

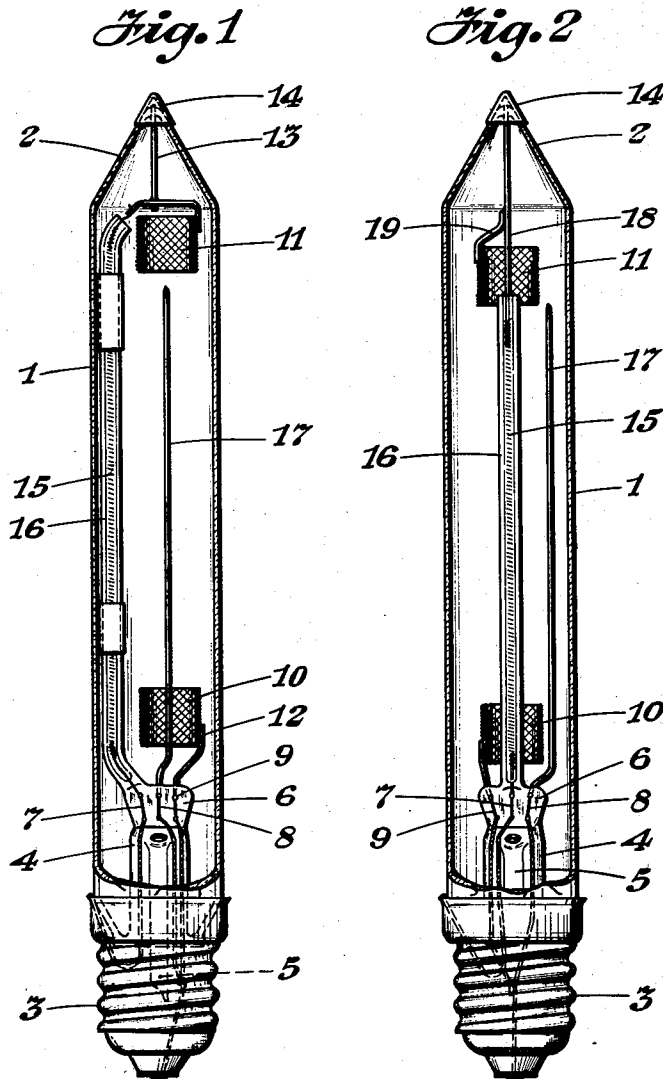
July 20, 1937.

G. GAIDIES

2,087,759

GASEOUS ELECTRIC DISCHARGE DEVICE

Filed May 28, 1935



INVENTOR
George Gaidies
BY *Harry E. Dunham*
ATTORNEY

UNITED STATES PATENT OFFICE

2,087,759

GASEOUS ELECTRIC DISCHARGE DEVICE

Georg Gaidies, Berlin-Pankow, Germany, assignor to General Electric Company, a corporation of New York

Application May 28, 1935, Serial No. 23,909
In Germany June 7, 1934

3 Claims. (Cl. 176-122)

The present invention relates to gaseous electric discharge devices generally and more particularly the invention relates to such devices useful as lamps.

5 The object of the invention is to provide a self-starting, efficient gaseous electric discharge lamp of simple structure. Another object of the invention is to provide a self-contained gaseous electric discharge lamp requiring no external auxiliary apparatus for starting and operating. 10 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.

15 In accordance with this object the new and novel lamp comprises a sealed, tubular container having solid, activated electrodes mounted near the ends thereof and current leads for said electrodes sealed into one end of said container. A 20 screw base is fastened to the end of the container wherein the electrode leads are sealed. The ballast resistance for said lamp is a helically coiled wire surrounded by a tube of insulating material and extends along the discharge path 25 between said electrodes in said container. The electrode mounted in the end of the container opposite the end in which the current leads are sealed is supported by a wire anchored in the dome of the container and said electrode is connected to said resistance which thus serves as a 30 current lead for said electrode. An auxiliary electrode in the form of a wire extending along the discharge path between said electrodes, electrically connected to one of said electrodes and terminating adjacent the other of said electrodes 35 is mounted in said container to facilitate the starting of the main discharge in the device.

The new and novel lamp is a self-contained unit requiring no external auxiliary apparatus 40 for starting or operation and can be screwed into the sockets customarily used for incandescent lamps. The ballast resistance mounted inside the lamp container gives off heat when the lamp is operating which is of particular advantage 45 when a vaporizable material, the vapor of which is a light emitting element during the operation of the device, is present in said lamp as the heat emitted thereby is useful in maintaining an effective vapor pressure. Thus all the energy consumed by the lamp is utilized therein for a useful purpose whereas in prior lamps with the resistance mounted outside the lamp the heat 50 emitted by the resistance was wasted.

55 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 5 of the invention.

Like numbers denote like parts in both the figures.

Referring to Fig. 1 the new and novel gaseous electric discharge lamp comprises an elongated, 10 tubular container 1 having a gaseous atmosphere therein consisting of a gas, a mixture of gases, a vapor, a mixture of vapors, or a gas-vapor mixture and preferably of a mixture of a rare, starting gas and a metal vapor, such as a mixture of argon and mercury vapor, or neon, argon and sodium vapor. Said container 1 terminates 15 in a cone 2 at one end thereof and has a stem 4 fused into the other end thereof. A two-contact base 3 is cemented to the stem end of said container 1. Said stem 4 is provided with an exhaust tube 5 opening into the interior of said container 1 and through which the container 1 is exhausted during the manufacture of the device. Current leads 7, 8, and 9 are fused into 20 the press 6 of said stem 4 and said current leads 7 and 9 are attached to the contacts on said base 3. Two cylindrical electrodes 10 and 11 are axially mounted in said container 1 and at opposite ends thereof. Said electrodes are hollow, 30 open-ended cylinders of wire mesh, such as nickel, tungsten, or molybdenum gauze cylinders, and are preferably coated or impregnated with electron emitting material, such as alkali earth metals, or the oxides thereof, particularly barium 35 oxide or strontium oxide, or a mixture of these. When desired, said electrodes 10 and 11 consist of sheet metal, such as nickel, coated with electron emitting material.

