Apr. 3, 1923. 1,450,670

F. C. LA MAR

INDICATOR FOR ELECTRIC FUSES

Filed June 7, 1920

Fig. 1.

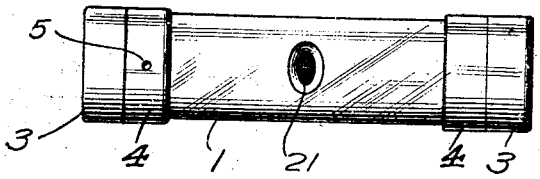


Fig. 2.

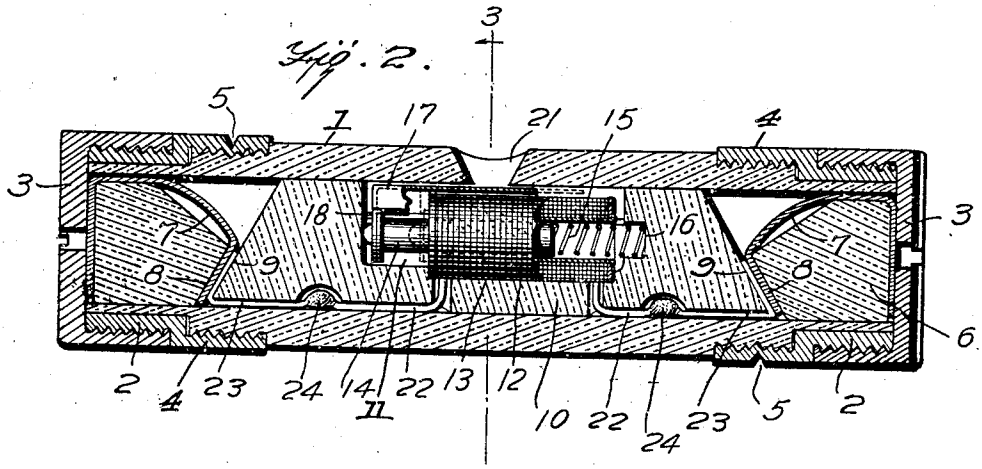


Fig. 3.

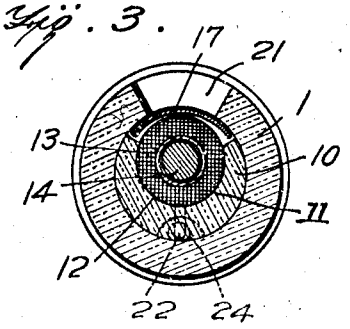


Fig. 4.

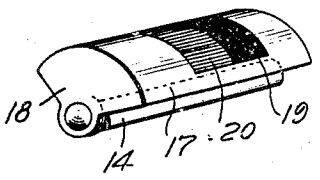


Fig. 5.

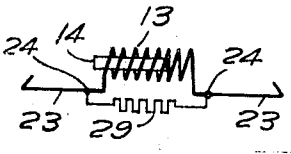
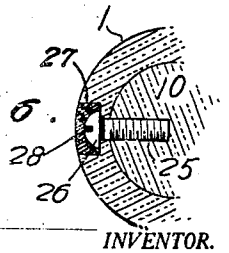


Fig. 6.



INVENTOR.

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BY

ATTORNEY.

Patented Apr. 3, 1923. 1,450,670

UNITED STATES PATENT OFFICE.

FRANK C. LA MAR, OF PITTSBURGH, PENNSYLVANIA.

INDICATOR FOR ELECTRIC FUSES.

Application filed June 7, 1920. Serial No. 387,017.

To all whom it may concern:

Be it known that I, FRANK C. LA MAR, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Indicators for Electric Fuses, of which the following is a specification.

This invention relates to electric fuses.

The object of the invention is to provide such fuses with an indicating device or attachment, which is simple and economical in construction, and also efficient and positive in operation, and the purpose of which is to positively notify an operator or attendant whether the circuit in which the fuse is placed as a protecting medium is open or closed, and thereby avoid all danger of injury to the operator or attendant from electric shock in attempting to repair or adjust the machinery operated by the current passing through the fuse and also to notify the operator or attendant when the fuse is blown-out so the fuse may be removed for refilling or reloading without danger of shock, and also avoid loss of time and delay in locating a particular fuse which has blown-out or become ruptured in service.

Another object of this invention is to provide an indicator for an electric fuse which is permanent and continuous in operation and needs no repair or replacement of parts, a difficulty which is common in the indicators now in use on some types of electric fuses. So far as I am aware, I am the first to provide an indicator for electric fuses which constitutes a permanent attachment for the fuse and which will continuously indicate positively the flow or interruption of current through the circuit in which the fuse is placed.

