March 29, 1932. F. ECKHARDT ET AL 1,851,898

SAFETY DEVICE FOR ELECTRIC INCANDESCENT LAMPS

Filed Jan. 23, 1929

FIG. 1.

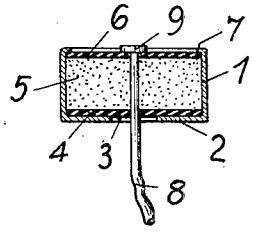


FIG. 2.

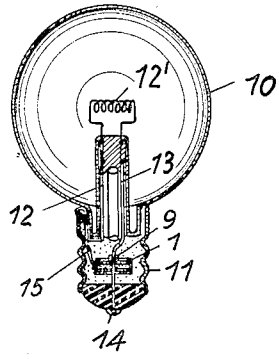


FIG. 3.

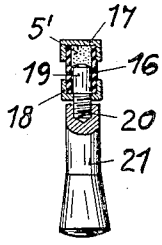


FIG. 4.

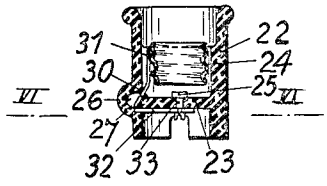


FIG. 5.

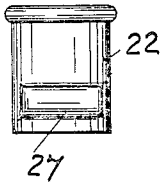
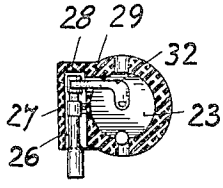


FIG. 6.



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UNITED STATES PATENT OFFICE

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SAFETY DEVICE FOR ELECTRIC INCANDESCENT LAMPS

Application filed January 23, 1929, Serial No. 334,572, and in Germany September 17, 1928.

This invention relates to the so-called "safety devices" for electric incandescent lamps connected in series to the supply circuit. Such safety devices are provided with resistances which are shunted across the incandescent filament of each lamp and which, as long as the lamp is still good, that is to say as long as the voltage required for its operation is applied across its terminals, do not allow practically any current to pass through them, but which, when the filament of the lamp is destroyed and consequently a voltage substantially higher than that required for its operation is applied, become conductive and thus bridge over the destroyed filaments.

More particularly the invention relates to safety devices in which the resistance consists of a large number of small particles of metal, natural ores, metal sulphides, or metal oxides, which lie loosely next to one another or are united together into a solid body.

Such safety devices have previously been manufactured, by disposing the voltage sensitive resistance, more particularly the small particles or the conglomerated solid body, in a hollow space of the base cap or in the socket of the lamp. The accommodation in a hollow space of the lamp, however, causes great difficulties in the new lamp sealing methods, since in most cases a suitable space in the glass bulb itself is not available.

The mounting within the socket of the lamp had the disadvantage that after the safety device had come into operation at least once, the whole of the socket could no longer be used.

The object of the present invention is to avoid these disadvantages. The invention consists in this that the voltage responsive resistance, which preferably consists of a large number of small particles is enclosed in an insulating casing which is provided with two contacts and together with the said casing is accommodated as a whole in one of the fittings leading the current to the lamp, more particularly in the base cap or in the socket of the lamp and is connected in such a manner with the leads that the resistance is shunted across the incandescent filament. The particles constituting the resistance may consist of metal, natural ore, which can be roasted, of a metal oxide, or a metal sulphide, of a synthetic chemical compound which is the equivalent of a natural roasted or non-roasted ore, for instance of roasted galena, or of iron hammer-scale (Fe_3O_4).

In the preferred form of construction, the safety device is mounted in the socket of the incandescent lamp and it is removably secured therein, the electrical connection being also easily detachable, for instance by means of springs, so that the safety device, that is to say the casing containing the resistance, can be easily exchanged.

Other essential features of the invention will hereinafter be described with reference to the accompanying drawings, in which

Fig. 1 illustrates in a section along the axis and on an enlarged scale, one form of construction of the safety device which is especially suitable for accommodation in the base cap.

Fig. 2 shows a section along the axis of an incandescent lamp in which a safety device as shown in Fig. 1 is mounted in the base cap.

Fig. 3 is a section along the axis and on an enlarged scale of a form of construction of the safety device which is especially suitable for accommodation in the sockets of incandescent lamps.

