

Oct. 25, 1938.

A. PÜTZER

2,134,577

ELECTRODE SYSTEM

Filed July 22, 1937

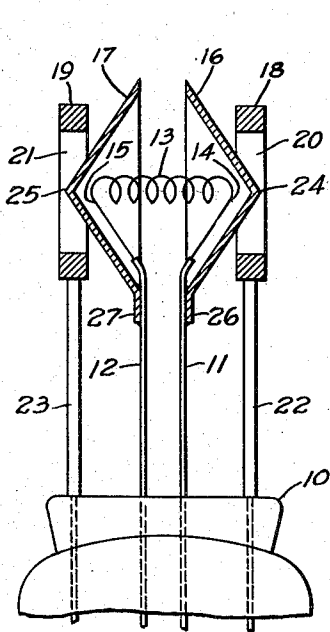


Fig. 1.

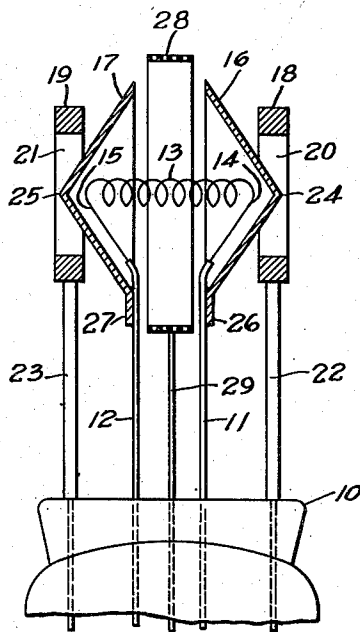


Fig. 2.

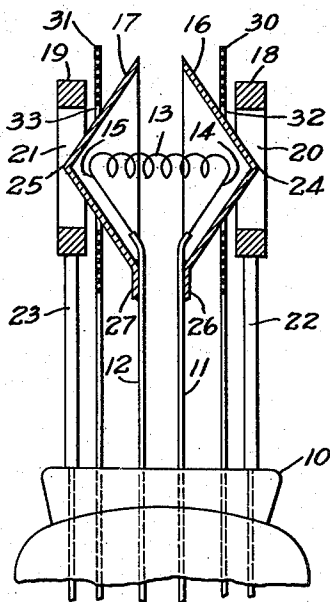


Fig. 3.

WITNESSES:

Michael Stark
RW Bailey

INVENTOR

Alfred Putzer

BY

F. W. Lytle
ATTORNEY

UNITED STATES PATENT OFFICE

2,134,577

ELECTRODE SYSTEM

Alfred Pützer, Berlin-Spandau, Germany, assignor to Siemens & Halske Aktiengesellschaft, Siemensstadt, near Berlin, Germany, a corporation of Germany

Application July 22, 1937, Serial No. 154,952
In Germany July 23, 1936

5 Claims. (Cl. 250—27.5)

The invention relates to discharge devices and especially to such devices utilizing a hot cathode.

An object of the invention is to conserve heat energy applied to a hot cathode of a discharge device.

Another object of the invention is to prevent back-fires in hot cathode devices.

Other objects and advantages of the invention will be apparent from the following description and drawing, in which:

Figure 1 is a view partly in cross section of a preferred embodiment of the invention, and

Figs. 2 and 3 are modifications of the invention disclosed in Fig. 1.

Specifically stated, the invention concerns the utilization of curved reflectors or shields or caps about the ends of a hot cathode for the purpose of conserving the heat and to provide a more uniform temperature throughout the length of the cathode. At the same time, the shields are located intermediate between the two main electrodes and back-fire from the anode or anodes to the cathode is prevented.

