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GASEOUS ELECTRIC DISCHARGE LAMP DEVICE

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Fig. 1

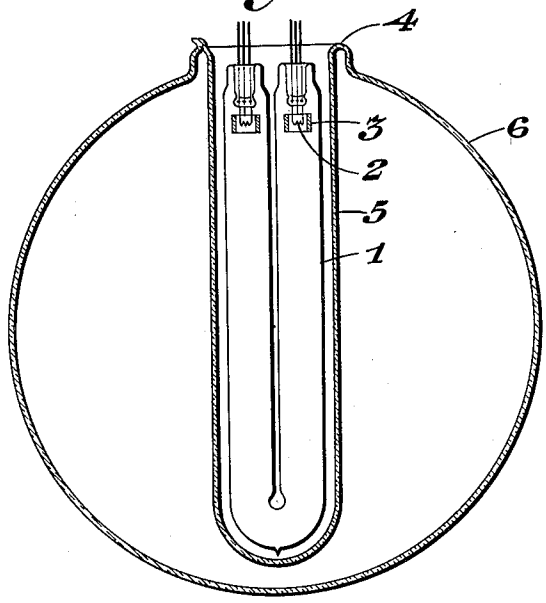
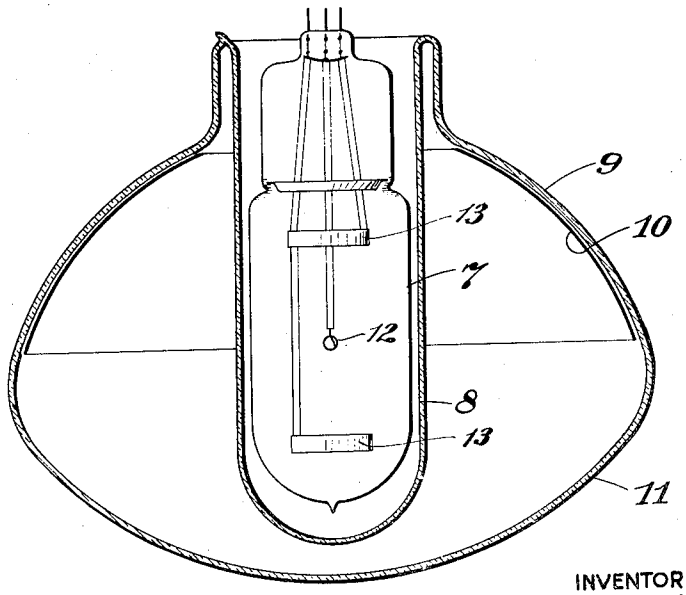


Fig. 2



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GASEOUS ELECTRIC DISCHARGE LAMP DEVICE

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1 Claim. (Cl. 240—11.4)

The present invention relates to gaseous electric discharge lamp devices generally and more particularly the invention relates to lamp units incorporating such devices.

In certain types of gaseous electric discharge lamp devices, particularly those having a gaseous atmosphere consisting of or comprising a difficultly vaporizable metal, it is advantageous to provide a light transmitting heat conservator for the lamp device to reduce the transfer of heat from the container thereof to the ambient atmosphere. The lamp container is thus maintained at a higher temperature and the metal vapor in the lamp is maintained at a higher pressure during the operation of the device than is the case when no heat conservator is provided and the lamp operates more efficiently. A double walled glass jacket in which the lamp is mounted, said jacket having the space between the walls thereof evacuated is effective for this purpose as the evacuated space in the jacket acts as a thermal insulator.

In lamp units of the above type the temperature of the lamp container and the metal vapor pressure therein is affected by temperature variations in the outside wall of the jacket. These temperature variations in the outside wall of the jacket are caused by changes in ambient temperature, or by wind, rain, or snow. These changes in metal vapor pressure lower the efficiency of the lamp device by changing the operating characteristics thereof and lower the intensity of the light emitted by the device.

The object of the present invention is to minimize the effect of changing ambient conditions on the efficiency of the lamp device in lamp units of the above type. Still further objects and advantages attaching to the device and to its use and operation will be apparent to those skilled in the art from the following particular description.

We have discovered that the above object is attained when the area of the outer wall of the jacket is considerably larger than the area of the inside wall thereof and that the effect of changing ambient conditions on the efficiency of the lamp device decreases as the area of the outer wall increases. We have also discovered that when the area of the outer wall of the jacket is approximately 1.8 or more times that of the inner wall of the jacket the effect of ambient conditions on the lamp device is effectively eliminated. Increasing the area of the outer wall of the jacket with respect to the inner wall thereof increases the effectiveness of the jacket. A suitable form of jacket is one wherein the outer wall thereof is globular and the inner wall thereof a reentrant tubular part. It is advantageous to make the outer wall of the jacket of light diffusing material as the lamp unit is then a source of high intensity light having a comparatively low surface brightness.

In the drawing accompanying and forming part of this specification two embodiments of the invention are shown in which

Fig. 1 is a front elevational, partly sectional view of one embodiment of the invention, and

Fig. 2 is a similar view of another embodiment of the invention.

Referring to Fig. 1 of the drawing the lamp unit comprises a gaseous electric discharge lamp device having a U-shaped tubular container 1. A pair of electrodes comprising a cathode 2 and an anode 3 surrounding said cathode 2 is sealed into each end of said container 1. Said cathode 2 consists of a coiled filament, such as a tungsten filament, another filament, such as a nickel filament, wrapped around said coiled filament and electron emitting material, such as barium oxide, coated on said filaments. Said cathode 2 is viewed end on in the drawing. Said container 1 has therein a fixed gas, such as neon, and a quantity of vaporizable material, such as sodium.

