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(54) High pressure metal vapour discharge lamps

(57) A high pressure discharge lamp comprises a light transmitting and high temperature resistant discharge vessel 2, electrodes 8,9 of a high melting point metal, a filling of a buffer gas and metal halide additives containing only iodides or iodides and bromides as the halide or iodine or iodine and bromine as the halogen, an outer bulb, 1a and heat absorbing agents 5 selected and arranged such that the lamp has an arc output of less than 100 W/cm. The heat absorbing agents may include at least two selected from a tube encircling the vessel 2, one or more infra-red reflecting layers, and etching or sanding of the surface of the vessel 2.

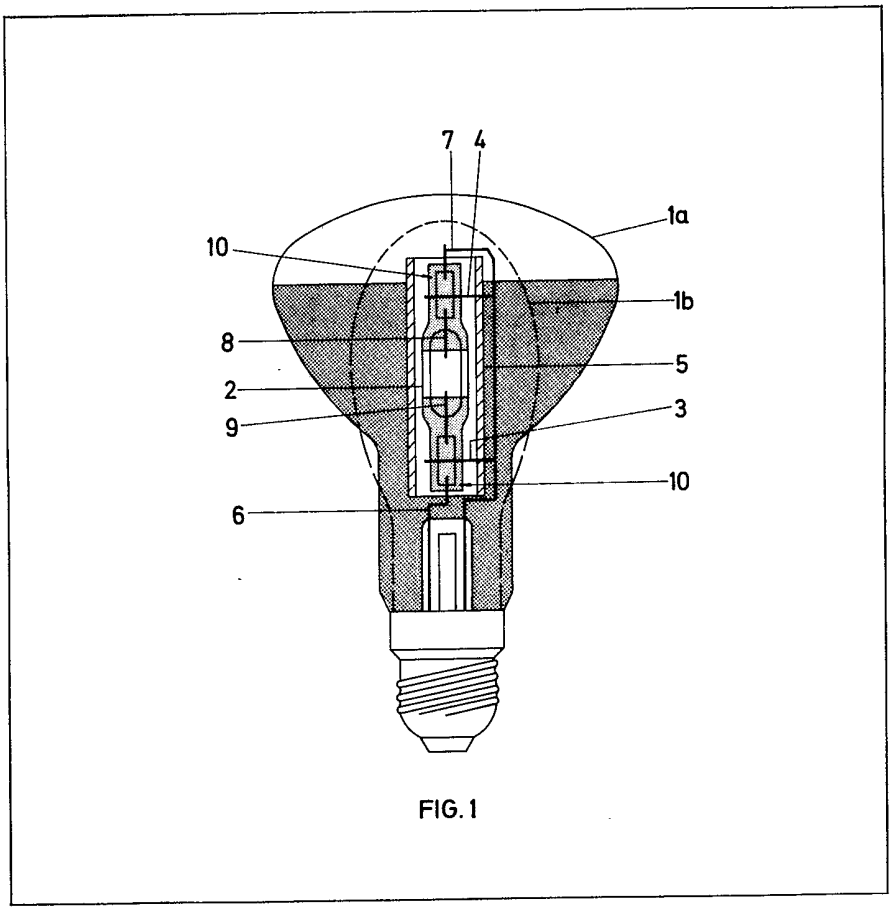

FIG. 1

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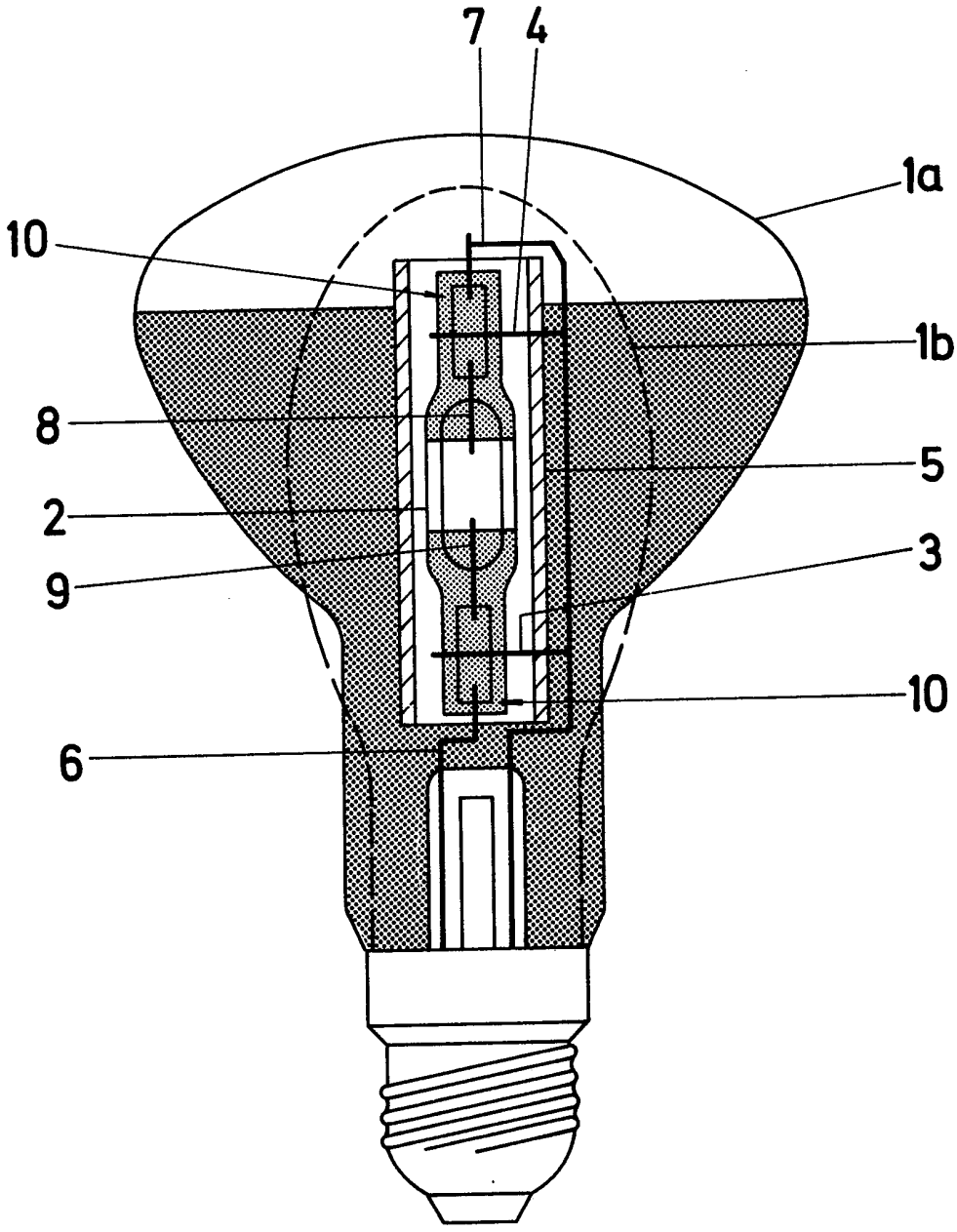

FIG. 1

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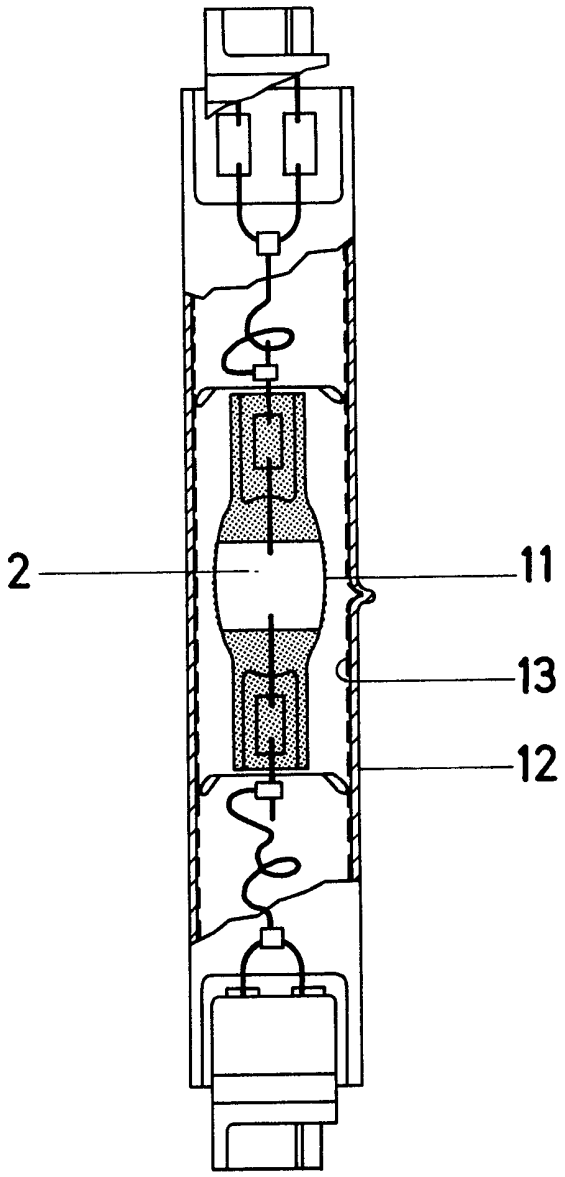

