

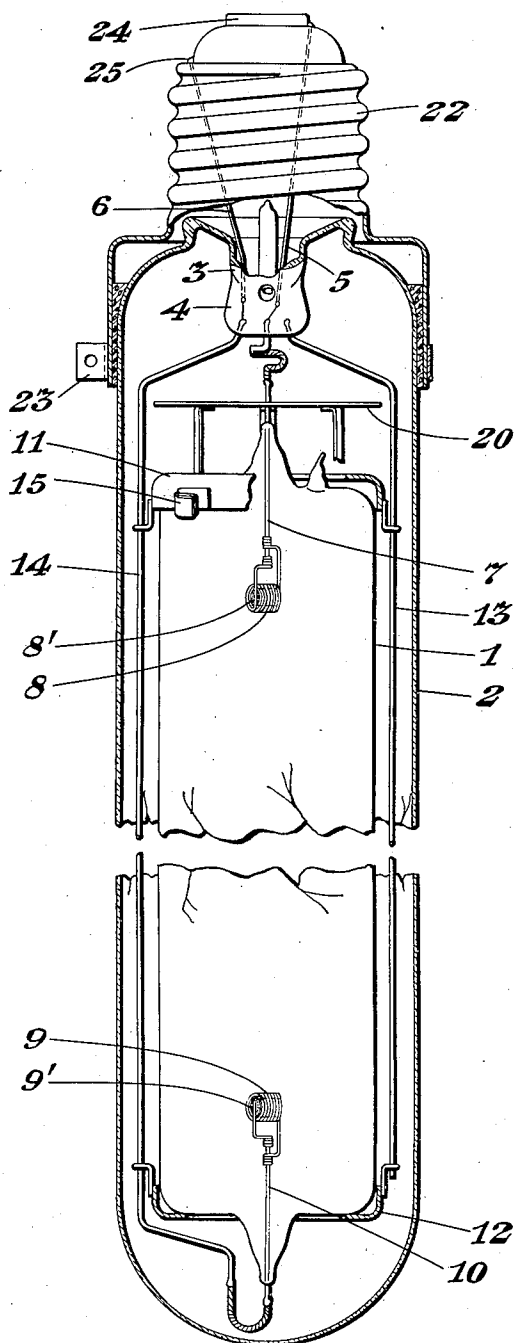
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H. KREFFT

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ELECTRIC GASEOUS DISCHARGE DEVICE

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INVENTOR
Hermann Krefft
BY *Harry E. Dunham*
ATTORNEY

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ELECTRIC GASEOUS DISCHARGE DEVICE

Hermann Krefft, Berlin-Friedrichshagen, Germany, assignor to General Electric Company, a corporation of New York

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2 Claims. (Cl. 176—122)

The present invention relates to electric gaseous discharge devices generally, and more particularly to vapor arc devices which operate at relatively high pressures.

A particular object of the invention is to provide a high pressure gaseous discharge lamp which will have a long useful life. Another object of the invention is to eliminate the blackening of the lamp envelope. Still other objects and advantages of the invention will appear from the following detailed specification or from an inspection of the accompanying drawing.

The invention consists in a new and novel combination of elements, as hereinafter set forth and claimed.

In operating gaseous discharge devices such as the high pressure mercury vapor arc lamps with thermionic electrodes which are now coming into considerable use a blackening of the lamp envelope has been found to occur heretofore after a relatively short burning period. This rapid blackening of the envelope, which is caused in part by decomposition of the electrodes and in part by the influence of ultraviolet rays and electric particles, has tended to limit the useful life of these devices, and hence is undesirable.

I have now discovered that this undesired blackening of the mercury high pressure lamp is avoided if a small quantity, of the order of 0.2-5%, of caesium is mixed with the vaporizing mercury base body, provided that a special aluminum silicate glass is used in constructing the discharge vessel of the lamp. This special glass has 60% or less of silica, more than 20% alumina, and also contains small quantities of other glass builders such as boric oxide, magnesium oxide and calcium oxide. With a tube constructed in this manner, in addition to the mercury vapor, a small quantity of caesium vapor is also produced during operation of the lamp by vaporization of the base body. Although this caesium vapor, because of its small quantity, does not participate in the light radiation to any appreciable extent and therefore does not noticeably change the mercury radiation, nevertheless, in combination with the definite construction of the lamp vessel, it has the effect that the heretofore unavoidable blackening of the lamp vessel is eliminated.

