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Martin et al.

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[54] **SINGLE-ENDED HALOGEN-CYCLE INCANDESCENT LAMP WITH BRIDGELESS MOUNT ASSEMBLY**

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[73] Assignee: **Westinghouse Electric Corporation**, Pittsburgh, Pa.

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[52] **U.S. Cl.** **313/276**, 313/222, 313/279, 313/286

[51] **Int. Cl.** **H01k 1/14**, H01k 1/18

[58] **Field of Search** 313/222, 271-276, 313/279, 285, 286, 289

[56] **References Cited**

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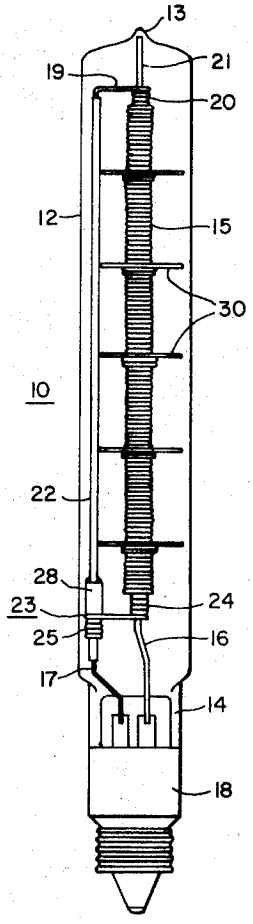
Assistant Examiner—Marvin Nussbaum
Attorney—A. T. Stratton et al.

[57] **ABSTRACT**

The coiled filament of a tubular halogen-cycle type lamp is suspended within the envelope by a mount assembly which is so constructed that the lead wires are rigidly coupled to and electrically insulated from each other without the quartz bridge member customarily employed. Discoloration of the envelope in the region of the bridge member is inhibited and the lumen maintenance of the lamp is thus enhanced.

10 Claims, 6 Drawing Figures



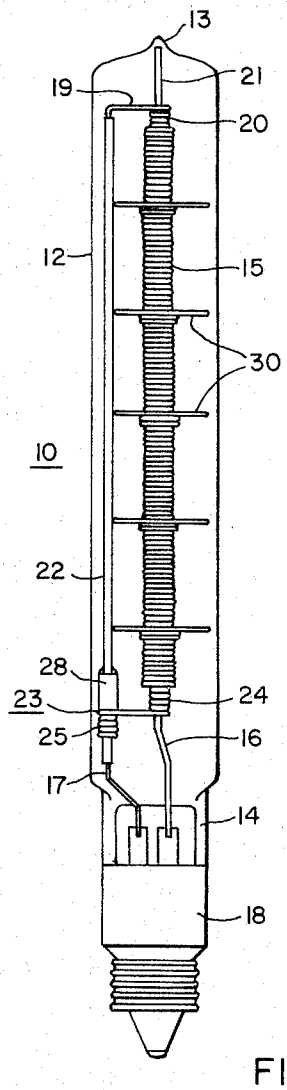

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FIG. 1.

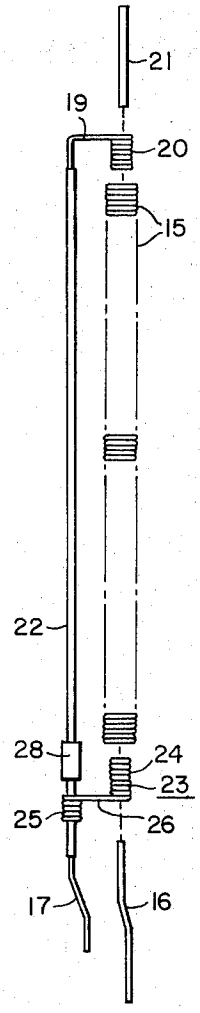
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FIG. 2.

