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J. SLEPIAN

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DISCHARGE TUBE

Filed March 12, 1925

Fig. 1.

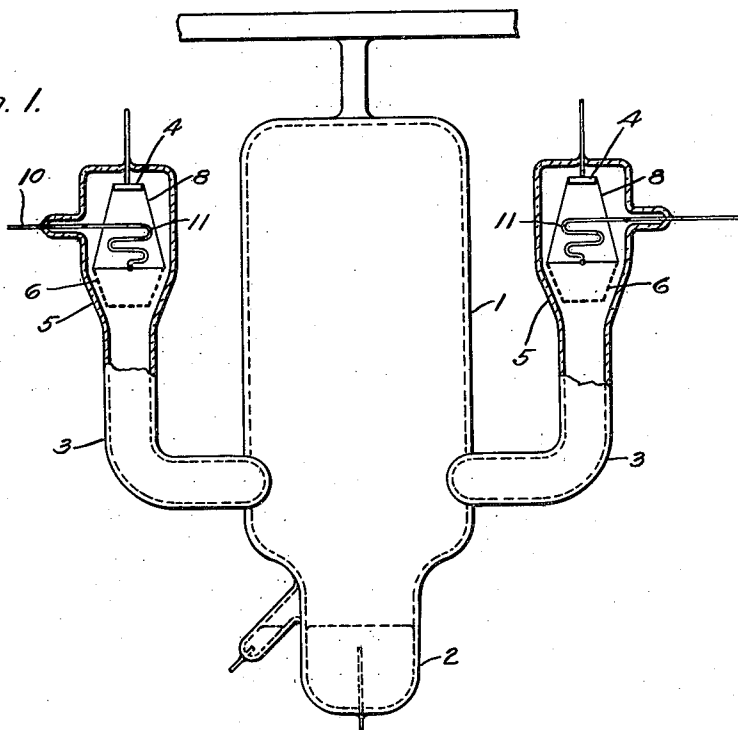
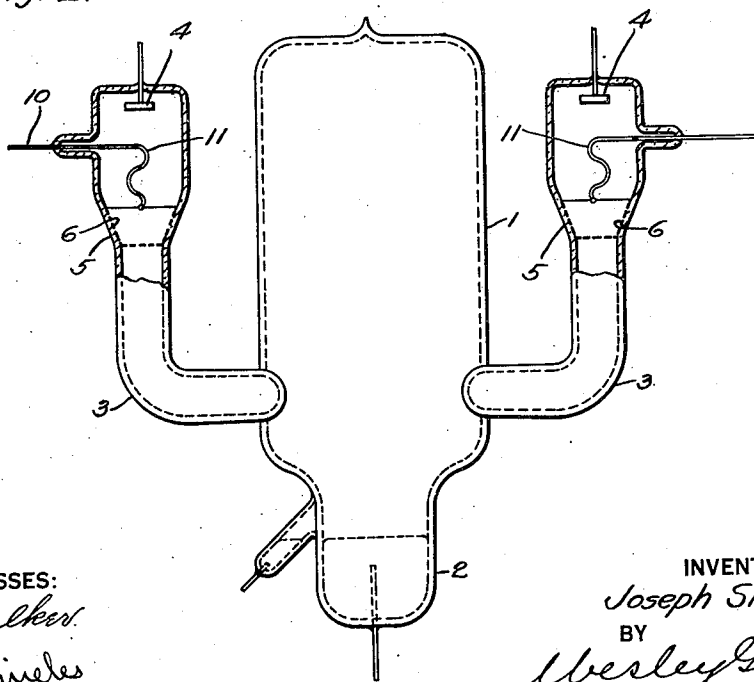


Fig. 2.



WITNESSES:

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DISCHARGE TUBE.

Application filed March 12, 1925. Serial No. 15,047.

My invention relates to space-current discharge devices and it has particular relation to the evacuation and the treatment of the electrodes of such devices.

