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REPAIRING AND TESTING MEANS FOR CONTACTLESS THERMAL PROTECTORS.

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906,615. Patented Dec. 15, 1908.

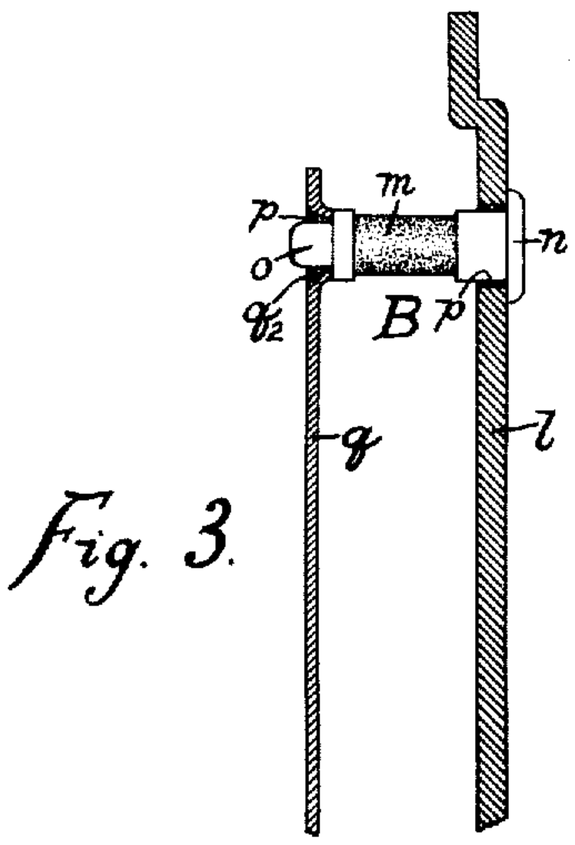

Fig. 3.

Fig. 1.

Fig. 5.

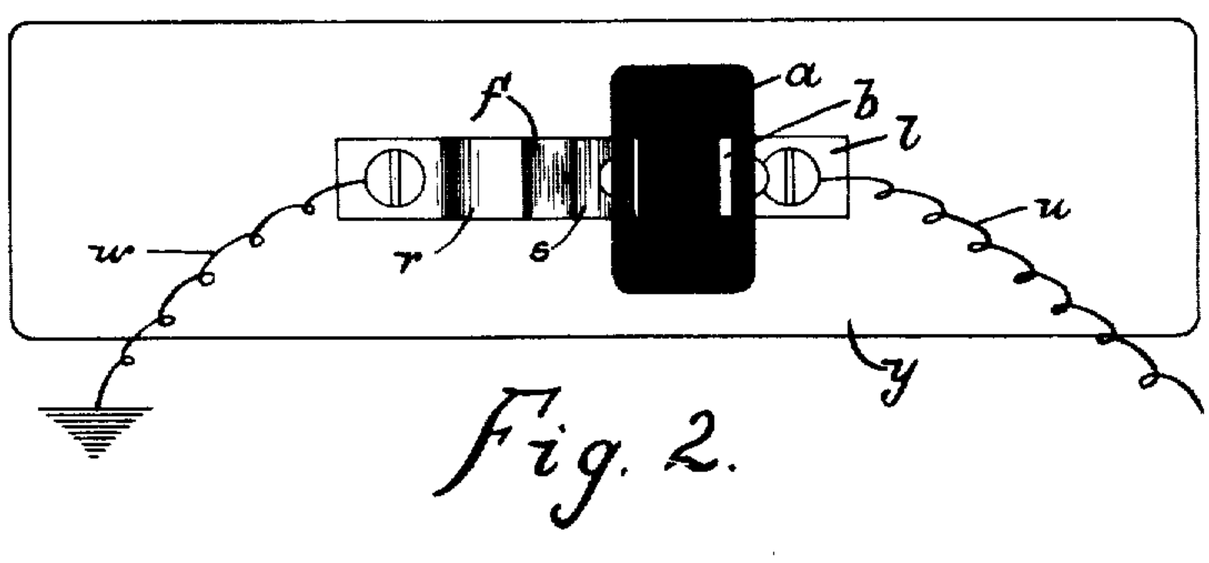

Fig. 2.

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REPAIRING AND TESTING MEANS FOR CONTACTLESS THERMAL PROTECTORS.

No. 906,615. Specification of Letters Patent. Patented Dec. 15, 1908.

Application filed July 28, 1905. Serial No. 271,662.

To all whom it may concern:

Be it known that I, FRANK B. COOK, a citizen of the United States of America, and a resident of the city of Chicago, in the State of Illinois, have invented new and useful Repairing and Testing Means for Contactless Thermal Protectors, of which the following is a specification, reference being had to the accompanying sheet of drawings, illustrating same.