FIG. 2

SPECIFICATION

A high-pressure discharge lamp

The invention relates to a high-pressure discharge lamp. One such lamp comprises a discharge vessel made from a material which allows the passage of light and is resistant to high temperature electrodes sealed into the discharge vessel and comprising a metal which is not easily melted and a filling which contains at least one buffer gas addition of metal halides, tin and sodium halide being amongst these, whereby the lamp contains either only iodides or iodides and bromides as its halides and iodine or iodine and bromine as the halogen. By this means a halogen metal vapour high-pressure discharge lamp can be achieved of high luminous efficiency, a colour temperature which is less than 3800 k, a good colour reproduction and a small output capacity of the lamp, an electrode stabilized arc with an electrode spacing of less than 20 mm, a specific arc power of up to 300 W/cm arc length, a wall loading capacity of up to 100 W/cm^2, an operating pressure of up to 50 atmospheres and a discharge vessel which has an isothermal geometry.

The invention seeks to create lamps which have a good colour temperature and luminous efficiency when the output capacity is smaller than that of the known lamps.

According to the invention, there is provided a high-pressure discharge lamp having a light transmitting and high temperature resistant discharge vessel and electrodes sealed into the discharge vessel which comprise a light melting point metal and a filling which contains at least one buffer gas and additives of metal halides, containing only iodides or iodides and bromides as the halides and iodine or iodine and bromine as the halogen power wherein the lamp is provided with an outer bulb heat absorbing agents are so selected and arranged that the lamp provided has an arc length of less than 100 W/cm.

Preferably the halides includes tin halide and sodium halide. Thus a tube located between the discharge vessel and the outer bulb may be used as a heat absorbing agent, the said tube surrounding the discharge vessel at a small spacing and preferably being open at its ends and comprising a material such as quartz glass or hardened glass which is capable of high thermal loading. It is advisable for at least two heat absorbing agents to be used, such as a tube encircling the discharge vessel, an infra-red reflecting layer several infra-red reflecting layers, or a surface of the discharge vessel treated on the outside by means of etching, sanding etc. Thus two infra-red reflecting layers are valid as these two heat-absorbing agents, whereby the reflection characteristics of the two infra-red reflecting layers does not have to be the same with respect to its wavelength. The layers may be arranged directly one above the other or on different surfaces whereby layers made from Sn-doped In_2O_3 or Si0-$Ti0_2$ have proven to be suitable for this. The layers may be arranged on the heat absorbing tube and/or on the illumination sources and/or on the outer bulb.

Etching of the surface of the illumination source causes large paths of the radiation coming from the plasma to pass into the wall of the illumination source partially as a result of total reflection. The walls of the illumination source are heated up consequently by means of absorption and contribute therefore to the increase in vapour pressure. In the lamps present here, in which importance is placed on the increase in vapour pressure of the metal halide which is not easily vaporized and present partially as a condensate, such as sodium iodide and/or sodium bromide, the combination of the different heat absorbing measures causes all of the components of the filling which are important for the colour temperature, colour reproduction and luminous efficiency to vaporize in sufficient quantity out of the condensate. The heat absorbing measures which must of course be selected so that they do not involve too large a loss of luminous efficiency are particularly important for all lamps which have a small output capacity. Surprisingly it has been shown that it is possible in this way to obtain for the first time high-pressure discharge lamps with metal halide additions having an output capacity which is almost as small as desired (for example 50 W) which still have a light yield which is a multiple of that of incandescent lamps and yet have a low colour temperature (say 3000 to 3500 K). These convenient lamps - their size is comparable to that of an indandescent lamp facilitate increased use of high-pressure lamps in the illumination of interiors.

