Oct. 31, 1939. W. HAGEN ET AL 2,177,714

GASEOUS ELECTRIC DISCHARGE LAMP DEVICE

Filed Oct. 26, 1937

Fig. 1

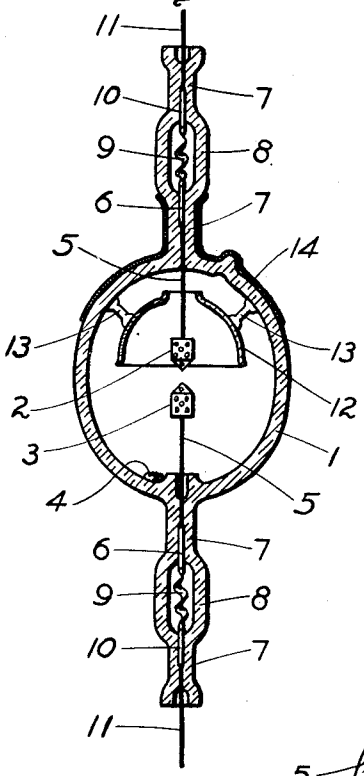


Fig. 2

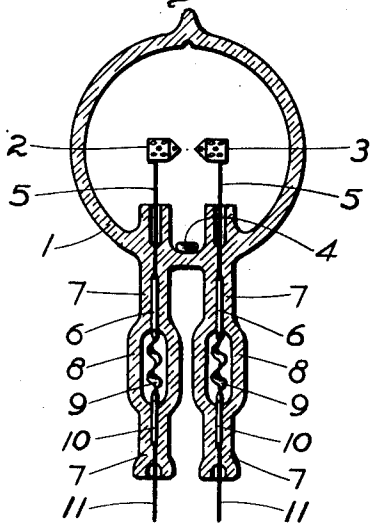
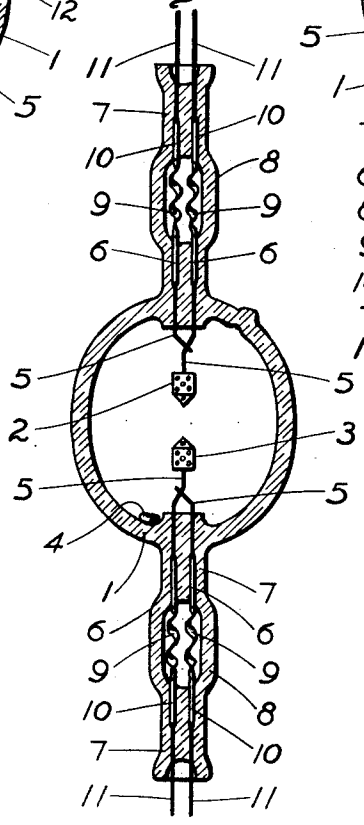


Fig. 3



INVENTORS
Wilhelm Hagen
BY Wolfgang Thouret
Harry E. Dunham
ATTORNEY

Patented Oct. 31, 1939

2,177,714

UNITED STATES PATENT OFFICE

2,177,714

GASEOUS ELECTRIC DISCHARGE LAMP DEVICE

Wilhelm Hagen, Berlin, and Wolfgang Thouret, Berlin-Wilmersdorf, Germany, assignors to General Electric Company, a corporation of New York

Application October 26, 1937, Serial No. 171,112
In Germany October 27, 1936

4 Claims. (Cl. 176—122)

The present invention relates to gaseous electric discharge lamp devices generally and more particularly the invention relates to such devices capable of operating at high vapor pressures, such as vapor pressures in the order of 20 atmospheres or more.

Such devices are now known to the art and one type of device consists of a spherical container of vitreous material, such as quartz or hard glass, having a pair of electrodes mounted therein, separated a distance less than the diameter of the container. In such devices it is essential that the joints between the current leads and the container remain gas tight during the operating life of the lamp. We have observed that the parts of the current leads which project from the lamp container and which become extremely hot during the operation of the lamp are oxidized by contact with the air and that the oxide coating which is thus formed on the current leads gradually creeps forward along the leads into the fused joint between the vitreous container and said leads and causes said joint to leak.

The object of the present invention is to provide a gaseous electric discharge vapor lamp of the above type which has a long useful operating life. A further object of the invention is to provide a sealed structure for gaseous electric discharge vapor lamps of the above type in which oxidation of the current leads is avoided in a positive manner. 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.

The invention attains its objects by providing externally protruding seals on the lamp container which seals are cylindrical in shape and have a chamber at the mid-portion thereof. A molybdenum ribbon extends through said chamber and is fused into the rod-shaped cylindrical parts extending from opposite ends of the chamber. The ends of the molybdenum ribbon fused into said rods are extremely thin and are connected at the one end to the current lead, of tungsten or molybdenum, which extends into the container of the lamp device and serves to support the electrode. The other end of the molybdenum ribbon is connected to the current lead which projects beyond the external end of the seal and serves to connect the lamp device to a terminal of the current source. The part of the molybdenum ribbon in the chamber is substantially thicker than the end part thereof to avoid injury to the midparts of the ribbon during the fusing-in process.

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

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

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

Fig. 3 is a similar view of still another embodiment of the invention.

