Nov. 12, 1935. M. PIRANI ET AL 2,020,736

GASEOUS ELECTRIC DISCHARGE DEVICE

Filed Jan. 20, 1933

Fig. 1

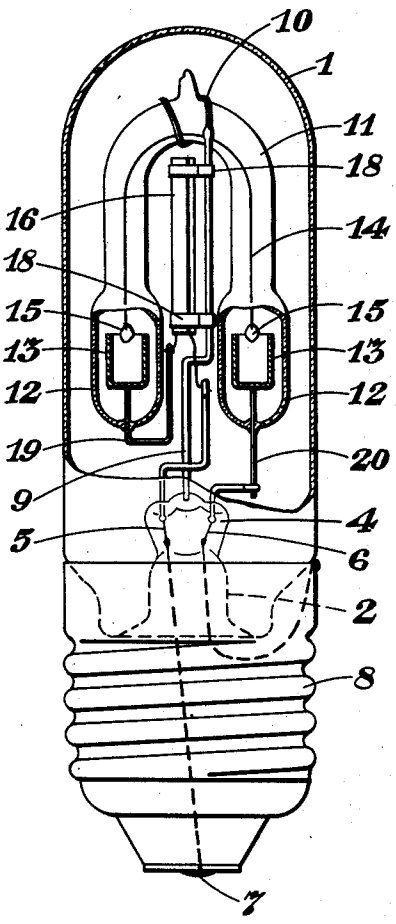
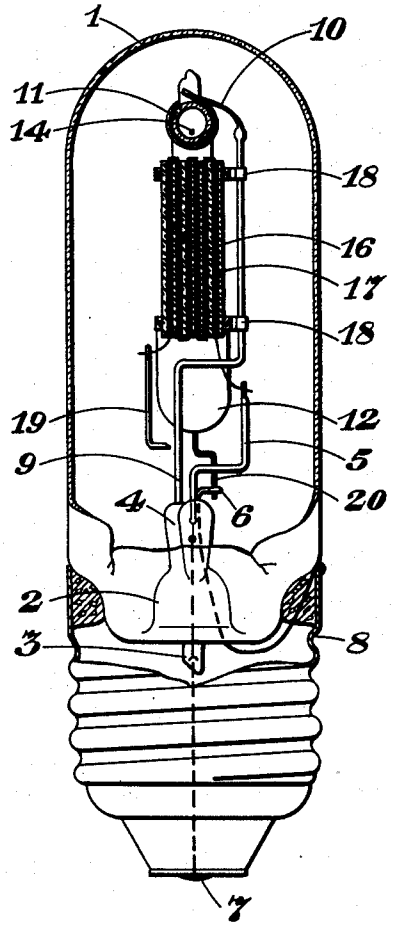


Fig. 2



INVENTORS
Marcello Pirani
Martin Reger
BY
Charles V. Tulla
ATTORNEY

Patented Nov. 12, 1935 2,020,736

UNITED STATES PATENT OFFICE

2,020,736

GASEOUS ELECTRIC DISCHARGE DEVICE

Marcello Pirani, Berlin-Wilmersdorf, and Martin Reger, Berlin, Germany, assignors to General Electric Company, a corporation of New York

Application January 20, 1933, Serial No. 652,736
In Germany February 22, 1932

5 Claims. (Cl. 176—122)

The present invention relates to gaseous electric discharge devices generally and more particularly the invention relates to improvements in electric discharge lamp devices operating on a 110 or 220 volt current source in which the container of the device is of U shape and is mounted in a gas tight envelope approximately the size of the well known incandescent lamp bulb.

The object of the present invention is to improve the luminous efficiency of such devices without increasing the size thereof.

The invention attains its object by utilizing the ballast resistance of the lamp as a heater element for the container of the gaseous electric discharge lamp device. Where the gaseous filling of the lamp device comprises a vaporizable material, such as sodium, the heater increases the luminous efficiency of the device by heating the container of the device to a higher temperature which maintains the vapor of the vaporizable material at a correspondingly higher pressure during the operation of the device than would be the case if such heater element were not provided in said lamp device.

The invention will be readily understood by an inspection of the accompanying drawing and a perusal of the following description thereof.

Fig. 1 of the drawing is a front elevational view of a gaseous electric discharge lamp device embodying the present invention, and

Fig. 2 is a side elevational, partly sectional view of the device shown in Fig. 1 rotated 90°.

Like numbers denote like parts in both views of the device.

