No. 831,847. PATENTED SEPT. 25, 1906.

J. ERICKSON.

ELECTROTHERMAL SWITCH.

APPLICATION FILED DEC. 31, 1904.

Fig. 1.

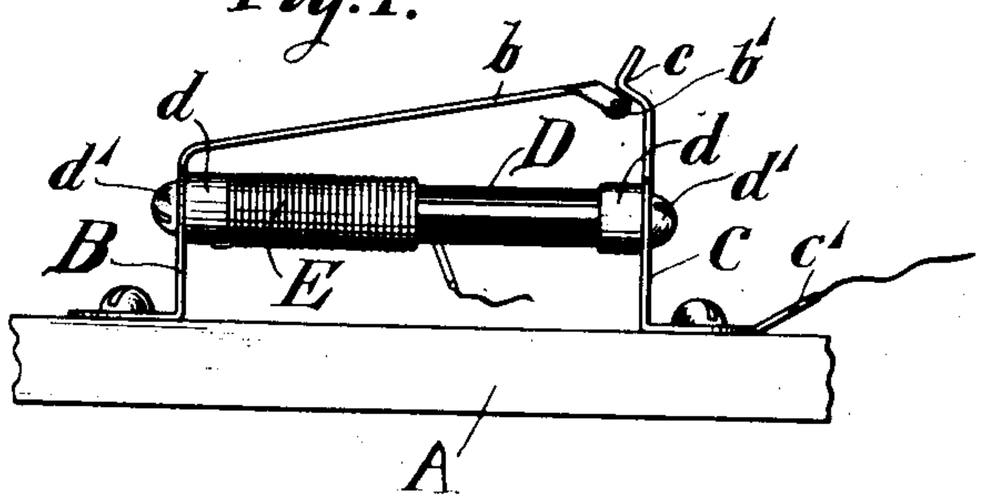


Fig. 2.

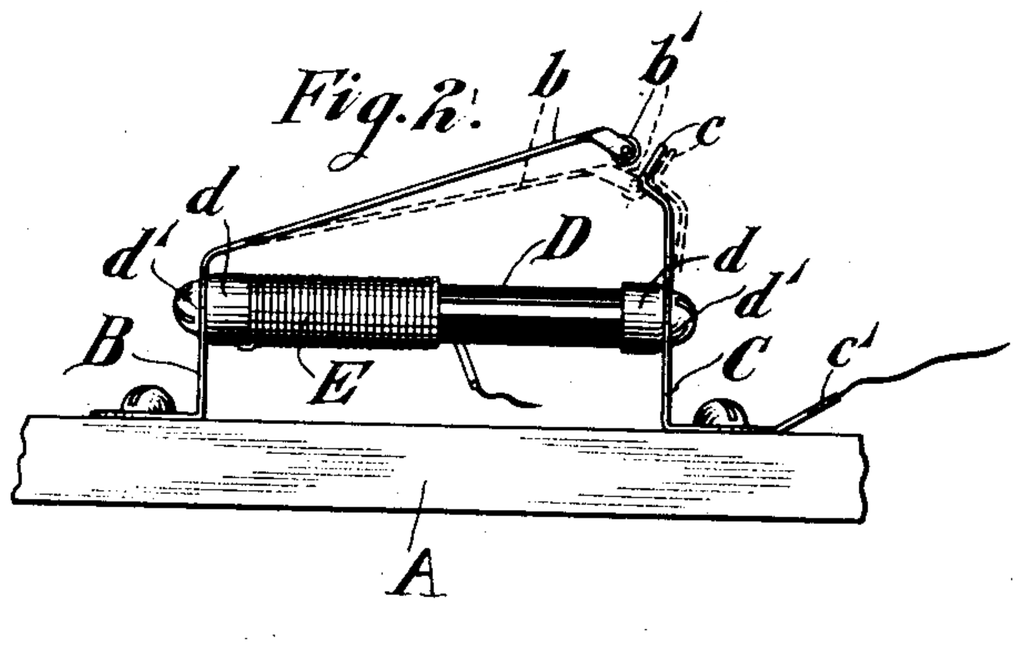
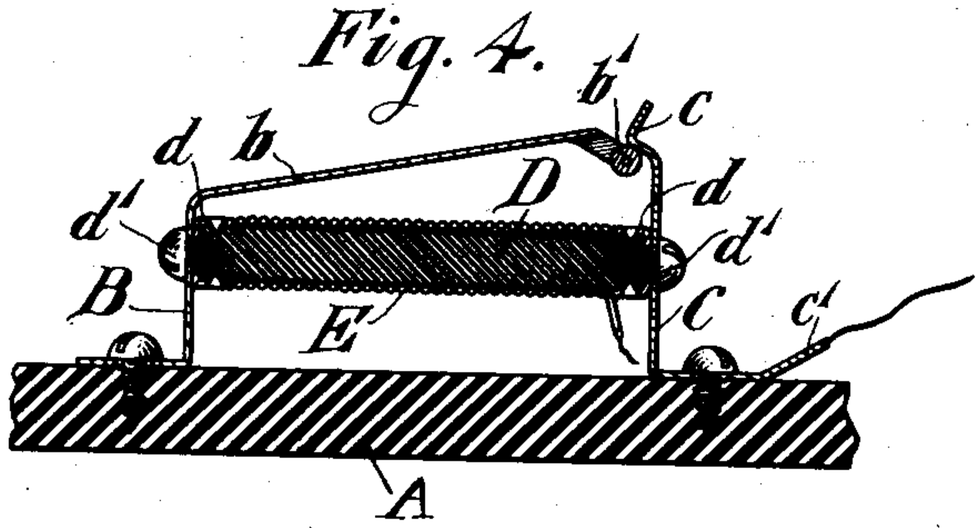


