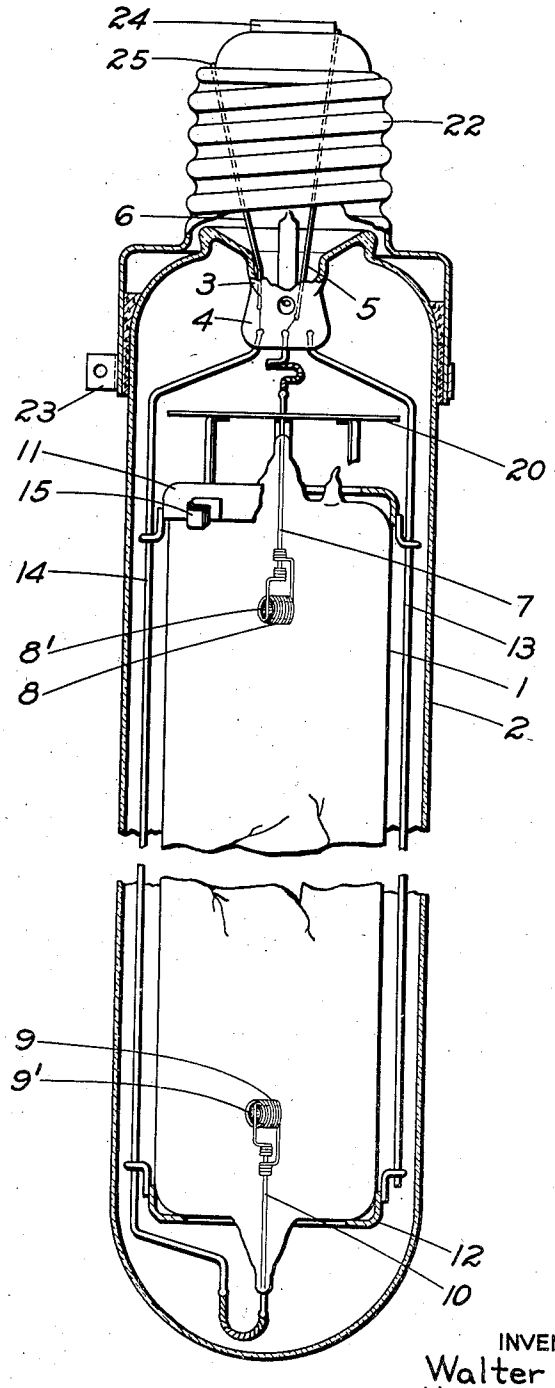
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ELECTRIC GASEOUS DISCHARGE DEVICE

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ELECTRIC GASEOUS DISCHARGE DEVICE

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1 Claim. (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 intensities.

A particular object of the invention is to provide a high intensity gaseous discharge lamp which will have a long useful life. Another object of the invention is to eliminate the blackening of the lamp envelope. Another object of the invention is to provide a high intensity lamp in which the radiations of caesium are added to those of mercury. 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.

It has been proposed to modify the light emitted by high intensity mercury vapor arc lamps by admixing caesium with the mercury, and by then increasing the temperature of the discharge vessel so as to achieve a sufficiently high caesium vapor pressure so that the caesium radiation constitutes a considerable portion of the total radiation from the discharge. For this purpose it has been found necessary to operate these lamps at temperatures of the order of 500° C. or more. At such high temperatures it has been found that there is appreciable blackening of the lamp envelope where any of the usual glasses of the prior art are used, due to the fact that during operation of the lamp the caesium reacts with the component parts of the glass.

We have now found that these mercury-caesium lamps can be operated without any appreciable blackening provided a novel glass of our invention is used for the lamp envelope. This novel glass has a silica content amounting to only 25 to 40%, a boric oxide content of 10 to 20%, an alumina content of 25 to 35% and an earth alkali oxide content of 20 to 40%. Furthermore the sum of the silica and the boric oxide should not amount to more than 50% of the entire composition. We have found that high intensity mercury vapor lamps having envelopes consisting of such a glass are not only subjected to no blackening during operation but are also resistant to reduction by the caesium vapor even at the high operating temperatures. Calcium oxide and barium oxide are preferably used as the earth alkali oxides in this glass, but where desired they are partially replaced by magnesium oxide and zinc oxide.

The proportion of caesium added to the mercury is ordinarily of the order of 0.2 to 5%, but in some cases, as where the lamp is operated at an especially high temperature, the caesium is introduced in proportions as high as 12%, in which case the caesium radiation becomes especially strong in relation to the mercury radiation. It has been found that even with the larger of these caesium additions, and with the correspondingly higher temperature of the discharge vessel which is necessary therewith, no blackening of the lamp envelope occurs either as a result of the discharge itself or as a result of the chemical influence of the caesium vapor.

This novel glass of our invention has a low coefficient of expansion, and at the same time has a high softening temperature, in excess of that required by the operating temperatures of the mercury-caesium lamp.

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

As shown in this drawing our novel lamp has a tubular envelope 1 filled with any suitable gas or vapor or mixtures thereof. For example, we 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%, or in some cases as much as 12%, 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 cur-

rent 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 a glass of special composition which we have discovered resists blackening when subjected to a high temperature mercury-caesium discharge. This glass contains 25 to 40% silica, 10 to 20% boric oxide, 25 to 35% alumina and 20 to 40% earth alkali oxide, the sum of the silica and the boric oxide in all cases being less than 50%. Such a glass has a low coefficient of expansion and is likewise resistant to chemical attack by either mercury vapor or caesium vapor, even at temperatures considerably in excess of 500° C., so that no blackening of the envelope is produced by these vapors during operation of the lamps. A glass of the following composition has proved to be especially suitable:

	Percent
SiO_2	35
B_2O_3	10
Al_2O_3	30
CaO	15
BaO	10

This glass has a softening temperature considerably in excess of that required by any of these lamps, so that a discharge at several atmospheres pressure can be operated in a lamp constructed thereof without damage.

While we have described our invention as embodied in a lamp having an envelope consisting of our novel glass composition, it is to be understood that this glass may likewise be used to flash the inside of envelopes of other composition having a suitable coefficient of expansion and transformation point. It is likewise to be understood that various other changes, modifications and substitutions, within the scope of the appended claim, may be made in the structure which we have used to illustrate our invention without departing from the spirit thereof.

In a divisional application, Serial Number 122,310, filed January 25, 1937, a claim is made to the glass composition originally claimed herein.

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

An electric gaseous discharge device comprising a sealed envelope having a gaseous atmosphere including a metal vapor therein, the portion of said envelope exposed to said discharge having the following composition:

	Percent
SiO_2	35
B_2O_3	10
Al_2O_3	30
CaO	15
BaO	10

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