The new and novel electric discharge lamp device comprises an outer envelope 1 resembling in size and shape an incandescent lamp bulb. Said envelope 1 has a screw base 7, 8 cemented thereto. A stem 4 is fused to said envelope 1 and electrode leads 5 and 6, connected to the contacts 7 and 8, respectively, of the base 7, 8, are sealed into said stem 4. Said envelope 1 is exhausted through tubulation 3 fused to said stem 4 and opening into the interior of said envelope 1. The U shaped container 11 of the gaseous electric discharge lamp device is supported in said envelope 1 by rod 9 sealed into the stem 4. The upper part 10 of said rod 9 is looped around the upper part of said container 11 on each side of the exhaust tip of said container 11 as shown. Said container 11 has a gaseous filling therein comprising a rare gas, a metal vapor, or a gaseous mixture, such as a mixture of neon and helium at 10 mm. pressure, for example, and sodium vapor. An electron emitting electrode 13 is sealed into an electrode chamber 12 at each end of said container 11. Said electrodes 13 are hollow, sheet metal electrodes, such as nickel electrodes, coated with an electron emitting material, such as an alkali earth metal or a combination thereof, barium oxide, for example.

An electrically conducting wire 14 extends along the discharge path between said electrodes 13 and the terminals thereof are physically connected to, but electrically insulated from said electrodes 13 by glass beads 15. The distance between said electrodes 13 and the terminals of said wire 14 is such that the voltage required for the operation of the lamp is sufficient to start the discharge between said electrodes 13 and the terminals of wire 14. A heater element 16, 17 is supported in said envelope 1 by clamps 18 fastened to said rod 9 and said heater element 16, 17 is located between the parallel legs of said container 11, as shown in Fig. 1. Said heater element 16, 17 comprises a body of insulation material, such as a magnesium plate 16, and a filament 17 embedded therein, as shown in Fig. 2. The filament 17 of said heater element 16, 17 is connected in series with the electric discharge between said electrodes 13 by the leads 5 and 19 and said heater element serves as the ballast resistance for the electric discharge lamp device during operation thereof. The other of said electrodes 13 is connected to current inlead 6 by lead 20.

When current is applied to the above described lamp device a glow discharge takes place along said wire 14 which ionizes the gaseous electric discharge path between said electrodes 13 to facilitate the starting of a gaseous electric glow discharge in the neon-helium mixture in said lamp device. The heat from said glow discharge and the heat from the heater element 16, 17 quickly vaporizes the sodium present in said container 11. The sodium vapor participates in conducting the discharge between said electrodes 13 and the glow discharge then changes to a positive column discharge. The heat radiated by said series connected heater 16, 17 maintains said container 11 at a high temperature during the operation of the lamp device. The vapor pressure therein corresponds to the high temperature of said container 11 so that the electric discharge lamp device has a higher luminous efficiency than would be the case if said heater element 16, 17 were not used. The sodium spectrum dominates the light emitted by the device during the operation thereof.

The outer envelope 1, when desired, is filled

with a heat absorbing gas, such as carbonic acid gas, at a pressure of approximately 1.0–10 mm. to reduce the radiation of heat from said container 11 to a minimum during the operation of the lamp device.

A lamp device having the above structure starts and operates on 220 volts, and even with a loss of 6 watts in the ballast resistance 16, 17, has an over all efficiency of 0.7 watts per HK. The lamp device is particularly useful for continuous, general illuminating and advertising purposes due to its small wattage consumption and its monochromatic yellow 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 spirit of the invention, for example, other types of electron emitting electrodes, such as the sintered, self-heating, mixed metal and oxide electrodes known in the art as Pirani electrodes, or hollow, closed, perforated metal shells having an electron emitting material in the interior thereof are used in place of electrodes 13 when desired, and an internal or external electrical conducting body on the walls of said container 11, and extending between said electrodes 13, is used in place of said wire 14, when desired.

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

1. An electric discharge lamp device comprising a container, electrodes sealed therein, a gaseous atmosphere therein comprising a vaporizable material, an envelope completely enclosing and spaced from said container and a ballast resistance for said device mounted in said envelope, said ballast resistance being a heater element for said container.

2. An electric discharge lamp device comprising a container, electrodes sealed therein, a gaseous atmosphere therein comprising sodium, an envelope completely enclosing and spaced from said container and a ballast resistance for said device mounted in said envelope, said ballast resistance being a heater element for said container.

3. An electric discharge lamp device comprising a container, electrodes sealed therein, a gaseous atmosphere therein comprising a vaporizable material, a body of electrically conducting material extending from electrode to electrode, the terminals of said body being adjacent to, but spaced apart from said electrodes, an envelope completely enclosing and spaced from said container and a ballast resistance for said device mounted in said envelope, said ballast resistance being a heater element for said container.

4. An electric discharge lamp device comprising a container, electrodes sealed therein, a gaseous atmosphere therein comprising a vaporizable material, an envelope completely enclosing and spaced from said container, said envelope being filled with a gas having poor heat conductivity characteristics and a series connected ballast resistance for said device mounted in said envelope, said ballast resistance being a heater element for said container.

5. An electric discharge lamp device comprising in combination, a tubular U-shaped container, electrodes sealed therein at the ends thereof, a gaseous atmosphere therein comprising a vaporizable material, an exhausted envelope for said container, and a ballast resistance for said device mounted in said envelope, said ballast resistance being mounted between the parallel parts of said U-shaped container and being a heater element for said container.

MARCELLO PIRANI.
MARTIN REGER.