

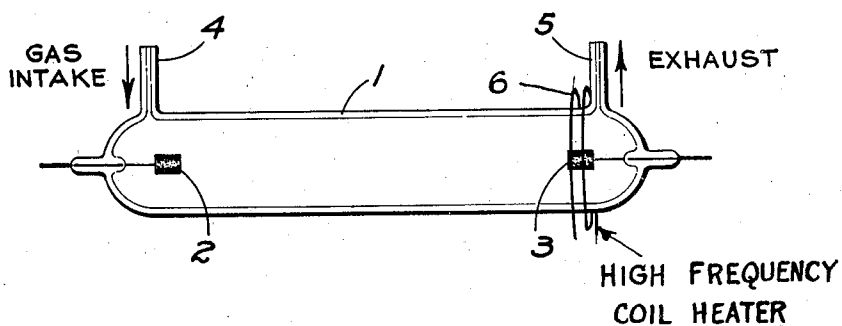
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GASEOUS ELECTRIC DISCHARGE LAMP DEVICE

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GASEOUS ELECTRIC DISCHARGE LAMP
DEVICESHans Alterthum and Marcello Pirani, Berlin-
Wilmerdorf, Germany, assignors to General
Electric Company, a corporation of New YorkApplication February 4, 1937, Serial No. 124,130
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2 Claims. (Cl. 176—2)

The present invention relates to gaseous electric discharge lamp devices generally and more particularly the invention relates to methods and means for removing the gaseous impurities from the containers of such devices during the manufacture thereof.

One method of removing the gaseous impurities from the tubular containers of gaseous electric discharge lamp devices having thermionic electrodes comprises the step of passing rare gas through the container while a discharge is operating between the electrodes. The internal parts of the lamp devices are raised to an elevated temperature by the heat from the discharge so that the impurities, such as water vapor, hydrogen and carbon dioxide, are given off by said lamp parts and are removed from the container by the rare gas flowing through the container. These impurities increase the operating voltage of the discharge and for this reason a high potential alternating current is used.

The object of the present invention is to provide a method and a means for expeditiously removing the gaseous impurities from the containers of gaseous electric discharge lamp devices during the manufacture of said devices. Another object of the invention is to provide an economical method and means of removing the gaseous impurities from discharge lamp containers. Still further objects and advantages of the method and of its various steps will be apparent to those skilled in the art from the following particular description thereof.

The invention attains its objects by connecting the discharge lamp container to an exhaust system which causes a flow of rare gas through the container, ionizing the gas in said container and by causing an electrophoretic motion in the gaseous impurities in the direction of the flow of rare gas through the container. One way of causing an electrophoretic motion of the gaseous impurities is by using an asymmetric discharge current. When the terminals of the device are connected across the terminals of a source of symmetrical alternating current and when the device is provided with thermionic electrodes a simple expedient for changing the symmetrical alternating current supplied to the device into an asymmetric discharge current is by heating one of the thermionic electrodes to a higher electron emitting temperature than the other of said electrodes thus making one of said electrodes a better cathode than the other. The gas intake tube is fused to the container adjacent the electrode which is the poorer cathode and the exhaust tube is pref-

erably fused to the container adjacent the electrode which is the better cathode. The gaseous impurities driven out of the walls of the container by the heat of the discharge have a lower ionizing potential than the rare gas used in the process and are consequently attracted to the electrode having the higher electron emissivity characteristics where they are removed from the container through the exhaust tube. The gaseous impurities are thus not only removed from the container by the flow of rare gas through said container but also by the effects of the discharge current in the lamp. This not only shortens the time required to remove such impurities but also saves rare gas.

