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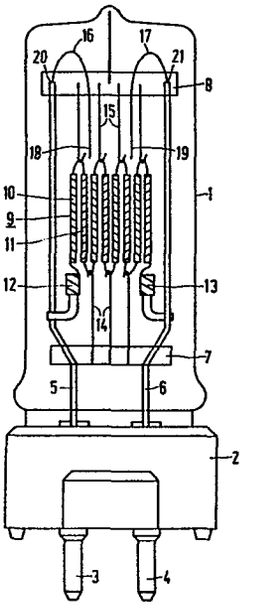
(54) Electrical incandescent lamp.

(57) The electrical incandescent lamp according to the invention has a filament (9) having several parallel arranged sections (10, 11), which are kept taut by a frame (5, 6, 7, 8) consisting of current supply conductors (5, 6) and insulator beams (7, 8). Metal wires (16, 17) of a predetermined thickness are connected to a respective current supply conductor (5, 6). They are embedded over part of their length in an electrically insulating body (8), from which they emanate at a distance from the current supply conductors (5, 6). Their free ends (18, 19) are located near the filament (9) and spaced closer together than the current supply conductors (5, 6) in the frame (5, 6, 7, 8). If at the end of the life of the lamp a discharge arc is produced, the latter abruptly moves to the metal wires (16, 17) and these wires melt away upto or into the electrically insulating body (8). The arc is thus extinguished.



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Electrical incandescent lamp.

The invention relates to an electrical incandescent lamp comprising:

- a translucent lamp vessel sealed in a vacuum-tight manner,
- current supply conductors which enter the lamp vessel at one end thereof and are interconnected inside the lamp vessel by insulator beams with which they constitute a frame;
- a filament having several helically wound sections, which are kept taut at least substantially parallel to each other by said frame, the ends of said filament being electrically connected to a respective current supply conductor.

Such a lamp is known from British Patent Specification 2,069,233.

An incandescent lamp of this kind can be used inter alia for the illumination of photographers' or film studios, as a theatre lamp or as a projection lamp. The lamp is mostly constructed as a halogen incandescent lamp and is then provided with a lamp vessel of quartz glass or another glass having an SiO_2 content of at least 95 % by weight and a halogen-containing inert gas.

In such an incandescent lamp, a discharge arc can be produced at the end of its life when the filament burns through. A high current will then flow through the lamp, which may lead to overheating of the lamp vessel, as a result of which the lamp explodes. In order to counteract explosion, the lamp is operated in series arrangement with a fuse that may be built in and interrupts the current circuit through the lamp when it becomes operative in response to a high current.

In certain types of lamps, the current through the lamp is however smaller (for example 80 A) upon the occurrence of a discharge arc than the high current (for

example 100 A) transiently flowing when the lamp is switched on. Because of its short duration, this high transient current is not harmful, in contrast with the lower arc current should the latter be maintained for a considerable length of time. Said lower arc current renders it very difficult to choose a fuse which becomes operative at the lower arc current, but does not become operative at the higher transient current.

The invention has for its object to provide a lamp of a construction which protects the lamp against explosion and nevertheless allows higher transient currents.

According to the invention, this object is achieved in a lamp of the kind described in the opening paragraph in that a respective thinner metal wire of a predetermined thickness is secured to each of the current supply conductors, the free ends of these wires being situated close to the filament, and closer to each other than the current supply conductors in the frame, and the thinner metal wires are embedded over part of their length in an electrically insulating body, from which they emanate at a distance from the current supply conductors.

If the lamp according to the invention is positioned during operation so that the free ends of the thinner metal wires are located above the filament, then any discharge arc, obtained at the end of the lamp life is displaced to these free ends. Two phenomena play a role therein: Firstly, convection current produced by the discharge arc displace the arc in an upward direction, Secondly, the whole voltage applied to the lamp is present across the ends of the thinner metal wires, whereas the voltage drop across a discharge arc between remaining fragments of the filament is only a part of that lamp voltage since the discharge arc is electrically in series with fragments of the filament. After the arc has been displaced to the thinner metal wires, due to the

high arc current the thinner metal wires melt away up to or into the electrically insulating body in which they are embedded over part of their lengths. The arc then extinguishes.

The current supply conductors are comparatively thick because they have, besides an electrical function, a mechanical function, that is, to hold the filament in a stable position and to keep the sections of the filament in a taut condition. Due to their thickness, the arc current cannot cause the current supply conductors to melt. If the discharge arc could reach the current supply conductors, the discharge arc would be maintained on them for such a long time that the lamp would explode. In order to prevent the discharge arc from reaching the current supply conductors, the thinner metal wires are embedded over part of their length in an electrically insulating body and emanate therefrom at a distance from the current supply conductors. As a result, when the arc reaches the electrically insulation body, it is kept separated from the relevant current supply conductor.

