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H. GARBERS

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SAFETY SWITCH

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FIG. 1

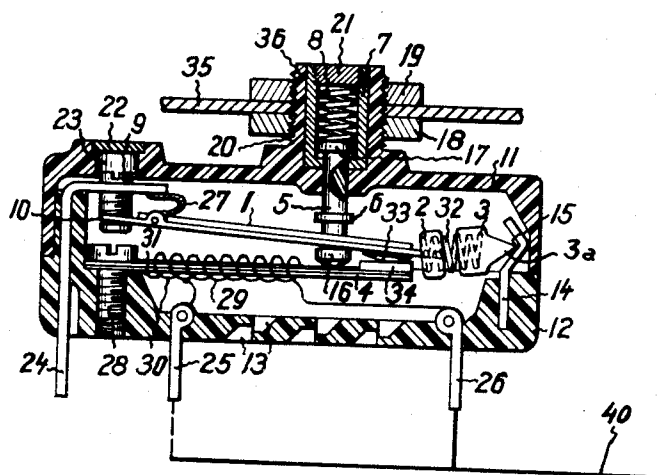
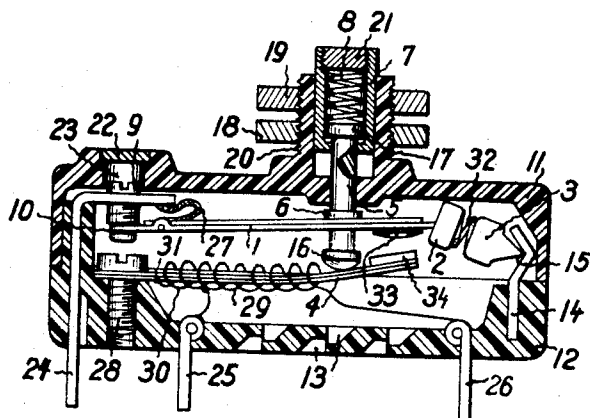


FIG. 2



Inventor:

HELMUT GARBERS

By Taulmin & Taulmin

Attorneys

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SAFETY SWITCH

Helmut Garbers, Neumunster, Germany, assignor to Licentia Patent-Verwaltungs-G.m.b.H., Hamburg, Germany

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5 Claims. (Cl. 200—122)

This invention relates to automatic safety switches. More in particular this invention relates to automatic safety switches with heat actuated contacts consisting of bi-metal strips or other devices responding to a heat actuation by a snap switching action.

It is known in the art to control electrical appliances and prevent them from being destroyed by overloading. To achieve this purpose apparatus have been devised consisting mainly of a control member and a switching member. Both members are provided with contacts. An overloading of the particular electrical appliance results in an actuation of the control member and this actuation is transmitted to the switch member by means of the contacts whereby the switch member is caused to switch off the electrical appliance.

In most of these devices the switch means do not reassume their initial position so as to close the circuit and restart the operation of the electrical appliance after the condition causing the interruption of the switch has subsided. Rather, after the temporary overloading condition has actuated the control member in the known switch means and the member has once brought the switch means into the switch-off position, this position is retained even after the heat-actuated member has cooled down.

It is true that, in many instances, it is undesirable to provide for an automatic reclosing of the circuit because the switching in of the appliance is to be supervised and effected by a supervising person.

For these reasons the afore mentioned safety switch devices known in the art have been provided with an independently operable switch means consisting of a push button or a key by means of which the snap member of the switch can be readjusted to its initial position thus closing the circuit at will. These known safety devices suffer from the considerable disadvantage that the snap device can be readjusted to close the circuit even though the initial actuating cause, i.e. the overload condition of the electrical appliance and the resulting production of heat transmitted to the control member has not yet subsided. As a result, the protection of the electrical appliance offered by the automatic operation of the control member and the snap switching member can be interfered with by the supervising person through the independently operable push button or key device. As a result, the electrical appliance can be destroyed by holding the circuit closed contrary to the tendency of the control member, for example a bi-metal strip, to effect the switch-off through the snap switch.

It is an object of the present invention to provide for an improved safety switch.

It is a further object of the present invention to provide for an improved safety switch wherein the automatic switching off operation cannot be interfered with against the tendency of the control member to switch off the appliance protected by the switch.

These objects are achieved and the problem for which the devices known in the art are unsatisfactory, is solved by the following device of the present invention. The

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push button or key means is provided with an energy-storing member adapted to store up a determined amount of energy produced by pressing the key or the button. This pent-up energy is sufficient to produce a force, whereby the position of the snap switching means can be changed if only the inertia of the latter has to be overcome. It is not sufficient, however, to change the position of the latter whenever it is supported in its interrupted position by an additional force imparted to it by the heat actuated control member. As a consequence, it is possible to reset the snap switch to its initial position by pressing the key if the circuit is not overloaded, and hence there is no thermal energy produced; but it is not possible to reset the switch, whenever the inertia of the switch is supported by the force of the heat-actuated control member.

