

PATENT SPECIFICATION

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(54) HALOGEN METAL VAPOUR DISCHARGE LAMP

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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
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.

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.
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
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).

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

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.

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.

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.

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.

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 enhance-
ment 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.

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

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.

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.

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. 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 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 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 noticable 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 $R_a=85$.

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

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.
2. A halogen metal vapour discharge lamp, as claimed in claim 1, wherein the arc tube is frosted only in the cooler spots.
3. A halogen metal vapour discharge lamp, as claimed in claim 1, wherein the arc tube is frosted across its entire outer surface.
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.
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.
6. A halogen metal vapour discharge lamp substantially as described herein with reference to the drawing.

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COMPLETE SPECIFICATION

1 SHEET

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

