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E. G. AUDESSE ET AL

3,466,489

INCANDESCENT LAMP

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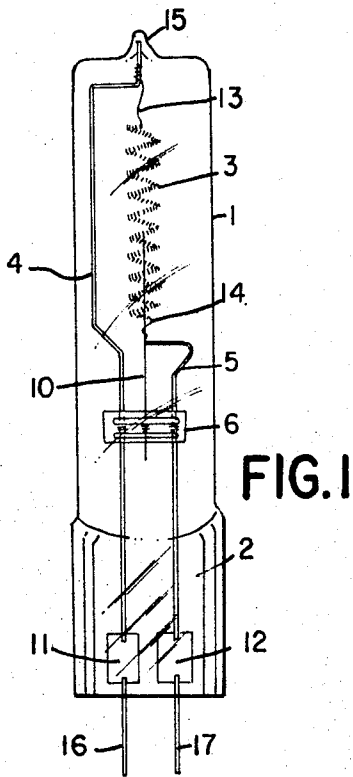


FIG. 1

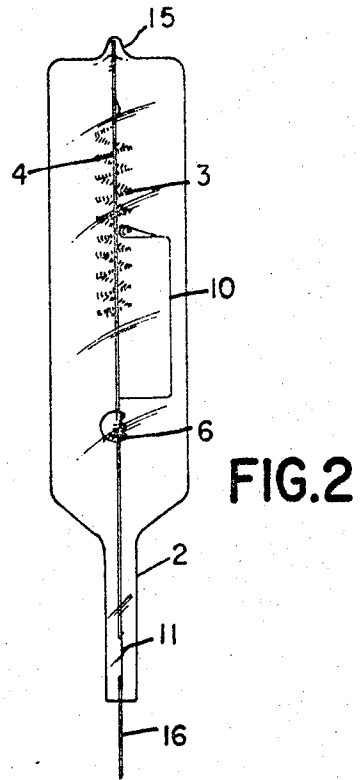


FIG. 2

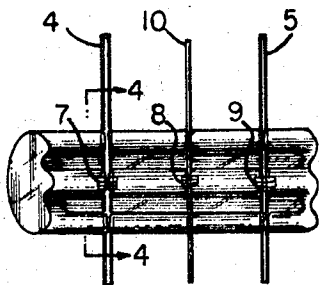


FIG. 3

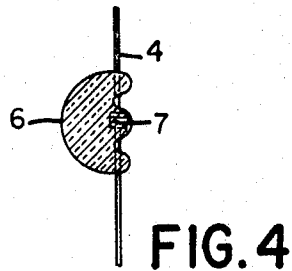


FIG. 4

EMERY G. AUDESSE
LEROY S. HUSTON JR.
INVENTOR

BY *Lawrence Brown*
ATTORNEY

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INCANDESCENT LAMP

Emery G. Audesse, Salem, and Leroy S. Huston, Jr.,
Marblehead, Mass. (Both % Sylvania Electric Prod-
ucts Inc., 60 Boston St., Salem, Mass. 02146)

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9 Claims

ABSTRACT OF THE DISCLOSURE

A quartz halogen lamp having a filament mounting bridge which includes lead-in wires embedded in a quartz rod. The bond between the lead-in wire and the quartz rod is substantially improved by a coil encircling the lead-in wire within the situs of embedment.

BACKGROUND OF THE INVENTION

Field of the invention

This invention pertains to incandescent lamps and particularly to tubular lamps in which a quartz envelope contains a quantity of halogen which has a regenerative effect on the filament and improves lamp maintenance. More specifically, it pertains to a lamp wherein lead-in wires and a quartz rod constitute a bridge which supports the filament coaxially with the envelope.

Description of the prior art

The prior art disclosed quartz halogen lamps in which a tungsten filament was disposed within a quartz envelope. The end of the envelope was sealed by heat and mechanical pressure, resulting in a press seal. Lead-in wires extended into the press seal and were supported therein. The lead-in wires were also connected within the press seal to connectors leading externally of the lamp.

Some of the problems involved in lamps of this type are in positioning the filament in the center of the envelope and in maintaining a coaxial filament position throughout the press sealing operation. In a typical case, the filament mount, comprising the filament, lead-in wires and connectors, is inserted into a quartz tube which is open at one end. The connectors leading externally protrude beyond the end of the tube. The open end of the tube is then heated to the softening point of the quartz and mechanically squeezed to close and seal the tube on the lead-in wires and connectors, which operation physically secures the filament mount within the tube. However, because of the relative flexibility of the mount and its inaccessibility to external positioning devices during this operation, it is difficult to maintain the coaxial filament position necessary for satisfactory operation of the lamp throughout its rated life. The plasticity of the heated quartz tube on which part of the mount is disposed during the press sealing operation also makes the coaxial position of the filament more difficult to maintain throughout this operation.

