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DUAL FUSE WITH INDICATOR

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Fig. 1.

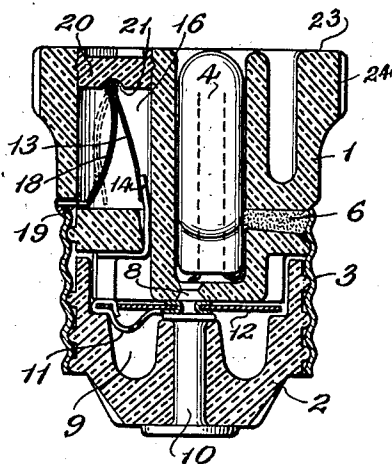
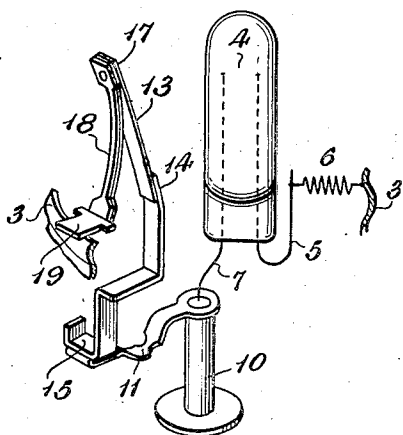


Fig. 3.

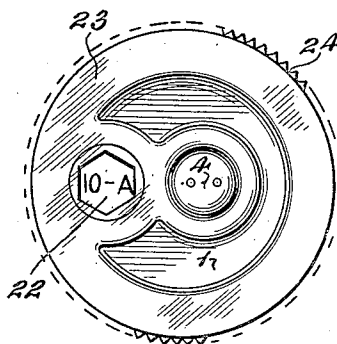


Fig. 2.

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UNITED STATES PATENT OFFICE

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DUAL FUSE WITH INDICATOR

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8 Claims. (Cl. 200—121)

The present invention relates to circuit breakers for the protection of electrical circuits (employing a fusible element) which becomes blown or ruptured when a short circuit or overload occurs in the electrical circuit having amongst its principal objects the provision of an automatically controlled switch connected in series with the fusible element which will function before the fusible element when a slight overload occurs to break the electrical circuit and continue to intermittently and momentarily reestablish the current should such overload continue over a period of time, thereby maintaining the circuit in substantially continuously broken condition and which will again close the circuit when such overload is removed thereby increasing the life of the fusible element.

A further object of the invention is to provide a fuse with two thermal control circuit breakers of different amperage, the circuit breaker having the lower value being adapted to automatically open and close the electrical circuit and the circuit breaker having the greater value adapted to permanently open the electrical circuit when blown or ruptured.

A still further object of the invention is to provide a fuse comprising two thermal control circuit breakers connected in series and an indicator connected in parallel therewith, whereby when either circuit breaker is opened, said indicator will announce or signal the broken condition of the electrical circuit to which the fuse is applied.

Another object of the invention is to provide a fuse comprising a unitary structure having a plurality of circuit breakers housed therein and connected in series with the contact terminals of the fuse and an indicator connected to the terminals of the fuses, but arranged in parallel with the circuit breakers for indicating the ruptured condition of either circuit breaker.

Other objects of the invention will be in part obvious and in part pointed out hereinafter.

In order that the invention and its mode of operation may be readily understood by persons skilled in the art, I have in the accompanying illustrative drawings and in the detailed following description based thereon, set out one possible embodiment of the same.

Figure 1 is a vertical sectional view through the fuse embodying the invention;

Figure 2 is a plan view of the same, and

Figure 3 is a detail perspective view.

Referring now more particularly to the accompanying drawing, wherein like and correspond-

ing parts are designated by similar reference characters throughout the several views, I have herein shown a fuse of the plug type consisting of a casing molded from a suitable insulating material to provide an upper section 1 and a lower or detachable section 2. The upper section 1 has attached thereto a threaded contact shell 3 capable of being fitted within a standard socket of the ordinary cut-out block and detachably fitted within this shell 3 is the lower section 2.

The upper section 1 has formed therein a central recess in which is arranged an indicator herein shown as a miniature glow lamp 4. Terminal 5 of this lamp is connected to the shell 3 through a resistor 6. The resistor as herein shown is formed from a plastic composition containing carbon and glycerine and is positioned within a recess formed within the section 1 of the casing as is better illustrated in Figure 1. The other terminal 7 of the lamp 4 is attached to a rivet 8 secured within the lower end of the section 1 of the casing.

The lower section 2 of the casing has formed therein an annular recess so that when the same is connected to the upper section 1, a fuse compartment 9 is formed. A rivet 10 forming a contact terminal of the fuse is mounted within the lower section of the casing. The fuse link 11 is carried by a holder 12 and when placed within the fuse compartment 9, one end of this link 11 contacts the rivets 9 and 10, thereby completing a connection between the terminal 7 of the lamp indicator and the contact rivet 10.