5 In my copending application, Serial No. 668,555, filed October 15, 1923, and in the copending application of V. K. Zworykin and D. Ulrey, Serial No. 665,487, filed September 28, 1923, both assigned to the Westinghouse Electric & Manufacturing Company, it was pointed out that the control electrode employed in a mercury arc tube, or, in general, in any gas-filled space-current device, should be so arranged that the control electrode entirely surrounds a portion of the discharge path and is in contact with the tubular glass wall surrounding the same. It was pointed out that ordinary grids or control electrodes which do not extend over the entire width of the discharge path are not sufficient to control the discharge in such tubes, by reason of the fact that the electrons emitted by an excited cathode may easily slip through the gap between the grid and the insulating walls of such devices, thereby making the control of the discharge ineffective.

When making space-current discharge devices of the above described character, with the control electrodes disposed in contact with the glass walls, it is difficult to free the relatively large electrodes from the absorbed gases, as it is inadvisable to raise the temperature of the control electrodes to a sufficiently high temperature, on account of the proximity of the glass walls.

One object of my invention is to provide a vacuum tube of the above-described character wherein the control electrode is held in a position out of contact with the walls during the heat treatment incident to the evacuation of the tube and is subsequently disposed adjacent to the walls for the normal operation of the tube.

Another object of my invention is to provide a new method of treating tubes of the above-described character, by evacuating the same while the grid or the control electrode is out of contact with the surrounding walls and subsequently positioning the control grid adjacent to the glass wall as required for normal operation.

Other objects of my invention will appear from the following description and claims. In the accompanying drawing,

Figure 1 is an elevational view of a mercury arc rectifier embodying my invention and illustrating the arrangement of the control electrodes during evacuation, and

Fig. 2 is a similar view illustrating the rectifier with the control electrode in the normal operating position.

Referring to Figs. 1 and 2, a mercury arc rectifier comprises a glass envelope 1 having a mercury cathode 2 at the bottom portion thereof. Two tubular anode arms 3 extend laterally from the envelope and carry anodes 4 at their upper ends. At a point somewhat below the anode 4, each tubular arm 3 is provided with a conical enlargement 5 adapted to receive a similarly shaped grid or control electrode 6. In the normal operating position shown in Fig. 2, the grid is in direct contact with the glass walls of the conically shaped enlargement 5 and it entirely intercepts the discharge path between the anode and cathode.

As mentioned hereinbefore, difficulties are encountered in freeing such tubes from gases, by reason of the relatively large mass of the control electrode and the difficulty of heating the same to a temperature at which the absorbed or occluded gases will be driven off. According to my invention, I evacuate the tube while the control electrode 6 is maintained in a position out of contact with the glass walls, as shown in Fig. 1, and subsequently bring the same into the normal operating position in contact with the conically shaped walls of the arm 3.

The control electrode 6 may be suspended from the anode 4 by means of thin wires 8, as shown in Fig. 1. In that position, the control electrode may be heated, either inductively or in any other suitable manner, while the tube is being exhausted to remove the gases expelled from the control electrode during the heating process.

The control electrode is connected to a terminal conductor 10 which is sealed into a lateral extension of the anode arm 3. The connection between the terminal conductor and the control electrode 6 is effected by means of a resilient metallic spring member 11, which forces the electrode toward its normal operating position, the control electrode being prevented from taking that position by the wires 8 extending from the anode. After the tube has been evacuated, a short flash of current, by way of the ter-

minal conductor 10, the thin wires 8 and the anode 4, melts and evaporates the wires 8 holding the control electrode in suspension, the latter now being forced toward its seat in the anode arm 3 by the action of the spring 11.

While I have described the use of a movably disposed electrode in connection with a mercury arc tube, my invention is not restricted to such particular use, since it may be employed in many other applications wherein it is desired to place an electrode of an evacuated discharge device in different positions during several stages of the treatment or of the operation of the same.