For the purpose of illustrating my invention I have shown an elevational view, in part section, of a preferred embodiment thereof in the accompanying drawing.

As shown in this drawing my novel lamp has a tubular envelope 1 filled with any suitable gas

or vapor or mixtures thereof. For example, I have obtained excellent results using argon at a pressure of the order of 5 mm. of mercury, together with just enough mercury to provide substantially atmospheric pressure when it is all evaporated. Mixed with this mercury is a small quantity of caesium, of the order of 0.2 to 5% of the mercury. Surrounding said envelope 1 there is a tubular jacket 2. The space between the envelope 1 and the jacket 2 is either evacuated or filled with an indifferent gas, such as nitrogen, at any suitable pressure, such as half an atmosphere. The jacket 2 has at one end thereof a stem 3, through the pinch 4 of which two current inleads 5 and 6 are sealed. The current inlead 5 is flexibly connected to the inlead 7 which is fused into the adjacent end of the envelope 1. Said inlead 7 carries at its inner end a thermionic cathode 8, while a second thermionic cathode 9 is carried by an inlead 10 which is sealed through the opposite end of the envelope 1. These thermionic electrodes 8 and 9 can be of any desired type and composition, but I prefer to use a wound tungsten helix, as shown, within which there is retained a rod 8' and 9', respectively, of electron emitting material, such as a sintered mixture of 90 parts of barium oxide and calcium oxide with 10 parts of tungsten, since such an electrode has been found to be exceptionally effective in my novel lamp. Dished metal rings 11 and 12 are fitted against the ends of the envelope 1, and are held in this position by means of rigid longitudinal wires 13 and 14 which unite them with each other. These wires 13 and 14, which together with the rings 11 and 12 form a stiff frame surrounding the envelope 1, are anchored in the pinch 4. The wire 14 is in practice made an extension of the inlead 6, and the lower end thereof is flexibly connected with the inlead 10, so that this wire also serves to conduct the current to the thermionic cathode 9. Each metal ring 11 and 12 has a plurality of spring fingers 15 affixed to the outside thereof which bear against the inner wall of the jacket 2, and thus serve to prevent lateral displacement of the envelope 1. A screw base 22 is firmly attached to the jacket 2 by means of the clamping band 23, leads 5 and 6 being connected to the tip 24 and sleeve 25 thereof, respectively.

The glass of the envelope 1 is preferably an aluminum silicate glass of special composition which I have discovered resists blackening. This glass contains silica of the order of 60% or less, and 20% or more of alumina, the remainder of

said glass consisting of any suitable glass forming materials, such as boric oxide, magnesium oxide, and calcium oxide. Such a glass has an expansion coefficient of between 30 and 50×10^{-7} and is likewise resistant to chemical attack by either mercury vapor or caesium vapor, even at temperatures considerably in excess of 300°C. , so that no blackening of the envelope is produced by these vapors during operation of the lamp. A particularly effective glass composition has been found to be as follows:

	Per cent
SiO_2 -----	57.6
B_2O_3 -----	1.2
Al_2O_3 -----	28.4
MgO -----	8.2
CaO -----	4.6

This glass has a softening temperature of approximately 750°C. , so that a mercury vapor discharge at several atmospheres vapor pressure can be operated in a lamp constructed thereof without danger.

While I have described my invention by reference to a lamp of particular construction, wherein all of the mercury is vaporized during operation, it is to be understood that it is likewise applicable to other high pressure lamps in which the metal is not all in the vapor phase. It is furthermore to be understood that my invention

is not only useful in lamps containing mercury, but also in devices containing other vaporizable metals, such as cadmium, sodium, or the like, and particularly to devices operating at relatively high temperatures, of the order of 300°C. Various changes, substitutions and omissions, within the scope of the appended claims may, of course, be made in the structures illustrated and described without departing from the spirit of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. A mercury vapor arc lamp of the high pressure type comprising a sealed envelope containing mercury together with from 0.2 to 5% of caesium, and having electrodes sealed within said envelope, said envelope consisting of an aluminum silicate glass having a composition of the order of 60% or less of silica, more than 20% alumina, the balance consisting of other glass forming materials such as boric oxide, magnesium oxide and calcium oxide.

2. A mercury vapor arc lamp of the high pressure type comprising a sealed envelope having thermionic electrodes sealed therein, said envelope containing mercury together with from 0.2 to 5% of caesium.

HERMANN KREFFT.