Fig. 3.

Fig. 4.



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ELECTROTHERMAL SWITCH.

No. 831,847. Specification of Letters Patent. Patented Sept. 25, 1906.

Application filed December 31, 1904. Serial No. 239,131.

To all whom it may concern:

Be it known that I, JOHN ERICKSON, a citizen of the United States of America, and a resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Electrothermal Switches, of which the following is a specification.

My invention relates to switches of that particular character in which the circuit-controlling contacts are opened or closed as a result of the heat generated by the passage of current, either of abnormal strength or for an abnormal period of time, through a suitable resistance.

Generally stated, the object of my invention is the provision of an improved, simplified, and highly-efficient electrothermal switch of the foregoing general character.

A special object is the provision of an improved construction and arrangement by which the switch after it has been operated by an abnormal current-flow may be restored to its normal condition without the necessity of repairing or renewing any of its parts.

Another object is the provision of an improved construction and arrangement whereby the switch-contacts are operated by the expansion of a suitable substance—such, for example, as hard rubber or rubber vulcanite—and as a result of the heat generated by the resistance.

A further object is to so construct the switch that a comparatively wide break or separation of the normally closed switch-contacts may be accomplished as a result of only a comparatively slight expansion on the part of the thermal member or expansible substance.

It is also an object of course to provide such details and features of improvement as will tend to increase the general efficiency and serviceability of a device of this particular character.

In the accompanying drawings, Figure 1 is a side elevation of an electrothermal switch embodying the principles of my invention, the said switch being shown in its normal condition and a portion of the winding or heat-coil being shown removed for convenience of illustration. Fig. 2 is a view similar to Fig. 1, but showing the normally closed switch-contacts in their operative or separated condition. Fig. 3 is a perspective of the end portion of one of the switch-contacts. Fig. 4 is a vertical and longitudinal section of the switch shown in the preceding figures.

As thus illustrated, my improved electrothermal switch may be employed in various connections—such, for example, as maintaining the continuity of a circuit until such time as the presence of a trespassing or abnormal current-flow in the circuit shall endanger the apparatus included in said circuit.

