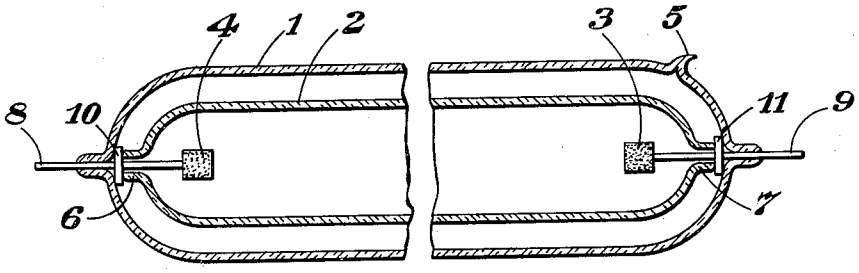
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GASEOUS ELECTRIC DISCHARGE DEVICE

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GASEOUS ELECTRIC DISCHARGE DEVICE

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The present invention relates to gaseous electric discharge devices generally and more particularly the invention relates to such devices in which the gaseous atmosphere comprises a metal vapor.

When the metal vapor in the gaseous atmosphere is that of a difficultly vaporizable metal, such as thallium, magnesium, zinc, cadmium, caesium, rubidium, sodium or potassium, it is the practice in the art to enclose the container of the gaseous electric discharge device in a gas tight envelope in order to maintain said container at the required high temperature by reducing the radiation of heat from said container to a minimum. The manufacture of such devices is complicated and expensive and the container is apt to fracture at that part thereof fused to the electrode inleads.

The object of the present invention is to provide a double walled container for a gaseous electric discharge device which is inexpensively and readily manufactured. Another object of the invention is to provide such a container in which the tendency of the inner wall to fracture at that part thereof wherein the electrode inlead is sealed is entirely overcome. Further objects and advantages attaching to the device and to its operation will be apparent to those skilled in the art from the following particular description and from the appended claims.

The invention attains its objects by making the connection between the inner container and the electrode inleads a mechanically tight joint rather than a fused, gas tight joint as in prior devices of this type and by limiting the pressure of the metal vapor in the inner container to 1 mm. pressure or less. The diffusion of the metal vapor atoms, which are of small number, from the inner container to the outer container is reduced to a minimum during the operation of the device because of the extremely small size of the passage between the space in the inner container and the space in the outer container. An electric discharge device having the structure above described is simply and inexpensively manufactured as the inner and outer containers are pumped simultaneously and in one operation and then filled with a rare gas. The vaporizable metallic material is introduced into the inner container before the pumping operation takes place. As the joint between the wall of the inner container and the electrode inlead is a mechanical joint instead of a fused gas tight joint the danger of fracturing the wall of said inner container is entirely obviated.

In the drawing accompanying and forming part of this specification an embodiment of the invention is shown in a sectional, side elevational view.

Referring to the drawing the new and novel gaseous electric discharge device comprises a double walled container 1, 2. Electrodes 3 and 4 are sealed into said container 1, 2. Said electrodes are self-heating, electron-emitting mixed metal and oxide electrodes known in the art as Pirani electrodes. The inleads 8 and 9 for said electrodes 4 and 3 respectively are sealed into the outer wall 1 of said container 1, 2. Each of said inleads 8 and 9 are joined to the inner wall 2 of said container 1, 2 by a mechanical joint indicated at 6 and 7. Two discs 10 and 11 are attached to said inleads 8 and 9 respectively, are adjacent the joints between said inleads 8 and 9 and the wall 2 of said container 1, 2 and press against said wall 1 to help maintain the wall 2 in a fixed position in said container 1, 2. Said discs 10 and 11 are of flexible, insulating material such as mica and close off the end parts of said outer wall 1 to prevent the formation of an electric discharge between those parts of said inleads 8 and 9 located between said walls 1 and 2. Said container 1, 2 is filled with a rare gas, such as neon and a difficultly vaporizable material, such as sodium, is located in the part of said container 1, 2 surrounded by said inner wall 2.

During the operation of the device the pressure of the metal does not exceed 1 mm. even though the wall 2 attains a high temperature due to a high current load on the device. The vapor of such difficultly vaporizable metals as thallium, magnesium, zinc, cadmium, calcium, sodium, gallium, indium, bismuth, or antimony is a very efficient light emitter even at low pressures, such as 1 mm. or less. Thallium, for example, emits a pure green light under the influence of an electric discharge between said electrodes 3 and 4 and at a temperature of 600° C. of the inner wall 2. Zinc emits a blue light at a temperature of 400° C. of the wall 2 and magnesium a yellow green light at the same temperature of said inner wall 2. The above temperatures of said wall 2 correspond to a pressure of 1 mm. or less of the particular metal used. The particular rare gas used, such as neon in the case of sodium vapor, is chosen so as to complement the color of the light emitted by the particular metal vapor. During the operation of the device the rare gas is at like pressure in both compartments of said container 1 and 2, but the metal vapor is confined almost exclusively in the compartment

formed by inner wall 2 due to the comparatively small number of atoms of said metal vapor and the small dimensions of the passage between said compartments which reduces the diffusion of the metal vapor from the inner compartment to the outer compartment to a minimum.

When desired two or more difficultly vaporizable metals are introduced into the inner compartment of said container 1, 2 to obtain a multicolored light. It is important in such cases, however, that, during the operation of the device, while each of the metals be vaporized the total metal vapor pressure should not exceed 1 mm.

A similar result is obtained by introducing an easily vaporizable metal, such as mercury, or an amalgam, the vapor pressure of which during the operation of the device is more than 1 mm. into either the inner or outer, or both compartments of said container 1, 2. The numerous atoms of this supplementary metal vapor which is at a higher pressure than the main light emitting vapor, diffuse uniformly, as do the rare gas atoms, through the passages between the compartments in said container 1, 2 without increasing the rate of the diffusion of the atoms of the main vapor present in small number in the inner compartment.

By using two or more metal vapors such as zinc and mercury or thallium in a lamp having the above described structure in combination with a lamp device filled with mercury vapor a light is produced which is a close approximation of daylight. The light emitted by a lamp device having the above structure and filled with a mixture of thallium and mercury vapor emits a strongly actinic light valuable in connection with the photographic art generally.

While we have shown and described and have pointed out in the annexed claims certain novel features of the invention, it will be understood the 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.

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, electrodes and electrode leads sealed therein, a gaseous atmosphere therein comprising a rare gas and the vapor of a metal, said container being double walled, the joint between the inner wall thereof and the electrode leads being a gas pervious mechanical joint, the vaporizable metal being in the chamber formed by said inner wall.

2. A gaseous electric discharge device comprising a double walled container, electrodes and electrode leads sealed therein, a gaseous atmosphere therein comprising a rare gas and the vapor of a difficultly vaporizable metal, the joint between the inner wall of said container and said electrode leads being a gas pervious mechanical joint, the difficultly vaporizable metal being in the part of said container enclosed by the inner wall of said container.

3. A gaseous electric discharge device comprising a double walled container, electrodes and electrode leads sealed therein, a gaseous atmosphere therein comprising a rare gas, the vapor of an easily vaporizable metal and the vapor of a difficultly vaporizable metal, the joint between the inner wall of said container and said electrode leads being a gas pervious mechanical joint, the difficultly vaporizable metal being in the part of said container enclosed by said inner wall, the easily vaporizable metal being in the part of said container enclosed by said outer wall.

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