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[54] **FILAMENT MOUNT FOR A SINGLE ENDED TUNGSTEN HALOGEN LAMP**

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Related U.S. Application Data

[63] Continuation of Ser. No. 780,678, Dec. 3, 1968, abandoned.

[52] **U.S. Cl.** **313/271,** 313/344

[51] **Int. Cl.** **H01j 1/92,** H01j 19/46, H01k 1/18

[58] **Field of Search** 313/271, 344

[56] **References Cited**

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2,848,642 8/1958 Wisco et al. ..... 313/344 X

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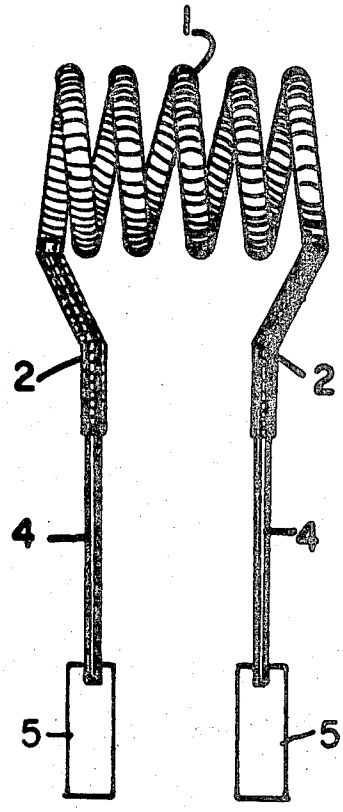
[57] **ABSTRACT**

A support wire, having a bend near one end, is inserted into the coiled leg of a tungsten filament having a coiled body. The coiled leg is flexible enough to permit complete insertion of the support wire therein and to adapt the shape of the leg to that of the wire. The filament and wire assembly is then heat treated to modify the tungsten microstructure and stabilize the filament.

5 Claims, 3 Drawing Figures



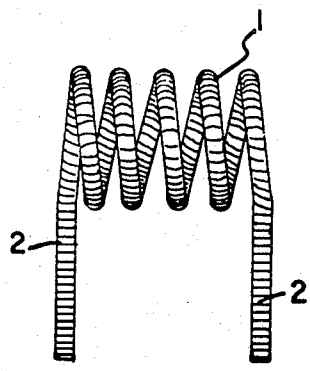
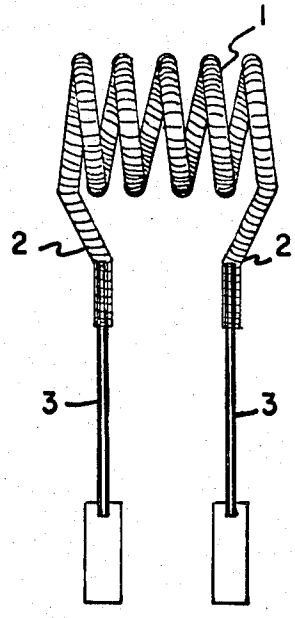


FIG. 1



PRIOR ART

FIG. 2

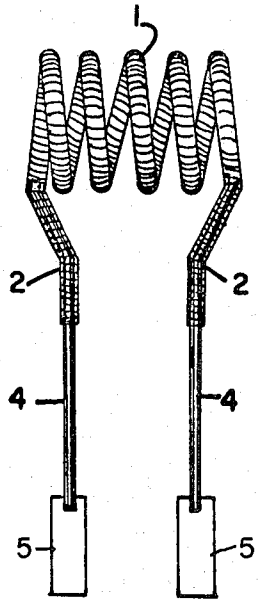


FIG. 3

FILAMENT MOUNT FOR A SINGLE ENDED TUNGSTEN HALOGEN LAMP

This is a continuation of Ser. No. 780,678, filed. Dec. 3, 1968, now abandoned.

BACKGROUND OF THE INVENTION

1. Field Of The Invention

This invention relates to tungsten filament mounts and particularly to those mounts the filaments of which have a coiled body and substantially parallel coiled legs. Such mounts are useful in single-ended incandescent lamps, but this invention is especially useful in bulbous (as contrasted with tubular) single-ended quartz halogen lamps.

