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BENT END ELECTRIC LAMP HAVING LEAD WIRES ANCHORED AT ENDS OF BEND AND PROVIDED WITH EXPANSION PORTION

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Fig. 1.

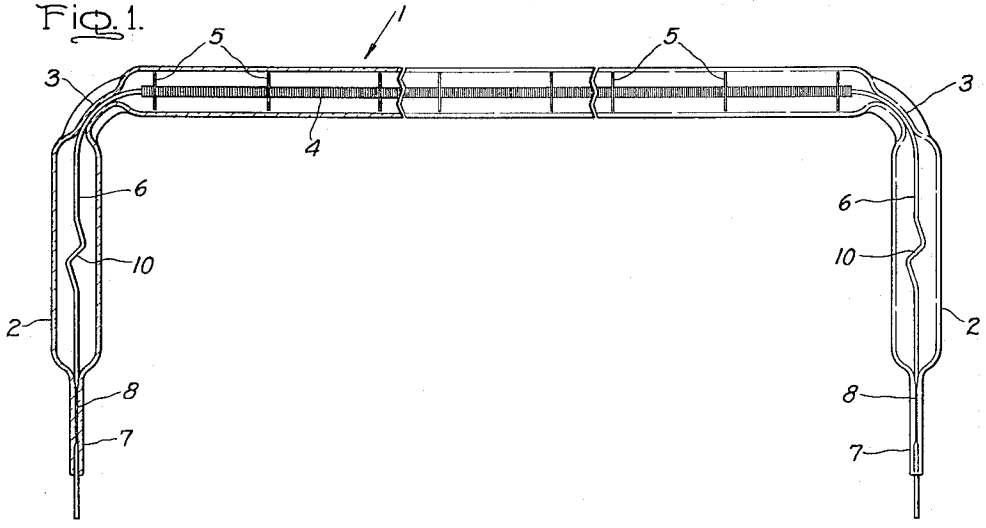
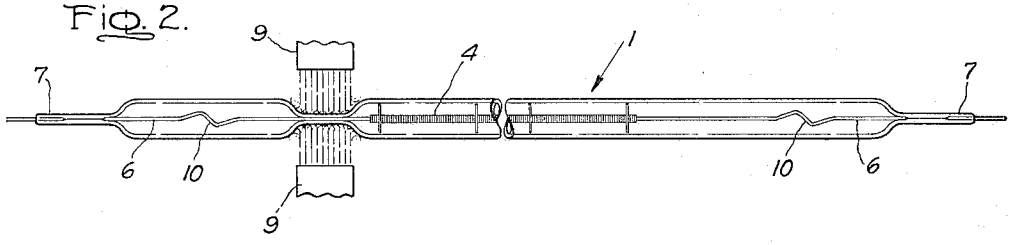


Fig. 2.



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BENT END ELECTRIC LAMP HAVING LEAD WIRES ANCHORED AT ENDS OF BEND AND PROVIDED WITH EXPANSION PORTION

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This invention relates generally to electric lamps, and more particularly to elongated tubular double-ended lamps having laterally extending end portions.

Lamps have recently been marketed comprising an elongated tubular envelope of vitreous material having laterally extending end portions joined to the main body portion of the envelope by compressed or flattened bend portions. The main body portion contains an energy translation element, in this case an incandescent filament extending longitudinally thereof. At each end of the lamp an elongated lead-in wire is connected at its inner end to the adjacent end of the filament and extends through the associated compressed bend portion of the envelope and through the associated laterally extending end portion which has its extremity compressed and hermetically sealed to a localized portion of the lead-in wire extending therethrough.

Difficulty has been experienced in the way of failure of a certain number of such lamps early in life. Some of those failures were due to cracks developing in the bend portion of the envelope, resulting in leakage of air into the envelope with consequent oxidation and early failure of the filament. Occasionally there was a breakage or rupturing of a thin foil-like portion of the lead-in wire which is hermetically sealed and embedded in the seal portion at the extremity of the laterally extending end portion of the envelope.

In accordance with the invention, we have discovered the cause of both types of failure to lie in strains introduced into the lead-in wires and into the bend portions of the envelope during manufacture of the lamp. The difficulty is not alleviated merely by attempting to anneal the vitreous material at the said bend.

The lamp is initially assembled as a straight unit wherein the extremities of a straight tubular envelope are hermetically sealed and compressed about localized portions of the lead-in wires which extend well into the interior of the envelope where they are connected at their inner ends to respective ends of the longitudinally extending filament. The envelope is also compressed at localized areas upon portions of the lead-in wires adjacent their said inner ends, and the bends are formed at those localized compressed areas. Each of the lead-in wires is thereby anchored at the seal portion at the associated extremity of the envelope and also at the associated bend. During the heating of the vitreous envelope to permit forming the bend, the lead-in wire also becomes heated and expands in length. The bend is made while the lead-in wire is in its expanded length. Upon cooling of the lamp, contraction of the lead-in wire causes the formation of excessive strains in the vitreous envelope material at the area of the bend, and those strains cause development of cracks at said bend. In some cases, contraction of the lead-in wire causes rupturing of the thin foil-like portion of the lead-in wire in the seal area as mentioned above.