Fig. 4 illustrates a section along the axis of a socket adapted to be equipped with a safety device according to Fig. 2.

Fig. 5 is an elevation of the socket according to Fig. 4 seen from the side where the safety device is provided.

Fig. 6 is a cross section along the line VI—VI of Fig. 4, seen from below, with a safety device according to Figure 3 inserted therein.

Referring to Fig. 1, 1 is a metal casing having the shape of a flat cylinder, the bottom 2 of which is provided with a large opening 3 in the centre. An insulating disc 4 is mounted on the bottom of the casing. The latter is filled with the material 5 constituting the resistance and which may consist of powdered roasted galena. An insulating disc 6 is placed on the resistance filling, which disc is held

in position by the inner flange 7 provided on the casing 1. A conducting wire 8 passes through the centre of the casing, the insulating disc 4, the resistance filling 5 and the insulating disc 6 and is connected to a small metal plate 9, which rests on the insulating disc 6. The resistance 5 is thus conductively connected with the casing 1 as well as with the wire 8.

Referring to Fig. 2, 10 is the bulb of an incandescent lamp and 11 is the metal base cap thereof. 12 and 13 are the leads to the incandescent filament 12′ of the lamp, the lead 12 being conductively connected in the usual manner to the base cap 11. A safety device as illustrated in Fig. 1 is mounted within the hollow space of the base cap, being for instance cemented therein. The lead 13 of the lamp is conductively connected to the small plate 9 of the said safety device, being for instance soldered thereto and the wire 8 of the safety device is conductively connected, for instance by soldering, to the usual foot contact 14 of the base cap. The wall of the casing 1 is conductively connected by means of a separate wire 15 to the lead 12.

When a plurality of such lamps are connected in series with one another across the supply circuit, for instance eight lamps, across a supply circuit of 110 v., then as long as the filaments of the lamps are still good, the current will flow through each lamp along the following path: 14—8—9—13—12′—12—11. Between the wall 1 of the casing and the central wire 8, there is a voltage of 110÷8=14 v. and this voltage is not sufficient to render the resistance 5 conductive. However, when the incandescent filament is destroyed, the whole of the voltage of the supply circuit, viz. 110 v. is applied between the wall 1 and the wire 8 and this voltage is sufficient to render the resistance conductive and thus bridge over the gap which has been produced by the breakage of the filament.

Referring to Fig. 3, 16 is a small tube of insulating material, 17 a metal cap for closing up the said tube, whilst 18 is a second closing cap of metal for the said tube. The end of the tube lying next to the cap 11 is filled up by a metal bolt 19 which passes through the cap 18 and is screw-threaded, as shown at 20, beyond that cap. A knob or handle 21 of insulating material is screwed on to the screw-threaded part 20 of the bolt. The space between the top end of the bolt 19 and the cap 17 is filled with a powder 5′, for instance powdered iron hammer-scale, which does not allow the current to pass through as long as a small voltage is applied between the caps 17 and 18, for instance 10–30 v. but which becomes conductive when a higher voltage, for instance more than 60 v. is applied between the caps 17 and 18.

Referring to Figs. 4–6, 22 is a cylindrical sleeve of insulating material forming the socket of an incandescent lamp. 23 is a partition wall of insulating material provided in the lower end of the said cylindrical sleeve. 24 is the screw-threaded part of the socket for the neck and 25 is a foot contact.

At approximately the height of the partition wall 23 the cylindrical sleeve 22 is provided with a hole 26, which lies transversely to the axis and which is closed on the one side by a wall 27 and at the back by a bottom part 28, whilst it is open towards the front. The hole is so wide that a safety device according to Fig. 3 can be accommodated therein. In the proximity of the bottom 28, the hole 26 communicates with an opening 29, which leads to the space below the partition wall 23 whilst at about its centre the hole 26 communicates with an opening 30 leading to the space above the partition wall 23.

A resilient metal strip 31, which is conductively connected with the screw-threaded portion 24 of the neck passes through the opening 30 into the hole 26, whilst a resilient metal strip 32, which is conductively connected with the foot contact 25 by means of a bolt 33 passes through the opening 29 into the hole 26. The distance between the openings 29 and 30 is such that when a safety device according to Fig. 3 is inserted into the hole 26, the resilient member 32 comes in contact with the cap 17 and the resilient member 31 in contact with the cap 18.