2. Description Of The Prior Art

Single-ended quartz-halogen lamps, such as are commonly used in film projectors, generally have a press seal at one end of a lamp envelope and a coiled tungsten filament disposed within the envelope. Generally the legs of the filament are coiled and are connected to and supported by inserted lead-in wires which, in turn, are connected to molybdenum ribbon connectors. The press seal generally embeds all of the ribbon connectors and a sufficient portion of the lead-in wires to structurally support them and the filament throughout the life of the lamp.

In the prior art, the lead-in wire usually consisted of a straight piece of tungsten wire, one end of which was inserted into the filament leg and the other end of which was connected to the ribbon connector. In some cases where the filament legs protruded substantially orthogonally from the coil body, the ribbon connectors were substantially in line with the filament legs and a straight support wire could be inserted into the complete length of the filament leg. In those cases, the ribbon connectors were spaced apart from each other about the same distance as the length of the coil body and the filament mount could be enclosed in a tubular quartz envelope. However, in some cases it was desired to miniaturize the lamp envelope, especially where the lamp was used in a film projector and was associated with a proximate reflector. Hence, a bulbous envelope was often used, in which the length of the press seal was less than the major diameter and thus the ribbon connectors were spaced apart less than the length of the filament body. In such lamps, the filament legs had to be bent toward each other somewhat in order to reduce the space therebetween and to accommodate the reduced span of the ribbon connectors and the press seal.

When straight lead-in wires were inserted into the inwardly bending coiled legs of such filaments, they could not be inserted completely therein, that is, they could not be inserted to the junction point of the filament body and the filament leg. For example, in a filament mount in which parallel lead-in wires were 6 mm. apart and in which the coil body was 12 mm. long, each filament leg had to be bent sharply for at least 3 mm. from its junction point with the coil body. The result was that at least 3 mm. of each leg was not engaged, and therefore not shorted out, by the support wire. In operation, these 3 mm. sections were undesirably heated to incandescence and yielded inefficient illumination since they were outside the useful field of the reflector. Generally the reflector and lamp were positioned so that only the illumination emanating from the coil body was efficiently reflected towards a projection screen.

It is an object of this invention to provide an improved tungsten filament mount for a single ended lamp in which the coiled legs of the filament are effectively shorted out by a supporting bent lead-in wire.

SUMMARY OF THE INVENTION

A filament mount, in accordance with this invention, comprises a tungsten filament having a coiled body and coiled legs protruding, prior to mounting, generally parallel to each other. In addition, the mount includes a support wire inserted into the complete length of each leg and extending beyond the end thereof. The inserted portion of the support wire is bent in such a manner that the filament legs, which are sufficiently flexible at the time of insertion to adapt to the shape of the inserted portion of the support wire, bend toward each other somewhat in order to reduce the space therebetween.

The diameter of the inserted portion of the support wire is so related to the inside diameter of the coiled leg as to not only permit insertion therein but to also provide a close enough fit to provide physical support therefor. In addition, there must be sufficient contact between the support wire and the individual turns of the leg that the support wire electrically shorts out substantially the entire length thereof.

The tungsten filament, at the time of insertion of the support wire, has a fibrous microstructure. Such a structure imparts moderate flexibility to the wire and permits it to be cold worked to some extent. However, the desired microstructure in the finished lamp is a long grained interlocking structure for the purpose of preventing filament sag. Such a structure results in a more brittle wire and is obtained by heat treating the wire at a suitable temperature. The heat treating process is called stabilizing. Accordingly, after insertion of the support wires into the filament legs, the filament assembly is supported on a suitable jig and stabilized, thereby reducing the flexibility of the filament. After removal from the jig, the filament assembly can be conventionally mounted and sealed in a lamp envelope.

As described in a co-pending application Ser. No. 770,569, now U. S. Pat. No. 3,544,830 entitled "Quartz Halogen Lamp And Method Of Making", filed on Oct. 24, 1968, a single U-shaped support wire may be used in place of a separate insert for each leg. In such a case, the stabilizing jig can be merely a tungsten rod passing through the coil body, since the support wire maintains the proper leg spacing during the stabilizing process. Of course, after stabilizing, the support wire is severed into two separate support wires to avoid shorting out the filament.