Since the metal wires have to melt away in order to eliminate the points of application for the discharge arc, they are thinner than the current supply conductors. However, it has been found that these wires must not be so thin that they melt away too rapidly. The fragments of the filament would then still be so hot, when the wires have melted away, that a discharge arc can readily be produced again between these fragments. For each lamp type, the correct wire thickness can readily be determined with a small number of test lamps.

In a studio lamp (colour temperature 3200 K), which in operation at 110 V consumed 2000 W, it was found that tungsten wires of 150 µm diameter melted away so rapidly that a new arc was spontaneously produced between the fragments of the filament after the discharge arc that had been present between the metal wires had been extinguished.

Wires of 300 /um diameter melted away more slowly, but sufficiently quickly that the current through the lamp was definitely interrupted 10 ms after the discharge arc had developed. It was further found that in studio lamps of this kind no explosion occurs within 20 ms.

Lamps of the kind mentioned in the opening paragraph are mostly operated in vertical position arranged so that the free ends of the current supply conductors are on the upper side. In a favourable embodiment of simple construction of a lamp according to the invention suitable to be operated in this position, the free ends of the current supply conductors are embedded in an insulator beam of the frame. The thinner metal wires are secured at or near these free ends and emanate from the insulator beam on the side remote from the filament and are bent back towards the filament and extend to the proximity of the latter. In this embodiment, the insulator beam acts as the electrically insulating body.

An embodiment of the lamp according to the invention is shown in the drawing. In the drawing:

Fig. 1 is a side elevation of the lamp, and

Fig. 2 is a side elevation of the lamp of Fig. 1 rotated through 90°.

In the Figures, a quartz glass lamp vessel 1 sealed in a vacuum-tight manner has at one end a lamp cap 2, which is provided with contact pins 3, 4. At this end, current supply conductors 5, 6 of tungsten enter the lamp vessel. They are connected to a respective contact pin 3,4. The current supply conductors 5, 6 are mechanically interconnected inside the lamp vessel 1 by quartz glass beams 7, 8, with which they constitute a frame 5, 6, 7, 8 by which a filament 9 is kept taut. The filament 9 has several helically wound sections 10, 11, which extend at least substantially parallel to each other in two parallel flat planes (Fig. 2). The ends 12, 13 of the filament 9 are each electrically connected to a respective current supply conductor of 700 /um diameter 5, 6. Suppor-

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ting hooks 14, 15 anchored in the glass beams 7 and 8, respectively, hold the filament 9 in place.

Each of the current supply conductors 5, 6 has secured to it a respective thinner metal wire 16, 17 of a predetermined thickness, whose free ends 19 and 18, respectively, are situated near the filament 9. The free ends 18, 19 are located closer to each other than the current supply conductors 5, 6 in the frame 5, 6, 7, 8. The thinner metal wires 16, 17 are embedded over part of their length in an electrically insulating body 8, from which they emanate at a distance from the conductors 5, 6.

In the Figures, the connections 20, 21 of the thinner, tungsten, wires 16, 17 to the tungsten current supply conductors 5, 6 are at the free ends of the current supply conductors and these connections 20, 21, and hence the free ends of current supply conductors 5, 6 are embedded in the quartz glass beam 8 of the frame 5, 6, 7, 8. The thinner tungsten wires 16, 17 emanate from the quartz glass beam 8, in contrast with the current supply conductors 5, 6 on the side remote from the filament 9. They are bent back towards the filament 9 and extend as far as the proximity of the latter.

The lamp shown is a 100 V 2000 W halogen theatre lamp having a gas filling containing hydrobromide, in which the tunsten wires 16, 17 have a diameter of 300 /um. If during operation the filament burns through in the vertical position shown and a discharge arc develops, the latter is displaced under the influence of convection currents in an upward direction. The same voltage is applied across the free ends 18, 19 as across the contacts 3, 4, while the discharge arc, which is electrically in series with fragments of the filament 9, has only a part of this voltage. The discharge arc soon abruptly moves to the free ends 18, 19. The wires 16, 17 melt away as far as into the quartz glass beam 8, as a result of which the arc is extinguished within 10 ms after it has been produced. At the area of the filament 9, the conditions then existing

are such that a new discharge arc does not develop. The lamp, except for the filament and the wires 16, 17, remains entirely intact.

1. An electrical incandescent lamp comprising:
- a translucent lamp vessel, sealed in a vacuum-tight manner;
- current-supply conductors, which enter the lamp vessel at one end thereof and are interconnected inside the lamp vessel by insulator beams with which they constitute a frame;
- a filament having several helically wound sections which are kept taut at least substantially parallel to each other by said frame, the ends of said filament being electrically connected to a respective current supply conductor,
characterized in that each of the current supply conductors has secured to it a respective thinner metal wire of a predetermined thickness, whose free end is situated near the filament, said free ends being located closer to each other than the current supply conductors in the frame and the thinner metal wires being embedded over part of their length in an electrically insulating body from which they emanate at a distance from the current supply conductors.

