Dec. 24, 1940. G. VESZI 2,225,726

METHOD OF PRODUCING INCANDESCENT LAMP CORES OR BASES

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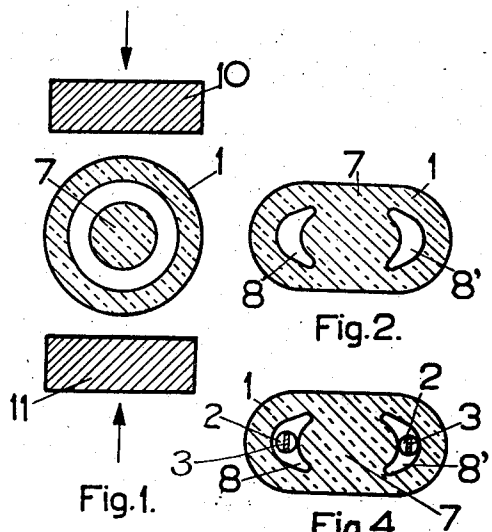

Fig.1.

Fig.2.

Fig.4.

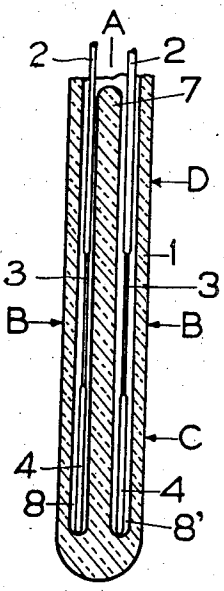

Fig.3.

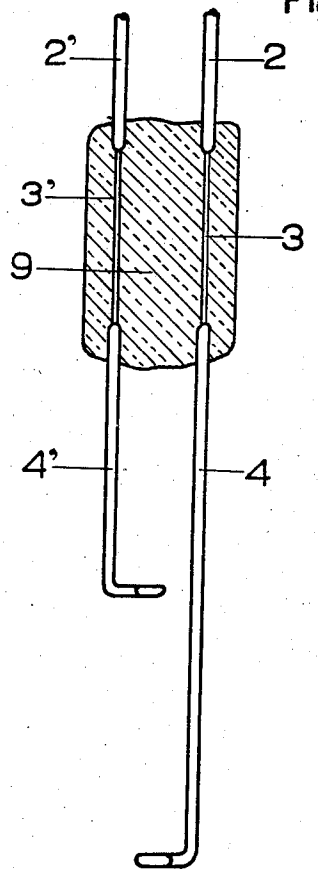

Fig.5

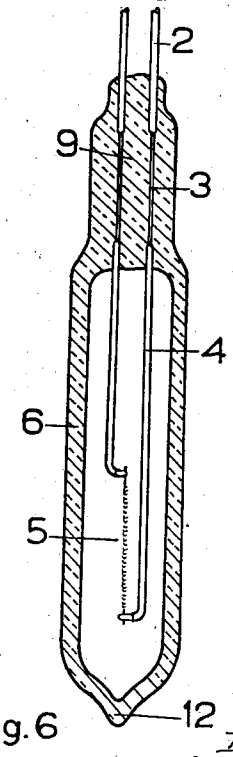

Fig.6

Inventor
Gabor Veszi
By Dowell & Dowell
Attorneys

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METHOD OF PRODUCING INCANDESCENT LAMP CORES OR BASES

Gábor Vezzi, Budapest, Hungary, assignor, by mesne assignments, to General Electric Company, a corporation of New York

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2 Claims. (Cl. 176—7)

This invention relates to electric lamps, or improvements therein, and aims to provide a desirable improvement in the construction of such articles, having reference more particularly to the core or base parts of the same.

The manufacture of electric lamp core parts or bases and especially small lamp bases, from hard glass or quartz glass is attended by substantial difficulties in spite of the fact that various methods are known for hermetically sealing into such glasses the current leads in the form of wires or thin foils made of refractory metals. For example, tungsten wires, up to a millimetre or more in thickness, can be sealed directly into certain borosilicate glasses of high melting point and in the case of quartz glass, either a so-called intermediate glass which can be sealed (on the one hand) to tungsten and (on the other hand) to quartz can be used, or a thin foil of a refractory metal, such as molybdenum, can be employed instead of a wire and the softened quartz glass allowed to collapse on to it in vacuo.