With this understanding of the broad principle and purpose of the invention, it will be stated that the invention is particularly designed for use in connection with what are known as refillable fuses and is applicable to any of the well known fuses of this type, and I have shown herein the indicator forming the subject of this invention applied to a refillable fuse of the construction and principle of that type described and claimed in my co-pending application filed June 3, 1920, Serial No. 386,280.

The present invention consists in an electric fuse, comprising a casing, a fuse element secured in said casing, and an electric indicator for indicating the flow and interruption of current through the fuse connected in circuit with the fuse element and adapted to be operated by the making and breaking of the current passing through the fuse whereby the on and off conditions of the current of the working circuit is successively and continuously indicated.

The invention also consists in an electric fuse, comprising a casing, a fuse element fixed in said casing, and an electro-magnetically operated indicator for indicating the flow and interruption of the current through the fuse, connected in circuit with the fuse element between its terminals and adapted to be operated by the making and breaking of the current passing through the fuse, whereby the on and off conditions of the working current is successively and continuously indicated.

The invention also consists in the details of construction and combination and arrangement or location of parts as herein shown and described, all substantially as I will proceed now to more particularly set forth and finally claim.

In the accompanying drawings, illustrating the invention, in the several views of which like parts are similarly designated, Figure 1 is an elevation of an assembled fuse showing the indicating opening in the casing. Fig. 2 is a longitudinal section, on a larger scale, showing the fuse in assembled condition. Fig. 3 is a transverse section taken substantially in the plane of line 3—3, Fig. 2, and looking in the direction of the arrows. Fig. 4 is a perspective view of the indicator plate and its attached armature. Fig. 5 is a detail view showing a modified connection between the fuse element and the electro-magnet or solenoid, and Fig. 6 is a detail view, in cross section of the casing and the fuse element fixing plug, showing one form of means for securing the fuse-element fixing plug in the casing and sealing the same.

As shown in the drawings, the fuse, as in my application above mentioned, comprises a casing 1 having screwthreaded ends 2, end caps 3 fitted upon said screwthreaded ends, a main fuse element fixed in a block of insulating material pemanently fitted within

the casing, and removable fuse elements fitted upon blocks and inserted in the ends of the casing and contacting with the terminals of the main fuse elements, and held in place by the end caps, the main fuse element being of greater conducting capacity than the removable end fuse elements, whereby in case of an excess current passing through the fuse the removable fuse elements will be ruptured or burned out, leaving the main fuse element intact so the fuse may be reloaded with fresh fuse elements, and, in case the fuse should by accident or otherwise be reloaded with fuses of greater capacity than the main fuse element, and the fuse be subjected to an excess or overload current, the main fuse element will be ruptured, thereby destroying the fuse against reloading and future use.

I have herein shown the screwthreaded end ferrules 2, as constructed with an internally screwthreaded extension 4 adapted to be screwed upon the casing and also adapted to be punched at one or more places, as at 5, after being screwed to place to more securely lock the ferrule against rotation upon the casing.

In my application referred to I have shown the blocks 6 for supporting and anchoring the removable fuse elements 7 in the ends of the casing with a tongue and groove connection with the casing to prevent them from turning in the casing, and have herein shown the beveled and contacting portions 8 and 9 of the blocks and the main fuse plug at a greater angle than that in my said application which construction will effectively prevent rotation of the blocks, instead of the tongue and groove connection.

In the construction herein, and for the purpose of this invention, the main fuse element carrying and supporting plug 10, which as in my application above mentioned is permanently secured in the casing, is formed with a recess 11 opening upon one side of the plug, and the bottom of which is provided with a sunken rounded seat 12 to receive and support a solenoid or electromagnet 13, including a movable core or armature 14 backed up at one end by a coiled spring 15, seated in a socket 16 in one of the end walls of the recess of the plug and normally projecting the movable core or armature into engagement with the opposite end wall of the recess. Secured to the outer end of the movable core or armature 14, as by riveting or otherwise, is an indicating plate 17, which as herein shown is of curved form to coincide with the contour of the interior of the casing and overhangs the solenoid or magnet and is provided with a depending portion 18 by which it is secured to the movable core of the solenoid. The plate 17 is provided upon its upper surface with two distinctive colored spaces or portions, 19 and 20, such as black and red, respectively, to be exposed at an opening 21 in the casing to indicate "on" and "off," or the plate may be provided with any other suitable marks for indicating the on and off conditions. In the present illustration the black will indicate "off" and the red will indicate "on."

