

[54] **ELECTRIC INCANDESCENT LAMP FOR SERIAL CONNECTION, PROVIDED WITH A SHORT-CIRCUIT MECHANISM ACTING AS A FUSE AT THE SAME TIME**

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[22] Filed: **June 20, 1972**

[21] Appl. No.: **264,493**

[30] **Foreign Application Priority Data**

June 21, 1971 Netherlands..... 7108537

[52] U.S. Cl..... **315/47, 315/74, 315/75, 315/125**

[51] Int. Cl..... **H01j 29/96**

[58] Field of Search..... **315/47, 65, 74, 75, 125**

[56]

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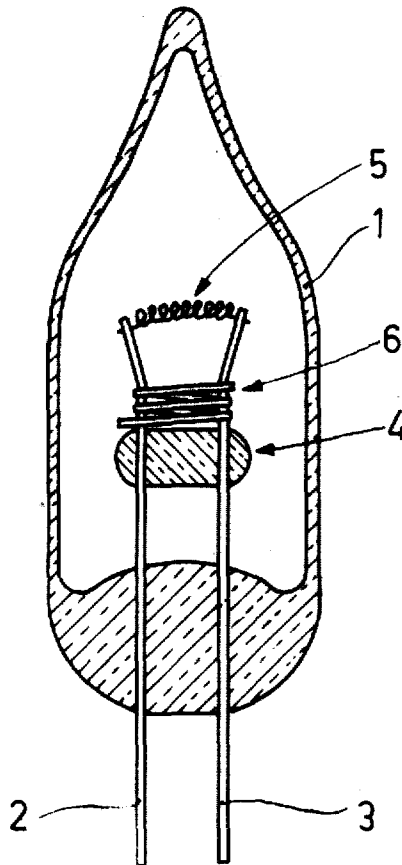
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[57]

ABSTRACT

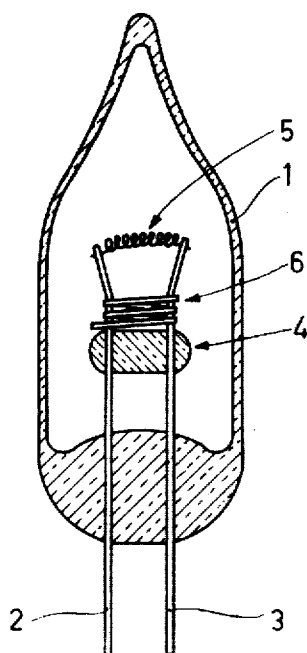
Electric incandescent lamp for serial connection, provided with a short-circuit mechanism consisting of a wirepiece wound about the current conductors. This wirepiece consists of an alloy of nickel and copper. The current conductors and/or the metal wire are provided with an oxide film.

4 Claims, 1 Drawing Figure



PATENTED FEB 26 1974

3,794,880



ELECTRIC INCANDESCENT LAMP FOR SERIAL CONNECTION, PROVIDED WITH A SHORT-CIRCUIT MECHANISM ACTING AS A FUSE AT THE SAME TIME

The invention relates to an electric incandescent lamp for serial connection, provided with a short-circuit mechanism acting as a fuse at the same time. Electric incandescent lamps of this type are known per se. They are used, for example, for the manufacture of Christmas-tree lighting.

The object of the short-circuit mechanism present in these lamps is to prevent that when a lamp fails, for example, by breakage of the filament in a series arrangement, the other lamps in this series arrangement are also extinguished. In fact, it is quite possible to continue to use such a series arrangement in spite of the failure of one or several lamps and in addition it is difficult and often time-consuming to find the broken filament in a lamp when all lamps are extinguished due to the failure of one lamp in a series arrangement. For these reasons series arrangements of this kind employ lamps which are provided with a short-circuit mechanism which becomes operative at the instant when the filament of a lamp burns or breaks due to other causes. The short-circuit mechanism may consist of a wire which is wound several times about the current conductors within the envelope of the lamp and which connects these conductors together but is electrically insulated therefrom by a layer of an electrically insulating material which is present on the short-circuit wire or on the current conductors or on both and which breaks down only when the full mains voltage is present across the lamp. The latter is the case when a filament in an incandescent lamp in a series arrangement burns, or breaks due to another cause.

When the short-circuit mechanism becomes operative the resistance across the relevant lamp decreases. As a result ever-increasing currents start to flow in the series arrangement when several lamps fail one after the other. This may be dangerous because the flexes used are not resistant to large currents so that there is a risk of fire, while on the other hand the last lamps in the series arrangement may burn within a short period due to overload of the filament.

For this reason the short-circuit mechanism is formed in such a manner that it operates as a fuse at the same time for the purpose of maintaining the intensity of the current flowing through the series arrangement below a current intensity considered admissible for the reasons mentioned above.

Thin wires of aluminium, copper and tungsten have been proposed for this purpose.

However, it has been found that wires of these metals are less suitable in practice for the envisaged object. When using copper and aluminium wire provided with an oxide film, a reliably operating short-circuit mechanism may be obtained, but when such a short-circuit mechanism is also to operate as a fuse, it is found that the diameter of the wire is to be chosen so small that due to the slight strength of the wire much breakage occurs when winding this wire about the current conductors.