As shown, my improved electrothermal switch comprises a suitable base A, preferably of insulating material. Upon the said base two metal springs or flexible supports B and C are mounted and arranged a suitable distance apart. The flexible support B has its upper end portion extended to provide a horizontal or substantially horizontally disposed spring *b*, and the free end portion of this flexible or spring-like member *b* is preferably provided with a small roller *b'*, as shown more clearly in Fig. 3. Preferably the upper end portion of the flexible support C is extended to provide a stop or abutment *c*, against which the roller *b'* may bear, and which thus serves as one of the normally closed switch-contacts. It will be observed that the upper portions of the two flexible supports B and C are preferably rigidly connected or separated by means of a horizontally-disposed thermal member D. The said thermal member may be of any suitable heat responsive or expansible substance—as, for example, hard rubber or rubber vulcanite. If made of such material, the said thermal member preferably has its ends provided with metal caps *d*. The flexible metallic supports B and C can be provided with slots adapted to receive screws *d'*, which latter extend through the said supports and engage threaded openings in the ends of the caps *d*. In this way the opposite ends of the said thermal member are connected with the two flexible supports B and C in such manner as to permit of more or less adjustment and a consequent accurate positioning of the different parts of the switch. Upon the said thermal member a coil of insulated wire E is mounted. As shown, one terminal of said coil is connected with the cap *d*, which is in contact with the support B, while the other terminal is left free or connected with some suitable binding-post on the base.

The spring-support C is provided with a

suitable terminal c', and in this way the circuit includes the normally closed contacts c and b' in series with the coil E. Consequently when sufficient current or a current-flow of sufficient duration passes through the said coil, and consequently through the said contacts, the heat generated by the coil will cause the thermal member D to expand endwise. This will obviously cause more or less separation of the spring-supports B and C—that is to say, these two supports will bend or flex away from each other as a result of the endwise expansion of the said thermal member. Normally the spring b is preferably under tension while the contacts are closed, and it is evident, therefore, that said spring b will fly upward as soon as the springs B and C move apart sufficiently to draw the roller b' out from under the stop or abutment c. In this way only a comparatively slight expansion on the part of the thermal member D is sufficient to produce the comparatively wide gap between the separated contacts. When the coil and the thermal member are allowed to cool upon the cessation of current through the coil as soon as the contacts separate, the thermal member D then contracts and allows the spring-supports B and C to return to their normal positions. After this the spring b can then be pressed downward until the roller b' is again caught and held by the under side of the stop or abutment c.

It will be understood, of course, that the coil E may consist of any suitable amount of wire wound upon more or less of the thermal member D. Also it is obvious that any other suitable resistance may be associated with the said thermal member—that is to say, any form of resistance which will be capable of generating the heat necessary for expanding the said thermal member. Again, it is evident that the switch-contacts may be of any suitable or desired number and character and may be connected and operated by the thermal member in any suitable or required manner.

Obviously my improved switch when operated can be restored to its normal condition without the necessity of repairing or renewing any of its various parts or essential elements. The thermal portion of the switch is self-restoring, so to speak, inasmuch as it is capable of restoring itself to its normal condition, and it will be seen that the said restoration is of such character that everything in the switch, with the one exception of the two normally closed contacts, assume their exact normal or original positions.

It will be seen that the roller b' facilitates or improves the engagement and disengagement of the two contacts with and from each other.

Preferably the spring-supports B and C are under tension, so as to normally subject the thermal member D to a pull or tensile strain, although this is not absolutely necessary. This is preferably accomplished by so constructing and tensioning the arm b that its up-pull tends constantly to crowd or force the supports B and C apart; but when the arm b is released the thermal member D is then subject to an endwise-compressive strain by the pressure toward each other of the supports B and C, so as to insure accurate restoration of all parts to their normal condition.

The upper end of the spring C is preferably beveled, as shown, or provided with some other equivalent means for engaging the roller b' and for facilitating the restoration of the roller to circuit-closing position.

I do not, of course, limit myself to the exact construction shown and described, as the construction can be varied or changed and still retain the novel features and combinations and advantages of my invention.