The invention will now be described in greater detail by way of example, with reference to the drawings, in which:-

Figure 1 shows a lamp in accordance with the invention with a heat-absorbing tube, and

Figure 2 shows a lamp with an etched discharge vessel surface and an infra-red reflecting layer on the outer bulb.

In Figure 1 a lamp is shown in which two shapes of outer bulb are indicated schematically. A reflector bulb provided with a mirror finish is indicated at 1*a* and an ellipsoid-shaped bulb is indicated at 1*b* which of these outer bulbs surrounds the discharge vessel 2 depends on the use to which the lamp is to be put. The space between the discharge vessel and the outer bulb is preferably evacuated. A heat-absorbing tube 5 made from quartz or hardened glass is mounted by means of two wire brackets 3 and 4 between the outer bulb and the discharge vessel. The discharge vessel 2 is made from quartz glass and is constructed isothermally. It is provided with mountings 6, 7 which are at the same time current supply lines to the electrodes 8, 9 spaced from each other by a distance of, for example, 10 mm. A heat-reflecting coating 10 of $Zr0_2$ for example, is applied to the ends of the discharge vessel 2. The filling of the discharge vessel 2, which has, for example, an inner diameter of 10 mm and a volume of approximately 1 cm^3, comprises a firing gas, for example 30 to 40 Torr of argon and 6umol tin per cm^3, 12 umol sodium, 0.6 umol thallium, 0.1 umol indium, 78 umol mercury, 30 umol iodine and bromine atoms. The atomic proportion between bromine and iodine is 0.7. The constructional data

and the quantities of filling to be added apply to a lamp having an output capacity of 75 W which is operated at 1.1 A on 220 V A.C. The loading capacity of the wall of the discharge vessel 2 is approximately 15 W/cm^2 and the specific arc output is approximately 75 W/cm. the lamp has a pressure of approximately 15 atmospheres. With a lamp having a reflector bulb, the luminous efficiency is 50 to 60 1m/W with a colour temperature less than or equal to 3500 K.

By etching the discharge vessel outer surface, a reduction in the colour temperature may be achieved of approximately 14%. The drop in the colour temperature achieved by applying an infra-red reflecting layer to the heat-absorbing tube 5 is of the same order of magnitude.

In Figure 2, a discharge vessel 2, the outer surface 11 of which is etched, is surrounded by a narrow cylindrical outer bulb 12 made from quartz glass. An infra-red reflecting layer 13 made from indium oxide doped with tin is applied to the inner surface of the outer bulb. The space between the discharge vessel 2 and the outer bulb 12 is preferably evacuated.

CLAIMS

1. A high-pressure discharge lamp having a light transmitting and high temperature resistant discharge vessel and electrodes sealed into the discharge vessel which comprise a high melting point metal and a filling which contains at least one buffer gas and additives of metal halides, containing only iodides or iodides and bromides as the halides and iodine or iodine and bromine as the halogen power wherein the lamp is provided with an outer bulb and heat absorbing agents are so selected and arranged that the lamp provided has an arc length of less than 100 W/cm.

2. A high pressure discharge lamp according to claim 1, wherein the halides include tin halide and sodium halide.

3. A high-pressure discharge lamp according to claim 1 or 2, wherein a heat absorbing tube made from a material capable of high thermal loading is located between the discharge vessel and the outer bulb and encircles the discharge vessel at a small spacing therefrom.

4. A high-pressure discharge lamp according to claim 1 or 2, wherein at least two heat-absorbing agents are used simultaneously.

5. A high pressure discharge lamp according to claim 4, wherein the least absorbing agents include at least two selected from a tube encircling the discharge vessel, an infra-red reflecting layer, several infra-red reflecting layers, and the treatment of a surface of the discharge vessel by etching, sanding or the like.

6. A high pressure discharge lamp substantially as described herein with reference to the drawings.

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