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TUBE HAVING A PLURALITY OF GRIDS

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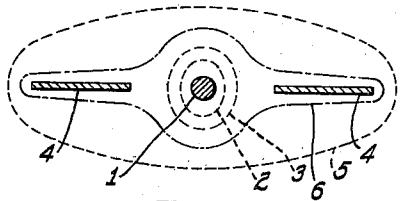


Fig. 1.

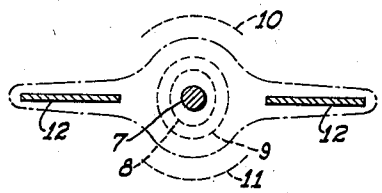


Fig. 2.

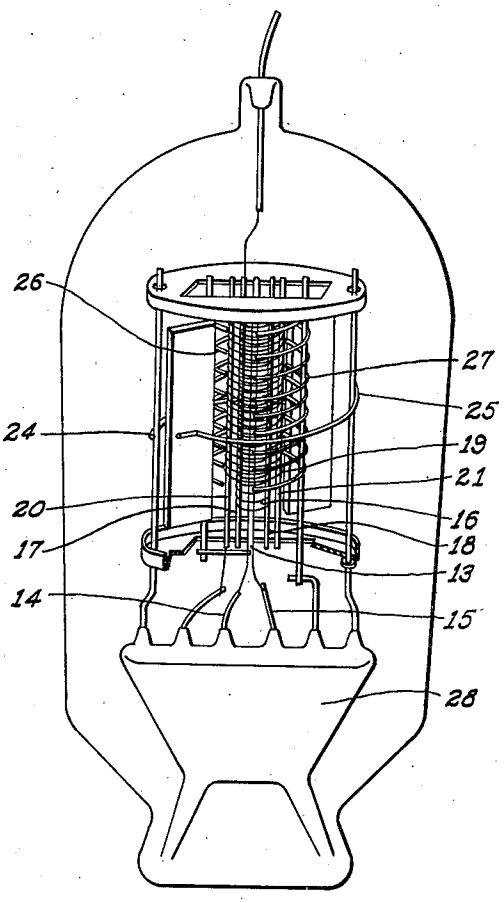


Fig. 3.

WITNESSES:

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TUBE HAVING A PLURALITY OF GRIDS

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1 Claim. (Cl. 250—27.5)

The invention relates to discharge tubes and especially such tubes with a plurality of grids including tubes having a screen grid therein.

An object of the invention is to prevent secondary emission as far as possible and to eliminate the effect of such secondary emission as may be present.

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

Figure 1 is a schematic cross section of the electrodes in a tube constructed according to the invention;

Fig 2 is a modification of Fig 1; and,

Fig 3 is a perspective view of a tube embodying the invention.

It is desirous that the characteristic curve representing the anode current as a function of the anode potential in discharge tubes be as far as possible horizontal to make possible a control extending to small values of anode potentials. In other words, it is desirous that the well-known bend in the characteristic curve be in the region of very low anode potentials. Secondary emission at the anode or at the grid has prevented this type of tube characteristic curve. In the region in which the anode potential is smaller than the screen grid potential, secondary electrons are released from the anode and drawn to the screen grid. This results in a very rapid drop in the characteristic curve of the tube, and the bend point, which is the measure of the extent of the control, is projected into the region of higher anode potentials. When smaller anode potentials are utilized, there are then too large distortions in the output potential. If the anode potential is larger than the applied screen grid potential, then the anode current rises at the expense of the screen grid current, weakened by secondary emission. The secondary screen currents make the characteristic curve more steep instead of horizontal. The strength of the secondary emission also fluctuates with the life of the tube and the constants of the tube are thus varied.

Another disadvantage of the tube of the usual structure consists in the fact that the hot anodes heat up the control grids and excite these control grids to thermionic emission of electrons, especially in the case in which the ordinary excited coated cathodes are utilized.

Various attempts heretofore made to suppress the desired phenomena of secondary electron emission involved complicating the electrode structure by additional members, domes, lugs and other auxiliary arrangements.

By the present invention, the disadvantages heretofore mentioned are overcome in a very simple manner. According to the invention, the anode, or anodes, in the tube consists of one or more plates arranged in a radial direction. By this arrangement, the heat produced at the anode is projected to the grid only to a small extent, thus distinguishing clearly from the case in which anodes either wholly or in part enclose the other electrodes and project their heat into the discharge space.

In Figure 1 is disclosed schematically the electrode system of a tube according to the invention. The cathole **1**, which may be heated directly or indirectly, is enclosed by a control grid **2**, and the latter is enclosed by a screen grid **3**. The radially arranged anode sheets **4** are disclosed on two opposite sides of the cathode, although more or less members could be utilized and spaced as desired about the cathode. The whole electrode system is preferably enclosed by a screen **5**. The function of the screen is to keep scattered electrons away from the glass walls and finally to influence the form of the equipotential lines in a desired manner. This screen is preferably maintained at a constant potential that is lower than the anode potential. To explain the course of the field, an equipotential **6** is shown dotted.

Fig. 2 discloses a similar tube. Here also the cathode **7** is enclosed by a control grid **8** and a screen grid **9**. The screen **10** or **11**, which, as disclosed in the drawing, may be at cathode potential, preferably encloses the electrode system only in part and leaves open the region around the two anode plates **12**.

A preferred mechanical structure of a tube according to Fig. 2 is disclosed in Fig. 3 in perspective. The cathode **13** is directly heated and has current leads **14** and **15**. The control grid **16** enclosing the cathode is supported by the supports **17** and **18**. The screen grid **19** is located around the control grid and is carried by supports **20** and **21**. The two anode plates are supported by the bars **24** and **25**. The screens **26** and **27**, which are preferably maintained at cathode potential, can also be seen in the figure, enclosing the electrode structure except for the anode plates. All the supporting wires are fused into the press **28**.

The heat radiation from the anodes or anode members takes place in such a direction that disadvantageous effects are not produced by this

heat, such as the secondary electron emission of the grids previously mentioned. It is accordingly possible to increase the anode power loss far above the usual value and even to heat the anode sheets to such an extent that they glow during operation. As a material for the sheets, either molybdenum or tantalum may be selected.

The electric field around the electrodes assumes such a form that the secondary electrons formed at the anode are released therefrom only with difficulty or not at all. The configuration of the potential field becomes more propitious when the screen enclosing the whole electrode system is maintained at a fixed potential, as for example ground potential. This screen need not completely enclose the electrode system, as disclosed in Figs. 2 and 3.

The application of the invention is not limited to tubes which have the number of electrodes illustrated in the drawing. In particular, a large number of anode plates, control grids, or also a space discharge grid may be provided. In fact, many modifications may be made in the form and arrangement of the elements disclosed, and accordingly, the following claim is not to be limited except as is necessitated by the prior art.

I claim as my invention:

A discharge device comprising a cathode, a control grid enclosing said cathode and concentric thereto, an anode comprising at least two plates mounted in a radial direction to said cathode, and a screen enclosing approximately the discharge space between the inner ends of said anode plates but not the plates.

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