In Fig. 1, there is illustrated the usual press 10 which may be part of the well known glass container type of vessel, although in its broad aspects the invention is also applicable to devices with metal casings. On this press 10 are preferably standards 11 and 12 which act also as lead-ins for the cathode 13 of the hot or incandescent type. This cathode is an extended one and preferably is in the form of turns extending from one end 14 to the other end 15 where both are connected to the standards 11 and 12. About the ends 14 and 15 are placed curved shields or disks 16 and 17, preferably in conical shape. It is preferred to utilize two anodes 18 and 19 although the invention is applicable to a single pair of main electrodes. These anodes 18 and 19 are preferably annular rings with central openings 20 and 21 and these anodes are supported on the standards and leads 22 and 23. It is preferred to have the conical shields 16 and 17 located with their apexes 24 and 25 extending within the openings 20 and 21 of the anodes.

Inasmuch as the device is particularly adapted to gas or vapor filled devices, such as the noble gases or mercury vapor, it is preferred to locate the reflectors or shields 16 and 17 within the mean free path distance of their respective anodes 18 and 19, in order that there may be no discharge therebetween. The conical shields or reflectors 16, 17 are preferably supported directly upon the cathode standards 11 and 12 and may have a poor heat conducting connection thereto

at 26 and 27. Instead, the reflector shield may be made of poor heat conducting material. In any event, the shields are preferably very smooth on their surface and are preferably highly polished towards the cathode at least in order to reflect heat back to the turns.

It will be noted that the cathode will be prevented from radiating heat to the side walls of the tube, except for the small space between the two conical reflectors that is left for the passage of electrons to the anodes. Inasmuch as the shields are intermediate the anode and cathode, a direct back-fire from one to the other is likewise prevented.

In Fig. 2, there is disclosed a modification in which the control electrode 28 has been added preferably in the form of a mesh ring with its ring adjacent the edge of the two conical shields 16 and 17. This electrode may take other forms and be of a solid instead of a mesh construction supported on a lead-in standard 29.

In Fig. 3, there is disclosed a still further modification in which two control grids 30 and 31 are disclosed as hollow members preferably in a mesh form with central openings 32 and 33 placing them about the conical shields 16 and 17. In Fig. 3, the mesh of the grids lies in the electron path from the cathode 13 around the edges of the curved reflectors to the anodes. It will be noted that in the various figures, the standards and lead-ins can be located all in one plane on the press 10 and that the electrodes are axially aligned.

The reflectors prevent the cooling that would otherwise take place at the ends of the cathode due to radiation. Because the anodes are ring-shaped and the caps penetrate the rings, space is saved and the arrangement is easily mountable. By the ring-shaped construction of the anodes, their radiation surface is increased, their temperature is maintained lower and the danger of back-fire is decreased. No particle of cathode coating can be sputtered directly to the anode because of the shield.

The hot cathode is preferably a helix with a coating of good electron emissive material. The pitch of the helix may be made comparatively large since the temperature along the cathode is made uniform by the caps, and it is, therefore, not necessary to wind the helix narrow for the purpose of interradiation between turns. This is advantageous during the manufacture, and for gas filled discharge vessels it is desirable for the sake of attaining a better removal of the space charge.

While there has been shown preferred embodiments of the invention, it is apparent that many changes may be made in the shape, arrangement and number of the elements. Accordingly, it is desired that only such limitations be imposed on the following claims as is necessitated by the prior art.

I claim as my invention:

1. A discharge device comprising an annular anode, an incandescible cathode and a curved reflector around one end of said cathode and extending within said annular anode.
2. A discharge device comprising an annular anode, a cathode and a conical member having its apex extending within said annular anode and its edges around a portion of said cathode.
3. A discharge device comprising an anode hav-

ing an opening therethrough, a conical member having its apex extending within the opening in said anode, a cathode, said conical member having its edges around a portion of said cathode.

4. A discharge device comprising a cathode, anodes having openings therein and positioned adjacent the respective ends of said cathode and conical reflectors intermediate said anodes and said cathode and having their apexes within said anode openings.

5. A discharge device comprising an annular anode, an incandescible cathode, a curved reflector intermediate said cathode and said anode and an annular control electrode located in the discharge space between said anode and cathode.

ALFRED PÜTZER.