The operation of the device is as follows:— When such a socket is connected in series with a plurality of other similar sockets and an ordinary lamp is inserted in each socket and a current is passed through the lamps, the said current will flow from the neck contact of the socket through the incandescent filament of the lamp to the foot contact of the socket. Between the neck contact and the foot contact and consequently between the resilient members 31 and 32, as well as between the caps 17 and 18, there is applied only the operative voltage of the lamp, for instance 14 v. and since for this voltage the resistance consisting of the powder 5′ is not conductive, no current will flow through the safety device. However, when the filament of the lamp is destroyed, the whole of the supply circuit voltage, for instance 110 v. is applied between the caps 17 and 18 and the powder 5′ becomes conductive, with the result that the safety device bridges the gap produced by the disconnection of the lamp and the other lamps continue to glow.

The invention is not limited to the forms of construction hereinbefore described. The essential feature is that a resistance which is not conductive at a low voltage and is conductive at a higher voltage is accommodated in a casing of insulating material provided with two contact members, which casing is of such a size that it can be mounted in the base cap or socket of an incandescent

lamp, so that the safety device constitutes a self-contained unit which can be separately manufactured and be readily inserted into the position of use and be easily replaced.

What we claim is:—

1. As an independent article of manufacture, an electric safety device comprising a flat cylinder with conducting side wall and insulating cover and bottom, a conducting wire passing through the said cover and bottom and projecting beyond the bottom, a pulverized mass filling the hollow space of the said cylinder, which mass is in conductive contact with the said conducting wall and wire, the said mass being such that it conducts the current only when the potential difference between the said conducting wall and wire exceeds a predetermined value, said safety device being insertable in the fitting of an electric incandescent lamp, as and for the purposes set forth.

2. As an independent article of manufacture, an electric safety device comprising an insulating tube, a conducting cover and bottom therefor, a mass filling up the space of the said tube and being in conductive contact with the said cover and bottom, the said mass being such that it conducts the current only when there is a potential difference between the cover and bottom which exceeds a predetermined value, said safety device being insertable in the fitting of an electric incandescent lamp and said conducting cover and bottom being adapted to engage conductively contacts in said fitting, as and for the purposes set forth.

3. A socket for electric incandescent lamps comprising an insulating socket body having a neck contact and a foot contact, an insulating casing with two contact pieces mounted in the said socket body and capable of being exchanged, a resistance in the said casing in conductive contact with the said two contact pieces, a removable conductive connection from the one contact member to the neck contact and a removable conductive connection from the other contact member to the foot contact, the said resistance being such that the current is conducted only when a voltage is applied between the said contact members which is greater than the operative voltage of the incandescent lamp.

4. A socket for electric incandescent lamps comprising an insulating, substantially cylindrical hollow body, an insulating partition wall which divides the said hollow body into an upper and a lower space, a neck contact on the inner wall of the upper space, a foot contact on the side of the partition wall facing the upper hollow space, an outer wall which is transverse to the axis of the cylindrical insulating body and which forms with the wall of the insulating body a passage open at one end, the said passage having an opening which communicates with the lower hollow space of the insulating body and an opening which is in communication with the upper hollow space of the said insulating body, a bottom at the other end of the passage, an insulating sleeve in the said passage, the said insulating sleeve having contact members at its two ends, a resilient member fixed to the neck contact which passes through the opening which is in communication with the upper space, the said resilient member being resiliently connected to the one contact member of the sleeve, a conducting member which is secured to the foot contact and passes through the opening which is in communication with the lower space into the said passage and is resiliently connected with the other contact member of the sleeve, a resistance in the insulating sleeve in conductive contact with the two contact members, which resistance is such that it conducts the current only when a voltage is applied to the contact members which is higher than the operative voltage of the incandescent lamp.

5. A safety device for electric incandescent lamps comprising an insulating container independent from the base cap and the socket of the lamps and adapted to be loosely inserted into the fitting of the lamp, at least one conducting part on the outside of said container, two contact members in the said container and a resistance filling up the interior of the container and consisting of a large number of small particles, the said resistance being in conductive contact with the said contact members and being such that it conducts the current only when the potential difference between the said contact members exceeds a predetermined value.

In testimony whereof we have signed our names to this specification.

FRITZ ECKHARDT.
MAX HOHNEKAMP.