Lamp bases of hard glass or quartz glass are most necessary when the lamp bulb itself is made of such materials. Hard glass or quartz glass bulbs are always used when, for any reason, it is preferable or essential to reduce the size of the bulb below a certain limit, as, for example, in the case of high pressure incandescent lamps, with filling pressures in excess of five atmospheres, incandescent lamps with a filling of mercury vapour etc. As it is precisely the reduction in the size of the bulb which compels the use of hard glass or quartz glass as a material for the bulbs and bases, the importance of being able to make lamp bases of small size in these materials will very readily be apparent. Significant examples of the application of such bases are high pressure incandescent lamps with filling pressures of thirty, fifty or more atmospheres, and tubular hard glass or quartz glass bulbs 6 mm. or less in diameter.

One object of the present invention is to provide a novel and simple method of making lamp bases of hard glass or quartz glass.

Another object is to provide an improved method of making lengths of two-duct capillary tubing in hard glass or quartz glass, to serve as starting material or stock for the manufacture of bases or stems for lamps as hereinbefore referred to.

Another object is to provide a method of making small, compact electric incandescent lamps of a kind adapted for operation with a high internal gas pressure and/or vapor pressure.

Yet another object is to provide lamp bases or stems of novel construction, for incorporation in electric incandescent lamps and a final object is to provide a lamp of very simple and compact construction, such lamp being particularly well adapted for operation under a high internal pressure of filling gas and/or vapor.

The lamp bases according to the invention are produced by sealing the current leads simultaneously into one hard glass or quartz glass capillary tube having or formed with two ducts. The sealing in of such leads may be effected under reduced (i. e. less than the usual) pressure and this expedient is indeed usually desirable when sealing foils of refractory metal directly into quartz glass. Particularly in the case of very small lamp bases, it is preferable, when using current leads in the form of metal foils, so to arrange the foils for sealing in that their broader faces (as distinguished from their edges) confront one another and are parallel.

If, for example, tungsten wires are used as leads and if the double capillary tube is made of borosilicate glass of suitable composition, the wires can be sealed directly into the glass and the sealing-in operation can be conducted in atmospheric air. On the other hand, the mode of procedure adopted when using a quartz glass double capillary tube may, for example, be as follows:— Two thin molybdenum foils, about 20μ thick and 1 mm. wide, to the ends of which tungsten or molybdenum wires of suitable shape and dimensions are welded, are introduced into the two ducts of a double capillary tube of quartz glass. The capillary is sealed off at one end and evacuated and then, by heating the appropriate points with an oxy-hydrogen flame, the quartz glass is allowed to collapse onto the the molybdenum foils, after which the projecting ends of the tube can be cut off.

The process according to the present invention permits of working to fine limits of tolerance, even in the case of very small bases; it eliminates the risk of short circuits and it can be carried out rapidly. In cases where a quartz glass capillary tube is used in conjunction with leads made of molybdenum foil, it has also the great advantage that the lamp base can be sealed into the lamp bulb in atmospheric air. This is of great importance, particularly in high pressure lamps wherein it is necessary to exercise meticulous care in making the fused joint between the bulb of the lamp and the base thereof.

It should also be remarked that the double capillary tubes required by the process of this invention can be manufactured easily, by sealing

into a flattened tube of hard glass or quartz glass, a rod of the same material, or by flattening a tube onto a rod previously introduced into it and sealing the two together.

The invention will now be more particularly described with reference to the accompanying drawing, in which:

Fig. 1 is an enlarged cross sectional view illustrating a tube and an inserted rod, both of quartz glass, in concentric arrangement between press plates which unite and shape the two glass elements so as together to form a double capillary tube;

Fig. 2 is a cross section through a capillary tube formed by or from the two glass elements of Fig. 1 pressed together;

Fig. 3 is a longitudinal section of such a double capillary tube, having current leads inserted in its capillary ducts, this view being drawn to a scale smaller than that of the preceding figures but the same as that of the following Figs. 5 and 6;

Fig. 4 is a cross section taken on the line B—B of Fig. 3 and is drawn to the same scale as Figs. 1 and 2;

Fig. 5 shows a lamp base structure produced by the process of the invention; and

Fig. 6 illustrates a finished incandescent lamp incorporating a base such as that shown in Fig. 5.