The invention will be more fully comprehended by the following detailed description taken in conjunction with the accompanying drawings wherein,

Figure 1 is a sectional elevational view of the apparatus of the invention showing the first end position of the switch, control and key devices.

Figure 2 is a sectional elevational view of the apparatus of the invention showing the second end position of the switch, control and key devices.

Within the casing consisting of an upper part 11 and a lower part 12 there is arranged a snap lever 1, 2, 3 provided with a contact 33 and constituting the switch device. Also within the casing and in parallel direction below the snap lever there is arranged a bi-metal strip 4 having a contact 34 directly opposed to the contact 33 of the snap lever 1, 2, 3 constituting the control device.

The casing has openings 13 admitting air and thus allowing warm air to reach the bi-metal strip 4.

The snap switching device comprises a lever 1 being supported at one end in the recess 10 of a screw 9. The other end of the lever 1 is displaceably positioned in a cap 2. A second cap 3 is supported in the recess 15 of a support member 14 with its end 3a opposite to the end facing the first cap. Between cap 2 and cap 3 there is arranged a pressure spring 32. The two end positions of the snap switching device are shown in Figure 1 and Figure 2, respectively.

In the upper part 11 of the casing there is mounted a cylinder shaped hull 36. This hull may form an integral part of the upper part of the casing 11. The hull is provided with a threading 20 engaged by two screw nuts 18 and 19 by means of which the entire device can be clamped to a wall 35. A cylindrical body 7 is slidably positioned within the cylindrical hull 36. A piston 17 mounted on bolt 5 is positioned within the cylinder 7. A spring 8 is arranged between the surface of the piston and the cover plate 21 screwed to the upper end of the cylindrical body. The bolt 5 leads into the interior of casing 12 and is provided with a first annular flange 6 and a second or head flange 16 serving as a pestle and cooperating with the bi-metal strip 4.

The bolt 5 is led through a corresponding hole in the snap lever 1 which lever is joined to the circuit by means of a flexible conductor 27 connected with the current junction 24. The bi-metal strip 4 is fastened to the lower part of the casing 12 by screw 28. Additional junctions 25 and 26 are connected with the heater windings 29 and 30 coiled around the bi-metal strip 4 and also lead to the outside of the casing where they constitute the connections for the supply line 40. The recess bearing 10 can be adjusted by turning the screw 9 in order to adjust the initial position of the snap switching means 1, 2, 3. By turning the screw 9 to withdraw the same outwardly from the casing the initial position of the lever 1 and thereby the entire lever switching device 1, 2, 3

is raised, and thereby a greater amount of heat and a greater bending of the bi-metal strip corresponding to a higher temperature will still retain the contact 34 in contacting position with contact 33. By turning the screw 9 it is thus possible to regulate the contact means 1, 2, 3 so as to correspond to a predetermined value. The adjustment of the screw as well as its insertion into the casing is performed through the opening 23 which can be covered by a plate 22 after the screw has been inserted or its adjustment has been completed.

The various junctions 24, 25, 26 serve the function of obtaining a varying heating of the bi-metal strip, according to whether an electrical appliance must be controlled at the switch-in moment or during its operation. For this purpose only the winding 29 or both the winding 29 and the winding 30, or only the winding 30 can be connected to the circuit. The end of the entire winding is connected with the bi-metal strip at 31. The connection 31 can be obtained by spot welding. The entire circuit comprises the windings or at least one of the windings, 29 and 30, the bi-metal strip 4, the contacts 34 and 33, the contact lever 1, the flexible connection 27 and the line 24.

The operation

Whenever an excessively elevated electric current results in a heating of the bi-metal strip 4 causing the same to bend, thereby bringing the contact means 1, 2, 3 into the position shown in Figure 2, the contacts 33 and 34 are being separated. At the same time the bolt 5 is moved in upward direction and consequently the key means described in detail further above with its cover 21 protrudes from the hull 36. As soon as the bi-metal strip 4 has cooled down and reassumes its initial position shown in Figure 1 of the drawings the contact lever 1, 2, 3 remains in the position shown in Figure 2. It can be reset to the position of Figure 1 by pressing the key 21 into the cylindrical shaped body 7. If this is done, the flange 6 of the bolt 5 takes along the contact lever 1 and results in a snap switching action of the same.

