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TUNGSTEN HALOGEN LAMP WITH TUNGSTEN MESH DEFLECTOR

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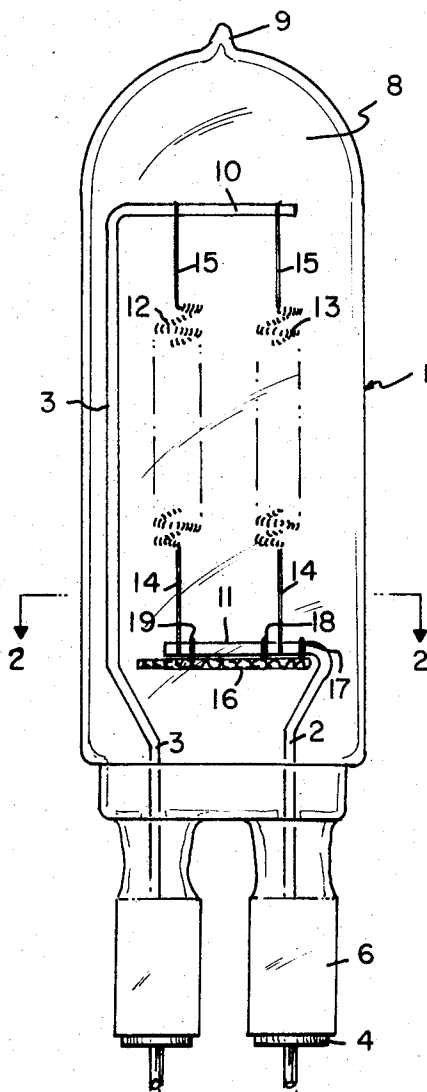


FIG. 1

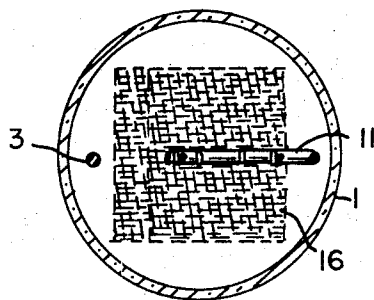


FIG. 2

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TUNGSTEN HALOGEN LAMP WITH TUNGSTEN MESH DEFLECTOR

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3 Claims

ABSTRACT OF THE DISCLOSURE

A high power tungsten halogen lamp in which a convection shield is used near the base to control redeposition of tungsten on the filament and prevent the formation of needle-like crystals extending out of the filament.

FIELD OF INVENTION

This invention relates to tungsten halogen incandescent lamps, that is, to lamps having a tungsten filament operating in a halogen atmosphere to improve lumen maintenance, generally in an envelope of quartz or other hard glass in order to operate at high temperature.

BRIEF SUMMARY OF PRIOR ART

In tungsten halogen lamps having a vertical filament configuration, the coiled filament and its enclosing glass envelope are such that tremendous velocities are imparted to the filling gases as they sweep past the coiled filament, thereby removing heat differentially from the outer surfaces of the coil. The tungsten halides which are formed at the bulb wall or between the wall and the filament are entrained with the filling gas. Dissociation of these halides takes place at the cooled surface of the filament resulting in the deposition of tungsten atoms on the cooled surface of the filament. These atoms then form various crystal habits and grow in random directions with consequent bridging or short-circuiting of the filament turns. Also, the addition of metal to parts of the filament by redeposition further cools the areas where the growth takes place, resulting in the adjacent areas becoming hotter and thus raising the rate of evaporation of these areas of the filament. These reactions can and do control the filament life in a way that is detrimental to the best performance of the lamp.

BRIEF DESCRIPTION OF INVENTION

I have found that the disadvantages described above can be reduced or eliminated and the lamp life increased as much as 50% by the use of a tungsten deflector placed inside the envelope preferably transversely of the axis and between the ends of the filaments and the seal of the envelope. This deflector can be of tungsten sheet, plain or perforated, although I prefer to make it of a tungsten grid or mesh, which has a larger surface area and a structure through which part of the convection current can pass to have its tungsten absorbed.

This deflector is located below the filament to intercept the convection currents of the gases, which include the tungsten halides entrained with them. The deflector is mainly heated by radiation from the filament and when properly located will become sufficiently high in temperature to dissociate the halides which contact it on their way into the upward stream of gases. The tungsten atoms thus released attach themselves to the deflector and are unable to reach the cooled areas of the filament in sufficient numbers to substantially alter the performance of the filament. The deflector also slows down the velocity of the gas currents in the vicinity of the filament, thereby reducing the cooling effect on the surface areas of the filament, thus preventing tungsten atoms from depositing

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in these areas. A third effect is a reduction in the temperature of the base of the lamp. By reducing the temperature of the lamp in the base area, the life of the glass-to-metal seal is lengthened. It can also be said that the conducted heat through the lamp lead-in wires is reduced.

Deflectors in lamps have been known before. A deflector of nickel mesh or perforated nickel sheet is shown in U.S. Pat. No. 2,862,125 to O. H. Biggs, but it is not used in a tungsten halogen lamp, is not itself of tungsten, and is in a different position in the lamp. Nickel mesh deflectors parallel to the axis have been known in large incandescent lamps. But such lamps did not operate at the high envelope temperatures used in quartz halogen lamps, and did not have to take part in the chemical reactions incident to the operation of filaments in an atmosphere containing halogen. In fact, the nickel used for such deflectors would not be effective, since it would replace the tungsten in the halogen and use up the halogen available for the regenerative reaction with the tungsten, thus increasing the blackening of the envelope rather than decreasing it.

BRIEF DESCRIPTION OF DRAWINGS

Other objects, features and advantages of the invention will be apparent from the following specification taken in connection with the accompanying drawing in which:

FIG. 1 is an elevational view of a lamp according to the invention; and

FIG. 2 is a sectional view along plane 1—1 of the same lamp.

DESCRIPTION OF SPECIFIC EMBODIMENT

In FIG. 1, the light-transmitting glass envelope 1 has the tungsten lead-in and support wires 2, 3, welded to the molybdenum cups 4, 5 which are sealed to the glass tubes 6, 7 as shown for example in copending U.S. patent application Ser. No. 811,965, filed Apr. 1, 1969 by Dayton et al. The wire 2 is bent transversely to the axis of bulb 1, and wire 3 extends upwardly toward the other end of the bulb and is bent transversely near said other end 8 of the lamp, which has the sealed exhaust tubulation 9. Between the transversely bent portion 10, 11 of the wires 2, 3, extend the two coiled-coil tungsten filaments 12, 13, fixed to the transverse portion 10, 11 by the tungsten wires 14, 15 which each have one of their ends wrapped around one of the transverse portions 10, 11 and the other end of each extending into the primary coil of one of the coiled-coils 12, 13 to hold the latter.

A tungsten mesh piece 16 is fixed to the transverse wire portion 11 by wrapping wires 17, 18, 19 through the mesh and around the transverse wire portion 11, or in some other convenient manner. The tungsten mesh 16 should be under the bottom of the coils, so that part of the mesh would be in register with the axis of the coils and be in the space beneath the major coils 12, 13, so that it would intercept convection currents flowing upwardly from the chimney effect of the interior of said coils.

The tungsten mesh should be near enough to the filament to be heated to incandescence, preferably to a temperature of about 1200° C., as this temperature is necessary if the mesh is to remove tungsten efficiently from the convected tungsten halide, which in this case would be tungsten bromide, since bromine is used as part of the filling gas.

The tungsten mesh is preferably transverse to the axis of the envelope, although it can be inclined at an angle if desired.

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Before being sealed off, the envelope is filled with nitrogen, argon or a mixture of suitable gases at a pressure of about 700 torr, and bromine at a pressure of about 6.0 torr, although other pressures can be used. The bromine can be introduced as hydrogen bromide.

Although a specific embodiment of the invention has been described above, various changes and modifications will be apparent from the foregoing specification to one skilled in the art, and the invention is limited in scope only by the claims.

What I claim is:

1. A tubular single ended electric incandescent lamp comprising: a sealed enclosing envelope; lead-in wires sealed through the end of said envelope; a coiled filament disposed within said envelope and supported on said lead-in wires; a gas mixture therein comprising an inert gas and a halogen which can combine with tungsten to form a halide thereof; a tungsten mesh deflector supported transversely between said filament and said envelope end, said deflector being disposed in the lower part of said envelope in relation to convection currents in the lamp during normal lamp operation, said deflector being close enough to the filament to be heated thereby sufficiently to dissociate tungsten halide present in said convection

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currents, whereby tungsten from said dissociated tungsten halide is preferentially deposited on said deflector in lieu of on said filament.

2. The lamp of claim 1, in which the tungsten deflector is supported by one of the lead-in wires.

3. The lamp of claim 1 in which the axis of the filament is along or parallel to the axis of the lamp envelope.

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PALMER C. DEMEO, Primary Examiner

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