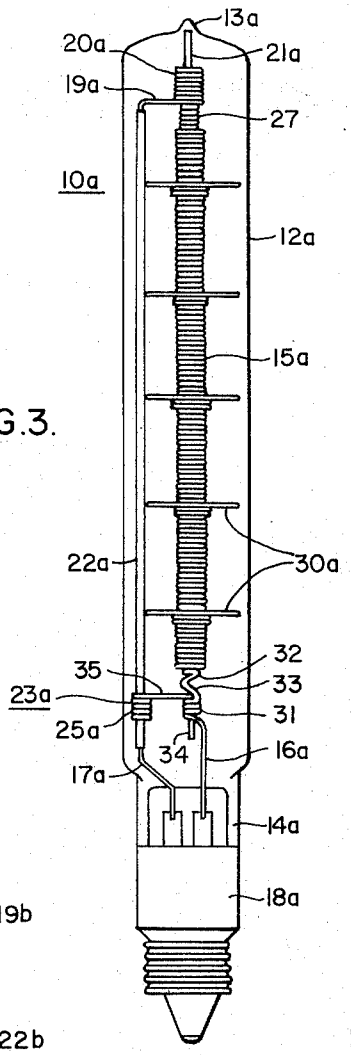

FIG.3.

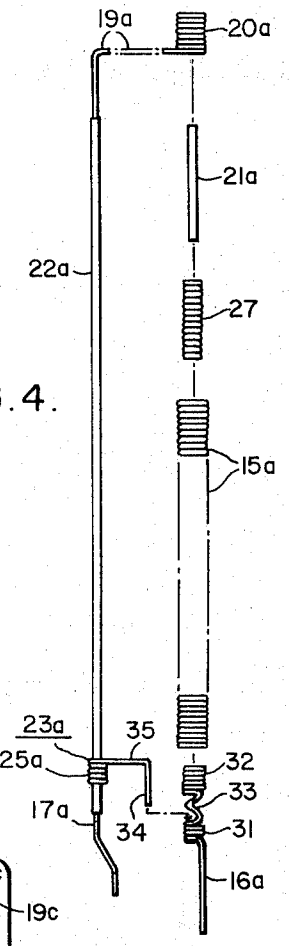

FIG.4.

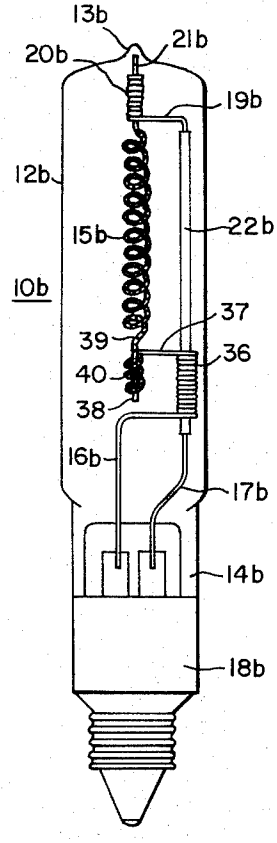

FIG.5.

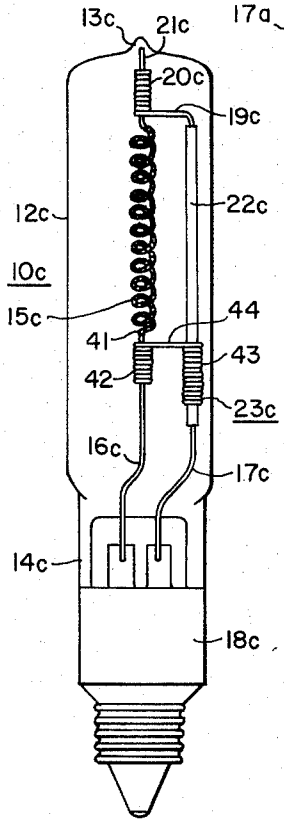

FIG.6.

SINGLE-ENDED HALOGEN-CYCLE INCANDESCENT LAMP WITH BRIDGELESS MOUNT ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATION

The present invention is related to the subject matter of copending application Ser. No. 86,844 filed Nov. 4, 1970, now Pat. No. 3,696,265, issued Oct. 3, 1972 by the same inventors and assigned to the same assignee as this application.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to electric incandesent lamps and has particular reference to an improved filament mount structure for a quartz-halogen lamp.