During the operation of the lamp device the spectrum of the light emitted thereby is rich in rays characteristic of the sodium vapor provided the sodium vapor is at an effective pressure, that is, a pressure at which the sodium vapor is excited to luminescence by the passage of an electric discharge between said pairs of electrodes 2 and 3. The pressure of the sodium vapor is determined by the temperature of the container 1 and the container 1 should be at an elevated temperature, such as a temperature of 200 to 300° C., to obtain an effective metal vapor pressure during the operation of the device. In order to reduce the transfer of heat from container 1 to the outer atmosphere, and thus to maintain the container 1 at an elevated temperature and the sodium vapor at an effective pressure during the operation of the lamp, a heat conservator in the form of a double walled, glass jacket 5, 6 is mounted about the lamp container 1. The space between the walls 5 and 6 of the jacket is evacuated. The inside wall 5 of the jacket is tubular in shape and one end thereof is closed and rounded. The outer wall 6 of the jacket is spherical in shape and, of course, is considerably larger (more than twice as large) in area than the inner wall 5.

Because of the large area of the outer wall 6

the heat radiated thereto by the lamp device does not raise said wall 6 to as high a temperature as would be the case were said wall 6 of smaller area. Therefore, the heat radiated backward to the lamp by said wall 6 becomes less important, in view of Stefan's well known radiation law, and hence changes in the quantity of heat radiated backward to the lamp by the wall 6, which changes are caused by changes in ambient temperature, become less important. The effect of changes in ambient temperature on the temperature of the wall 6, and, consequently, the metal vapor pressure in the lamp, is thus minimized and likewise the effect of wind, rain, mist or snow on the temperature of the wall 6 and the metal vapor pressure in the lamp is minimized. The large area of the outer wall 6 of the jacket thus minimizes the effect of changes in ambient conditions on the efficiency of the lamp unit.

The embodiment of the invention illustrated in Fig. 2 of the drawing comprises a different type of lamp device than the embodiment of the invention illustrated in Fig. 1. The lamp device comprises a container 7 having sealed therein a thermionic cathode 12 similar to the cathode 2 used in the lamp device of the embodiment illustrated in Fig. 1 and two annular anodes 13 mounted on opposite sides of and at equal distances from said cathode 12. A flexible disc divides the stem part of the container 7 from the part of said container 7 surrounding the electrodes. The gas in the lamp device is the same as that disclosed above in connection with the lamp device of Fig. 1 and the vaporizable metal is located in the part of the container 7 enclosing the electrodes 12 and 13. The disc prevents the metal vapor from entering into and condensing in the stem part of the container 7, which is the coolest part of said container 7 during the operation of the device and also protects said stem part from attack by the hot metal vapor so that the stem part can be made of a sealing glass non-resistant to attack by the hot metal vapor.

The container 7 is mounted in a double walled jacket 8, 9, 11 having the space between the walls 8 and 9, 11 thereof evacuated. The inner wall 8 of said jacket 8, 9, 11 is tubular in shape. The part 9 of the outer wall 9, 11 is parabolic in shape and the inner side of part 9 of the outer wall 9, 11 has a reflecting surface 10 mounted thereon. The reflecting surface 10 is of such shape, a parabolic reflector, for example, that the greater part of the light emitted by the lamp device is directed outward from the lamp unit without passing through the lamp device. The part 11 of the outer wall 9 and 11 is hemispherical and is contiguous to the part 9. The area of the outer wall 9 and 11 is considerably larger than that of the inner wall 8 and the double walled jacket 8, 9 and 11 has the same advantages as the jacket illustrated in Fig. 1.

It will be understood that a complete lamp unit comprises heat insulating means to close off the space between the inner wall of the jacket and the lamp device from the outside atmosphere. A suitable means for this purpose is an asbestos ring or packing interposed between said lamp and said inner wall. When desired the stem part of the lamp container is out of the space between the lamp device and the jacket closed off from the outside atmosphere. Cracks in the stem parts caused by the high temperature in said space are thus avoided. This is particularly advantageous when the stem parts consist of a non-resistant sealing glass, such as a glass containing lead, rather than a resistant glass, such as a boro-silicate glass. The jacket and the lamp device is provided with separate bases by which these elements are separately fastened to a supporting socket in a complete lamp unit. These parts have been omitted from the drawing for purposes of simplicity of illustration.

While we have shown and described and have pointed out in the annexed claim 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 heat conservators illustrated and described are useful in lamp units comprising different types of lamp devices than those shown and described and particularly in connection with high pressure mercury vapor lamps of the unsaturated vapor pressure type.

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

A lamp unit comprising in combination, a gaseous electric discharge lamp the gaseous atmosphere of which comprises the vapor of a difficultly vaporizable metal highly absorbent of the light emitted thereby when excited to luminescence, a double walled heat conservator for said lamp, and a reflector interposed between the walls of said heat conservator, the outer wall of said conservator having a paraboloidal part closed by spherical part, the inner wall of said conservator being a reentrant tube having the longitudinal axis thereof in the major axis of said paraboloidal part of said outer wall, said lamp being axially mounted in said reentrant tube, said reflector being mounted on the inner surface of the paraboloidal part of the outer wall of said conservator and conforming in shape therewith, said conservator minimizing the effect of ambient changes on the operating characteristics of said lamp, said reflector directing the light from said lamp incident thereat away from said lamp.

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