Electric lamp.

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DE-A-1 958 307
DE-U-1 912 570
GB-A-1 060 297

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Description

The invention relates to an electric lamp comprising a lamp vessel which is fused at one end with a tube extending into the lamp vessel and being sealed in a vacuum-tight manner at its end located inside the lamp vessel by means of a pinch through which current-supply conductors leading to a light source arranged inside the lamp vessel are sealed, which lamp vessel is secured at its said end to a lamp cap comprising contacts to which the current-supply conductors are connected, at least one of said contacts being present at the bottom of the lamp cap, a fuse wire which extends through an electrically insulating mass being present at least one of the current-supply conductors between the relevant contact and the pinch of the lamp. Such a lamp is known from British Patent GB—A—1060297.

It is of great importance that electric lamps are provided with a fuse to interrupt the current circuit when an excessively high current flows through the lamp. However, when the fuse melts, a discharge arc can be produced which can flash over to the current-supply conductor or to the sheath of the lamp cap. The discharge arc may result in that the lamp cap is welded to the lamp holder, in that the fuse of the equipment to which the lamp is connected becomes operative, or in that the lamp explodes. Therefore, numerous proposals have been made to avoid these phenomena. In many cases, these proposals reside in that additional parts are used, as a result of which manufacture of the lamp becomes more expensive.

In the lamp according to the aforementioned British patent, the tube is filled with quartz sand or with glass beads, the lamp cap is fixed on the lamp vessel and sealed with cement and the lamp cap is filled for the remaining part with foamed synthetic material. As a result, the fuse is entirely incorporated in electrically insulating material and a discharge arc cannot be produced.

The foamed material in this lamp has a double function: it holds the grains of sand or glass in place and it insulates the fuse from the other current conductor and from the lamp cap (except for the relevant contact at the lamp cap).

It has been found that in practice this construction has great disadvantages. The synthetic material from which the foam has to be formed upon heating has to be pressed to form rings which are then fixed in the lamp cap. During the process of assembling the lamp vessel and the lamp cap, the lamp vessel should be arranged with its neck directed upwards in order to prevent the grains of glass or sand from flowing away, which implies that the lamp cap should be arranged with its opening downwards. The price of the lamps is increased by the steps of pressing the rings and fixing them. However, a very great disadvantage is that the rings of foamed synthetic material between the production machine for lamp caps and the assembling machine for lamps can drop out of the lamp cap. As a result, the assembling machine should be provided with means for checking the presence of the rings in order to avoid that lamps are manufactured in which the fuse wire is not satisfactorily enclosed by insulating material.

The invention has for its object to provide a lamp provided with a fuse which is of a very simple construction.

According to the invention, this is achieved in a lamp of the kind mentioned in the opening paragraph in that a fuse wire is present in a current-supply conductor connected to a bottom contact of the lamp cap, and in that said tube is filled at its sealed end with a coherent electrically insulating mass in which the fuse wire is embedded over part of its length and which remains coherer at the temperatures prevailing in situ during operation of the lamp.

In contrast with the teachings according to the prior art, experiments have shown that it is not necessary for a safe and reliable fuse that the fuse wire is incorporated throughout its length in an insulating mass, or that the end of the fuse wire connected to or located near the relevant contact of the lamp cap is embedded in an insulating mass. It is in fact sufficient if only the end of the fuse wire located near the pinch is incorporated in an insulating mass. This is probably due to the fact that, when the fuse wire becomes operative and melts away, the comparatively thick current-supply conductor extending through the pinch into the tube and connected to the fuse wire cannot act as an electrode for a discharge arc. The thick current-supply conductor is in fact only accessible for an arc through the narrow duct in the insulating mass which still was filled beforehand by the fuse wire.

Although the tube may be filled for a large part, or even entirely, with the insulating mass, this is not necessary. Generally, it is sufficient if the fuse wire is embedded over about 12mm of its length. This has the advantages of low material consumption, small weight and a rapid manufacture. Especially when an exhaust extends through the said tube to the pinch, the space inside the said tube is very restricted and a very low amount of material suffices to embed the fuse wire. Due to the fact that the fuse wire need be incorporated in the insulating mass over only part of its length, it is not necessary for the fuse wire to be secured to a thick wire which is secured to a contact on the lamp cap, as is the case in certain known constructions.

The insulating mass can be provided in a controllable manner because this can be effected before the lamp cap is fitted. The mass can be provided whilst the lamp vessel is in the same position as usual during the arrangement of the lamp cap: the end to which the lamp cap has to be secured is then directed upwards. This has the great advantage that an insulating mass cross-linking and/or foaming at the ambient temperature can be used, which is obtained immediately before the application by mixing two components. A thermal treatment can then be dis-
pensed with. If the mass should have to be put into the lamp cap or if the lamp cap should also have to be filled, the use of such cold-hardening or cold-foaming masses would be objectionable in view of the time required to arrange the lamp cap on the lamp vessel.

A strong adherence of the insulating mass to the tube has proved not to be necessary because the mass is enclosed sufficiently by the tube, the current-supply conductors and the exhaust mostly present so that it is held in place. Very favourable results have been obtained with foams, such as silicone polyester foams and especially with polyurethane foams.