2. Description of the Prior Art

Halogen type incandescent lamps are weil known in the art and are used in various industries and applications where a compact source of light or heat is required. A persistent problem in the manufacture of these lamps is that of connecting the ends of the lead wires to the coiled filament and maintaining the latter in centralized position within the tubular quartz envelope during the life of the lamp.

According to the teachings of the aforesaid copending application, the mount structure is simplified by bending the end of the long lead wire into a loop which nests within the top of the bulb and thus serves as an integral mount-positioning-and-bracing means. In one embodiment, a quartz bridge member joins the lead wires at the basal end of the lamp to rigidify the mount and serve as an anchorage point for a filament-support wire. In the other embodiment disclosed in the aforesaid copending application, the lower bridge member is omitted and the straight axially-extending portion of the long lead wire is encased in an insulating sleeve of quartz or the like to prevent it from contacting and short-circuiting the filament.

A quartz-halogen lamp having a bridge member that joins the long and sort lead wires together at the press-sealed end of the lamp and has a fused hollow tip at the top of the bulb which is engaged by the inner end of the long lead wire is disclosed in U.S. Pat. No. 3,497,753 issued Feb. 24, 1970 to L. S. Huston, Jr. A tubular incandescent lamp having a long lead wire that is encased in a glass tube and held in centrally-disposed position within the envelope by bending the end of the long lead wire into a loop which nests within a tapered dome formed on the end of the envelope is disclosed in U.S. Pat. No. 3,300,675 issued Jan. 24, 1967 to Z. Deshaw. An incandescent lamp having a filament that is suspended in coaxial position within a tubular envelope by an auxiliary filament-support wire of spiral configuration is disclosed in U.S. Pat. No. 923,797 issued June 1, 1909 to R. McNeill. A quartz-halogen lamp having a coiled-coil filament that is held in coaxial position within a tubular envelope by a pair of wire connectors having laterally-offset coil segments that are attached to the ends of the lead wires and respective legs of the filament is disclosed in U.S. Pat. No. 3,486,065 issued Dec. 23, 1969 to J. Martin.

While the aforementioned prior art mount structure held the filament in the desired axial position within the envelope and provided satisfactory electrical connections between the leads and filament, it has been found that the presence of the relatively massive bridge member of quartz or the like at the bottom of the bulb causes the latter to darken and become dicolored as the lamp burns. It is theorized that the bridge member acts as a sort of "heat sink" which reduces the operating temperature of the bulb wall in this region to a low enough value to permit vaporized tungsten from the filament to condense and remain on this part of the bulb. Another possibility is that the bridge member acts as a baffle which obstructs and impedes the circulation of the halogen gas through the bottom of the bulb and thus prevents it from "gettering" deposited tungsten particles and returning them back to the filament. Whatever the reason, the portion of the envelope adjacent the bridge tends to blacken during lamp life — thus reducing the lumen maintenance and lamp efficiency.

It would accordingly be desirable to provide a rugged mount structure for a tubular halogen lamp which does not require a vitreous bridge member to rigidify the lead wires, or a filament support that requires such a bridge member to hold it in place. It would be especially desirable to provide a "bridgeless" mount structure for high-wattage halogen lamps of long length which thus have filament that requires some means of intermediate support.

SUMMARY OF THE INVENTION

The foregoing objectives are achieved in accordance with the present invention by placing an insulating sleeve of quartz or the like over a medial portion of the long lead wire that is offset toward and extends along the inner wall of the envelope and by joining the end of the long lead to one end of the filament coil by coupling means which engages the hollow tip of the bulb so that the long lead and coupling means serves as a brace and centralizing structure for the filament. The end of the short lead wire is connected to the filament and attached to an insulated part of the long lead by a second coupling means — thereby further strengthening the mount and providing a very rugged lamp.

In lamps having long singly-coiled filaments, intermediate support of the filament is achieved by means of wire loops that are attached directly to the filament and extend laterally toward and are seated against the insulated section of the long lead and surrounding portions of the bulb wall. Various forms of coupling means for joining the lead wires to each other and to the respective ends of the filament are disclosed.

