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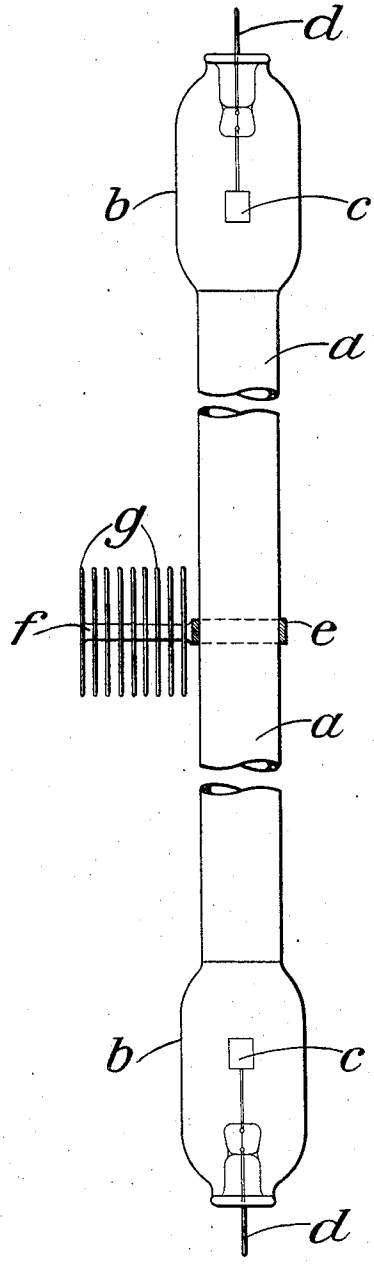
GASEOUS ELECTRIC DISCHARGE DEVICE

Filed May 30, 1930



INVENTOR
BY Marcello Pirani
Charles E. Mullaly
HIS ATTORNEY

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UNITED STATES PATENT OFFICE

MARCELLO PIRANI, OF BERLIN-WILMERSDORF, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

GASEOUS ELECTRIC DISCHARGE DEVICE

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The present invention relates to gaseous electric discharge devices generally and more particularly the invention relates to such devices in which the gaseous atmosphere consists wholly of a vapor or in which a vapor is a component of the gaseous atmosphere.

In such devices the vapors of such metals as sodium, potassium, mercury, lithium, cæsium, and zinc, or alloys or mixtures thereof are commonly used, either alone or mixed with a discharge conducting gas or gases, for example, nitrogen or a rare gas, as the gaseous atmosphere. As is well known in the art such vapors will separate out of the gaseous atmosphere and deposit on the walls of the envelope of the device during operation if the walls of the envelope or parts of said walls, are cooled below the condensation temperature of the particular vapor used. Such vapor condensation reduces the metal vapor pressure which impairs the efficiency of the device, reduces the intensity of the emitted light, and often results in a total extinguishment of the light column.

The object of this invention is to maintain the condensible material in vaporous condition under all conditions of operation of devices of this type, and further to prevent the formation of permanent deposits of the condensible material in or on any part of such devices, thus insuring that all the condensible material is available in vapor form for use in the discharge path and the tube is maintained in clean condition and transparent to the radiations of the discharge path and free from undesired changes in operating characteristics due to loss of vapor in the tube device or lamp. Still further objects and advantages attaching to the device and to its use and operation will be apparent from the following particular description and from the claims.

The invention attains its object by maintaining a part of the discharge container of the device at a point along the discharge path; say mid-way between the electrodes, as the coolest part of the tube so that if any vapor condensation takes place it will be localized in that cooled area. As the discharge path extends through this cooled portion of the discharge container the condensed material while forming is subjected to an ion and electron bombardment which impels the particles of the condensed material into the discharge path where they are vaporized by the heat of the discharge. Thus the condensible vapor is maintained in the gaseous condition and permanent deposits of condensed material in any part of the envelope of the device is avoided. Hitherto such deposits took place in the electrode chambers of devices of this type as these, being of greater area than the discharge part of the container were the coolest parts of the device. These deposits were permanent as they were not subject to ion and electron bombardment from the discharge path as are the deposits formed in accordance with this invention. The permanent deposits of condensed material formed in prior devices were especially noticeable in gaseous electric discharge devices operating on direct current as in such devices one electrode operates at a lower temperature than the other electrode hence large deposits of metal are formed in the cooler electrode chamber, being the anode chamber, while no deposits are formed in the cathode chamber. This condition is obviated by this invention as hereinbefore explained.

In the drawing accompanying and forming part of this specification an embodiment of the invention is shown partly in section for purposes of disclosure.

Referring to the drawing the invention comprises a discharge container "*a*" having two electrode chambers "*b*", "*b*" at both ends thereof into which are sealed current leads "*d*", "*d*" carrying electrodes "*c*", "*c*". Said electrodes "*c*", "*c*" may be of any desired shape and of any suitable material; sintered oxide electrodes, which are brought to a glow by the operating current of the device, and similar to those described in the application of Ewest and Pirani, Serial Number 377,044, being particularly useful in this connection. Such oxide electrodes may be heated by a special heating circuit, as is well known in

the art. Ring "*e*" is attached to said discharge container "*a*" at or near the center portion thereof. Said ring "*e*" has a carrying part "*f*" to which is attached laminations or ribs or fins or vanes, "*g*". Said laminations or vanes "*g*" are cooled by the surrounding atmosphere to conduct heat away from the center portion of container "*a*" surrounded by ring "*e*" to maintain said portion cooler than the other portions of the container and especially the electrode chambers "*b*", "*b*". Hence, if any tendency toward condensation of the vapor present in the device takes place it will occur at said cooled portion. The resulting deposits are only temporary, however, as the intense ion and electron bombardment on the walls of the container at that part of the container impels particles of the deposits into the discharge path where they are vaporized. Hence, the vapor is maintained as a vapor in the device and permanent deposits of condensed material are avoided.

While I have shown and described a particular form of air cooling apparatus it will be understood that any suitable cooling apparatus may be used including a water cooling apparatus, and that the invention is applicable to electric discharge devices generally, and particularly to said devices when used as electric lamps, of the positive column type having a glow or arc discharge. It will also be understood that various omissions, substitutions and changes in the form and details of the device may be made by those skilled in the art without departing from the broad spirit and scope of the invention.

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

1. In an electric discharge device, a container, electrodes sealed therein, a gaseous filling therein comprising a condensible vapor, and means for preferentially cooling a portion of said container along the discharge path to maintain the vapor throughout the length of the discharge path and keep the device free of undesired deposits.

2. In an electric discharge device, a container, electrodes sealed therein, a gaseous filling therein comprising a gas and condensible vapor, and heat radiating fins located at the mid-portion of said container for preferentially cooling said portion to maintain said vapor in vaporous condition throughout the length of the discharge path and keep the device free of deposits at other portions of the device.

3. The method of maintaining the gas pressure of an electric discharge device having a filling of condensible vapor which consists in maintaining as the coolest part of the device a portion of the container walls along the discharge path to cause deposits thereon and in vaporizing such deposits by ion or electron bombardment from the gaseous discharge passing through said portion.

In witness whereof I have hereunto set my hand this 15th day of May, 1930.

MARCELLO PIRANI.