I claim as my invention:

1. The method of evacuating a discharge tube, comprising a glass envelope and a conducting body of relatively large mass suspended between two electrode terminals sealed into said envelope, which comprises heating said body and evacuating said envelope while said body is in suspended position and subsequently sending current through a circuit including said electrode terminals for releasing said body from said suspended position.

2. The method of evacuating a discharge tube, comprising a glass envelope and a conducting body of relatively large mass suspended from a conductor of relatively small cross section connected to a terminal outside said envelope, which comprises treating said body while in suspended position and subsequently sending current through a circuit including said conductor for destroying the suspension of said conducting body.

3. A discharge tube comprising a glass envelope, a metallic electrode of relatively large mass inclosed within said envelope, a terminal conductor sealed into said envelope and connected to said electrode, said electrode being positioned adjacent to the glass walls of said envelope during normal operation, and fusible means for holding said electrode out of immediate contact with said glass prior to normal operation during the heat treatment and evacuation of the same.

4. A discharge tube comprising a glass envelope, a metallic electrode of relatively large mass inclosed within said envelope, a terminal conductor sealed into said envelope and connected to said electrode, said terminal conductor including a resilient member tending to position said electrode adjacent to the glass within said envelope for normal operation, and means for holding said electrode out of immediate contact with said glass prior to normal operation.

5. A discharge device comprising a glass envelope, an electrode member movably disposed within said envelope, said envelope comprising a supporting member adapted to engage said electrode member and to support the same during normal operation, and

a resilient member adapted to maintain said electrode member in contact with said supporting member.

6. A discharge device comprising a glass envelope having a tubular member, an electrode member movably disposed within said tubular member, said tubular member comprising a restricted portion adapted to engage said electrode member and support the same during normal operation, and a resilient member connected to said electrode member and adapted to maintain the same in contact with said restricted portion.

7. A gaseous discharge device comprising a cathode, an anode, an enclosing glass envelope having a tubular member constituting the discharge path between said anode and said cathode, and a tubular control electrode mounted in said tubular member and therein movable from a position out of contact with the walls of said tubular member to a position wherein its outer surface is in contact with said walls.

8. A gaseous discharge device comprising a cathode, an anode, an enclosing glass envelope having a tubular member of substantially conical shape constituting the discharge path between said anode and said cathode, a tubular control electrode mounted in said tubular member and therein movable from a position out of contact with the walls of said tubular member to a position wherein its outer surface is in contact with said walls, and a resilient member for forcing said control electrode into the last named position.

9. A mercury-vapor discharge device comprising a glass envelope having a chamber containing a mercury cathode, a tubular arm upwardly extending from said chamber, an anode mounted in the upper portion of said arm, said arm having a conically shaped portion constituting the discharge path between said cathode and said anode, a tubular control electrode of conical shape adapted to fit into, and contact with, the walls of the conical portion of said arm, and means for holding said control electrode in a position out of contact with said walls during the evacuation and for positioning said control electrode in contact with said walls during normal operation of said discharge device.

10. A space-current discharge device comprising an envelope; a plurality of electrodes therein, said electrodes including terminal connections, one of said electrodes being movable, and destructible means within said envelope for supporting said movable electrode in an abnormal position, said supporting means being destructible without causing substantial injury to any of the other parts of the device.

11. A discharge tube comprising a glass enclosing vessel having a conical wall portion, a conical electrode within said vessel adjacent to said conical wall portion, and

means for yieldably mounting said conical
electrode including a destructible member,
said electrode being biased by said mounting
means to tend to move axially with respect
5 to said conical wall portion to assume a po-
sition in contact with said conical wall por-
tion upon the destruction of said destructible

member, said destructible member being de-
structible without causing substantial injury
to any of the other parts of the device.

In testimony whereof, I have hereunto
subscribed my name this 9th day of March,
1925.

JOSEPH SLEPIAN.

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