The present invention thus provides a rugged and durable mount assembly which eliminates the need for bridge members and thus prevents premature bulb blackening.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the invention will be obtained from the exemplary embodiments shown in the accompaying drawings, wherein:

FIG. 1 is an elevational view of an 800 watt T 2 ½ quartz-halogen lamp embodying the present invention;

FIG. 2 is an exploded view of the various components employed in the mount assembly shown in FIG. 1;

FIGS. 3 and 4 are similar views of an alternative lamp and mount structure, respectively; and

FIGS. 5 and 6 are elevational views of two lamp embodiments of lower wattage rating that have shorter filaments and thus do not require auxiliary filament support members.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 there is shown an **800** watt single-ended incandescent lamp **10** of the halogen-cycle type which embodies one form of the invention and comprises the usual tubular envelope **12** of quartz (or other suitable high melting point material) that is terminated by a hollow fused tip **13** and is hermetically closed at its opposite end by a press seal **14** and contains an elongated singly-coiled filament **15** of tungsten wire. The envelope **12** in this particular embodiment is of the T 2 ½ type (5/16 inch or 7.9 millimeters OD) and contains an inert gas such as a mixture of argon and nitrogen that is dosed with a suitable halogen such as iodine or bromine. The filament **15** is suspended in coaxial position within the envelope **12** by a mount assembly which includes a short lead **16** and a long lead **17** that are embedded and anchored in the press seal **14** and connected by the usual ribbon conductors and outer leads to the terminals of a base **18** that is cemented to the press seal.

As will be noted in FIG. **1** and shown more particularly in FIG. **2**, the filament coil **15** is maintained in the desired coaxial location within the envelope **12** by offsetting the central portion of the long lead **17** so that it is disposed adjacent and extends along the inner wall of the envelope, encasing this lead portion in a sleeve **22** of quartz (or other material such as alumina or a suitable ceramic), and bending the free end of the long lead to provide a transversely-extending arm **19** which is terminated by an axially-extending coiled segment **20** that is dimensioned to threadably fit into and engage the end of the filament coil **15.** A short spud wire **21** is partly inserted into the coiled segment **20** of the long lead **17** and securely fastened in such position by hot clamping — thereby electrically and mechanically coupling the members and permitting the end of the spud wire **21** to enter and engage the envelope tip **13.**

The short lead wire **16** is electrically connected to the other end of the filament **15** and mechanically attached to an insulated part of the long lead **17** by a connector **23** consisting of rigid wire that is wound into two laterally-offset coiled segments **24** and **25** that are joined by a transverse arm portion **26.** The coiled segment **24** is of such size that it threadably engages and is interlocked with the end of the helical filament **15** and snugly receives the end of the short lead **16** to which it is secured by welding. The length of the arm portion **26** is such that the other coiled segment **25** can be slipped over the insulating sleeve **22** (when the mount is being assembled) and thus maintain that end of the filament **15** in the desired coaxial alignment. The connector **23** effects a snug fit with the sleeve **22** and is locked in place thereon by fusing a short collar **28** of quartz or the like to the sleeve **22** (after the filament **15** is pulled taut) so that the end of the collar **28** is seated against the coiled segment and acts as a stop. This arrangement permits a wider tolerance for the inside diameter of the coiled segment **25** and automatically positions the connector **23** on the long lead **17** during mount assembly.

As will be noted in FIG. **2**, the singly-coiled filament **15** is devoid of any depending legs and consists of a coil barrel of cylindrical configuration. The filament **15** (as illustrated in FIG. **1**) is supported at a plurality of spaced points along its length by wire spirals **30** that are attached directly to the turns of the filament **15** and extend laterally toward and nestingly engage the insulating sleeve **22** and the curved inner wall of the envelope **12.**