2. An electrical incandescent lamp as claimed in Claim 1, characterized in that the free ends of the current supply conductors are embedded in an insulator beam of the frame and in that the thinner metal wires emanate from the insulator beam on the side remote from the filament and are bent back towards the filament and extend to the proximity of the latter.

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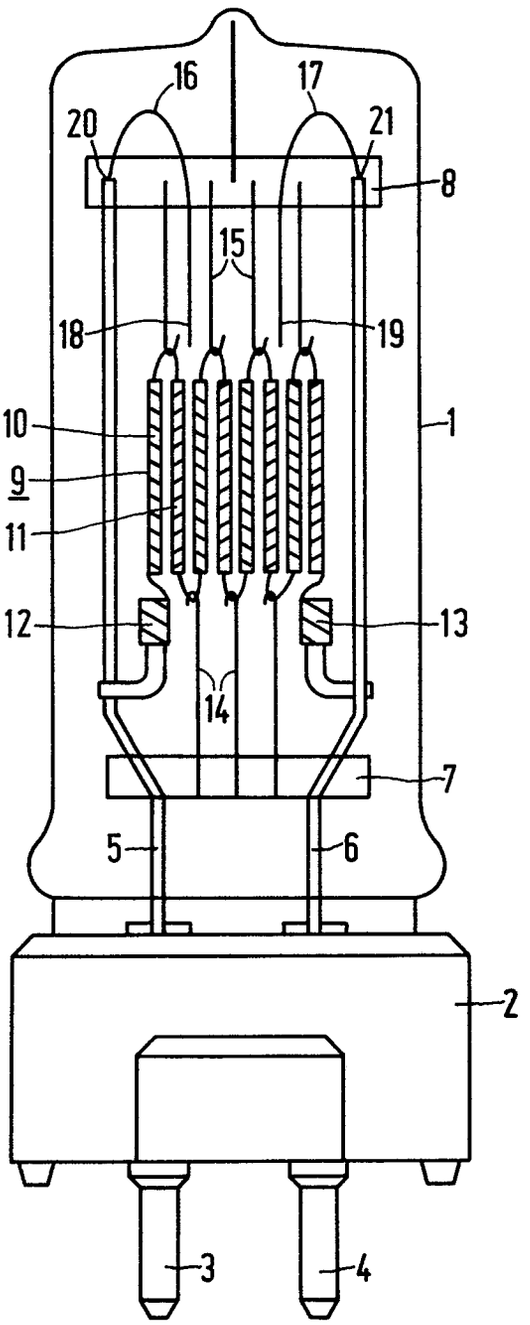

FIG.1

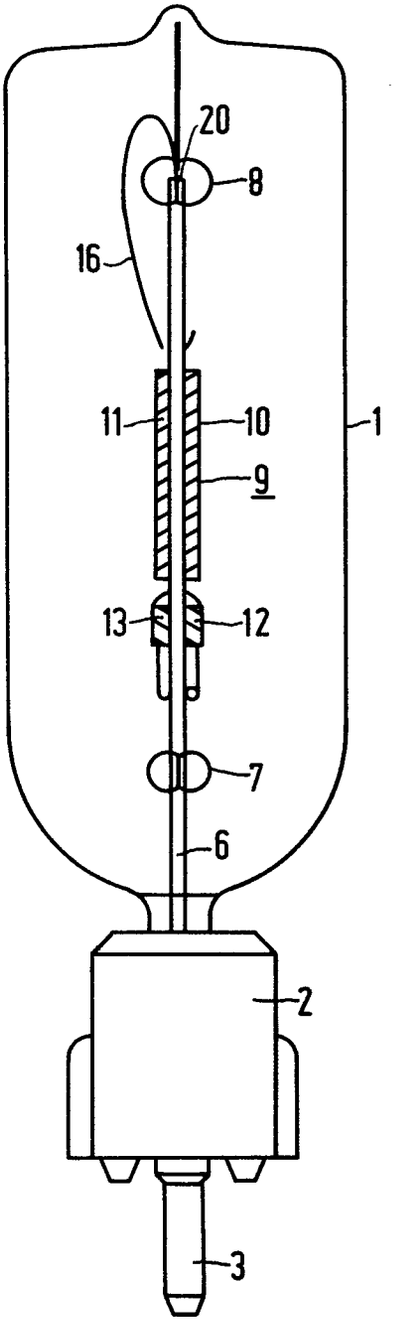

FIG.2

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European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 85 20 0539

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,A	GB-A-2 069 233 (PHILIPS) * Whole document *	1	H 01 K 1/68 H 01 K 1/40
A	DE-C- 441 335 (J. SALPETER et al.) * Page 2, lines 36-75; figure *	1	
A	FR-A-1 081 694 (PHILIPS) * Page 2, column 1, line 10 - column 2, line 2; figures 1-10 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

H 01 K 1/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02-07-1985	SARNEEL A.P.T.

CATEGORY OF CITED DOCUMENTS

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