

T. YANAI.
METHOD FOR FORMING CONDUCTING SEALS FOR INCANDESCENT LAMP BULBS OR THE LIKE.
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1,350,907.

Patented Aug. 24, 1920.

Fig. 1.

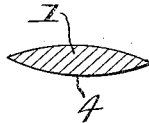
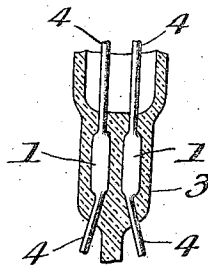


Fig. 2.



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TEIZO YANAI, OF TOKYO, JAPAN, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS,
TO NIHON DENKI KOGYO KABUSHIKI KAISHA, OF TOKYO, JAPAN.

METHOD FOR FORMING CONDUCTING-SEALS FOR INCANDESCENT-LAMP BULBS OR THE
LIKE.

1,350,907.

Specification of Letters Patent. Patented Aug. 24, 1920.

Application filed September 30, 1916. Serial No. 122,990.

To all whom it may concern:

Be it known that I, TEIZO YANAI, subject of Japan, residing at No. 64, 2-chome, Nagata Cho, Kojimachi Ku, Tokyo, Japan, have invented new and useful Improvements in Methods for Forming Conducting-Seals for Incandescent-Lamp Bulbs or the like, of which the following is a specification.

This invention relates to a conducting seal for incandescent lamp bulbs, rectifiers or the like, and has particular application to a method and apparatus for hermetically sealing the leading-in wires of an incandescent lamp.

An object of the invention is to provide simple and efficient methods of hermetically sealing the leading-in wires, such seal being immune to temperature changes.

Another object of the invention resides in the provision of leading-in wires which are formed of any metal which may be readily oxidized and thus dispensing with the use of the very expensive platinum generally used as such parts.

Hitherto, in electric lamps and any other vacuum tubes, platinum wires or wires of alloy metal other than platinum, in which the coefficient of expansion is made equal to that of platinum, have been used; and the leakage of air through the crevices, caused by the difference in the coefficients of thermal expansion of the materials forming leading-in wires, when subjected to changes in temperature, has been presented.

My invention is an improvement on the above method, and uses only a pure metal, such as copper or the like, and a metal which is not combined with any other metal either chemically or mechanically.

I will now describe one method embodying my invention and will then point out the novel features thereof in claims.

In the accompanying drawing, Figure 1 is a view, showing, in cross section, one form of leading-in wire embodying my invention;

Fig. 2 is a view, partly in elevation and partly in section, showing one manner of applying the leading-in wires through the neck of an electric lamp bulb.

Referring now to the drawings in detail, 4 designates a pair of leading-in wires which are formed of any pure metal such as copper, iron or the like. As shown in Fig. 2, the lead-in wires 4 have portions thereof

embedded or fused into a rod 3. The rod 3 is formed of insulating material, such as glass, and, as here shown, constitutes the neck of an incandescent lamp bulb. As shown in Fig. 1, that portion of each wire which is fused to the rod 3 is flattened, as indicated at 1, so that the surface area thereof is appreciably increased. I preferably roll or hammer the portions 1 until they assume the form illustrated in Fig. 1, so as to produce a large surface area upon which the oxidizing process and fusing may take place, as will be hereinafter described.

According to my method, before the leading-in wires are placed within the rod 3, the surfaces 1 of the wires are oxidized by bathing the same in a mixture of potassium bichromate and sulfuric acid, or in a mixture of potassium permanganate and caustic soda. When the surfaces of the wires are well oxidized, they are then embedded within the glass rod 3, which latter has been previously softened by heating, whereupon the rod 3 is heated nearly to the melting point, thereby causing the oxid on the surface of the wires to fuse to the glass, forming between the copper wires and the glass a layer of glass containing copper oxid. This combination of glass and copper oxid has a coefficient of thermal expansion between that of the copper and glass; wherefore it will be seen that although the coefficients of expansion of copper and glass greatly differ, they are made, by virtue of the intermediate layers of glass and copper oxid, to change from one to the other only very gradually, they being practically equal between any two adjacent parts. It will therefore be seen that notwithstanding the changes of temperature to which the elements are subjected, a hermetical seal is maintained at all times.

Although, as specifically stated, the leading-in wires are to be bathed in an oxidizing solution, this step in the process may be eliminated, yet the same result obtained by previously heating the wires, thus forming a thin layer of oxid upon the surface. However, it has been found in practice that the bathing of the wires in an oxidizing solution is more satisfactory, in that it produces heavier layers of oxid.

Although, I have herein shown and described only one form of seal and one method, each embodying my invention, it is to be un-

derstood that various changes and modifications may be made without departing from the spirit and scope of the appended claims.

What I claim is:

5 1. A method of hermetically sealing leading in wires for glass vacuum containers which consists in flattening wires of a single metal and then oxidizing the wires to form on them a coating of oxid of the metal, embedding the oxidized portions of the wires 10 in the glass after the same has been softened by heating, and then heating the wires to nearly the melting point to form between the wires and the glass a layer of glass containing oxid of the metal of the wires and 15 having a coefficient of thermal expansion between that of the metal and glass.

2. A method of hermetically sealing leading in wires for glass vacuum containers 20 which consists in flattening copper wires and then oxidizing the wires to form thereon a coating of oxid of copper, embedding the oxidized portion of the copper wires in the glass after the same has been softened by 25 heating, and then heating the copper wires nearly to the melting point to cause the oxid on the surface of the copper to fuse to the

glass and form between the copper wires and the glass a layer of glass containing copper oxid and having a coefficient of thermal expansion between that of copper and glass. 30

3. A method of hermetically sealing leading in wires for glass vacuum containers which consists in flattening copper wires and then oxidizing the wires by subjecting them 35 to an oxidizing bath to form on the wires a coating of oxid of copper, embedding the oxidized portion of the copper wires in the glass after the same has been softened by heating, and then heating the copper wires 40 nearly to the melting point to cause the oxid on the surface of the copper to fuse to the glass and form between the copper wires and the glass a layer of glass containing copper oxid and having a coefficient of thermal expansion between that of copper and glass. 45

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

TEIZO YANAI.

Witnesses:

YOSHIKA IKEDA,
H. F. HAWLEY.