The terminals 22, of the solenoid winding may be electrically connected with the main fuse elements 23 in any suitable manner, preferably by soldering, as at 24, and the winding of the solenoid may be of the same carrying capacity as the main fuse elements and thus form part of the main fuse element, and in this case the entire solenoid or coil would be destroyed or burned out should the fuse be subjected to an overload by reloading the fuse with removable end fuse elements of greater capacity than the main or permanent fuse element. Therefore, it is desirable or preferable to provide the solenoid with a winding of greater carrying capacity than the main fuse portions 23 and solder or otherwise connect the winding with these fuse portions, so that in case of a blow out by overloading the fuse with removable end fuses, the portions 23 of the fixed fuse element only will be burned out or ruptured to open the circuit, and the solenoid and other parts of the indicating mechanism remain undamaged for removal from the otherwise damaged and unrepairable fuse, for further use in building other fuses.

In my application hereinbefore referred to, it is stated that the main fuse element supporting plug is permanently and immovably secured in the casing for the purpose of preventing the reuse of the fuse after the occurrence of a blow out of the main fuse element on account of overloading, and in order to provide for the removal of the solenoid and indicating mechanism of the construction herein, as above stated, the main fuse plug may, as shown in Fig. 6, to be fixed in the casing by drilling a hole through the casing and into the plug as at 25 to receive a screw 26 and countersinking the casing about the hole, as at 27, to receive the head of the screw, and filling the countersink with sealing wax or other hardening material 28, to seal the fastening against ready removal by unauthorized persons, but permitting removal of the fastening screw by breaking out the sealing material when it is desired to remove the plug and the undamaged indicating mechanism from an otherwise damaged and useless fuse, for the purpose hereinbefore stated.

In Fig. 5, I have shown a diagrammatic view of a modified arrangement of the main fuse element and solenoid, in which a resistance 29 is shunted around the solenoid so that the full current from the supply source will not enter the solenoid winding, and the capacity of this resistance may be adjusted to suit the desired capacity of the solenoid

to effect the operation of the indicating mechanism.

The operation of the fuse will be understood from the above description in connection with the description thereof in my application referred to, and it will be observed that when the fuse is installed and the circuit in which the fuse is placed is turned on, the magnet or solenoid 13, will be energized and draw in the armature core 14 and its attached indicating plate 17 so the red portion 20 thereon will coincide with the opening 21 in the casing, thereby indicating that the current is on, the core in its inward movement compressing the spring 15, and the outer enlarged end of the core engaging the end of the coil and serving as a stop to limit the inward movement of the core and properly position the red portion of the indicator plate at the opening in the casing. When the current is turned off, the magnet or solenoid will be deenergized, and the spring 15 will force the core outwardly and the black portion of the indicating plate will be moved opposite the opening in the casing, thus indicating that the current is off. The core in its outward movement will abut against the end wall of the recess in the plug 10 and serve as a stop to limit the outward movement of the core and thus hold the plate with its black portion at the opening in the casing. It will thus be seen, that when the service current is switched on and off, the indicator will alternately and continuously indicate the on and off conditions of the current, thereby avoiding all danger of accidents occurring by not knowing whether the current is on or off in any particular line or circuit in which the fuses are placed.

In case of a blow out at the end fuse elements, the magnet or solenoid will become deenergized and the indicator moved to the off position and thus indicate that the current in this particular circuit of any number of circuits that lead into a switch box has been subjected to an overload, and thereby enabling an operator to readily locate any trouble in his installation and avoid any delays in the running of his machines by reloading the thus readily located blown out fuse.

In the case of a fuse being refilled with end fuse elements of a load capacity greater than the main fuse element or elements, and an excess or overload current enter the fuse, then the main fuse element would burn out and break or interrupt the current and the solenoid or magnet deenergized and the indicator moved to off position and remain in that position if the current be again turned on, thus indicating that the main fuse element has been destroyed and the fuse absolutely dead and unrepairable or refillable.

Thus it will be observed that I have provided an indicator for electric fuses which is positive in operation and repeats its operation continuously so long as the fuse is in operative condition, and an indicator which is particularly useful in connection with enclosed fuses of the refillable type, whereby the danger of accidents and long delays in the operation of machinery due to interruptions in electric circuits and installations due to blow outs and short circuits and inability to locate the trouble, is greatly avoided.