Referring to Fig. 1 the gaseous electric discharge device comprises a spherical container of vitreous material, such as quartz, having two thermionic, activated electrodes 2 and 3 centrally mounted therein, which electrodes are separated a few millimeters from each other. Perferably the electrodes consist of a cylindrical perforated metal shell, such as a tungsten shell, filled with a material having high electron emissive characteristics at an elevated temperature, such as barium or strontium, or mixtures thereof. Other types of thermionic, activated electrodes, such as a pressed and sintered mixture of tungsten and electron emitting material, or of tungsten wire helices surrounding rods of electron emitting oxides, are used when desired. Said container 1 has therein a starting gas, such as neon, at a pressure of about 5 mm. and a quantity 4 of vaporizable material, such as mercury, preferably in such amount that it is completely vaporized at the operating temperature of the container 1. Each of said electrodes 2 and 3 is mounted on a tungsten or molybdenum current lead 5. A thin foil-like molybdenum strip 6 is welded or soldered to the current lead 5 and is hermetically sealed into the rod-like extensions 7 of the container 1. Each of the rod-shaped extensions 7 is mounted in the vertical longitudinal axis of the container 1. The midpart of each of the extensions 7 is expanded into a chamber 8 which is either evacuated or filled with an inert gas, such as nitrogen. A molybdenum strip 9 which is larger in cross-section and which is fused or welded to the strip 6 is mounted in said chamber 8. Another foil-like molybdenum strip 10 is fused into the remote part of said extension 7 and said strip 10 is welded or fused to the larger molybdenum strip 9. A current lead 11, of tungsten or another metal having similar properties, is fused or welded to said strip 10 and is sealed into the extension 7.

The current lead 5 of the electrode 2 is surrounded by a bell-shaped baffle 12, of quartz or hard glass, for example, which is secured to the

container 1 by the quartz or hard glass studs 13. The baffle 12 is a depositing surface for the sputtered particles of the electrode material to keep such deposits from forming on the inner surface of the container 1. When desired, said baffle 12 is supported in said container 1 by other supporting means, such as by metal springs or the like. The external surface of the container 1 is coated in part with a thin metal layer to reduce the dissipation of heat at said part.

The embodiment of the invention shown in Fig. 2 is similar in all respects to that shown in Fig. 1 with the exception that in this embodiment the electrodes 2 and 3 are mounted in the horizontal axis of the container 1 and the rod-shaped extensions 7 are mounted in parallel positions and are coextensive with respect to each other. In this embodiment the baffle 12 has been omitted and when desired the container 1 is provided with a cylindrical extension above the electrodes 2 and 3 which serves to trap sputtered particles of electrode material. When desired this cylindrical extension is externally coated with a metal layer to reduce the heat dissipation at this part.

The embodiment shown in Fig. 3 of the drawing is similar in all respects to that shown in Fig. 1 with the exception that a pair of electrode leads 5 is used to support the electrodes 2 and 3 and the parts 9 and 11 are in multiple as shown. The current carrying capacity of the current leads is thus increased and accordingly the lamp device shown in Fig. 3 is capable of operation with higher current loads than can be used with the embodiment shown in Figs. 1 and 2. When desired, the baffle 12 of Fig. 1 is used in the embodiment shown in Fig. 3.

The lamp devices described above have a long, useful operating life and rupture of the seals thereof by any oxide coating on the current leads is prevented in a positive manner since the protruding parts 11, consisting of tungsten, are at a low temperature, due to their remote position from the container 1, so that oxidation thereof does not take place.

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.

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

1. An electric discharge vapor lamp device of the high pressure type comprising a container, thermionic, activated electrodes and electrode leads sealed therein, a starting gas and a quantity of vaporizable material therein, said container having a protuberance consisting of vitreous material thereon and a current lead fused into said protuberance, said protuberance having an hermetically sealed chamber at the mid-part thereof and solid vitreous extensions at opposite ends of said chamber, one of which is fused to said container, said current lead consisting of two wires joined by a molydenum strip, said strip extending across said chamber and having the ends thereof fused into said extensions at opposite ends of said chamber to form an hermetic seal, each of said extensions surrounding one of said wires, each of said wires extending beyond the end of said extension remote from said chamber to conduct electrical energy into said container.

2. An electric discharge vapor lamp device of the high pressure type comprising a container, thermionic, activated electrodes and electrode leads sealed therein, a starting gas and a quantity of vaporizable material therein, said container having a protuberance consisting of vitreous material thereon and a current lead fused into said protuberance, said protuberance having an hermetically sealed chamber at the mid-part thereof and solid vitreous extensions at opposite ends of said chamber one of which is fused to said container, said current lead consisting of two wires joined by a molybdenum strip, said strip extending across said chamber and having the ends thereof fused into said extensions at opposite ends of said chamber to form an hermetic, electrically conducting seal, the part of said strip in said chamber being of larger dimensions than the end portions thereof fused into said extensions, each of said extensions surrounding one of said wires, each of said wires extending beyond the end of said extension remote from said chamber to conduct electrical energy into said container.

3. An hermetic, electrically conducting seal for a vitreous container, said seal consisting of a vitreous member and an electrically conducting metal member, said metal member consisting of two wires joined by a molybdenum strip, said vitreous member consisting of two cylindrical members and an hermetically sealed chamber interposed between and joining said cylindrical members, said modybdenum strip extending across said chamber and having the ends thereof fused into said cylindrical members, each of said cylindrical members surrounding one of said wires, one end portion of each of said wires extending beyond the end of said cylindrical member remote from said chamber.

4. An hermetic, electrically conducting seal for a vitreous container, said seal consisting of a vitreous member and an electrically conducting metal member, said metal member consisting of two wires joined by a modydenum strip, said vitreous member consisting of two cylindrical members and an hermetically sealed chamber interposed between and joining said cylindrical members, said molybdenum strip extending across said chamber and having the ends thereof fused into said cylindrical members, the part of said strip in said chamber being of larger dimensions than the parts thereof fused into said cylindrical members, each of said cylindrical members surrounding one of said wires, one end portion of each of said wires extending beyond the end of said cylindrical member remote from said chamber.

WILHELM HAGEN.
WOLFGANG THOURET.