In the alternative lamp embodiment **10*a*** shown in FIG. **3**, a slightly modified filament mount assembly is employed. Coupling of the components at the upper end of the mount according to this embodiment is achieved by terminating the transverse arm segment **19*a*** of the long lead **17*a*** by a coiled segment **20*a*** that extend axially toward the bulb tip **13*a*** rather than toward the proximate end of the filament **15*a***. The coiled segment **20*a*** and spud wire **21*a*** are fastened to each other and to the end of the filament **15*a*** by a coil insert **27** that threadably engages and is interlocked with the end of the filament barrel and snugly receives and is hot clamped to the spud wire **21*a***. The other end of the coil insert **27** is threaded into and interlocked with the coiled segment **20*a*** of the lead wire **17*a*** so that the protruding end of the spud wire **21*a*** enters and engages the tip **13*a*** of the envelope **12*a*** when the mount assembly is inserted into the envelope prior to the press-sealing operation. Of course, as will be recognized by those skilled in the art, at this stage of lamp manufacture the fused tip **13*a*** has not yet been formed and the end of the spud wire **21*a*** is positioned within the depending exhause tubulation which is subsequently melted and severed to form the fuse tip **13*a***, after the envelope **12*a*** has been evacuated and dosed with fill gas and halogen.

The lower end of the filament **15*a*** is coupled to the short lead wire **16*a*** by providing a pair of coiled segments **31** and **32** on the end of the short lead, which segments are joined by an opened turn **33** (shown more clearly in FIG. **4**). The end of the filament **15*a*** is threaded over and interlocked with the coiled segment **32** and a modified connector **23*a*** is employed to secure the short lead **16*a*** to an insulated part of the long lead **17*a***. The connector **23*a*** is generally U-shaped and has a longitudinally-disposed coiled segment **25*a*** and a longitudinal-depending straight leg segment **34** that are joined by a transverse arm segment **35** which is of such length that it permits the leg segment **34** to be inserted through the opened turn **33** and into coiled segment **31** of the short lead **16*a***. As before, coiled segment **25*a*** is dimensioned to effect a snug fit with the tubular insulator **22*a***.

In FIG. **5** there is shown a 250 watt halogen-cycle lamp **10*b*** that has a coiled-coil filament **15*b*** which is much shorter and thus does not require any auxiliary filament-support means. The envelope **12*b*** is of the T–4 type one-half inch or 12.7 millimeters OD) and is closed by a fused hollow tip **13*b*** at one end and by a press seal **14*b*** at its opposite end in the customary fashion. In accordance with this embodiment, the short lead **16*b*** is attached directly to an insulated part of the long lead **17*b*** by bending the end of the short lead toward the long lead and forming the end of the short lead into a longitudinal-extending coiled segment **36** that encircles and grips the insulator sleeve **22*b*** and is terminated by a transverse arm segment **37** and a downwardly-extending leg segment **38.** The conjoined end of the filament **15*b*** is formed with an open turn **39** in the primary winding so that a short axially-extending coil section **40** is provided at that end of the filament. The leg segment **38** is inserted through the open turn **39** and into the coiled section **40.** The upper end of the filament **15*b*** is coupeld to an axially-extending coiled segment **20*b*** on the long lead wire **17*b*** by bending one

end of the spud wire **21***b* into a partial turn which is threaded into the primary winding of the coiled-coil filament to form a "button hook" connection, and then slipping the coiled segment **20***b* over the straight portion of the spud wire **21***b* and hot clamping them together.

Alternatively, the upper end of the coiled-coil filament **15***b* can also be provided with an opened primary turn and a depending coil section and the end of the long lead **17***b* can be bent into an L-shaped hook that is inserted into the opened turn and through the coiled section of the filament to provide the same basic type of connection as that employed at the lower end of the filament.

In the alternative 250 watt lamp embodiment **10***c* shown in FIG. **6**, a modified coupling arrangement is used to fasten the short lead wire **16***c* to the coiled-coil filament **15***c* and the insulated portion of the long lead wire **17***c*. As shown, the end **41** of the short lead **16***c* is bent into a partial turn which is screwed into the end turn of the filament **15***c* and is welded to a coiled leg segment **42** of a connector **23***c*. The latter is U-shaped and has another longitudinally-extending coiled leg segment **43** that is slipped over and snugly on the insulator sleeve **22***c* which encloses the offset portion of the long lead wire **17***c*. The coiled leg segments of the connector **23***c* are joined by a transverse arm segment **44**, as shown.

