

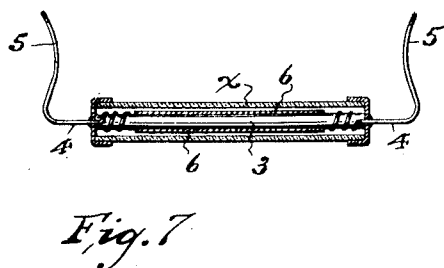
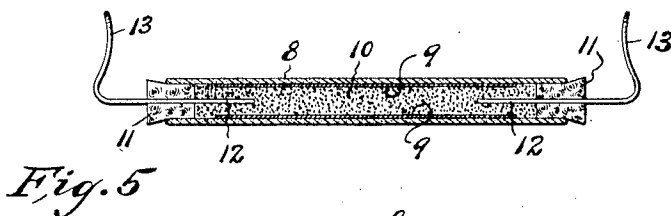
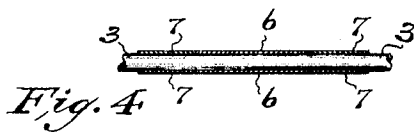
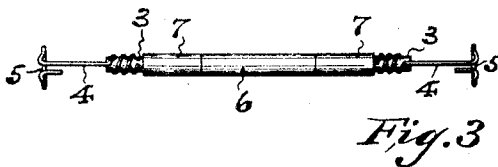
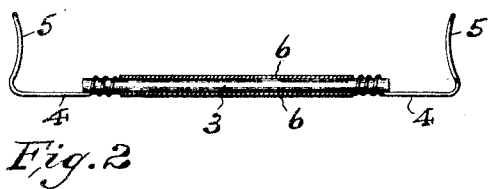
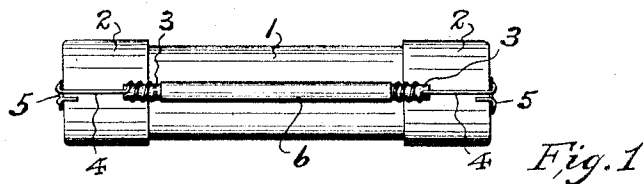
July 6, 1926.

1,591,029

F. A. FELDKAMP

FUSE INDICATOR

Filed June 15, 1922



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UNITED STATES PATENT OFFICE.

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FUSE INDICATOR.

Application filed June 15, 1922. Serial No. 568,374.

The present invention has reference, generally, to a novel construction of detachable indicator device for electrical cartridge fuses, and the like; and the invention relates, more particularly, to a novel construction of a device which may be readily attached to an electrical cartridge fuse or the like to visually indicate the inoperativeness of the latter after the same has been blown.

The invention has for its principal object to provide a cheap, simple and effective detachable indicator device, for the purpose stated, which is adapted to be electrically and mechanically attached to a cartridge fuse, or the like, and which possesses a novel functioning means adapted to produce a visible sign or indication when the cartridge fuse is blown and becomes inoperative; said sign or indication remaining visible so long as the inoperative fuse remains in place, but becoming invisible when the fuse is repaired, or the indicator device removed and attached to a replacing operative cartridge fuse.

To the above end I have devised a very simple form of indicator which operates entirely on the principle of temperature changes, whereby at a given normal or low temperature the indicator possesses one color appearance, and at an operative or high temperature the indicator possesses a different color appearance, thus producing the desired visible signal.

Other objects of the present invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

With the various objects of my present invention in view, the same consists, primarily, in the novel indicator device for electrical cartridge fuses, and the like, hereinafter set forth; and, the invention consists, furthermore, in the novel arrangements and combinations of the various devices and parts, as well as in the details of the construction of said devices and parts, all of which will be more fully described in the following specification, and then finally embodied in the appended claims.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a side elevation of an electrical cartridge fuse to which is attached the novel detachable indicator device made ac-

cording to and embodying the principles of the present invention; Figure 2 is a part top or plan elevation and part section of the indicator alone; Figure 3 is a front elevation of a modified form of the indicator, and Figure 4 is a fragmentary part elevation and part section of the same; Figure 5 is a longitudinal horizontal section of a further modified form of the novel indicator; Figure 6 is a transverse section thereof, said views being somewhat enlarged and Figure 7 shows the indicator device inclosed in a glass tube.

Similar characters of reference are employed in all of the hereinabove described views, to indicate corresponding parts.

Referring now to Figures 1 and 2 of the drawings, the reference character 1 indicates any usual construction of electrical cartridge fuse, having the metal terminal caps or ferrules 2 engageable by the terminal clips of a suitable fuse box (not shown), whereby said cartridge fuse is inserted in a desired electric circuit. In practice, as is known, an excessive current flowing through the fusible wire of the cartridge tends to so heat the same that it melts away, thereby breaking the circuit. When the fuse wire is thus disintegrated, the cartridge becomes inoperative, and is then spoken of as "blown". In cases where more than one cartridge fuse is employed in a circuit, or there are several circuits entering through several cartridges at one location, it is frequently difficult to quickly detect which cartridges are "blown" and which still remain operative. It is, therefore, the purpose of this invention to provide a simple and efficient form of signaling device attachable to the cartridge, which operates to change its color when the fuse blows so that a visible indication of its condition is at once given.

I have, therefore, in my prior United States Patent #1,314,583, dated September 2nd, 1919, devised an indicator serving the general purposes above set forth, but which operated upon the principle of driving off moisture from a chemical substance, when the same was heated, to produce the color change. In the present invention I have simplified the device, so that by change in temperature alone of a normally dry chemical coating, the different color changes are effected, thus not only cheapening the cost

of production, and simplifying the process of operation, but also producing a more sensitive, and more rapidly operating device, as well as one which is less detrimentally affected by repeated use.