In the copending application of Scoledge et al., S.N. 622,310, filed on May 10, 1967, entitled "Incandescent Lamp," assigned to the instant assignee, a coaxially positioned filament mount is disclosed, the lead-in wires of which are embedded and supported in a quartz rod. The construction of the mounting bridge simplified the process of manufacturing quartz halogen lamps and assured a more positive coaxial alignment of the filament. However, as lamp wattages increased, the use of heavier lead-in wires was required in order to handle the increased current. At lead-in wire diameters greater than about 25 or 35 mils, the joint between the wire and the quartz rod was not completely satisfactory throughout the life of the

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lamp. It is believed that the difference in the coefficients of expansion of tungsten and quartz resulted in a loosening of the joint during the normal on-off operation of the lamp.

It is an object of this invention to provide an improved union of the lead-in wire and quartz rod for the mounting bridge of a quartz halogen lamp.

SUMMARY OF THE INVENTION

This invention discloses an improved filament mounting bridge which, when inserted and positioned in the center of a lamp envelope, will maintain the filament substantially coaxially throughout the subsequent manufacturing operations and throughout the useful life of the lamp. The improved bridge comprises a quartz rod and lead-in wires partially embedded therein, with a filament axially disposed between the ends of the lead-in wires.

Within the situs of embedment of the lead-in wire, a short coil tightly encircles the lead-in wire and is also embedded within the quartz rod. Unexpectedly, even though the diameter of the lead-in wire is increased by the encircling coil, the bond to the quartz rod is substantially improved. The result is a mount in which the lead-in wire, even when of comparatively large diameter, does not substantially loosen in the quartz rod during normal on-off operation of the lamp. The improved bond is obtained even though the quartz does not necessarily completely envelop the wires and encircling coils, and even though the heated quartz is generally too viscous, at embedment, to completely follow the exact contour of the wires and coils. However, if there is sufficient space between the turns of the coil there will be some penetration of the quartz therein.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is a front elevational view of a quartz halogen lamp in accordance with this invention.

FIGURE 2 is a side elevational view of the same lamp.

FIGURE 3 is an enlarged perspective view of the quartz rod with embedded lead-in wires and coils.

FIGURE 4 is a cross-sectional view of the quartz rod, along the line 4-4 in FIGURE 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A quartz halogen lamp in accordance with this invention, as shown in FIGURES 1 and 2 comprises, inter alia, an envelope 1, a press seal 2, a coaxial filament 3 and lead-in wires 4 and 5 affixed to a supporting quartz rod 6.

In the manufacture of the lamp, pre-shaped lead-in wires 4 and 5 and support wire 10 are mounted on a suitable holding and forming device, not shown. Short coils 7, 8 and 9, tightly encircle wires 4, 5 and 10, respectively, and are in line with each other in the mount. The lengths of coils 7, 8 and 9 are shorter than the diameter of rod 6. The length of rod 6 is less than the inside diameter of envelope 1 to provide clearance when the rod is eventually inserted into the envelope. Quartz rod 6 is heated to its softening point, generally between 1500° and 2000° C., and then quickly impressed substantially orthogonally onto wires 4, 5 and 10 so that a portion of the quartz rod flows around the wires and coils 7, 8 and 9, as shown in FIGURES 3 and 4. Coils 7, 8 and 9 are substantially centered on quartz rod 6 so that there is quartz flow around each of the coils. However, because of the construction of the holding and forming device, the quartz does not usually completely surround the embedded wires and coils. The rod and wires are rigidly held until the quartz cools sufficiently to lose its plasticity and hold the

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wires and coils securely. The resultant combination of quartz rod 6 and wires 4, 5 and 10 is called bridge.

Filament 3 is then mounted on the bridge substantially orthogonal to quartz rod 6 by attaching upper filament leg 13 to the upper end of lead-in wire 4 and lower filament leg 14 to the upper end of lead-in wire 5. Support wire 10 is attached to the midpoint of filament 3 as shown in FIG. 2. Molybdenum ribbons 11 and 12, previously connected to external wires 16 and 17, are connected to the ends of lead-in wires 4 and 5 which protrude below quartz rod 6.

The bridge, with filament 3 mounted thereon and lead-in wires 4 and 5 connected to molybdenum ribbons 11 and 12, is then inserted into envelope 1 which is open at one end, so that the upper end of lead-in wire 4, which supports upper filament leg 13, is disposed within the centered exhaust tube at the opposite end of the envelope. The positioning and relative location of the elements of the bridge, envelope and exhaust tube results in a coaxial alignment of filament 3 with the envelope.

The open end of the envelope is then heated to the softening point of quartz, about 1500° to 2000° C., and mechanically squeezed to form hermetically tight press seal 2. The original length of the envelope is designed so that when press seal 2 is formed, all of ribbons 11 and 12, part of lead-in wires 4 and 5 and part of external lead-in wires 16 and 17 are embedded within press seal 2. The structure of the bridge, comprising filament 3, lead-in wires 4 and 5, support wire 1 and quartz rod 6, when positioned coaxially by means of the exhaust tube, renders it substantially immobile with respect to the envelope during sealing and subsequent manufacturing operations.