Referring to this drawing, 1 indicates a quartz glass tube from which the aforementioned double capillary or lamp base part is formed. Fig. 1 represents the method or manner of formation as last above described. That is, a rod 7 of the same, or also quartz glass, material is inserted into said tube, in this instance in a concentric relation. Upon heating said glass tube 1 sufficiently, the same can be pressed from opposite sides as by means of jaws or press plates 10 and 11 until its diametrically opposed portions or walls meet and are flattened upon said rod 7 into substantial fusion therewith. In this very simple way a quartz glass bar with two longitudinal capillary ducts, i. e. with channels on opposite sides of the rod, is produced as shown in Fig. 2. Said Fig. 2 shows the thus flattened tube 1 unitarily fused to the rod 7, the said ducts which are resultantly crescent shaped in cross section being designated 8 and 8' respectively.

As will be seen in Fig. 3, the two (composite) current leads, in this instance uncoated but which may be coated as with a glass that becomes intermediate (fused) between them and the capillary body in the hermetic seal later effected, are inserted respectively in these capillary ducts 8 and 8', the internal diameter of which may, for example, be of the order of 1 mm. Each of said current leads consists of a molybdenum wire 2 and a tungsten inner lead or electrode 4, connected by a molybdenum strip 3, which may for instance be 25μ thick and 0.8 mm. wide.

The double capillary tube thus composed is next evacuated. This can be done in vacuum or any other suitable way, but if the capillary ducts are closed at one end, by closure of the tube 1 as shown in Fig. 3, the other (open) end A of the tube can be connected directly to an air pump. The double capillary tube is then heated at the region of the line B—B, in Fig. 3, until it collapses or flattens in fusibly upon itself and the quartz glass makes airtight contact with and around the surfaces of the strips 3, or, if said strips are coated as previously mentioned, fuses with the material of such coating therearound which coating then becomes an intermediate element between the tube body and said strips. When this sealing-in is completed the capillary tube is removed from the air pump and its two ends are cut off at C and D, without severing the wires 2 and 4. The form of the lamp base thus obtained is shown in Fig. 5. In this last-named figure the references 2, 3, 4 again designate the tripartite current leads, those on the left side however being designated 2', 3' and 4' respectively, and 9 is used to unitarily designate the quartz body now completely fused into one homogeneous mass.

In producing an incandescent lamp as represented in Fig. 6, a tungsten coil 5 is attached between the ends of the two inner leads 4 and 4' (which may conveniently be referred to as "electrodes") and the completed base or body 9 with said connected leads or electrodes is then fused into the quartz glass bulb 6, in air in the usual way. The said bulb is next evacuated at 12 (through a pump tube not shown) and filled with a gas mixture, to a pressure higher than 10 atmospheres, after which it is sealed off or closed.

Heretofore, current leads have been fused directly into quartz glass bulbs and, as the fusion has had to be conducted in vacuo, the process has proved to be very inconvenient in practice. It will be apparent that the present invention affords a great and distinct advantage over this previously essential procedure in that only the sealing of the leads into the small double capillary tube has to be carried out under a vacuum, whereas the larger operation of sealing the conductor and base assembly into the bulb can be conducted at ordinary atmospheric pressure.

What I claim is:

1. The method of making a seal for electric lamps and similar devices which comprises arranging a rod of vitreous material within a tube of vitreous material, heating said tube to render it plastic and then compressing it upon said rod in such a manner as to leave a plurality of longitudinally extending capillary ducts formed by unfused portions of the exterior surface of said rod and the interior surface of said tube, subsequently introducing metal conductors severally into said ducts, and then fusing the vitreous material and causing it to collapse around said conductors to form a hermetic seal.

2. The method of making a seal for electric lamps and similar devices which comprises arranging a rod of vitreous material within a tube of vitreous material, heating said tube to render it plastic and then applying pressure upon opposite sides of said tube to compress it upon said rod to form a flattened tubular body having a pair of longitudinally extending capillary ducts in the opposed unflattened sides thereof, subsequently introducing a metal conductor into each of said ducts, and then fusing the vitreous material and causing it to collapse around said conductors to form a hermetic seal.

GÁBOR VESZI.