The other end of the filament **15***c* is coupled to the end of the long lead wire **17***c* in the same manner as in lamp embodiment **10***b* so that the end of the spud wire **21***c* engages the tip **13***c* of envelope **12***c*.

We claim as our invention:

1. A single-ended halogen-cycle incandescent lamp comprising:

a tubular envelope of vitreous light-transmitting material that contains a halogen additive and has a press seal at one end and a closed centrally-disposed fused hollow tip at its opposite end,

a coiled tungsten filament of elongated configuration suspended in longitudinal position within said envelope, and

a bridgeless mount assembly holding said filament in such suspended position comprising (a) a pair of rigid lead wires of unequal length that are embedded in said press seal and extend into said envelope, (b) means electrically insulating a medial portion of the long lead wire, (c) first coupling means fastening the end of the long lead wire to one end of said filament and engaging the hollow tip of said envelope, and (d) second coupling means fastening the short lead wire to the other end of said filament and to an insulated part of the long lead wire,

said long lead wire being offset toward and extending along the wall of said envelope and being terminated by a transverse arm segment that extends toward the filament and, in turn, is terminated by a longitudinally-disposed coiled segment that is in substantially coaxial alignment with the filament and constitutes part of said first coupling means.

2. The halogen incandescent lamp of claim **1** wherein said first coupling means includes a spud wire that extends into the tip of the envelope and into the coiled end segment of the long lead wire and associated end of the filament.

3. The halogen incandescent lamp of claim **1** wherein said insulating means comprises a sleeve of electrically non-conductive material that encloses the offset medial portion of the long lead wire which extends along the wall of said envelope.

4. The halogen incandescent lamp of claim **3** wherein a wire loop is anchored to a medial part of said coiled filament and extends transversely therefrom toward said insulating sleeve and the wall of said envelope and thereby constitute auxiliary support means for said filament.

5. The halogen incandescent lamp of claim **3** wherein said second coupling means inlcudes a wire connector component that extends transversely from the associated end of said filament to the long lead wire and is terminated by a coiled segment that encircles and grips said insulating sleeve.

6. The halogen incandescent lamp of claim **5** wherein;

the coiled end segment of said long lead wire extends into and is threadably interlocked with the associated end of the filament,

a spud wire extends from the tip of said envelope into the coiled end segment of said log lead wire, and

the end of said wire connector component that is fastened to the other end of said filament comprises a coiled segment that extends into and is threadably interlocked with the filament.

7. The halogen incandescent lamp of claim **5** wherein;

the coiled end segment of said long lead wire is axially spaced from the associated end of the filament and is of substantially the same inner diameter as the coiled filament,

a coiled connector component extends into and is threadably interlocked with the adjacent portions of the coiled end segment of said long lead wire and associated end of the filament, and

a spud wire extends from the tip of said envelope into the said coiled connector component.

8. The halogen incandescent lamp of claim **5** wherien;

the end of the short lead wire is also terminated by a longitudinally-disposed coiled segment that (a) extends into and is threadably interlocked with the associated end of said filament, and (b) is joined to a second coiled segment by an opened turn,

said wire connector component has a depending uncoiled leg segment that extends through the opened turn and into the said second coiled segment of the short lead wire that protrudes from the associated end of said filament.

9. The halogen incandescent lamp of claim **3** wherein;

said filament is of the coiiled-coil type, and

the short lead wire is (a) offset toward the long lead wire, (b) has a medial coiled segment that encircles and grips said insulating sleeve, and (c) is terminated by leg segment that is welded to a coiled section of the filament which is joined to the filament barrel by an opened primary turn.

10. The halogen incandescent lamp of claim **3** wherein;

said filament is of the coiled-coil type, and

said second coupling means inlcudes a generally U-shaped wire connector that is terminated at each end by a longitudinally-disposed coiled leg segment, one of which encircles and grips said insulating sleeve and the other of which encircles and is secured to the end of the short lead wire.

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