

PATENT SPECIFICATION

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(19)

(54) HALOGEN METAL VAPOUR DISCHARGE LAMP

(71) We, PATENT-TREUHAND GESELLSCHAFT FUR ELEKTRISCHE GLUHLAMPEN m.b.H. of 1 Hellabrunner Strasse, 8 Munchen 90,
 5 Federal Republic of Germany, a German body corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by
 10 which it is to be performed, to be particularly described in and by the following statement:

The invention relates to a halogen metal vapour discharge lamp. The arc tube of such lamps, which is enclosed within an outer bulb, contains in most cases mercury and metal halides, such as iodides and bromides of the metals sodium, indium, thallium, iron, rare earth metals, and others.

20 With high pressure discharge lamps which are only filled with mercury, it has become known to frost the outer surface of the arc tube partly or even entirely, for instance, by sandblasting with quartz sand.
 25 The aim is, to attain by means of the diffusing medium, a larger beam spread (German Patent Specification No 950 224, page 2, lines 84 and 85 and lines 5—12 or, to render the arc which is contracted in
 30 operation, visually so broad that the dark space between the arc and the tube wall is brightened and the electrodes are no longer discernible (US Patent Specification No 3,384,771, claim 1 and column 4, lines 2—5 and column 3, lines 19—21).

35 The present invention seeks to provide lamp of low colour temperature at high luminous efficiency and with good colour rendering.

40 According to the invention, there is provided a halogen metal vapour discharge lamp comprising an arc tube enclosed in an evacuated outer bulb, the arc tube being frosted at at least the cooler parts.

45 The arc tube may be frosted only in the cooler spots or may be frosted across its entire outer surface.

The fill quantity in the arc tube may be such that in operating condition the vapour

is either saturated or would be saturated in the case of an unfrosted arc tube, but with a frosted arc tube it is unsaturated. 50

Due to the treatment of the arc tube in accordance with the invention, part of the radiation emitted by the discharge is repeatedly reflected by the frosting and, consequently, absorbed by the tube wall to a higher degree than in the case of an unfrosted arc tube. Said absorption entails a higher temperature of the arc tube. 55

The vapour pressure of the filling is thereby increased and, depending on the quantity of fill substances — as mentioned above — operation of the discharge still takes place in the saturated condition or, due to the frosting, in the unsaturated condition. 60

In the case of a temperature increase of the filling, which is in saturated condition, then, apart from a rise in vapour pressure, an increase in particle density also occurs at the same time and thus there is an enhancement in luminous efficiency. With high pressure mercury vapour discharge lamps having no additives, the rise in temperature of the tube wall would also lead to an increase in vapour pressure, but an increase in density would not be attained and consequently, no enhancement of luminous efficiency. With the lamps according to the invention, a reduction of the colour temperature and improved colour rendering of the light which results from changed conditions of excitation is attained at the same time as enhanced luminous efficiency. This shows clearly that frosting in the known high pressure mercury vapour discharge lamps will be without effect as far as the present invention is concerned. 70

85 The frosting of the arc tube is of particular advantage in halogen metal vapour discharge lamps with rare earth metal halides, because it is highly desirable to increase the vapour pressure of these halides which have a relatively low vapour pressure. Due to the higher particle density brought about thereby and the more intense excitation of the rare earth metal halides, the red component in the spectrum 90

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of the discharge is intensified so that with the treatment of the arc tube according to the invention, there results the desired reduction of colour temperature of the discharge. The luminous flux reduced by the absorption in the frosting is compensated by the above described increase in luminous efficiency of the discharge. 5

10 The invention will now be described in greater detail, by way of example, with reference to the drawing, the single figure of which is a schematic view of a lamp in accordance with the invention.

15 In the figure, an arc tube 1 of quartz glass is provided at each end thereof with a ThO_2 -activated tungsten electrode 2 and 3, respectively, which are connected through foils 4 and 5 to the lead-in wires 6 and 7. 20 The two foils 4 and 5 are hermetically pinch sealed in known manner in the respective end portion of arc tube 1. The arc tube 1 has an inner diameter of 15.5 mm, the electrode spacing is 27 mm, the volume about 6 cc. The outer surface of arc tube 1 is provided with a frosting 8. The end portions of the arc tube are provided with a heat absorbing coating 9 or 10, respectively, of ZrO_2 . The arc tube 1 is filled with about 30 10 mg of mercury, 1 mg of rare earth metal, preferably dysprosium, 4 mg of HgI_2 , 1 mg of thallium iodide, 1 mg of cesium iodide, and argon at 30 torr as the basic gas. The arc tube 1 is enclosed within an evacuated 35 outer bulb 11 designed as a tubular or ellipsoidal bulb or, alternately, as a reflector bulb. The outer bulb 11, provided with a screw type base 12, may likewise be frosted, which is particularly noticeable in the desired way when the outer bulb is closely fitted around the arc tube. The lamp is operated with a 3 A at an operating

voltage of 100 V and a power input of 250 W. With bulbs frosted in accordance with the invention, the luminous efficiency is 80 lm/W, the colour temperature 4600 K, and the colour rendering index $R_a=90$, compared with a lamp having a clear arc tube bulb with a luminous efficiency of 80 lm/W, a colour temperature of 5600 K, and a colour rendering index $R_a=85$. 45 50

The lamps are suited for general lighting, preferably for interior or shop window lighting.

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WHAT WE CLAIM IS:—

1. A halogen metal vapour discharge lamp comprising an arc tube enclosed in an evacuated outer bulb, the arc tube being frosted at at least the cooler parts. 60
2. A halogen metal vapour discharge lamp, as claimed in claim 1, wherein the arc tube is frosted only in the cooler spots. 65
3. A halogen metal vapour discharge lamp, as claimed in claim 1, wherein the arc tube is frosted across its entire outer surface. 70
4. A halogen metal vapour discharge lamp as claimed in Claim 1, 2 or 3 wherein the fill quantity contained in the arc tube is such that, under operating conditions, the vapour is saturated. 75
5. A halogen metal vapour discharge lamp as claimed in Claim 1, 2 or 3, wherein the fill quantity contained in the arc tube is such that, in the case of an unfrosted arc tube, the vapour would be in saturated condition during operation, but with a frosted arc tube it is unsaturated. 80
6. A halogen metal vapour discharge lamp substantially as described herein with reference to the drawing.

For the Applicants:
J. F. WILLIAMS & CO.,

1579187

COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