In further accord with the invention, therefore, the strains due to contraction of the lead-in wire are virtually eliminated by permitting the wires to expand and contract freely between their respective areas of anchorage in the seal and bend portions of the envelope. Preferably, such freedom to expand and contract is provided by forming

the lead-in wire in a manner to provide longitudinal flexibility and compensation for expansion and contraction, as by forming an expansion bend in the wire.

Further features and advantages of the invention will appear from the following detailed description and from the drawing wherein:

FIG. 1 is a side elevation, partly in section, of a lamp comprising the invention; and

FIG. 2 is a side elevation of a lamp in an intermediate stage of manufacture.

The lamp shown in the drawing is a quartz infrared lamp of the type disclosed and claimed in application Serial No. 859,053 of E. B. Noel et al., filed December 11, 1959, now Patent No. 3,080,497, and assigned to the same assignee as the present application. The lamp comprises a tubular quartz envelope **1** having bent end portions **2** extending laterally of the main body portion and joined thereto by bend portions **3**. The main body portion of the envelope contains electric energy translation means which, in an electric discharge type lamp may be a pair of spaced electrodes but, in this case, is a filament **4** of coiled tungsten wire supported in the envelope axis by spaced supports such as discs **5**. The filament **4** is connected at each end to a molybdenum lead-in wire **6** which extends through the associated bend portion **3** and end portion **2** of the envelope to the exterior thereof. A seal portion **7** at the extremity of each end portion **2** is compressed upon and hermetically sealed to a locally flattened or foliated portion **8** of the lead-in wire. The bend portion **3** of the envelope is compressed upon the localized portion of the lead-in wire **6** extending therethrough.

In a preferred method of manufacturing the lamp, it is assembled as a straight unit as illustrated in FIG. 2, preferably by one of the methods disclosed and claimed in either Patent 2,900,771, Levand, or 2,855,265, Foote et al. The result is a straight length of quartz tubing containing a filling of inert gas such as argon at a pressure of several hundred millimeters of mercury and having its ends hermetically sealed at **7** around portions of the lead-in wires **6** to which is attached the filament **4** which has been stretched slightly prior to completion of the seals **7**. Thereafter, the envelope **1** is locally heated at **3'** by burners **9** to soften and collapse it thereat upon a localized portion of the lead-in wire **6** adjacent its inner end, after which the softened envelope portion **3'** is bent, together with the enclosed portion of the lead-in wire, to form the bend **3** (FIG. 1). The same procedure is followed to form the second bend **3** at the other end of the envelope.

Each lead wire **6** is thereby anchored at the associated seal **7** and also at the bend **3**. During heating of the quartz to allow the bending, the lead wire **6** is also heated and expands in length, and the bend **3** is made while the lead wire is in its expanded length. When the lead wire **6** is a simple straight length of wire, its contraction upon cooling places excessive strains in the quartz at the area of the bend **3** which tend to cause cracks to develop therein. Occasionally, the strain may be sufficient to cause rupturing of the foliated portion **8** of the lead wire which may have a thickness of some 0.0005 inch.

In accordance with the present invention, such strains are virtually eliminated by providing for free longitudinal expansion and contraction of each lead wire **6** between the areas anchored in the seal **7** and the bend **3**. This is preferably provided by an expansion bend in the wire which may be any suitable form such as a U-shaped bend or one or more helical turns of the wire, or preferably a substantially S-shaped bend as shown at **10**. While such an expansion bend **10** provides sufficient flexibility or elasticity to permit forming a virtually strain-free bend **3** in the envelope, yet sufficient longitudinal rigidity is

maintained in the lead wires **6** to permit sufficiently stretching the filament **4** during assembly of the lamp to place the filament in the desired degree of tension to avoid drooping thereof when it is heated during operation of the lamp.

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

1. A double-ended elongated electric incandescent lamp comprising a sealed gas-filled tubular envelope of vitreous material, an elongated current supply lead-in wire extending from the exterior at each end of said envelope a substantial distance inwardly of the envelope, an incandescible filament extending longitudinally of a main body portion of said envelope between the inner ends of said lead-in wires and connected to said wires, seal portions at the extremities of said envelope compressed upon and hermetically sealed to localized portions of the respective lead-in wires extending therethrough, localized pinch portions of said envelope spaced from respective said seal portions and compressed upon localized portions of respective lead-in wires adjacent their inner ends, the ends of said envelope beyond respective pinch portions extending laterally of and a substantial distance beyond the main body portion by virtue of a bend at respective said pinch portions, a portion of each of said lead-in wires which is anchored at and extends between respective seal and pinch portions of the envelope having therein an expansion bend which avoids the creation of excessive strains in the said pinch portions of the envelope.

2. A lamp as set forth in claim **1** wherein the said bend in each lead-in wire is substantially S-shaped.

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