As long as the bi-metal strip 4 is continued to be heated the bent up position of the strip will be maintained. Since the force exerted by the heated strip upon the top part 16 of the bolt 5 is greater than the force produced by the spring 8 and imparted to the piston 17 on the other end of bolt 5, the pressing down of the key does not alter the position of bolt 5 but only results in energizing the spring 8 by pressing the same against the piston 17 of bolt 5. As a consequence the bi-metal strip remains in its bent up position as shown in Figure 2 and a snap switching action of the lever 1, 2, 3 is prevented.

For these reasons a pressing of the key does not result in a switching of the lever and a closing of the circuit which has been interrupted by the heat actuation of the bi-metal strip 4, as long as this actuation of the bi-metal strip by the excessive heat prevails. It is, therefore, impossible for an operating person, to interfere by means of the key device, with the automatic interruption of the circuit caused by an overloading of the circuit and the electrical appliance, and any damage to the electrical appliance by interfering with the automatic control operation is avoided.

The invention can be applied particularly to electrical household appliances but it is not confined to an application thereto. It can be used in all electrical devices and appliances where the bi-metal strip is excited only by heat entering from the outside without special heat windings. By applying the present invention, for example, to the motor of an overloaded household appliance, it will become impossible to force the appliance into a continued operation and thereby damage the same.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions, and, accordingly, it is desired to compre-

hend such modifications within this invention as may fall within the scope of the appended claims.

What I claim is:

1. A safety switch for closing and breaking contact in an electric current circuit, comprising in combination, a switch member, an automatic control member which is deformable automatically in response to a predetermined heat stimulus and, when deformed thereby, actuating said switch member to interrupt said circuit, and key means operable at will independently of said stimulus and comprising a reset member comprising a push button which is movable to and fro in the direction of the deflection of said switch member and operatively associated with both said switch member and said control member in such a manner that when said push button is moved in one direction it engages only said control member and that when said push button is moved in the opposite direction it engages both said switch member and said control member, said push button being adapted to actuate said switch member to switch back to circuit-closing position, upon operation of said key means, only while said control member is not deformed.

2. A safety switch for closing and breaking contact in an electric current circuit, comprising in combination, a switch member, an automatic control member which is deformable automatically in response to a predetermined heat stimulus and, when deformed thereby, actuating said switch member to interrupt said circuit, and key means operable at will independently of said stimulus and comprising a push button reset member engaging said control member at all times and being adapted to cause said switch member to switch back to circuit-closing position, upon operation of said key means, only while said control member is not deformed, means for storing energy connected to said key means, said energy storing means being capable of absorbing a predetermined amount of energy produced by operating the key, which absorbed amount is equivalent to the inertia of said switch member taken alone and inferior to the sum of said inertia and the energy produced by said control member when being deformed and acting upon said push button reset member in response to a stimulus.

3. A safety switch for closing and breaking contact in an electric current circuit, comprising in combination, a switch member, an automatic control member which is deformable automatically in response to a predetermined heat stimulus and, when deformed thereby, actuating said switch member to interrupt said circuit, and key means operable at will independently of said stimulus and comprising a reset member engaging said control member at all times, said reset member comprising a bolt, an annular flange, and a head flange, said annular flange being mounted substantially at the middle portion of said bolt, said head flange forming the head end of said bolt, said bolt cooperating with said switch member through said annular flange and cooperating with said control member through said head flange, means for storing energy connected to said key means, said energy storing means being capable of absorbing a predetermined amount of energy produced by operating the key, which absorbed amount is equivalent to the inertia of said switch member taken alone and inferior to the sum of said inertia and the energy produced by said control member when being deformed and acting upon said reset member in response to a stimulus, said key means thereby being adapted to cause said switch member to switch back to circuit-closing position, upon operation of said key means, only while said control member is not deformed.

4. A safety switch for closing and breaking contact in an electric current circuit, comprising in combination, a switch member, an automatic control member which is deformable automatically in response to a predetermined heat stimulus and, when deformed thereby, actuating

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said switch member to interrupt said circuit, and key means operable at will independently of said stimulus and comprising a bolt, an annular flange, and a head flange, said annular flange being mounted substantially at the middle portion of said bolt, said head flange forming the head end of said bolt, said bolt cooperating with said switch member through said annular flange and cooperating with said control member through said head flange, said key means being adapted to cause said switch member to switch back to circuit-closing position, upon operation of said key means, only while said control member is not deformed.

5. A safety switch as described in claim 1, wherein said switch means comprise a switch lever, a first cap, a spring and a second cap, said first cap being hingedly mounted to said switch lever, said second cap connected to said first cap and said spring being interposed between said first and said second cap, an end bar, said end bar having a recessed upper portion, the tip of said second cap

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being supported within said recess, an adjusting screw, said screw having a recessed lower portion, the other end of said lever being positioned in said recess of said screw, and being lowered or raised by turning said adjusting screw in one direction or the other, respectively.

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