The electrothermal protector herein illustrated is an improvement on my United States Letters Patent No. 785,797, issued March 28, 1905, for thermal cut-out for electrical circuits.

My invention relates to thermal protectors such as are used for protecting electrical circuits and apparatus from abnormal electric currents.

My object is, first, to provide a protector in which there are no loose contacts in the circuit, that is, a protector in which all of the contacts, either in the protector or between the latter and its mounting and operating members, are normally soldered; and second, to provide means whereby this protector may be automatically repaired after operation, for another operation.

Heretofore, it has been the practice to provide a heat coil or thermal protector which is removably mounted in the circuit which it is to protect, so that the contacts with the protector are merely pressure contacts. With this form of protector, corrosion of the pressure contacts, or dust, dirt or the like, therein, may produce an open circuit or give a contact of very high resistance.

In this present invention it is my intention to provide a protector in which there are no pressure contacts, and thus do away with the objectionable features of the latter. Consequently I provide a protector in which all of the contacts, in the protector or between the latter and its coöperating members, are soldered. When the protector operates, certain soldered parts separate and thus open the circuit through the device. To reset the device to operative position, I provide mechanism which automatically presses the separated parts back together, heats the solder, and resolders the parts in their normal positions.

I will more particularly describe my invention by reference to the accompanying drawings, in which,—

Figure 1 is an elevation of the protector and repairing device, showing the preferred construction thereof, with portions shown in cross-section; Fig. 2 is a plan view of Fig. 1; Fig. 3 is an enlarged view of the protector of Fig. 1, with portions shown in cross-section; Fig. 4 is an end view of the heating element of Fig. 3; and Fig. 5 shows a modified form of thermal protector.

Like characters refer to like parts in the several figures.

B is preferably a piece of graphite or carbon, plated with metal at its ends over the portions *o* and *n* and turned away at *m* to adjust the resistance thereof to any desirable value. In making this element B the whole piece of resistance material may be electroplated all over, with copper or any suitable metal, and the portion *m* turned down to remove the portion of the plating at *m* and adjust the resistance of B to the desired value. The plated end portions *o* and *n* of B are then soldered to the metallic members *q* and *l* by heat-susceptible material *p*, preferably a low-melting-point metallic solder. The solder *p*, at *n*, may, if desired, be a hard solder, as this joint in this construction of my invention is not required to open when the device operates.

An abnormally large current of electricity passing through the element B for a short length of time, heats the same and thereby softens the solder *p* and allows the spring member *q* to separate from the element B and take the position q_3 of Fig. 1, preferably against the ground plate *r*. This operation of the protector opens the circuit through same and preferably switches the objectionable current to earth. The portion *n* of B is preferably enlarged to provide a suitable bearing surface to rest against member *l*. Spring *q* is preferably formed into a thimble at q_2 to provide a suitable surface to be soldered to the end portion *o* of B.

When spring *q* separates from the element B, the solder *p*, at *o*, is disarranged so that after it cools, the thimble q_2 cannot be fully replaced upon the end portion *o* until the solder *p* is resoftened.

When the thimble q_2 is soldered to the end portion *o* of B, it is simply sprung in place, which puts it under tension for operating the device, and is held there until the solder cools. This soldering may be accomplished by a soldering iron, by an automatic means, or in any desired manner. As spring *q* and member *l* are rigidly mounted to a suitable

support, spring q is pressed to its operative position where it is soldered to o, without in any way putting the device or apparatus under binding or buckling stresses which are found in other forms of protectors when the apparatus is set, and which greatly reduce the efficiency of the operation of such devices. It will be readily seen in my present invention, that when spring q operates it moves in exactly the opposite direction from which it was moved to set the device, and hence there is no binding of the parts when the device operates, and the latter is not under unnecessary stresses while set.

In Fig. 5 I have shown a modified form of protector in which the heat-producing winding m_2 takes the place of the carbon or graphite rod B. A metallic plate n_2 is soldered to the support l_2 by solder p and is rigidly secured to spool m_3 but insulated therefrom by an insulating disk n_3. Winding m_2 is connected in circuit with spool m_3 and plate n_2. An insulating shell m_4 incloses the winding m_2. The operation of the device is similar to that of the device of Fig. 3. The insulating disk n_3 being placed between spool m_3 and plate n_2, confines the greater part of the heat to the end o of spool m_3 and hence this end unsolders when the device operates, and the other end does not. Then again the heavy part l_2 conducts and radiates more heat from its solder joint p than spring q does from the solder joint at o, with the same degree of heating, and this fact also tends to keep the joint between n_2 and l_2 from opening when the device operates. In the automatic repairing means A, the insulating handle-portion a carries a light flexible spring c and a stiff conducting member b. A lever f is pivoted at g on a block of insulating material h which is mounted on the member b. A coil spring i is secured to lever f and member b, being insulated from the latter by an insulating bushing j. Spring i tends to pull lever f from the position f to f_2. A thumb-piece s is provided for pressing the lever f from the position f_2 to the position f. A source of electricity d and an indicating device, or the like, e are connected in circuit with spring c and member b. The circuit of battery d through the tool is normally open between spring c and lever f, as the latter is normally in the position f_2 and consequently out of contact with spring c which is normally in the position c_2.

