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QUARTZ-HALOGEN INCANDESCENT LAMP HAVING A FILAMENT AND A
SUPPORT MADE OF RHENIUM-TUNGSTEN ALLOY
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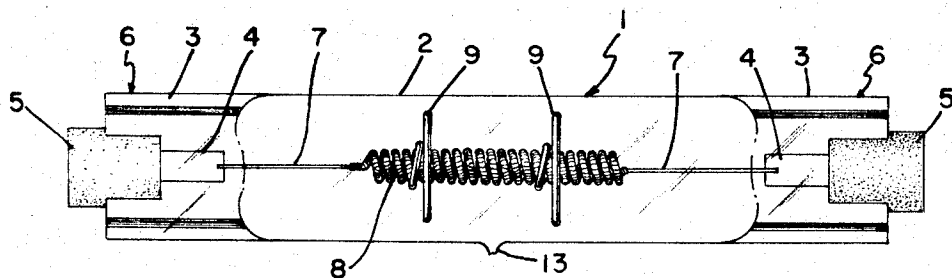


FIG. 1

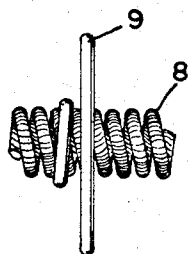


FIG. 2

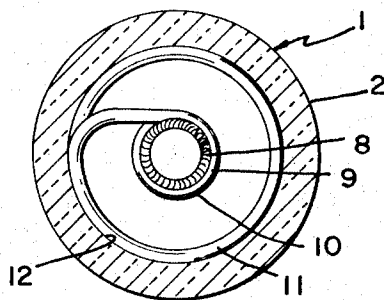


FIG. 3

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QUARTZ-HALOGEN INCANDESCENT LAMP HAVING A FILAMENT AND A SUPPORT MADE OF RHENIUM-TUNGSTEN ALLOY

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4 Claims. (Cl. 313—311)

This invention relates to incandescent lamps particularly to those of the tubular quartz-halogen type, such as quartz-iodine lamps. The invention especially relates to such lamps in which the filament is supported in at least one spot between its ends.

Quartz-halogen lamps generally have a sealed quartz envelope containing a tungsten filament with lead-in wires and an atmosphere of an inert gas having a small amount of halogen therein. The halogen used is generally iodine. Such lamps have high light output, high efficiency and long life. The lumen output remains high throughout at least 90% of the lamp's life, because the iodine vapor combines with the tungsten evaporated from the filament, forming an iodine therewith and keeping the tungsten from depositing on the wall of the envelope as a black film. The iodide formed dissociates in the region of the filament depositing the tungsten thereon. Since the tungsten is not deposited back in the same spot from which it came, parts of the filament will eventually become thinner and the lamp will eventually burn out.

Such a lamp has many applications, for example, in spotlights, projection lamps, flood lights, and even home lighting. Many of these applications require a tubular lamp, where the length of the lamp tube is about 3 or more times its diameter. In such lamps, if the filament is more than two inches long it must be physically positioned in the center of the tubular quartz lamp, and kept away from the walls; melting of the quartz tube would occur if the filament sagged too close to it, and thus would result in failure of the lamp. Heretofore, the filament has usually been held in position away from the tube walls by supports of tungsten wire. These supports are bent from a short single length of wire into a large circular ring, to accommodate and be supported by the inside surface of the quartz tube, and one end of the wire extends towards the filament into a comparatively central circular ring through which the filament extends and by which it is supported.

A number of such supports used depends upon the length of the lamp but should be sufficient for proper performance through the entire useful life of the lamp.

Prior to being sealed into the tube, the tungsten filament is stabilized with the supports attached. This is done by heating the filament to a temperature of 2000° C. or higher, for example by passing an electric current through the filament in a non-oxidizing atmosphere or in a vacuum. This stabilizing converts the tungsten wire from a fibrous ductile structure to a somewhat rigid brittle structure, and this non-sagging structure is necessary for proper performance of the lamp.