What I claim as my invention is—

1. An electrothermal switch comprising two flexible metallic supports, the end of one support being extended to provide a stop or abutment, and the end of the other support being extended to provide a spring-arm having its end normally in engagement with said stop or abutment, the said spring-arm being thereby normally under tension, a length of hard rubber or rubber vulcanite disposed horizontally between the said supports, the said length of hard rubber or rubber vulcanite constituting a thermal member and having its ends secured to said flexible supports, the said thermal member normally subject to a tensile strain, but subject to an endwise-compressive strain when the switch is operated, and a suitable resistance associated with said thermal member and connected in series with said spring-arm and stop or abutment, whereby the circuit of the resistance is opened when the thermal member expands, and thereby causes the said spring-arm to disengage itself from the said stop or abutment.

2. An electrothermal switch comprising two flexible metallic supports, the end of one support being extended to provide a switch-contact, and the end of the other support being extended to provide a spring-arm having its end provided with a roller, said roller normally engaging said switch-contact, and thereby constituting a second switch-contact, the two contacts being normally closed, a length of insulating material disposed horizontally between the two supports and provided with end caps which are secured to the said supports, the said insulation thereby constituting a thermal member for operating said contacts, the said thermal member normally subject to a tensile strain, but subject to an endwise-compressive strain when the switch is operated, and a suitable resistance

associated with said thermal member and connected in series with said normally closed contacts, whereby the said contacts are disengaged from each other, and the circuit of said resistance is opened when the two flexible supports are pushed away from each other by the expansion of said thermal member in response to the heat generated by the said resistance.

3. The combination of switch-contacts, a thermal member connected to operate said contacts, and a suitable resistance associated with said thermal member, said contacts including a metal-roller circuit-controlling contact normally in circuit with said resistance, and a beveled contact in the same circuit and normally engaged by said roller.

4. An electrothermal switch comprising switch-contacts, a thermal member for operating said contacts, said thermal member consisting of an endwise-expansible piece of insulating material, and a suitable resistance associated with said thermal member, said contacts including a metal-roller circuit-controlling contact normally in circuit with said resistance, and a beveled contact in the same circuit and normally engaged by said roller.

5. An electrothermal switch comprising switch-contacts, a thermal member for operating said contacts, said thermal member consisting of a rod of hard rubber or rubber vulcanite, the said thermal member normally subject to a tensile strain, but subject to an endwise-compressive strain when the switch is operated, and a suitable resistance wound upon said thermal member, said contacts including a metal-roller circuit-controlling contact normally in circuit with said resistance, and a beveled contact in the same circuit and normally engaged by said roller.

6. An electrothermal switch comprising normally closed switch-contacts, a thermal member, and a suitable resistance associated with said thermal member and connected in series with said normally closed contacts, the said thermal member normally subject to a tensile strain, but subject to an endwise-compressive strain when the switch is operated, whereby the circuit of said resistance is broken when the contacts are separated by the expansion of said thermal member in response to the heat generated by said resistance, said contacts including a metal-roller circuit-controlling contact normally in circuit with said resistance, and a beveled contact in the same circuit and normally engaged by said roller.

7. An electrothermal switch comprising two flexible supports connected by a length of insulating material, said insulating material being expansible when subjected to heat, and thereby constituting a thermal member, the said thermal member normally subject to a tensile strain, but subject to an endwise-compressive strain when the switch is operated, normally closed contacts adapted to be separated, when said supports are bent away from each other, by the expansion of said thermal member, and a suitable resistance wound upon said thermal member and connected in series with said normally closed contacts, said contacts including a metal-roller circuit-controlling contact normally in circuit with said resistance, and also including a beveled contact in the same circuit and normally engaged by said roller.

8. An electrothermal switch comprising switch-contacts, an expansible body of insulating material for operating said contacts, and a suitable resistance associated with said insulating material, said contacts including a metal-roller circuit-controlling contact normally in circuit with said resistance, and a beveled contact in the same circuit and normally engaged by said roller.

9. The combination of a metal-roller circuit-controlling contact, a heat-generating resistance normally in circuit with said roller, a beveled contact in the same circuit and normally engaged by said roller, and a thermal means for operating said contacts, substantially as and for the purpose set forth.

Signed by me at Chicago, Cook county, Illinois, this 1st day of December, 1904.

JOHN ERICKSON.

Witnesses:
W. LEE CAMPBELL,
R. C. GIFFORD.