To repair the heat coil and reset same to operative position after operation, the end of member o is first placed against an offset k in member l. Then by pressing on the thumb-piece s of lever f, the latter is pressed from the position f_2 to the position f, against the tension in spring i which is now stretched. Then the end of lever f is hooked over the free end of spring q in the position q_3 and the thumb-piece s released. Now the thimble q_2 is moved by the lever f from the position q_2 of Fig. 1, to against the solder p, at o, which closes the circuit of battery d through the resistance member m. In a few seconds the current from battery d heats the resistance m and softens solder p which allows thimble q_2 to slip clear upon portion o, due to the pressure of lever f, and the latter to take the position f_2. The circuit of battery d is now broken between spring c and lever f and therefore the solder p cools and solders thimble q_2 to portion o as originally. When the solder p has cooled sufficiently, the device A may be removed. The protector is now in position and condition to be operated again as originally. The cycle of operations, comprising the operation and repairing of the protector may be repeated as many times as desired. It will be seen that the repairing and resetting of the protector also tests the serviceable condition of same, as it cannot be reset and resoldered unless it is in proper condition to operate again.

With the repairing device herein shown, the apparatus cannot be strained in resetting, before the solder p is sufficiently softened to again resolder the parts together, as the resetting is done by spring i and the tension of this spring is suitably adjusted to prevent such straining. Neither can the protector be overheated in resetting, as the current from battery d is automatically cut off as soon as the device is fully reset. The indicating instrument e may indicate when the device is fully reset.

When it is desired to test the line, the solder joint at o may be unsoldered by the aid of the device A by engaging member b with support l and lever f with the inner side of the end of spring q and then depressing the thumb piece s slightly. This connection closes the circuit of battery d through the heating element m (or m^2), heats the latter and unsolders spring q which springs to the position q^3. This unsoldering of spring q may also be accomplished with an ordinary soldering iron.

I do not wish to limit this invention to the particular arrangement or details of construction herein shown. The principles involved are what I more particularly desire to claim.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is—

1. A repairing device for an electrothermal protector having a soldered joint openable upon excessive heating, comprising means for closing the said joint and thereby applying current through the protector to heat the said joint, and switching mechanism adapted to automatically open the circuit through the protector when same is sufficiently heated.

2. A repairing device for an electrothermal protector, comprising means for closing a joint in the protector and thereby applying current through the protector to heat same, and switching mechanism adapted to automatically open the circuit through the protector when same is sufficiently heated for purposes substantially as described.

3. A repairing device for an electrothermal protector having a thermally-openable joint, comprising electromechanical mechanism adapted to be applied to the protector after operation to close the said joint and thereby cause current to flow through the protector to heat same, and switching mechanism for automatically stopping the flow of current through the protector when same is sufficiently heated, to allow the protector to cool whereby the said joint is resecured preparatory to another operation.

4. A repairing device for an electrothermal protector having an openable joint normally held against opening by heat-susceptible material, comprising means for closing the said joint and thereby sending current through the protector to soften the heat-susceptible material, and switching mechanism for automatically stopping the flow of current through the protector when same has been sufficiently heated, the said means being adapted to hold the parts of the protector in reset position while the heat-susceptible material cools and thereby secures the joint in closed position.

5. A repairing tool for electrothermal protectors comprising a handle-portion, a metallic contact strip, an insulating support, a lever pivoted on the insulating support and provided with a thumb-piece to be depressed, a spring member controlling the said lever, and a second spring member adapted to make contact with the said lever when the thumb-piece is depressed; and a source of electricity in circuit with the said metallic contact strip and second spring member.

6. A repairing device for an electrothermal protector having heat-producing means and an openable joint normally held closed by heat-susceptible material, comprising a suitable handle portion, a metallic contact strip, an insulating support, a lever pivoted on the insulating support, a coil spring controlling the said lever, and a contact spring arranged to make contact with the said lever when the coil spring is placed under tension; and a source of electricity and an electrical indicating instrument connected in circuit with the said metallic contact strip and contact spring, the said device being adapted to be applied to the protector to automatically close the circuit of the said source through the heat-producing means to soften the heat-susceptible material, restore the openable joint to normal closed position, break the circuit through the heat-producing means upon sufficient heating, and hold the said joint closed until the heat-susceptible material cools and secures it in such position.

As inventor of the foregoing I hereunto subscribe my name in the presence of two subscribing witnesses, this 25th day of July, 1905.

FRANK B. COOK.

Witnesses:
FREDERICK R. PARKER,
F. W. PARDEE.