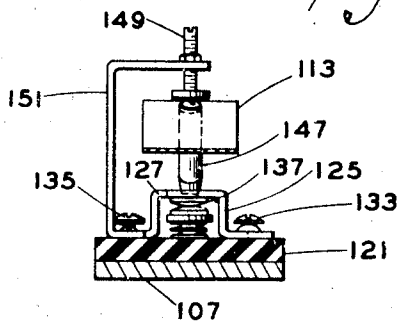

Fig-6

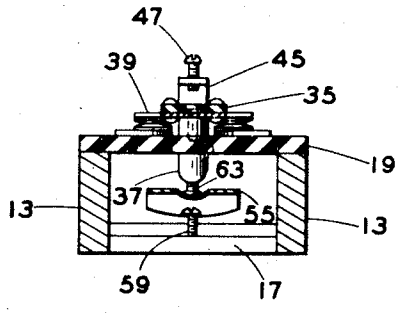

Fig-7

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IMPACT THERMOSTATIC SWITCH

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1 Claim. (Cl. 200—138)

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My invention relates to thermal switches and particularly to snap-acting thermal switches.

An object of my invention is to provide a novel thermal switch.

Another object of my invention is to provide a novel thermal switch comprising a minimum number of parts.

Another object of my invention is to provide a snap-acting thermal switch in which the pressure between the contacts is maintained constant until the instant of their separation.

Other objects of my invention will either be apparent from a description of several forms of device embodying my invention or will be set out in the course of such description and more particularly be set forth in the appended claims.

In the drawings,

Figure 1 is a top plan view of one form of device embodying my invention,

Fig. 2 is a vertical longitudinal section therethrough, taken on the line 2—2 of Fig. 1,

Fig. 3 is a view in vertical longitudinal section through another form of device embodying my invention,

Fig. 4 is a top plan view of still another form of device embodying my invention,

Fig. 5 is a vertical longitudinal section therethrough, taken on the line 5—5 of Fig. 4,

Fig. 6 is a vertical lateral section, taken on the line 6—6 of Fig. 5, and,

Fig. 7 is a view in vertical lateral section, taken on the line 7—7 of Fig. 2.

Referring first of all to Figs. 1, 2 and 7, I have there shown a snap-acting thermal switch designated generally by numeral 11, comprising a metallic frame 13 of substantially hollow rectangular outline. The rectangular frame 13 comprises a lateral cross bar 15 at one end of the frame and a second cross bar 17 extending across the other end of the frame 13. Cross bars 15 and 17 are narrower than the longitudinal walls of the frame 13.

I provide a relatively small plate 19 of electric-insulating material, which member 19 is secured against that end of frame 13 where member 17 is also located, member 19 being secured against the upper surface of frame 13 by a plurality of screws 21 extending through member 19 and into member 13. I provide further a small frame member 23 which is secured against the upper surface of frame 13 by a plurality of screws 25. Member 23 is preferably made of brass and has an arcuate inner portion 27 for a purpose to be hereinafter set forth.

I provide a toggle comprising a first, relatively short, fixed arm 29 (which is member 23) and a second, relatively long, movable arm 31 together with a tension coil spring 33 connected to the two arms intermediate their ends. The arm 31 is pivotally mounted on the sharpened

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end of arm 29 and has secured thereto at its right-hand end a small bar or plate 35 of electric-insulating material, which plate is adapted to support an impact member 37 as well as a contact bridging member 39, both adjacent its lower surface. The contact bridging member 39 is adapted to be held in close engagement with two fixed contacts 41 and 43 secured against the upper surface of plate 19, more particularly by spring 33. A stop means 45 of substantially Z-shape is secured to the upper surface of plate 19 and is provided with an adjustable stop 47 in the shape of a relatively small machine screw.

I provide a second toggle comprising a first, relatively long, toggle arm 53 which is made of bimetal and which has pivotally secured thereto a second toggle arm 55, a spring 57 being connected to the two arms intermediate their respective ends. I provide further a stop or adjusting screw 59 in member 17 whereby it is possible to adjust within certain limits the temperature at which snap-acting movement of the second arm 55 will occur in an upward direction. I may secure the first toggle arm 53 against the upper surface of member 15 as by a plurality of screws 61. An adjusting screw 60 having screw-threaded engagement with cross bar 15 permits of adjusting the temperature at which bimetal bar 53 will operate. The construction and adjustment of the parts of the switch is such that the normal position of all of the parts are substantially as shown in Fig. 2, that is, the contact bridging member 39 is normally in spring-pressed engagement with the contacts 41 and 43. The bimetal bar 53 will occupy substantially the position shown in Fig. 2 but will be moved in a clockwise direction upon, say, an increase of temperature until suddenly arm 55 will move upwardly into engagement with an adjusting means 63 in member 37 with an impact which will cause sudden disengagement of the contact bridging member 39 from the fixed contacts 41 and 43. The contact bridging member 39 will be held out of engagement with the fixed contacts 41 and 43 until the temperature to which particularly the bimetal arm 53 is subject has been reduced sufficiently to cause the bimetal arm 53 to move in a counter-clockwise direction with the result that at a certain temperature arm 53 and arm 55 will move backwardly into substantially the positions shown in Fig. 2 of the drawings. As is shown in Fig. 2, the tension center line of spring 33 passes below but close to the supporting pivot of arm 31. When the switch has operated (by arm 55 striking screw 63 and lifting arm 31) this center line lies even closer to the pivot but still lies below it to supply the downward force for closing the contacts when arm 55 snaps back to its normal position.