Said electrode 10 is electrically connected to 40 said lead 9 by the support wire 12 fastened thereto and fused into the press 6 of said stem 4. Said electrode 11 is supported in said container 1 by wire 13 fused into the cone shaped end 2 of said container 1. A cone shaped cap 14 of insulating 45 material is fastened to the tip of cone 2 to prevent objects from coming into contact with the end of the support wire 3 projecting from the tip of the cone 2. A helically coiled resistance wire 15 closely surrounded by a thin tube 16 of insulating material, such as glass, is fused to the pinch 50 6 of the stem 4 and is eccentrically mounted inside said container 1. Said resistance 15 extends along the discharge path between said electrodes 10 and 11 and is connected at one end thereof to 55

the current lead 7 and at the other end thereof to the electrode 11. One end of an elongated, auxiliary starting electrode 17 is fused into the press 6 of said stem 4 and the other end thereof is adjacent the electrode 11. Said auxiliary electrode 17 is in the longitudinal axis of the container 1 and the electrode 10 and is connected to the current lead 9 of said electrode 10 by the current lead 8. The end of the auxiliary electrode 17 adjacent the electrode 11 is thus at the same potential as the electrode 10 and facilitates the starting of the main discharge between said electrodes 10 and 11.

When potential is first applied to the lamp a glow discharge takes place between the end of the auxiliary electrode 17 and the main electrode 11. The main electrode 11 is thus heated to an electron emitting temperature. The glow discharge travels along the auxiliary electrode 17 and transfers to the main electrode 10 which is then heated thereby to an electron emitting temperature. When said electrodes 10 and 11 have been heated to a temperature at which a prolific emission of electrons therefrom takes place the glow discharge changes to an arc discharge. The heat from the discharge, the electrodes 10 and 11 and the resistance 15 quickly vaporizes the metal vapor during the starting period and maintains an effective vapor pressure in the lamp during the operation thereof. By an "effective vapor pressure" is meant a pressure such that the light emitted by the lamp is rich in rays characteristic of the metal vapor.

The gaseous electric discharge device illustrated in Fig. 2 of the drawing is similar to that shown in Fig. 1 except that in this embodiment the resistance 15 and the insulating tube 16 are mounted in the longitudinal axis of the container 1. The end of the resistance 15 is connected to a support wire 18 fused into said conical part 2. Electrode 11 is supported by wire 17 attached thereto and to the support 18. The auxiliary electrode 17 is mounted eccentrically in the container 1 in this embodiment. The starting and operating characteristics are the same as those described in connection with Fig. 1. Mounting the resistance 15 axially in the container 1 is advantageous in securing an even distribution of the heat emitted thereby over the walls of the container 1.

It will be understood of course that when a chemically active metal vapor, such as sodium vapor, is used in the lamp the container thereof is made of a glass chemically resistant to such vapor, such as the boro-silicate glasses now known in the art. A heat conservator, such as a double-walled jacket in which the lamp is mounted, is useful in minimizing the heat losses from the lamp container to improve the efficiency of the lamp.

While I 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 ex-

ample, other types of electron emitting electrodes, such as the indirectly heated Hull electrodes, are used when desired, and the lamp container is translucent, transparent or colored, when desired.

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

1. A gaseous electric discharge device comprising an elongated, tubular container, thermionic electrodes sealed therein, current leads for said electrodes sealed into one end of said container, a gaseous atmosphere therein, a ballast resistance mounted in said container, and a tube of insulating material surrounding said ballast resistance, one of said electrodes being mounted in the end of said container opposite the end thereof in which said current leads are sealed, said resistance extending along the discharge path between said electrodes and being connected to said last named electrode, another of said electrodes being an auxiliary electrode extending along the discharge path between said electrodes, terminating adjacent one of said electrodes and being electrically connected to the other of said electrodes.

2. A gaseous electric discharge device comprising an elongated, tubular container, thermionic electrodes sealed therein, current leads for said electrodes sealed into one end of said container, a gaseous atmosphere therein, a ballast resistance mounted in said container, and a tube of insulating material surrounding said ballast resistance, one of said electrodes being mounted in the end of said container opposite the end thereof in which said current leads are sealed, said resistance extending along the discharge path between said electrodes and being connected to said last named electrode, another of said electrodes being an auxiliary electrode extending along the discharge path between said electrodes, terminating adjacent one of said electrodes and being electrically connected to the other of said electrodes, said resistance being eccentrically mounted in said container and said auxiliary electrode being mounted axially in said container.

3. A gaseous electric discharge device comprising an elongated, tubular container, thermionic electrodes sealed therein, current leads for said electrodes sealed into one end of said container, a gaseous atmosphere therein, a ballast resistance mounted in said container, and a tube of insulating material surrounding said ballast resistance, one of said electrodes being mounted in the end of said container opposite the end thereof in which said current leads are sealed, said resistance extending along the discharge path between said electrodes and being connected to said last named electrode, another of said electrodes being an auxiliary electrode extending along the discharge path between said electrodes, terminating adjacent one of said electrodes and being electrically connected to the other of said electrodes, said resistance being axially mounted in said container and said auxiliary electrode being eccentrically mounted in said container.

GEORG GAIDIES.