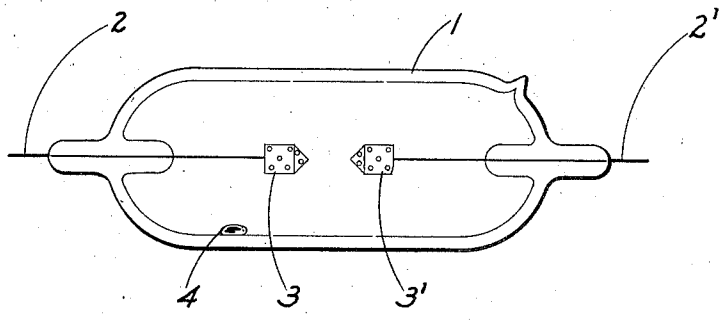
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GASEOUS ELECTRIC DISCHARGE LAMP DEVICE

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## GASEOUS ELECTRIC DISCHARGE LAMP DEVICE

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4 Claims. (Cl. 176—122)

The present invention relates to gaseous electric discharge lamp devices generally and more particularly the invention relates to vapor discharge lamp devices operating with elevated container temperatures and with correspondingly elevated vapor pressures, such as a vapor pressure in the order of atmospheres, similar to that disclosed in co-pending application, Serial No. 120,066, filed January 11, 1937, inventors Wilhelm Hagen and Wolfgang Thouret.

The containers of such devices are at a temperature of about 600° C. and higher during the operation of the device and large differences in temperature between different parts of the container exist under service conditions. It is desirable, since the gaseous atmosphere of the lamp consists of, or comprises mercury vapor, to use a vitreous container material which transmits both the visible and the ultra violet light emitted by the excited mercury vapor during the operation of the device. It has been customary in the art, heretofore, to make the lamp container of fused silica, or quartz, this being the only material available which would successfully meet the above requirements. Quartz containers are difficult and expensive to fabricate due to the high softening temperature of the quartz and the low coefficient of expansion thereof which make the sealing of current leads therein, such as tungsten or molybdenum leads, complicated. The useful operating life of such lamps having quartz containers is not as long as could be desired due to the fact that the quartz tends to devitrify at high container temperature, such as temperatures from about 570° C. to about 870° C., and the transmissivity thereof for the light emitted by the gaseous electric discharge rapidly diminishes.

The object of the invention is to provide an inexpensive gaseous electric discharge lamp device capable of operation with an elevated container temperature and having a long useful operating life. Another object of the invention is to provide a vitreous material useful as a container material for gaseous electric discharge devices generally and particularly for such devices operating with elevated container temperatures. Further objects and advantages of the invention will be apparent to those skilled in the art from the following particular description.

We have discovered that a glass consisting of from 80 to 98% silica ($SiO_2$), from 2 to 12% alumina ($Al_2O_3$) and from 0 to 8% of alkaline earth metal oxide, such as calcium oxide and barium oxide, is a good container material for mercury vapor, electric discharge lamps operating with elevated container temperatures. Such glasses have a softening temperature of about 1,000° C., are more easily workable than quartz and do not devitrify as rapidly as quartz. The ultra violet transmission of the glass is comparable to that of quartz. Perhaps the chief advantage of the glasses of the invention over quartz is that while the coefficient of expansion thereof is low enough to avoid breaking strains under large differences of temperature it is such that current leads of tungsten or molybdenum can be sealed directly into a lamp container consisting of such glass.

In the following table various glass compositions which we have discovered are useful as container glasses for gaseous electric discharge lamp devices are listed, together with the coefficient of expansion measured at 50° C. and the softening temperature of each glass composition. The softening temperature of each glass is the temperature at which a rod 10 cm. long and about 3 mm. in diameter resting on two knife edges begins to bend.

| | $SiO_2$ | $Al_2O_3$ | CaO | BaO | Expansion coefficient (AK) $\alpha.10^{-7}$ 50° C. | Softening point |
|---|---|---|---|---|---|---|
| | | | | | | °C. |
| 1 | 94.5 | 5.5 | | | 6.5 | 1175 |
| 2 | 93 | 5 | 1 | 1 | 7.0 | 1130 |
| 3 | 89.5 | 7 | 1.75 | 1.75 | 11 | 1040 |
| 4 | 82.5 | 10 | 3.75 | 3.75 | 20 | 1010 |

In the drawing accompanying and forming part of this specification a gaseous electric discharge lamp device having a container consisting of one of the glasses disclosed above is shown in a side elevational view.

Referring to the drawing the gaseous electric discharge lamp device comprises an elongated, tubular container 1 having current leads 2 and 2' sealed therein, one in each end thereof. Said current leads 2 and 2' consist of high melting point material, such as tungsten and are sealed directly into the glass of container 1. Said container 1 has therein a starting gas, such as argon, or a starting gas mixture and a quantity 4 of vaporizable material such as mercury, the vapor of which is luminosity producing during the operation of the device. The lamp starts as a gas lamp and operates as a vapor lamp and the vapor pressure in the lamp is about ten atmospheres or higher during the operation of

the lamp device. The electrodes 3 and 3' are mounted on said leads 2 and 2', respectively. Each of said electrodes 3 and 3' consists of a perforated, tungsten shell filled with a mixture of aluminum oxide, tungsten and an alkaline earth metal oxide and is heated to a high electron emitting temperature by the discharge incident thereat.

Said container 1 consists of a glass having one of the compositions disclosed above and the gaseous electric discharge lamp is a long-lived, high efficient, inexpensively manufactured source of visible and ultra violet light.

While we have shown and described and have pointed out in the annexed claims certain novel features of the invention, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its use and operation may be made by those skilled in the art without departing from the broad spirit and scope of the invention, for example, the container 1 is made in other shapes, such as a spherical shape, or a small bore tube, when desired, the electrodes are mounted in other positions in the container, when desired other types of thermionic electrodes, such as those requiring a special heater source are used, when desired, and the part of the current leads in the lamp is surrounded by a tube of high melting point, insulating material to protect it from the discharge, when desired.

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

1. A gaseous electric discharge device comprising a container, a gaseous atmosphere therein and electrodes sealed therein, said container consisting of a glass consisting of about 80 to 98% silica ($SiO_2$), about 2 to 12% alumina ($Al_2O_3$) and about 0 to 8% alkaline earth metal oxides.

2. A gaseous electric discharge device comprising a container, a gaseous atmosphere therein and electrodes sealed therein, said container consisting of a glass consisting of about 94.5% silica ($SiO_2$) and 5.5% alumina.

3. A gaseous electric discharge device comprising a container, a gaseous atmosphere therein and electrodes sealed therein, said container consisting of a glass consisting of about 93% silica ($SiO_2$), 5% alumina ($Al_2O_3$), 1% calcium oxide (CaO) and 1% barium oxide (BaO).

4. A gaseous electric discharge device comprising a container, a gaseous atmosphere therein and electrodes sealed therein, said container consisting of a glass consisting of about 82.5% silica ($SiO_2$), 10% alumina ($Al_2O_3$), 3.75% calcium oxide (CaO), 3.75% barium oxide (BaO).

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