Referring now to Fig. 3 of the drawings, I have

there shown a modified form of device embodying my invention and comprising a hollow rectangular metal frame designated by numeral 65, having at its left-hand end a cross member 67 as well as a cross member 69 at its right-hand end. I provide a small bar or plate 71 of insulating material which may be secured as by screws (not shown), which plate is adapted to have secured against its upper surface a pair of fixed contact members 73. A contact bridging member 75 is adapted to have engagement with the innermost surfaces of the pair of fixed contacts 73, contact bridging member 75 being secured to the under surface of a small block 77 of electric-insulating material, which block is secured to the free end of a leaf spring 79. Spring 79 has its fixed end secured as by a screw 81 to a bar 83 of electric-insulation secured against the upper surface of the side walls of frame 65. A stop member 85 of substantially Z-shape is secured against the outer end of plate 71 and has a small machine screw 87 extending therethrough, against which plate 77 may abut when the contact bridging member 75 has been moved out of engagement with fixed contact members 73. An impact member 89 secured to contact bridging member 75 extends through an opening 91 in plate 71.

I provide a bimetal arm 93 secured as by one or more screws 95 against the upper surface of member 67. A second toggle arm 97 is pivotally mounted on the outer end of arm 93, the two arms being held by a tension coil spring 99, the coil spring being connected to the two arms 93 and 97 at points intermediate their respective ends. I provide means for adjusting the operating temperature comprising a manually adjustable screw 101 which has screw-threaded engagement with member 67. I provide an adjusting screw 105 in member 69 to fix the temperature differential of the snap-acting toggle arm comprising arms 93 and 97 and spring 99.

Referring now to Figs. 4 through 6, I have there shown a still further modification of a device embodying my invention and embodying a flat longitudinally extending plate 107. Plate 107 has secured thereto at, say, its left-hand end, a member 109 of substantially channel shape for supporting one arm 111 of bimetal, of a double arm toggle, in addition to a second arm 113 as well as a tension coil spring 115. The left-hand end of arm 111 is secured to the upper portion of member 109 as by a plurality of rivets 117. An adjusting screw 119 is also supported by the upper part of member 109 in order to permit of varying the operating temperature at which snap-acting movement of the arms 111 and 113 will occur from the positions shown in Fig. 5.

I provide a small block 121 of electric-insulating material which may be held against the upper surface of member 107 as by a plurality of rivets 123. Block 121 is provided with a plurality of fixed contact members 125 and 127 which may be held in proper operative position against the upper surface of plate 121 by suitable rivets 129 and 131. Fixed contact members 125 and 127 are provided with screws 133 and 135 to permit of securing leads thereto. The fixed contact members 125 and 127 extend upwardly and then horizontally and have contact terminals 137 secured to their under surfaces.

I provide a movable contact bridging member 139 which is mounted on a pair of rods 141 and 143 vertically movable in openings in member 121. Contact bridging member 139 is held in close operative engagement with the fixed contact members 125 and 127 by springs 145 encircling the rods 141 and 143. The springs will hold the contact bridging member in close operating engagement with the fixed contact members 125 and 127 until an impact member 147 secured to the outer end of the second arm 113 strikes the contact bridging member 139 upon snap-acting movement of arm 113 when a certain predetermined temperature is reached. I provide further an adjusting member 149 in a channel-shaped bracket 151 by means of which the temperature differential of operation of the double arm toggle comprising the bimetal arm 111 and the arm 113 may be adjusted.

It is evident that the various structures comprising my invention cause first of all a snap-acting movement of the second arm of a toggle and that in two of the forms of device embodying my invention the impact member receives a sudden blow by one of the arms of the toggle after said arm has been set in motion. In the other form, namely, that shown in Fig. 5 of the drawings, the impact member receives a blow by a moving toggle arm and causes a contact bridging member to be disengaged from fixed contact members, this disengagement occurring only after the toggle arm has been set in motion, so that it will not strike the impact member until it has been caused to move at relatively high speed so that the interruption of the engagement between the fixed and the movable contacts will take place at relatively high speed. It is further evident that the pressure of engagement between the fixed and movable contacts is not decreased before the instant of entire and sudden disengagement of the two contacts.

Various modifications may be made in the device embodying my invention without departing from the spirit and scope thereof and I desire that all such modifications coming clearly within the scope of the appended claim shall be considered a part of my invention.

I claim as my invention:

A thermostatic switch comprising a pair of fixed contacts, a contact bridging member insulatedly mounted on one end of a toggle arm, a second fixed toggle arm, a tension spring connected to said toggle arms holding said bridging member in close engagement with said contacts, a bimetal bar having one end thereof fixed, constituting one arm of a second toggle, a second toggle arm for said second toggle, a tension spring connecting the arms of said second toggle, said bimetal bar causing snap-acting movement of said second toggle arm of said second toggle into abutment with said contact bridging member at a predetermined temperature and disengagement thereof from said fixed contacts, and a stop for said first toggle arm for preventing it, when said contact-bridging member is so operated, from moving over center.

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