The automatically controlled circuit breaker comprises a switch having a movable blade 13 and a stationary contact 14. To provide this stationary contact, I form a metallic copper strip in the shape as is better shown in Figure 3 in order that one end 15 may project within the fuse compartment 9 and have contact with one end of the fuse link 11 whereas, its opposite end projects within the chamber 16 and forms the contact 14. The upper end of the blade 13 has riveted thereto as at 17, an arm 18 made from a suitable bimetallic material and the lower end of this arm 18 is connected with and supported by an extension 19 which latter extends through the fuse casing and has contact with the upper end of the shell 3. The upper end of the chamber 16 is closed by means of a plug 20 and the lower face of this plug is provided with a recess 21 in which may oscillate and pivot the upper connected ends 17 of the arm 18 and switch blade 13. The outer face 22 of this plug 20 may

have suitable markings thereon to designate the ratings in amperes of the fuse whereas, the outer face 23 of the fuse casing may have the required markings such as the trade-mark, name of manufacturer and voltage of the fuse. Serrations 24 are formed with the outer edge of the section 1 of the fuse casing thereby providing a hand grip for turning the fuse into and out of the cut-out base socket to which the fuse is to be applied.

From the foregoing, it is obvious that the circuit breaker comprising the fuse link 11 and the circuit breaker comprising the switch blade 13 are connected in series with the terminals 10 and 3 of the fuse whereas, the lamp indicator 4 is also connected to the terminals of the fuse but arranged in parallel with the circuit breakers, whereby, should either circuit breaker be opened, the current will be permitted to flow to the lamp and cause the latter to become luminous for indicating the broken or opened condition of the electrical circuit to which the fuse is connected.

The bimetallic strip or arm 18 is formed of metals to withstand all temperatures imposed by the normal conditions of use without any appreciable diminution of their thermo-flexible properties and yet form a good conductor predetermining the permissible maximum current flow, but is adapted to automatically respond to the heat generated by excess temperatures by flexing to a circuit-breaking position. This arm 18 having a thickness and width adapting it to carry or conduct a certain amperage, but an amperage of a lower value than that of the maximum value of the fuse link 11 will, when a slight overload occurs in the electrical circuit to which it is applied by the heat generated, flex the arm 18 so as to cause it to withdraw the blade 13 from the contact 14 before the fuse link 11 becomes blown or ruptured and thereby break the circuit. As the arm 18 cools, it will automatically return to its normal position to again cause the blade 13 to engage the contact 14 for reestablishing the circuit, but should the overload continue, the arm 18 will maintain the circuit in substantially a continuous broken condition until the overload is removed. However, should the overload or short circuit cause an excessive amperage to a value greater than the maximum value of the fuse link 11, the latter will readily respond to the heat so generated and permanently open the circuit until such time as a new fuse link is substituted therefor.

The plug 20 when placed in position will exert a pressure upon the arm 18 and blade 13 so as to flex the same in their normal positions as is shown in full lines in Figures 1 and 3 whereby the blade 13 will be retained in contact with terminal 14. When the heat is generated by the overload occurring in the electrical circuit, the arm 18 will contract or assume the position as shown in dotted lines in Figure 1 thereby drawing the blade 13 out of engagement with the contact 14. The upper connected ends 17 of the arm 18 and blade 14 are fulcrumed within the recess 21 of the plug 20 in such a manner as to permit a slight variation in their fulcrum point and thereby cause the blade to snap out of and into contact with the terminal 14 which will prevent arcing between the two contact members of the switch.

From the foregoing, it is apparent that I have conveniently arranged two circuit breakers of different amperage and an indicator therefor in an unitary structure, which latter may be substituted and used in place of the conventional

fuse plug, so that slight overloads that occur in an electrical circuit may be taken care of without rupturing the fusible element, but in the event a short circuit or excessive overload occurs, the fuse link will function in the usual manner and the lamp 4 will signal or indicate the opened condition of either circuit breaker.

Manifestly, the construction herein shown is capable of considerable modification and such modifications as come within the scope of my claims, I consider within the spirit of my invention.

I claim:

1. A fuse comprising a body, a center contact, a shell constituting a side contact, a thermo-responsive switch housed in said body and having a stationary section and a movable section, a fuse link connecting the stationary section with the center contact, a thermo-responsive strip extending longitudinally of the movable section and having one end secured to an end of the movable section and being normally bowed in one direction to support the movable section in position to engage the stationary section, means for electrically connecting the other end of the thermo-responsive strip with said shell, the strip when bowed in an opposite direction in response to change in thermal conditions supporting the movable section out of contact with the stationary section, a pocket being formed in said body and open at one end, a glow lamp indicator in said pocket visible through the open end thereof, a resistor connected in series with said lamp, and means for connecting said glow lamp and the resistor in series with the center contact and the side contact but in parallel with said thermo-responsive switch and the fuse link whereby the inoperative position of the thermo-responsive switch or the fuse link may be visibly indicated.