In its simplest form, as shown in Figures 1 and 2, the indicator, made according to the principles of the present invention, comprises a suitable conducting body or base 3, preferably in the form of a rigid rod, the same being made of a material offering a comparatively high resistance to the flow of current therethrough, such as a rod composed of clay and graphite hardened by baking at high temperature. Connected with each end of said rod are terminal clips 4, preferably made of metallic wire, and in such form that spring arms 5 are provided which may be engaged over the ends or ferrules 2 of the cartridge 1, so as not only to mechanically attach the indicator to the cartridge, but also to electrically connect the body or base 3 between the ferrules 2, and thus arranged in a shunt circuit with the cartridge. It will be understood that the form and arrangement of said terminal clips 4 is subject to considerable variation, and that consequently I do not limit myself to the specific forms thereof which are illustrated in the drawings.

The body or base 3 is coated, throughout a desired portion of its length, with a coating 6 of a suitable chemical compound, which will function to change its color when subjected to an abnormal temperature, or in other words, which will possess one color appearance under a normal or predetermined temperature, but which will change to another color when subjected to an increased or higher temperature. As illustrative of chemical substances which may be used for the purpose, but with no intent to confine myself to the use of such substances alone, may be named mercury and copper iodide; mercury iodide; mercury and silver iodide; or desired mixtures of the same.

The device when coated with mercury and copper iodide will possess a bright red color under a comparatively low temperature, but when the same is subjected to a comparatively high temperature its color will change to a dark or blackish brown.

When operatively attached to an operative cartridge fuse, the body or base 3 will offer such resistance to the flow of current, as compared with the conductivity of the fuse wire, that the current will follow the path of least resistance through the fuse wire, and consequently the base or body 3 remains at a comparatively low or normal temperature, under which condition the coating 6 retains its red color. When the fuse "blows", however, and the fuse wire of the cartridge is disintegrated, the current hav-

ing no other path, will flow through the body or base 3, which, owing to its high resistance will heat up to a comparatively high temperature, thus in turn heating the coating 6 to thereby cause the same to change its color whereby the visible signal indication of the "blown" condition of the cartridge fuse is produced. If the "blown" cartridge is removed and replaced by an operative cartridge to which the indicator is attached, the current will resume its normal path through the fuse wire, and the base or body 3 of the indicator will quickly cool to normal temperature, whereupon the coating 6 will resume its normal color. It will thus be understood that the indicator device may be used over and over again. If desired the indicator constructed substantially as above described may be enclosed in a glass tube 4, as shown in Fig. 7.

Referring now to Figures 3 and 4 of the drawings, I have shown a somewhat modified construction of the novel indicator. In this case, I partially coat the central zone of the base or body 3 with the color changing chemical coating 6, and then apply to the end zones of the base or body 3, adjacent to the coating 6, a non-changeable coating 7, such as a suitable paint or enamel, having a color corresponding to the normal color of the chemical coating 6. This non-changeable coating 6 will not change color under increased temperature, and will therefore, retain its normal color after the coating 6 changes color in operation, consequently a widely contrasting appearance between the central zone covered by the coating 6 and the end zones covered by the coatings 7 will be produced, which will greatly emphasize the visibility of the signal indication.

Referring now to Figures 5 and 6, I have shown therein another modified form of my indicator, which while operating on the same principles both as to electrical and color changing effects, is altered as to its mechanical structure. In this form of my invention I take a clear glass tube 8, and coat the inner surface of its wall with a coating 9 of the color changing chemical substance, I then fill the interior of the tube with a preferably granular substance such as graphite, to produce a conducting core 10 of relatively high resistance. The ends of the tube 8 are sealed or closed by suitable stoppers 11, through which pass the inner ends 12 of the metallic terminal clips 13, said inner ends 12 penetrating the core 10 so as to make electrical contact therewith. In this form of my invention the glass tube protects the coating of color changing chemical against mechanical abrasion or injury in use, and while somewhat more expensive to produce, it is, owing to such advantages, very desirable in many instances.

I am aware that some changes, other than

those already indicated, may be made in the various arrangements and combinations of the several devices and parts, and in the specific nature of the chemical coating material, without departing from the scope of this invention as above described, and as defined in the appended claims. Hence, I do not limit my invention to the exact arrangements and combinations as described in the foregoing specification, nor do I confine myself to the exact mechanical details of the construction of said parts as illustrated in the accompanying drawings.

15 I claim:—

1. In a device of the kind described, a base rod adapted to offer comparatively high resistance to the flow of an electric current therethrough, electric circuit conductors secured to opposite ends of said base rod, and an exterior coating applied to said base rod intermediate its ends, said coating consisting of a dry chemical substance the color of

which varies under the influence of temperature changes produced in said base rod. 25

2. In a device of the kind described, a base rod adapted to offer comparatively high resistance to the flow of an electric current therethrough, electric circuit conductors secured to opposite ends of said base rod, an exterior coating applied to said base rod intermediate its ends, said coating consisting of a dry chemical substance the color of which varies under the influence of temperature changes produced in said base rod, and an additional coating applied to said base rod adjacent to said first mentioned coating, said additional coating consisting of a pigment possessing a color corresponding to one color appearance of said first mentioned coating but being uninfluenced by temperature change produced in said base rod. 35 40

In testimony, that I claim the invention set forth above I have hereunto set my hand this 8th day of June, 1922.

FREDERICK A. FELDKAMP.