As mentioned above, the coiled filament leg must have sufficient flexibility, at the time of insertion, to permit the bent support wire to be inserted into substantially the entire length of the leg. The amount of flexibility needed is dependent on the degree of severity of the bend. For example, the coiled filament leg would have to have greater flexibility to accommodate a 90° bend than, say, a 30° or 45° bend. The flexibility of the coiled leg is dependent on the filament wire diameter, the inside diameter of the coiled leg and the pitch of the leg coiling. Increased flexibility results from an increase in pitch or a reduction in wire diameter or an increase in the ratio of inside diameter to a wire diameter. Said ratio should be at least about two

to one to impart sufficient flexibility to the coiling to permit it to be drawn over bends of up to 90°.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 shows a filament having parallel coiled legs prior to insertion of the support wires in the coiled legs.

FIG. 2 shows the filament of FIG. 1 as it would be mounted in the prior art.

FIG. 3 shows the same filament mounted in accordance with this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Filament 1, as shown in FIG. 1, was made of 8 mil tungsten wire, having a fibrous microstructure, and was a coiled coil having a body length of 12.0 millimeters and a body diameter of 0.221 inches. Legs 2 of filament 1 were part of the primary coiling thereof, the primary coiling being wound at 87.5 turns per inch on a 21 mil mandrel. Legs 2 were 9.0 millimeters long and both legs protruded in the same direction from filament 1.

When the straight support wires 3 of the prior art, shown in FIG. 2, were inserted into coiled legs 2 and were spaced 6 millimeters apart in order to accommodate the press seal of a particular bulbous envelope, support wires 3 could not be inserted into the entire length of legs 2. At least 3 millimeters of each of legs 2 was leg unshorted by support wires 3 and, in operation, yielded the undesired incandescence mentioned above in Description Of The Prior Art.

As shown in FIG. 3, support wires 4, made in accordance with this invention, consisted of a 20 mil diameter tungsten wire having two bends near one end thereof. The first bend had a radius of 0.050 inches, an angle of 52° and was about 0.070 inches from the end of the support wire. The scond bend was about 0.132 inches from and similar to the first bend so that the longer remaining length of wire 4 extended away from but substantially parallel to the 0.070 inch portion. The bent end of each of two wires 4 was then carefully inserted into each coiled leg 2 to within about three turns of the junction of leg 2 with the filament body. About 4 millimeters of coiling extended on the straight length of wire 4 beyond the second bend. Each leg 2 was then hot crimped on each respective wire 4.

A tungsten rod (not shown), threaded to correspond to the secondary turns of the filament body, was inserted through the filament body to prevent distortion thereof during stabilizing. The assembly was then placed in a tungsten tray and legs 2 were positioned symmetrically with respect to filament 1 and were substantially parallel to each other, being spaced about 6 millimeters apart at the straight lengths thereof. The filament was then stabilized at a temperature of 2,450°C for 1 minute in a vacuum furnace. Upon removal therefrom, the tungsten rod was carefully unthreaded from the filament body, care being required to avoid fracturing the somewhat embrittled filament.

Molybdenum ribbon 5 was then welded to the free end of each support wire 4 and the filament mount was ready for press sealing in a quartz envelope by conventional means.

We claim:

1. A tungsten filament assembly for a single ended tungsten halogen lamp comprising: a stabilized tungsten filament having an elongated coiled body and two coiled legs protruding substantially orthogonally therefrom, the legs being integral extensions of the primary coiling of said body; two tungsten support wires, one each inserted into each coiled leg for substantially only the entire length of said leg, each support wire having an obtuse angle bent at the inserted portion thereof, each support wire being longer than said legs, the inserted ends of the support wires being substantially parallel to each other, the other ends of the support wires also being substantially parallel to each other but spaced closer together than are said inserted ends; and separate molybdenum ribbon connectors connected to said other ends of the support wires.

2. The filament assembly of claim 1 wherein the space between the ends of said legs is less than the body length of said filament.

3. The filament assembly of claim 2 wherein the uninserted portions of said support wires are substantially parallel to each other.

4. The filament assembly of claim 3 wherein said support wires comprise the legs of a single U-shaped wire.

5. The filament assembly of claim 1 wherein the bend in said support wire effects a narrower spacing between legs.

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