The lamp assembly is exhausted through the exhaust tube and an atmosphere of halogen and inert gas is introduced. The lamp is then sealed leaving fused tipoff 15 as part of the finished lamp. The upper end of the long lead-in wire 4 which supports upper filament leg 13 is still disposed in tipoff 15 thereby maintaining the axis of filament 3 substantially coaxial with the axis of envelope 1 during the life of the lamp.

In a specific example for a 2000 watt lamp, lead-in wires 4 and 5, made of tungsten, were 35 mils and 28 mils in diameter, respectively. The extra length of lead-in wire 4 made it desirable to use a larger diameter wire therefor, mainly to improve the physical support but also to lower the electrical resistivity. The diameter of support wire 10, also made of tungsten, was only 18 mils, since it did not serve as a current carrying conductor and also required more flexibility than the lead-in wires because of the method of attaching it to the filament. Coils 7, 8 and 9 were made of tungsten wire of approximately half the diameter of wires 4, 5 and 10, respectively, and were wound on mandrels of about 1 mil larger diameter than the respective wires 4, 5 and 10. This permitted the coils to be slip fit on their respective lead-in wires and support wire. The coils were wound at about 200% pitch to permit quartz flow between the turns. However, even at 100% pitch, that is, with adjacent turns touching, the resultant bridge provided a superior bond than did the prior art bridges which had no embedded encircling coils on the lead-in wires. After coils 7, 8 and 9 were slipped on wires 4, 5 and 10, respectively, to their appropriate positions, they were hot crimped to secure them thereon.

The lengths of coils 7, 8 and 9 were between $\frac{1}{16}$ and $\frac{3}{16}$ inch, which was shorter than the $\frac{1}{4}$ inch diameter of quartz rod 6. Thus, when wires 4, 5 and 10, including coils 7, 8 and 9 thereon, were mounted in the holding device, and quartz rod 6, heated to plasticity, was impressed against the coils and wires, the viscous quartz flowed around the ends of all the coils. However, the quartz did not completely surround the wires and coils

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due to the construction of the holding device and the high viscosity of the plasticized quartz. The amount of circumferential envelopment varied from about 180° for the largest wire to about 360° for the smallest coil. But we found complete envelopment not necessary to obtain the improved bond of the invention.

The resultant bridge, comprising lead-in wires 4 and 5 with coils 7 and 9 thereon and support wire 10 with coil 8 thereon, all embedded in quartz rod 6, provided a rugged network for the subsequent manufacturing steps. Filament 3 was mounted between the upper ends of lead-in wires 4 and 5, and a hook at the upper end of support wire 10 was bent around a secondary turn at the midpoint of filament 3 to support it.

The bridge, including filament 3, was inserted in the open end of envelope 1 with the upper end of lead-in wire 4 protruding into the exhaust tube to position filament 3 substantially coaxially. After press sealing and introduction of a bromine-nitrogen atmosphere, as previously mentioned, the exhaust tube was tipped-off, leaving the end of lead-in wire 4 protruding into tipoff 15, which was about $\frac{3}{16}$ inch long. It is apparent that modifications and changes may be made within the spirit and scope of the invention, but it is our intention however only to be limited by the scope and spirit of the appended claims.

We claim:

1. A quartz halogen lamp comprising a tubular envelope and a filament mounting bridge disposed therein, said bridge comprising a lead-in wire embedded in a quartz rod, said lead-in wire having an encircling coil thereon within the situs of embedment, thereby improving the bond between the lead-in wire and the quartz rod.

2. The lamp of claim 1 wherein one end of said lead-in wire is disposed within a substantially centered tipoff at one end of said envelope.

3. The lamp of claim 1 wherein both ends of said encircling coil are within the situs of embedment.

4. The lamp of claim 3 wherein the turns of said encircling coil are spaced apart and the quartz of said rod is permeated therebetween.

5. The lamp of claim 3 wherein said encircling coil is fastened to said lead-in wire by mechanical means.

6. The lamp of claim 5 wherein said mechanical means includes hot crimping.

7. A quartz halogen lamp comprising:
a tubular envelope having a press seal at one end;
lead-in wires extending through said press seal;
a tungsten filament disposed substantially coaxially within said envelope and connected to said lead-in wires;

a quartz rod within said envelope disposed substantially orthogonal to said filament between said filament and said press seal;

said lead-in wires being affixed to said quartz rod; and coils encircling said lead-in wires within the situs of affixation.

8. The lamp of claim 7 wherein the ends of said encircling coils are within the situs of affixation.

9. The lamp of claim 8 wherein said encircling coils are fastened to said lead-in wires by mechanical means.

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JAMES W. LAWRENCE, Primary Examiner

RAYMOND F. HOSSFELD, Assistant Examiner

U.S. Cl. X.R.

313—276, 279, 315