One electrode in the container can be caused to emit a greater quantity of electrons than the other electrode by a simple means, for example, when the electrodes are of the type having two current leads which can be connected to a source of heater current the heater current on one electrode is of greater magnitude than the heater current on the other of said electrodes. When the electrodes are of the type which are heated only by the voltage drop thereat and the discharge current flow therethrough during the operation of the device one electrode may be heated by an outside heat source, such as a high frequency coil, to a higher temperature than the other of said electrodes. The asymmetric alternating current produced in the lamp by this method is equivalent as far as results are concerned to imposing a direct current on the alternating current supplied to the device but the apparatus required is much simpler.

It is also possible to obtain an electrophoretic motion in the gaseous impurities by mounting a thermionic electrode in the exhaust tube connected to the lamp container and by creating a discharge between the electrode at the remote end of the container and the electrode mounted in the exhaust tube. In this case the electrode in the exhaust tube is heated to a higher electron emitting temperature than the electrode in the container in order to obtain the electrophoretic motion of the gaseous impurities in the desired direction. This arrangement is particularly advantageous when several lamp containers are connected to a common exhaust tube, which containers are to be exhausted successively. In this case it is merely necessary to connect one electrode of each container with one terminal of the alternating current source while the electrode mounted in the exhaust tube is connected per-

manently to the other terminal of the current source.

In the drawing accompanying and forming part of this specification a lamp container connected to an exhaust system is shown in a side elevational view.

Referring to the drawing the lamp container 1 having the electrodes 2 and 3 mounted at each end thereof is provided with the tubulations 4 and 5 fused to the container 1 adjacent said electrodes 2 and 3, respectively. Said tubulation 4 is connected to a source of rare gas and the tubulation 5 is connected with an exhaust pump. Preferably the exhaust system is a closed one having a liquid air trap therein to trap the impurities removed from the container 1. The electrodes 2 and 3 consist of a pulverized, pressed, sintered mixture of high melting point metal, such as tungsten, and electron emitting material, such as barium oxide, and are heated to an electron emitting, arc discharge supporting temperature by the voltage drop thereat and the discharge current flow therethrough. Preferably the electrodes 2 and 3 are degassed before they are mounted in the container 1. During the exhaust process, when rare gas is flowing through the tubulation 4 into the container 1 and out through the tubulation 5, the electrodes 2 and 3 are connected across the terminals of an alternating current source and the electrode 3 is heated to a higher electron emitting temperature than the electrode 2 by a high frequency coil 6 mounted about the container 1. As pointed out above the gaseous impurities driven out of the walls of the container 1 and from the electrodes 2 and 3 are moved along the container 1 in the direction of the exhaust tube 5 not only by the flow of rare gas through the tube but also by the electrophoretic motion imparted thereto by the asymmetric current caused by the difference between the quantity of electrons emitted by the electrodes 2 and 3. When the gaseous impurities have been removed from the container 1 the other steps in the manufacture of the device are performed.

When desired, the asymmetric current in the container is caused by grounding a sensitive part of said container.

The method described above is applicable to the exhaust on gaseous electric discharge devices generally and shortens the time required for removing the impurities from the containers of such devices.

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

1. The method of removing the gaseous impurities from the container of an electric discharge device having thermionic electrodes separated an appreciable distance in said container which comprises the steps of causing a flow of rare gas through said container, applying a symmetrical alternating current across the terminals of said device and heating one of said electrodes to a higher electron emitting temperature than the other of said electrodes to change the symmetrical current into an asymmetric discharge current to cause the migration of said gaseous impurities in the direction of flow of said rare gas.

2. The method of removing the gaseous impurities from the container of an electric discharge device having thermionic electrodes separated an appreciable distance in said container which comprises the steps of connecting said container to an exhaust system having a thermionic electrode mounted therein, said system causing a flow of rare gas through said container, connecting one of said electrodes in said device to one terminal of a source of symmetrical alternating current, connecting the electrode in said exhaust system to the other terminal of said source and heating the electrode in said system to a higher electron emitting temperature than the electrode in said container to change the symmetrical current into an asymmetric discharge current to cause the migration of said gaseous impurities in the direction of flow of said rare gas.

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