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[54] **ELECTRIC LAMPS AND DISCHARGE DEVICES**

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[58] **Field of Search** 313/318, 331, 315

[56] **References Cited**

UNITED STATES PATENTS

3,001,097	9/1961	Smialek	313/318
3,448,322	6/1969	Millikan et al	313/331
3,001,096	9/1961	Mosby	313/318

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[57] **ABSTRACT**

An end construction of an electric lamp or discharge device has an hermetic pinch seal through which an electrical lead-out conductor passes, the conductor terminating in a cap unit which includes an externally-insulated metal tube filled with brazing alloy. The cap unit enhances dissipation of heat from the seal and thereby improving resistance to failure of the lead-out conductor by oxidation.

4 Claims, 2 Drawing Figures

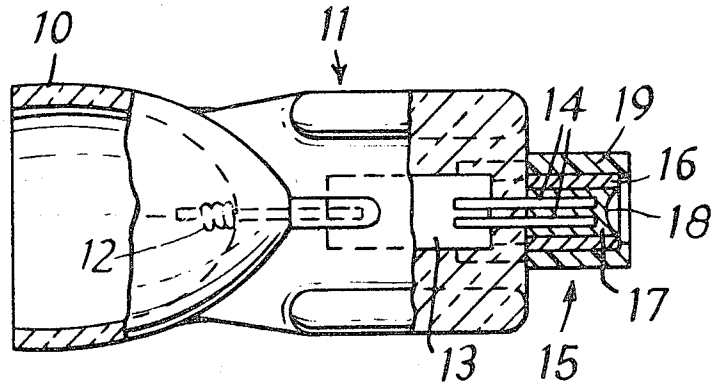


FIG. 1.

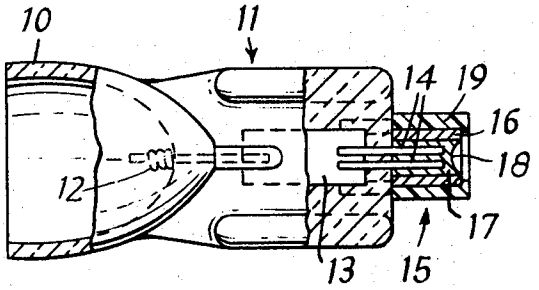
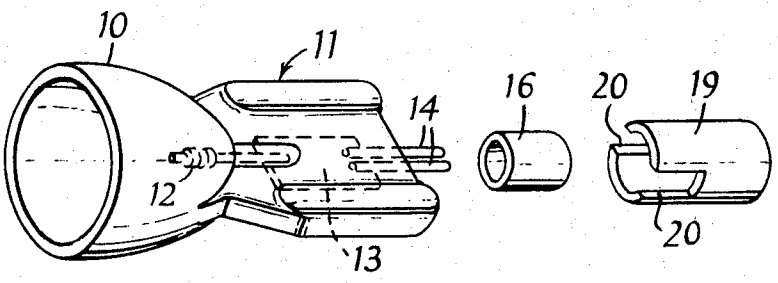


FIG. 2.



ELECTRIC LAMPS AND DISCHARGE DEVICES

The present invention relates to improvements in electric lamps and electric discharge devices employing glass-to-metal seals.

Molybdenum is commonly used in lead-in conductors to internal components such as filaments and discharge electrodes in incandescent lamps, in discharge lamps and in other electron discharge devices. Often, the molybdenum is in the form of a thin foil extending through a glass-to-metal seal which may be a pinch-seal. Molybdenum is chosen where fuzed silica or quartz is the material from which the envelope of the device is made, because molybdenum and silica or quartz, although having different coefficients of thermal expansion, will by the flexibility of the thin foil and atomic surface bond form a hermetic seal.

A problem arises when molybdenum is used since it oxidizes at a relatively low temperature. Failure of a lead-in conductor through oxidation imposes a limitation in the life of a lamp or other device operated at elevated temperatures. A safe operating temperature of a molybdenum foil in a glass-to-metal seal where it contacts the air is about 350°C for lamp lives of several thousands of hours.

Caps are frequently fitted to the exposed ends of lead-in conductors for strength and in order to establish electrical contact with an external supply lead, normally through a socket. In such a case, the cap contributes to mechanical supporting of the lamp. At the same time, the cap can be beneficial in assisting dissipation of heat away from the glass-to-metal seal.

According to the present invention, there is provided an electrical device including a glass-to-metal seal, wherein an electrical conductor leading out of the seal is accommodated within a metal sleeve forming a component of a terminal cap, the conductor and sleeve being brazed together and the interior of the sleeve being filled with brazing alloy. A terminal cap of this construction has a high thermal capacity and is particularly effective in promoting heat flow away from the seal and the lead-in conductor. A substantial reduction in the operating temperature of the seal is possible thereby and improved resistance to failure of the lead-in conductor through oxidation may be achieved. Preferably, the metal sleeve is copper or a copper-rich alloy to give good thermal conductivity with resistance to oxidation and the braze is a high silver content copper brazing alloy.