2. A plug comprising a casing having a plurality of compartments individually separated from one another and located within said casing, a fuse link arranged within one of said compartments, a thermo-responsive switch arranged within one of the other of said compartments, a lamp indicator arranged within the remaining one of said compartments, a central contact secured to said casing, a screw shell contact secured to said casing, means arranged within said casing for connecting said thermo-responsive switch and fuse element in series with said central contact and said screw shell contact and means arranged within said casing for electrically connecting said lamp indicator with said central contact and said screw shell contact whereby the inoperative position of either said fuse link or said thermo-responsive switch may be visibly indicated.

3. A fuse unit comprising a casing, a pair of spaced contact terminals carried by said casing, said casing having an opened end compartment formed therein defining intercommunicating inner and outer chamber, a circuit breaker arranged within said compartment and including a stationary contact in the inner chamber and electrically connected to one contact terminal and extending into the outer chamber and a movable contact in the outer chamber electrically connected with the other contact terminal, a plug secured within and closing the opened end of said compartment, said plug engaging the moveable contact of said circuit breaker for normally holding the same in engagement with the stationary contact.

4. A plug fuse comprising a casing, a central contact terminal, a screw shell terminal, said casing having an opened end compartment formed therein, a thermo-responsive switch arranged within said compartment and being electrically connected to said central contact terminal and said screw shell contact terminal, said thermo-responsive switch comprising a fixed blade and a movable blade, a plug for closing the opened end of said compartment and engaging said movable blade of said thermo-responsive switch for normally retaining the movable blade in contact with the fixed blade of said thermo-responsive switch and said plug having a recess formed therein providing a variable fulcrum point for the movable blade of said thermo-responsive switch.

5. A plug fuse comprising a casing, a central contact terminal, a screw shell contact terminal, a thermo-responsive switch arranged within said casing, said thermo-responsive switch comprising a fixed blade and a movable blade, means for connecting an end of said fixed blade to said central contact, an abutment having a seat shiftably receiving the other end of said movable blade, a bimetallic arm for normally retaining said movable blade in contact with said fixed blade having one end fixedly connected to said movable blade and holding the said end of the movable blade in the seat of said abutment and means for connecting the opposite end of said arm to said screw shell contact terminal.

6. A plug fuse comprising a body having upper and lower sections, a shell connecting said sections and constituting a side terminal, a center terminal extending through the lower section axially thereof, the lower section being formed with a fuse chamber surrounding the center terminal and open at its upper end, the upper section being formed with an axially extending pocket open at its upper end and with a longitudinally extending switch chamber spaced from said pocket and at its inner end communicating with the fuse chamber, a contact stud mounted through the bottom of said pocket, a carrier clamped between the sections, a fuse carried by said carrier with one portion engaging both the center contact and the contact stud, a resistor extending through the body between the pocket and a portion of said shell, an indicator in said pocket having terminals connected with the resistor and the stud terminal, a thermo-responsive switch having a stationary member in the fuse chamber engaging the fuse and a movable member in the switch chamber, a bi-

metallic member holding the movable member in contact with the stationary member and connected to the shell, and a plug closing the switch chamber and constituting a fulcrum for the movable member.

7. A plug fuse comprising a body having upper and lower sections, a shell connecting said sections and constituting an external side terminal, the upper section being formed with a pocket, a contact stud secured through the bottom of said pocket, a center terminal carried by the lower section under said stud, a fuse having one end clamped between the stud and center terminal, a resistor between the shell and pocket, a glow lamp in said pocket having terminals connected with the resistor and the contact stud, said upper section being also formed with a switch chamber having a reduced passage leading from its lower end and a side passage, a plug closing the outer end of the switch chamber, a stationary switch member bearing against the under face of the upper section and having an arm extending upwardly through the reduced passage into the switch chamber and a lower portion resting upon said fuse, and a movable switch member consisting of a bimetallic strip extending longitudinally in the switch chamber with its upper end bearing against said plug and its lower end provided with a foot extending through the side passage and secured to said shell, and an arm extending downwardly from the upper end of the bimetallic strip in diverging relation thereto with its lower portion contacting with the arm of the stationary switch member.

8. A plug fuse comprising a body having upper and lower sections, a fuse link clamped between the sections, a center contact carried by the lower section and engaging said fuse link, a side contact, the upper section being formed with an open pocket and with a switch chamber, a plug closing the switch chamber, a glow lamp in said pocket, a resistor in series with said lamp, the resistor and lamp being in series with the center contact, fuse link and the side contact, a stationary contact resting upon said fuse link between the upper and lower sections and having an arm extending into the lower end portion of the switch chamber, a bowed bimetallic strip in the switch chamber having its lower end connected to the side contact and its upper end in shiftable engagement with said plug, and an arm extending downwardly from the upper portion of the bimetallic strip with its lower portion normally in engagement with the arm of the stationary contact.

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