The lamp according to the invention may be any one of several kinds. The light source may be a filament, which may be provided in an inner envelope, or a filament and a discharge arc, in which case the filament serves at the same time as a current limiter for the discharge arc. Furthermore, the lamp may have an Edison lamp cap or a Swan lamp cap, whilst a contact may be present on the sheath of the lamp cap.

Among the large number of known constructions of lamps with a fuse, in which additional parts are required for entirely enclosing the fuse wire, the construction according to German Gebrauchsmuster DE—U—1,912,570 is mentioned. In this case, the fuse wire is a part of a current-supply conductor located entirely in the tube of the lamp and the tube is filled entirely with quartz sand covered with a glue layer in order to prevent the sand from flowing away. Not only does this construction require glue as well as sand, but also a thicker piece of wire has to be welded to the fuse wire in order to bridge the distance between the fuse wire located entirely in the tube and the contact on the lamp cap.

An embodiment of a lamp according to the invention is shown in the drawing in side elevation with the lamp cap in longitudinal sectional view.

The glass lamp vessel 1 is fused at an end 2 with a glass tube 3 which extends into the lamp vessel and is connected at its end located inside the lamp vessel 1 by means of a pinch 4 to an exhaust tube 5 and current-supply conductors 6 which lead to a light source 7 arranged inside the lamp vessel 1. The lamp vessel 1 is secured at its end 2 to a lamp cap 8 whose contacts 9 are connected to the current-supply conductors 6. The lamp vessel 1 has a spring conductor 5, each consist between the contacts 9 and the proximity of the pinch 4, of a fuse wire 10. The tube 3 contains a coherent electrically insulating mass 11 in which the end 12 of the fuse wires 10 located near the pinch 4 is embedded.

A few hundreds of lamps of the kind shown in the drawing were manufactured in which the coherent insulating mass was a polyurethane foam obtained from propylene glycol and an excess of methylene diphenyl di-isocyanate with halogenated hydrocarbon and water as foaming agent. Invariably, the fuse wire was embedded at its end over a length of from 1.5 to 2 cm. Several of these lamps were operated at nominal voltage till the end of the life. They then consumed at 220 V a power of 100 W. The temperature of the insulating mass was 250°C. At the end of the calculated life the filament burned through at least one of the fuse wires of the lamps fused. The current flow through the lamps was then interrupted without the occurrence of additional phenomena.

Lamps of the same kind were operated for 750 hours which is 75% of the calculated life. 50—70° before the maximum of the main voltage across the lamps was reached, an excess voltage of 3000 V was applied across the lamps for 2 to 5 milliseconds. As a result, the filament burned through and an arc discharge was produced inside the lamp vessel. The arc extinguished 1.5 msec. after it was produced due to the melting of at least one of the fuse wires. No discharge arcs then occurred inside the lamp cap. The 10 A fuse of the equipment was then still intact, while the lamp, except for the filament and the fuse wire(s) was also still intact.

Lamps of the same kind were held for 1500 hr at 250°C and were then tested, in the same manner as to the reliability of the fuse with the same result. In lamps without an insulating mass, the current through the lamp increased in 4 msec to 350 A and the lamp vessel became fixed in the lamp holder by welding.

Claim

An electric lamp comprising a lamp vessel (1) which is fused at an end (2) with a tube (3) extending into the lamp vessel and being sealed in a vacuum-tight manner at its end located inside the lamp vessel by means of a pinch (4) through which current-supply conductors (6) leading to a light source (7) arranged inside the lamp vessel are sealed, which lamp vessel is secured at its said end to a lamp cap (8) comprising contacts (9) to which the current supply conductors are connected, at least one of said contacts being present at the bottom of the lamp cap, a fuse wire (10) which extends through an electrically insulating mass (11) being present in at least one of the current-supply conductors between the relevant contact and the proximity of the pinch, characterized in that a fuse wire is present in a current-supply conductor connected to a bottom contact of the lamp cap, and in that said tube is filled at its sealed end with a coherent electrically insulating mass (11) in which the fuse wire is embedded over part of its length and which remains coherent at the temperatures prevailing in situ during operation of the lamp.

Patentanspruch

Elektrische Lampe mit einem Lampenkolben (1), der an einem Ende (2) mit einem sich bis in den Kolben erstreckenden Rohr (3) verschmolzen ist, das an seinem im Kolben liegenden Ende mit einer Quetschung (4) vakuumdicht abgeschlosse
Revendication

Lampe électrique comportant une ampoule (1), dont une extrémité (2) est scellée à un tube (3) qui s'étend dans l'ampoule et dont l'extrémité située dans l'ampoule est scellée, d'une façon étanche au vide à l'aide d'un pincement (4) dans lequel sont scellées des entrées de courant (6) s'étendant à une source lumineuse (7) disposée dans l'ampoule, ampoule dont ladite extrémité est fixée à un culot (8) présentant des contacts (9) auxquels sont reliées les entrées de courant, alors qu'au moins l'un desdits contacts est présent au fond du culot, un fil fusible (10) traversant une masse électro-isolante (11) étant présent dans au moins l'un des entrées de courant entre le contact en question et la proximité du pincement, caractérisé en ce qu'un fil fusible est présent dans une entrée de courant reliée à un contact de fond du culot de la lampe et que ledit tube est rempli, à son extrémité scellée, d'une masse électro-isolante cohérente (11), dans laquelle est noyé le fil fusible sur une partie de sa longueur et qui maintient sa cohérence aux températures régissant en régime à ce endroit dans la lampe.