In a preferred embodiment, the lead-in conductor includes a molybdenum foil in electrical contact at one end with a refractory metal wire, e.g. tungsten, which leads into the device. At its other end, the molybdenum foil is in electrical contact with one or more outer lead wires normally also molybdenum. These wires extend out from the seal, which may be a pinch seal, and are accommodated within the braze-filled sleeve. To ensure that oxidation of these wires is prevented, it is arranged that they are wholly surrounded by the brazing alloy, including their ends.

In a convenient arrangement, the terminal cap is completed by an outer insulating sleeve of ceramic bonded to the metal sleeve by means of a refractory cement. It is preferred to slot the ceramic sleeve longitudinally to enable it to embrace the end of the pinch seal so as to produce a strong, rigid structure. Electrical contact with a supply lead is then by way of the end of the terminal cap. An advantage of filling the metal sleeve with brazing alloy is that as it freezes its surface assumes a part-spherical meniscus concavity well adapted to make a snug seating for a contact pin of an electrical socket. By this means, good electrical and thermal contact can be achieved so that heat generated in the device is conducted away from the seal through the cap to the socket, which acts as a heat sink to dissipate the heat generated.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a side elevation, partially in section of an end of a lamp envelope embodying the invention,

FIG. 2 is an exploded perspective view of the end of the lamp envelope shown in FIG. 1.

The drawings illustrate an end portion of a tubular envelope 10 of an electric lamp. The envelope 10 is of quartz and is hermetically sealed, at its ends by pinch seals 11. As shown, a lead-in conductor extends into the envelope 10 through the pinch seal 11 and makes contact with an inner conductor 12, for example of tungsten. In incandescent lamps, the conductor 12 is electrically connected to a filament, and in discharge lamps, the conductor 12 forms an electrode at which discharge takes place.

The conductor 12 is electrically connected within the pinch seal 11 to one end of a molybdenum foil 13 which is embedded within the seal 11. Two outer conductors 14, embedded in the seal 11, electrically connect with the other end of the foil 13 and the conductors 14 extend outwardly from the seal for connection to an electrical supply. The conductors 14 must be capable of withstanding the temperatures used while forming the pinch seal 11 and molybdenum clad with platinum has been found to be particularly suitable in this respect and to possess adequate thermal conductivity. The conductors 14 may be flat, circular, elliptical or may have some other cross section to which a reliable pinch seal can be made.

The outer ends of the conductors 14 are received in a cap 15 whose function is to co-operate with an electrical socket both to provide mechanical support for the lamp and to establish an electrical connection with the lead-in conductor. The cap 15 includes an inner conductive member in the form of a copper sleeve 16 which either abuts, as shown, or embraces the end of the pinch seal 11. The conductors 14 extend axially along the tube and are soldered or brazed thereto using a high silver content copper brazing alloy 17. In this way, good thermal and electrical coupling between the conductors 14 and the sleeve 16 is achieved and the braze-filled copper sleeve or alloy has a high thermal capacity. As the brazing alloy freezes, a meniscus concavity 18 forms which is of part-spherical contour well adapted to provide a snug seating for a rounded contact pin of the associated electrical socket. Good heat transfer from the lamp to the socket is thereby obtained via the cap 15. Ths socket is designed to act as a heat sink for dissipating the heat generated in the lamp and the arrangement ensures that the temperature of the molybdenum components is kept to a minimum.

Before brazing, the outer ends of the conductors 14 are cropped to such a length that their ends are wholly within the brazing alloy, due allowance being made when cropping for shrinking of the alloy as it freezes. By arranging that the conductors 14 terminate below

the meniscus concavity **18**, oxidation of the molybdenum at their exposed, unclad ends is prevented.

Once the brazing alloy has frozen and cooled, the cap **15** is completed by the addition of an outer insulating sleeve **19** of ceramic material. The ceramic sleeve **19** is longitudinally slotted at **20** so as to fit over the end of the pinch seal. The ceramic sleeve **19** is secured in place by cementing to the pinch seal **11** and to the copper sleeve **16** using a heat-resistant cement.

We claim:

1. In an electric lamp having electrical conductors inside an envelope which has an hermetic closure in the form of a flattened pinch end seal: lead-out conductor means electrically connected to a conductor inside said envelope, said conductor means comprising a molybdenum foil and a molybdenum wire welded to said foil, said wire extending outwardly through the end of said flattened end seal, said foil and its welded junction with said wire being embedded within said seal, and a pin-type terminal fitted to said end seal, said terminal comprising a hollow cylindrical metal sleeve which surrounds the outwardly-extending molybdenum wire and abuts the end of said end seal to form a well therewith,

brazing alloy substantially filling said well, said alloy contacting said end of said end seal and being in thermal and electrical contact with said wire, and a cylindrical ceramic sleeve cemented to the outer surface of said hollow metal sleeve, said ceramic sleeve having a longitudinally-slotted portion which embraces the end of said end seal.

2. The combination according to claim **1**, wherein said outwardly-extending portion of wire extends partway along the length of said metal sleeve and its filling of brazing alloy, said portion of wire being completely surrounded by said alloy including the end of said wire, whereby said end of wire is protected against oxygen attack.

3. The combination according to claim **1**, wherein the surface of said brazing alloy at the remote end of said metallic sleeve from said seal is concave.

4. The combination according to claim **1**, wherein said metallic sleeve is made from material containing a major proportion of copper and said brazing alloy is a silver content copper-brazing material.

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