I wish to be understood that I do not limit the invention to the exact details of construction, combination and arrangement of parts herein shown and described, as the same may be changed or altered in various particulars and still be within the scope of the appended claims.

What I claim is:—

1. An electric fuse, comprising a casing, a fuse element fixed in said casing, and an electrically operated movable indicator for said fuse connected in circuit with said fuse element, adapted to be controlled by the current passing through said fuse element to continuously and alternately indicate the on and off conditions of the current.

2. An electric fuse, comprising a casing, a fuse element fixed in said casing, and an electrically operated movable indicator for said fuse connected in circuit with said fuse element between the terminals thereof and adapted to be permanently controlled by the current passing through said fuse element to alternately indicate the on and off conditions of the current.

3. An electric fuse, comprising a casing, a fuse element fixed in said casing, and an electro-magnetically operated movable indicator for said fuse connected in circuit with said fuse element and adapted to be continuously and permanently controlled by the current passing through said fuse element to alternately indicate the on and off conditions of the current.

4. An electric fuse, comprising a casing having an opening therein, a fuse element fixed in said casing, and an electro-magnetically operated indicator arranged in the casing and connected in circuit with the fuse element and adapted to be operated by the current passing through said fuse element to continuously and alternately expose off and on current conditions at the opening in said casing.

5. An electric fuse, comprising a casing having an opening therein, a fuse element fixed in said casing, a solenoid arranged in said casing and connected in circuit with said fuse element, a movable core in said solenoid, an indicator plate attached to and carried by said core and located adjacent to the opening in said casing and having distinctive marks thereon, the movement of said core adapted to be controlled by the make and break of the circuit passing through said

solenoid to cause said plate to alternately expose the distinctive marks thereon at the opening in said case, to indicate the on and off conditions of the current passing through the fuse.

6. An electric fuse, comprising a casing having an opening therein, a fuse element fixed in said casing, a solenoid arranged in the casing and connected in circuit with said fuse element, a movable core in said solenoid, an indicator plate attached to and carried by said core and located adjacent to the opening in said casing and having on and off indications thereon, the said core adapted to be operated by current passing through said solenoid to move the plate to expose its current on indication at said opening, and a spring for moving said core and plate to expose the current-off indication at said opening when the circuit is broken.

7. An electric fuse, comprising a casing having an opening therein, a fuse element fixed in said casing, a solenoid arranged in the casing and connected in circuit with said fuse element, a movable core in said solenoid, an indicator plate attached to and carried by said core and located adjacent to the opening in said casing and having on and off indications thereon, the movements of said core adapted to be controlled by the make and break of the circuit passing through said solenoid to cause the plate to expose its current on indication at said opening means to return the indicator to its off position when the circuit is broken and means for limiting the movements of said core and its attached indicating plate in both directions to properly position the indicating marks with relation to the opening.

8. An electric fuse, comprising a casing, a fuse element fixed therein, an electrically operated indicator connected in circuit with said fuse element and adapted to be operated by the making and breaking of the circuit passing through said fuse element, to indicate the on and off conditions of the current, and a resistance connected with said fuse element and shunted around said electrically operated indicator.

9. A refillable electric fuse, comprising a casing, a plug fitted in said casing, a main fuse element fixed in said plug and having its terminals exposed at the opposite ends thereof, an electrically operated indicator fixed in said plug and connected in circuit with the main fuse element, a screw passing through the casing and engaging said plug and having its head entering a countersink in said casing, a sealing material secured in said countersink and concealing the head of the screw to prevent ready removal of the screw and permanently securing the plug in said casing, removable fuse elements adapted to be inserted in the ends of the casing and contacting with the terminals of the main fuse element, and means for holding said removable fuse elements in place, the said sealing material adapted to be ruptured and removed, whereby said fastening screw may be removed and the main fuse plug and its attached indicating mechanism removed from the casing.

10. A refillable electric fuse, comprising a casing, a plug fitted in said casing, an electrically operated indicating mechanism fitted in a recess in said plug within the casing and being of a certain rated or predetermined load carrying capacity, main fuse elements of less load carrying capacity than the indicating means fitted in said plug and connected with said indicating means and exposed at the opposite ends of said plug, and removable fuse elements of less capacity than the main fixed fuse elements adapted to be inserted in the ends of the casing and contacting with the main fuse elements, whereby upon the overloading of the fuse with removable end fuse elements the main fuse elements will be blown by an excess current passing through the fuse without injury to the indicating mechanism.

In testimony whereof I hereunto set my hand this 7th day of June 1920.

FRANK C. LA MAR.