Copper has the drawback that one of the oxides is semiconducting.

Tungsten wire cannot be provided with insulating oxide films which adhere to the metal sufficiently for

the envisaged object so that there is the risk that when using such wires as a short-circuit mechanism and as a fuse, the short-circuit mechanism of a lamp starts to operate while the filament is not burned, which may give rise to flickering or extinguishing of the said lamp.

An object of the invention is to provide an electric incandescent lamp provided with a short-circuit mechanism which operates as a fuse at the same time and which consists of a metal wire wound about the current conductors, in which the current conductors and/or the metal wire wound thereabout are provided with an oxide film and in which these drawbacks do not occur. According to the invention an incandescent lamp of this kind satisfies this object and is characterized that the metal wire consists of an alloy of mainly nickel and copper and optionally of small quantities of additions commonly used for these alloys.

In practice alloys have been found to be very suitable which contain more than 30 percent by weight of nickel such as an alloy consisting of 43 percent by weight of nickel, remainder copper with the commonly used impurities (for example, constantane) and an alloy consisting of 67 percent by weight of nickel, 30 percent by weight of copper, 1.4 percent by weight of iron, 1.0 percent by weight of manganese, 0.1 percent by weight of silicon, 0.15 percent by weight of carbon and the commonly used impurities (for example "Monel", trademark of the firm "The International Nickel Company Inc.").

Satisfactory results were obtained with wires consisting of these alloys having diameters of 60 and 70 micrometres and being provided with an oxide film. An oxide film of the desired breakdown strength may be obtained by heating the wires in air, a different oxygen-containing gas mixture or oxygen, for example, by direct passage of current. The period of heating is dependent on the desired breakdown strength to be achieved. A heat treatment for several seconds is usually already sufficient to obtain an oxide film having a breakdown voltage upon alternating voltage load of between 10 and 60 Volts.

If the position of the current conductors is fixed by means of a bead, the winding of metal wire may be present above or below the bead.

It is advantageous when the metal wire winding is present at an area in the lamp such that during sealing of the system of stems or sealing of exhaust tubes oxidation of the metal wire and/or current conductors occurs at the area where the metal wire winding is present. Due to this step the detrimental results of possible damage of the oxide film during winding or transport, namely short circuit without the filament being burned, are eliminated.

An embodiment of the invention will be described in greater detail with reference to the accompanying drawing whose sole FIGURE shows a miniature lamp on a scale which is enlarged many times.

The sole FIGURE shows a miniature lamp having an envelope 1 of glass, two current conductors 2 and 3 whose position within the envelope is fixed by means of a glass bead 4. The ends of the current conductors within the envelope 1 support a filament 5. The current supply wires are mutually connected by means of a wire piece 6 which is wound about the current conductors and which consists of an alloy of mainly nickel and copper.

When a wire of constantane (43 percent by weight of nickel, remainder copper) having a diameter of 60 micrometres was used, it could be achieved that the short-circuit mechanism operated at a voltage of between 15 and 20 V and that the passage of current was interrupted in case of a current intensity of more than 2 A.

A similar result was obtained with a wire consisting of an alloy of 67 percent by weight of nickel, 30 percent by weight of copper, 1.4 percent by weight of iron, 1 percent by weight of manganese, remainder silicon and carbon ("Monel"). The breakdown voltage of the oxide film was between 20 and 60 V.

What is claimed is:

1. In an electric incandescent lamp adapted for serial connection with other similar lamps of the type having a pair of current conductors and a filament provided therebetween, the improvement comprising a wire metal provided with an oxide film being wound about the conductors, said metal wire consisting of an alloy of mainly nickel and copper and optionally small quantities of additions commonly used for these alloys, said wire for short-circuiting the current conductors upon application of a predetermined voltage between said current conductors and for operating as a fuse to open circuit upon application of a predetermined current

through said wire.

2. An electric incandescent lamp as claimed in claim 5 wherein the metal wire consists of an alloy of 43% by weight of nickel, with the remainder being copper and the commonly used impurities.

3. An electric incandescent lamp as claimed in claim 5 wherein the metal wire consists of an alloy of 67 percent by weight of nickel, 30 percent by weight of copper, 1.4 percent by weight of iron, 1 percent by weight of manganese, with the remainder being silicon and carbon.

4. In an electric incandescent lamp adapted for serial connection with other similar lamps of the type having a pair of current conductors and a filament provided therebetween, said current conductors having an oxide coating thereon, the improvement comprising a metal wire being wound about the conductors, said metal wire consisting of an alloy of mainly nickel and copper and optionally small quantities of additions commonly used for these alloys, said wire for short-circuiting the current conductors upon application of a predetermined voltage between said current conductors and for operating as a fuse to open circuit upon application of a predetermined current through said wire.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,794,880 Dated February 26, 1974

Inventor(s) Enrico Peretti, Piet Kramer

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 2, line 2, "5" should read --1--

Claim 3, line 2, "5" should read --1--

Signed and sealed this 1st day of October 197

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents