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Neumann

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[54] **HALOGEN INCANDESCENT LAMP**

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[52] **U.S. Cl.**..... **313/222,** 313/223, 313/184

[51] **Int. Cl.** **H01k 1/50**

[58] **Field of Search**..... 313/222, 223

[56] **References Cited**

UNITED STATES PATENTS

3,541,378	11/1970	Pebler	313/222
3,263,113	7/1966	Schroder	313/223

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Assistant Examiner—Richard A. Rosenberger
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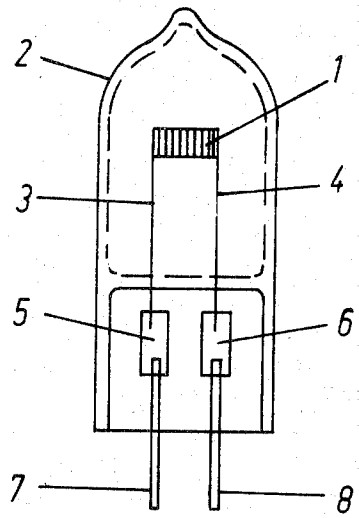
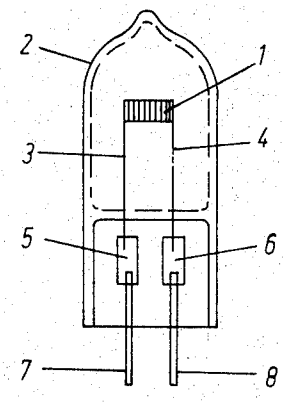
[57] **ABSTRACT**

Halogen incandescent lamps containing a tungsten filament and an inert fill gas. The lamps also contain an equimolar quantity of oxygen and fluorine in the envelope together with the inert gas. Preferably the amount of each of the oxygen and fluorine is between about 0.1 and 5 torr.

9 Claims, 1 Drawing Figure

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HALOGEN INCANDESCENT LAMP

Incandescent lamps having tungsten filaments and being filled with an inert gas which also contains one or more of the halogen gases as an additive to the inert gas are well known. During operation of the lamp, a cyclic process is initiated which utilizes the halogen additive. During this cyclic process the halogen additive acts as a transport aid. Tungsten is evaporated from the filament and otherwise deposited on the envelope wall. This tungsten is converted at the operating temperature of the lamp to tungsten halide(s) and transported back to the filament. The tungsten halide is decomposed on the hot filament to form tungsten which is deposited on the filament and to release the free halogen. In theory, incandescent lamps containing a halide additive to the fill gas should not be blackened throughout its service life and should deliver an approximately constant luminous efficacy during the service life.

U.S. Pat. No. 3,384,773 discloses such cyclic transport processes and discloses the use of the halogen gases, i.e., iodine, bromine and fluorine as well as gaseous mixtures thereof. It has been disclosed that when fluorine is added to the inert gas, the fluorine may attack various components of the lamp such as the inner wall of the envelope and other internal components such as the filament supports. To avoid such attack it has been proposed that such components be protected by a coating which is resistant to gaseous fluorine, see U.S. Pat. No. 3,263,113.

Investigations utilizing the fluorine transport cycle in halogen containing incandescent lamps have determined that with the usual filament temperatures, the decomposition rate of the tungsten fluorides is greater than the evaporative rate of the tungsten from the tungsten filament. Consequently, the vaporized tungsten from the gas phase when reacted with fluorine is carried to the portions of the filament having the highest temperature and is deposited there. This precipitation of tungsten at the hottest portions of the filament results in strengthening the filament and providing a more even temperature balance along the filament. It has not, however, been possible to utilize this advantage of the tungsten/fluorine transport cycle in view of the problems inherent in the attack of fluorine on the envelope material and on the internal lamp components which could only be avoided utilizing particularly complicated protective measures.

The concomitant presence of a small amount of oxygen in the inert fill gas has been disclosed for use in halogen incandescent lamps utilizing the iodine transport cycle, see U.S. Pat. No. 3,160,454. U.S. Pat. No. 3,541,378 discloses the use of oxygen with the various halides, and particularly oxygen-containing tungsten/-bromine compounds. U.S. Pat. No. 3,541,378 discloses that the proportion of halide to oxygen is about 4:1. It has been found that in the aforedescribed cyclic transport processes, because of the activating influence of the oxygen, the oxygen attacks the cold tungsten-lead-in wires.

It is an object of this invention to provide incandescent lamps utilizing the fluorine transport cycle without also requiring special measures for protection of the surfaces inside the lamp envelope and other lamp components.

SUBJECT MATTER OF THE INVENTION

The present invention provides gas filled incandescent lamps containing a closed light pervious envelope and a tungsten filament in said envelope. The gas filling comprises an inert gas together with equimolar amounts of oxygen and fluorine. Preferably the amounts of each of said fluorine and oxygen in said inert gas is at a cold fill pressure of from 0.1 to 5 torr. The fill pressure of the inert gas is in the order of magnitude of from several hundred to several thousand torr.

During operation of the halogen incandescent lamps of the present invention which contain equimolar amounts of fluorine and oxygen in the inert fill gas, corrosion was not observed on the internal lamp components, e.g., the lead-in wires, during operation of the lamp. This was accomplished without the application of protective measures on the inner walls of the lamp envelope to prevent possible attack by fluorine. In order to explain the foregoing surprising observations, it is theorized that the tungsten oxyfluoride having the composition WO_2F_2 is formed in the lamp envelope. The fluorine transport cycle occurs utilizing this compound for the transport of the tungsten fluoride evaporated from the filament. The compound is stable and, accordingly, elemental fluorine is not present in the vicinity of the exposed internal lamp components.

Halogen incandescent projection lamps rated for 12 volts and 100 watts were filled with argon at a cold pressure of 3000 torr. Fluorine in an amount of 4 torr and oxygen in an amount of 4 torr were added to the inert (argon) fill. Tests of this lamp determined that the service life increased by about 50 percent – 70 percent when compared with conventional halogen incandescent lamps utilizing the bromine transport cycle. No attack on the cold lead-in wires by the fill gas of the oxygen and fluorine containing lamp was observed.

The invention will be further described with reference to the accompanying drawing of a halogen containing incandescent lamp which contains equimolar amounts of fluorine and oxygen in the inert gas fill.

A tungsten filament **1** is positioned in the quartz glass lamp envelope **2** and is supported by wires **3,4.** The support wires **3,4** are connected to molybdenum foils **5,6** which are hermetically pinch-sealed into the quartz glass. The molybdenum foils **5,6** are welded to terminals **7,8.** The lamp is operated at 12 volts with a power input of 100 watts. The lamp envelope contains an inert gas fill such as nitrogen or one of the rare gases, or a mixture thereof. The lamp envelope also contains the equimolar amount of fluorine and oxygen.

The lamp envelope should be dimensioned so that during operation of the lamp, the wall temperature is at least 250°C. Then it is not necessary to use quartz glass for the lamp envelope. Other known high melting point glass, hard glass, and even ordinary glass may be used for the lamp envelope. The drawing depicts a single-ended halogen incandescent lamp. The invention is also applicable to halogen incandescent lamps of other designs such as, e.g., double-ended or socketed, or spherical lamps, and may be utilized for halogen incandescent lamps rated for voltage and wattage ranges other than those specified in the exemplified embodiment.

The foregoing illustrates that the present invention permits the utilization of the fluorine transport cycle in

tungsten filament incandescent lamps. This permits taking advantage of this cycle which redeposits the gaseous tungsten at the hottest spots on the filament. This is accomplished without the attack on internal lamp elements which was a characteristic of the fluorine and/or oxygen containing lamps of the prior art.

The lamp of the present invention contains an inert gas fill, preferably argon, in amounts between 600 torr and 6000 torr, and preferably between 1500 torr and 3500 torr. The amounts (equimolar) of both oxygen and fluorine are preferably between about 3 torr and 4.5 torr.

I claim:

1. A halogen incandescent lamp comprising
a closed light pervious envelope,
a tungsten filament in said envelope, and
an inert gas fill in said envelope, and
said envelope also containing in said inert gas, equimolar amounts of oxygen and fluorine.

2. The incandescent lamp of claim **1** wherein the amounts of each of said oxygen and fluorine is between about 0.1 and 5 torr.

3. The incandescent lamp of claim **2** containing about 4 torr of oxygen, and about 4 torr of fluorine.

4. The incandescent lamp of claim **3** containing about 3000 torr of argon.

5. The incandescent lamp of claim **2** wherein said inert gas is argon.

6. The incandescent lamp of claim **2** wherein the amount of said inert gas fill is between 600 torr and 6,000 torr.

7. The incandescent lamp of claim **6** wherein the amount of each of said oxygen and fluorine is between about 3 torr and 4.5 torr.

8. The incandescent lamp of claim **7** wherein the amount of said inert gas fill is between 1,500 torr and 3,500 torr.

9. The incandescent lamp of claim **8** containing about 4 torr of oxygen and about 4 torr of fluorine.

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