106. COMPOSITIONS, COATING OR PLASTIC

84 M

CROSS REFERENCE

Examiner

May 21, 1940. W. DAWIHL ET AL 2,201,717

SEALED ELECTRICAL DEVICE

Filed Jan. 22, 1938

174-50.59

Fig. 1.

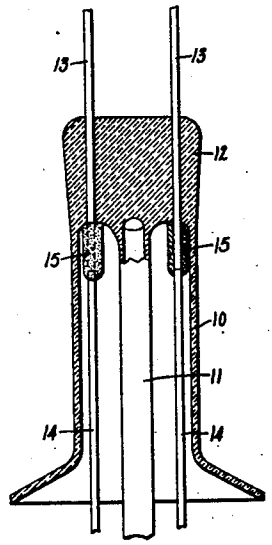
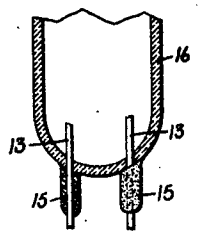


Fig. 2.



Inventors:
Walther Dawihl,
Wolfgang Thouret,
by Harry E. Dunham
Their Attorney.

Patented May 21, 1940 2,201,717

UNITED STATES PATENT OFFICE

2,201,717

SEALED ELECTRICAL DEVICE

Walther Dawihl, Kohlhasenbruck, near Berlin, and Wolfgang Thouret, Berlin-Wilmersdorf, Germany, assignors to General Electric Company, a corporation of New York

Application January 22, 1938, Serial No. 186,420
In Germany February 1, 1937

2 Claims. (Cl. 176—126)

Our invention relates to sealed electrical devices such as electric lamps or discharge devices comprising a vitreous bulb or envelope having lead-in conductors sealed therethrough. More particularly our invention relates to an improvement in the construction of the seal between the said lead-in conductors and envelope.

In sealed electrical devices, such as metal-vapor discharge lamps, which are provided with current leads of tungsten or molybdenum sealed in envelopes of quartz or glass with a high silicic acid content, the disadvantage is often noticed that the seals around the current-supply wires become colored and do not remain air tight after a certain length of time. This phenomenon for many years was considered to be due to the differences in the coefficients of expansion of the metal and glass, and therefore it was believed that it was possible to prevent the seals from leaking by the use of special alloys or by the use of intermediate glasses with coefficients of expansion between those of the metal and the glass. Actually the reason for the leaks at the seals is an oxidation of those parts of the lead-in wires which extend outward from the sealing point and are therefore exposed to air. When the lamp is placed in operation, the lead-in wires are heated considerably and the said outer portions become oxidized. This oxidation cannot be observed with the naked eye and was determined only by means of many microscopic examinations and glass analyses. This detrimental oxidation of the external part of the lead-in wire, which was unobserved up to the present, advances into the seal as time goes on and then leads to leaks.

According to the invention it is possible to effectively avoid the leaks in the sealing points of lead-in wires or strips of tungsten or molybdenum for bulbs consisting of quartz or of glasses with a high silicic acid content, by covering the parts of the leads which protrude outward with a cement which consists of a mixture of a material which oxidizes readily at higher temperatures, such as tungsten, molybdenum, magnesium, carbon or sulphur, a binding medium such as waterglass, and a filling material such as feldspar, kaolin or quartz. The oxygen of the surrounding air is bound by the readily oxidizable material in the cement coating which rapidly solidifies after it is applied to the external part of the lead-in wire. The oxygen is bound at the temperature which the lead-in wire and the cement coating assume in operation and is prevented from reaching the enclosed part of the lead-in wire. However, since the external parts of the lead-in wires do not become incandescent during operation but are heated to temperatures of, at most, several hundred degrees centigrade, and since, in addition, the particles of the readily oxidizing material are finely distributed in the cement coating, the binding of the atmospheric oxygen will of course take place extremely slowly so that even after a thousand hours of operation and more, the part of the cement consisting of readily oxidizing materials is not completely oxidized and particles of those materials are still available for binding oxygen from the air. Tests which have been carried out with the new cement coating have shown in any case that the sealing points of the lead-in wires are still tightly sealed after more than a thousand hours of operation and their appearance is unchanged.

The part of the mixture consisting of readily oxidizing materials may be from twenty to eighty per cent of the total quantity. Preferably, however, the mixture consists of approximately one half of pulverulent, readily oxidizing material while the other half consists of a binding medium and a filler.

The invention can be utilized to advantage in metal-vapor discharge lamps and also in discharge vessels of other types, as well as high capacity electric incandescent lamps.

The drawing illustrates how the cement may be applied to the lead-in conductors in accordance with our invention. Fig. 1 is a longitudinal sectional view of a stem having its leads coated in accordance with our invention, and Fig. 2 is a sectional view of a portion of an envelope for an electric discharge lamp or similar device with leads sealed therethrough and also coated in accordance with our invention.

The stem shown in Fig. 1 is of the conventional so-called tipless construction adapted to be sealed in and constitute part of a suitable bulb and comprises a stem tube 10 and exhaust tube 11 which are fused and compressed at their upper ends 12 around portions of lead-in conductors 13—13 which have outer leads 14—14 welded thereto. The tubes 10 and 11 may be made of a glass having a high silica content, while the inner leads 13—13 may be made of tungsten or molybdenum and the outer leads 14—14 of copper. In accordance with our invention, the portions of the leads 13—13 extending to the outside from the stem press 12 are provided with coatings 15—15 of the cement described above and containing a readily oxidizable powdered material which traps oxygen in the air and prevents oxidation of the portions of the leads 13—13 sealed

in the press 12 which would lead to the development of cracks.

In Fig. 2, the quartz or high-silica glass envelope 16 of a discharge lamp or similar device has the lead-in conductors 15—15 sealed through an end thereof, the external portions of said leads adjacent to the envelope being provided with the cement coatings 18—18.

A very useful cement to be used according to the present invention may consist of 50 parts by weight of molybdenum powder and 50 parts of feldspar powder; to this mixture is added about 30 parts of liquid waterglass in such a manner that an easily kneadable plastic cement mass is obtained which is easily applied by hand upon the wire parts to be covered.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In a sealed electrical device comprising an envelope of vitreous material of high silica content having at least one metallic lead-in conductor of a metal of the group consisting of tungsten and molybdenum fused therein and extending outwardly from said envelope, a coating of cement on the said outwardly extending portion of said conductor adjacent to said envelope, the portion of said conductor sealed in said envelope being free from the cement, said cement comprising a finely divided readily oxidizable metallic material, a binder and a filler, said oxidizable material being finely distributed throughout the mass of cement.

2. In a sealed electrical device comprising an envelope of vitreous material of high silica content having at least one lead-in conductor of a metal of the group consisting of tungsten and molybdenum fused therein and extending outwardly from said envelope, a coating of cement on the said outwardly extending portion of said conductor adjacent to said envelope, the portion of said conductor fused in said envelope being free from the cement, said cement comprising a mixture of a binder, a filler and a finely divided readily oxidizable metallic material finely distributed in the cement and constituting not more than about eighty per cent of the mixture.

WALTHER DAWIHL.
WOLFGANG THOURET.