We have discovered that the tungsten support becomes partially embrittled where it is in close proximity to the filament during the stabilizing process, that is, in the portion wound around the filament and in the length of wire extending from the small ring to the large ring. The point of maximum brittleness will generally occur at about the middle of this connecting portion of the support wire.

This results in a high rate of rejection during manufacture of the lamp, because the filament and supports are generally adjusted during the sealing operation and the support, being brittle, can be easily broken. The brittleness also results in short lamp life, if there is any mechanical shock or vibration.

We have discovered that this brittleness can be prevented by making the support of an alloy of tungsten and rhenium. An alloy of 97% tungsten and 3% rhenium is especially effective although the amount of rhenium present can be varied considerably with good results, the most effective range being between 1% and 10% rhenium in the tungsten. The high price of rhenium makes it desirable to use as little rhenium as is necessary to obtain the desired result. The use of such a tungsten-rhenium alloy for the support has the unexpected result of remaining ductile during the stabilizing process and thereby reducing or eliminating the difficulties caused by the embrittling of the tungsten support. The device has proven very effective in operation in lamps.

Other objects features and advantages of the invention will be apparent from the following specification taken in connection with the accompanying drawings, in which: FIGURE 1 is a longitudinal view of a lamp according to the invention;

FIGURE 2 is an enlarged view of the support and the filament in the vicinity of the support;

FIGURE 3 is a cross-sectional view through the middle of the lamp of FIG. 1.

In FIGURE 1 the quartz envelope 1 has the tubular portion 2 with the pressed ends 3, 3 through which the molybdenum ribbons 4 extend in a seal. The usual ceramic end caps 5, 5 are attached to each pressed end and the molybdenum ribbon 4 is connected to a contact (not shown) at the end of cap 5, through a wire in the usual manner, the end cap 5 having circular cross-section and being slotted to fit the flat pressed end 3. The outer edges 6 of the press seals 3 are thickened for strengthening. Lead-in wires 7 extend from the molybdenum ribbons 4 into the hollow interior of tubular portion 2 of bulb 1, extending into the ends of the tungsten wire coil 8, which is shown as a coiled-coil, although it may be a single coil if desired. Two support rings 9, 9 are shown at intermediate portions of the tungsten coil to support it along the longitudinal axis of the tube 2.

As shown in enlarged form in FIGURES 2 and 3, the support rings 9 are composed of a wire having a turn 10 of small diameter wrapped around the filament and with a pitch opposite to that of the filament, the wire extending from this turn to be formed into an outer turn 11, of larger diameter, fitting against the inside wall 12 of the quartz tube 2. The envelope is sealed by the exhaust tube 13 and contains an atmosphere of gas such as argon or nitrogen, inert with respect to the filament and at a pressure in excess of atmospheric, with the usual amount of iodine present in the tube to provide iodine vapor during operation of the lamp and thereby reduce blackening.

The support rings 9 are of an alloy of tungsten and rhenium, about 97% of tungsten and 3% rhenium being generally very effective, although the proportions of the tungsten and rhenium can be varied considerably.

Various modifications in the specific embodiment described above will be apparent to a worker skilled in the art without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim is:

1. A tubular incandescent lamp having an elongated vitreous light-transmissive tube, a coiled tungsten filament therein extending along the length of the tube, and a support for a portion of the filament between its ends, said support being of an alloy of tungsten and rhenium.

2. The lamp of claim 1, in which the support is a wire shaped to have a ring fitting against the inner wall of the tube, another and smaller ring fitting around the coil to support the same, and another portion of wire joining the two rings to support one from the other.

3. The lamp of claim 1, in which the sealed tube has a filling of inert gas and iodine vapor.

4. The lamp of claim 1, in which the filament is approximately composed of about 97% tungsten and 3% rhenium.

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