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G. F. BRETT
ELECTRON DISCHARGE DEVICE
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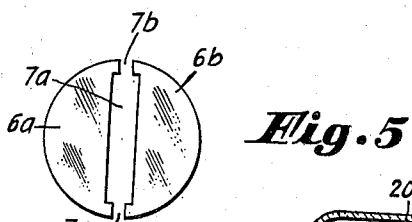
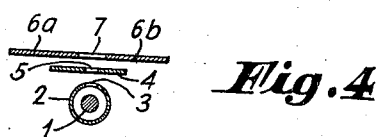
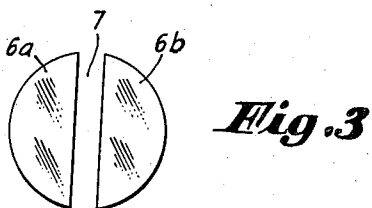
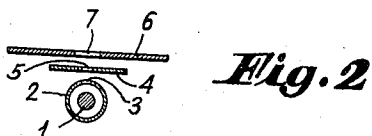
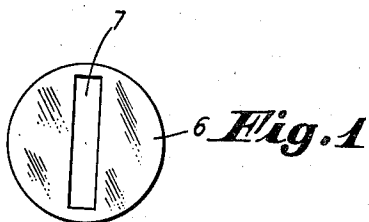
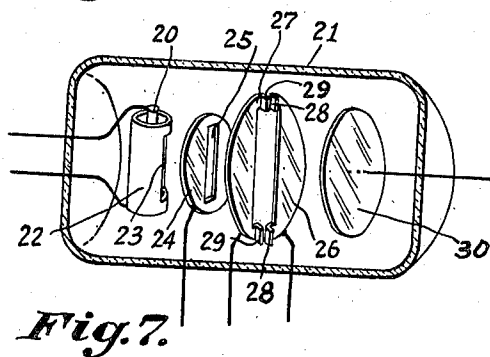
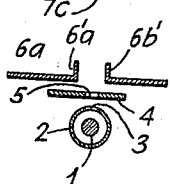


Fig. 6.



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ELECTRON DISCHARGE DEVICE

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4 Claims. (Cl. 250—27.5)

This invention which is for improvements in or modifications of the invention contained in the British patent specification No. 403,973, relates to electron discharge devices and more particularly to electron discharge devices of the type now becoming known as "electron beam valves," that is to say, to devices wherein the electron discharge takes place in the form of a thick high speed jet, ribbon, or beam of electrons rather than of a mere electron stream, the said discharge accordingly partaking more of the nature of that which takes place in a cathode ray tube than of the nature of that which takes place in an ordinary thermionic valve as at present in common use.

The object of the present invention is to provide electron beam valves wherein auxiliary or deflector control of the electron beam is possible and which shall be such that the general design need not be materially different—i. e. the general construction need not materially differ—from that of electron beam valves of at present ordinary design.

According to this invention an electron beam valve has an apertured suppressor electrode of normal configuration but which is, however, subdivided into a plurality of portions electrically insulated from one another so that the said portions may be given different potentials and thus used also for electron beam deflection purposes.

The invention is illustrated in and further explained in connection with the accompanying drawing in which—

Fig. 1 shows a front view of a gun arrangement.

Fig. 2 is a view of a gun arrangement.

Fig. 3 is a suppressor arrangement.

Fig. 4 is another schematic gun arrangement.

Fig. 5 is a suppressor grid arrangement, and

Fig. 6 shows still a further gun arrangement.

Fig. 7 is a view of a tube in accordance with my invention.

Referring first to Figs. 1 and 2 these figures, which are provided for purposes of explanation illustrate the electron gun system and the suppressor electrode of an electron beam valve which is not in accordance with the invention. Fig. 2 shows the gun system and suppressor electrode in sectional elevation, and Fig. 1 is a plan view of the suppressor electrode. The collector electrode is not shown. The electron gun system of Fig. 2 comprises a rectilinear cathode 1 which may be directly or indirectly heated and which is axially situated within a control electrode or grid in the form of a cylinder 2 having a slot or split 3 run-

ning parallel to the cathode axis. This concentric grid and cathode structure is placed immediately behind a slotted accelerator anode 4 of plate like form, the slot 5 therein running parallel to and being approximately of the same length and width as the slot in the control electrode. Closely adjacent the accelerator anode 4 is a slotted suppressor electrode 6 having its slot 7 running parallel to the slots already mentioned but being generally slightly longer and of somewhat larger width. The arrangement is such that a narrow ribbon like beam of electrons can emerge from the cathode and pass in succession through the slots in the control electrode, accelerator electrode, and suppressor electrode, towards the collector anode which is suitably positioned to receive the beam. Figs. 3 and 4 show one way in which a construction as shown in Figs. 1 and 2 may be modified to be in accordance with this invention, Figs. 3 and 4 being views corresponding respectively with the views of Figs. 1 and 2. As will be seen from Figs. 3 and 4 the suppressor electrode, instead of being in the form of a simple apertured single piece plate is composed of two similar plate like portions 6a 6b each approximately semi-circular, each portion thus being of size and shape corresponding to one or other of the portions of the suppressor electrode 6 of Figs. 1 and 2 which are on either side of the slot 7 of the said figures. In other words, the suppressor electrode 6a 6b of Figs. 3 and 4 may be regarded as consisting of an apertured plate like the plate 6 of Figs. 1 and 2 except that it has been cut in two by extending the slot 7 to the opposite edges of the plate. The two portions 6a 6b of the suppressor electrode may be quite close together, for example, their adjacent edges may be about 1.5 mm. apart. Separate external electrode connections (not shown) may be provided to the two portions 6a 6b so that by applying a suitable potential difference between the said two portions a desired transverse field may be applied to the beam.

Owing to the short spacing between the two suppressor electrode portions 6a 6b quite considerable deflecting force can be developed with only a few volts between the said two portions, especially since, in general, the accelerator voltage in a practical valve will be only of the order of 100 volts or so.

If zero or negative potentials (in relation to the cathode) be applied to one or both portions 6a 6b of the suppressor electrode, the latter will still retain its two chief functions of acting as a screen and suppressing secondary electrons. In-

stead of providing separate external leads to the two suppressor portions, one portion may be permanently connected to the cathode either inside or outside the valve. The provision of separate leads is however preferred, for in that case negative potentials can be applied to both portions of the suppressor electrode which would in consequence impose practically zero load upon any potential system connected to it.

In carrying out this invention an electron beam valve may be provided with one or more collector electrodes of predetermined shape and disposition so selected as to secure a desired output current-input voltage law or laws, in part dependence upon the electron beam deflection produced in the valve.

By connecting together the portions of a divided suppressor electrode provided in accordance with this invention, the said portions may, of course, be caused to act together to constitute an ordinary suppressor electrode.

A sub-divided suppressor electrode provided in accordance with this invention so as to be capable of use for ray deflection control, is not necessarily of the simple divided disc or plate form shown in Figs. 3 and 4; for example, if desired, and as shown in Fig. 5 which shows an alternative form of divided suppressor in plan view, the two suppressor portions may be so shaped, that when assembled, the space between them is not uniform, but is less near the periphery than elsewhere; in other words the portions may be so shaped that the "slot" between the portions consists of a portion 7a of normal width terminated by portions 7b, 7c of reduced width. Again, as shown in Fig. 6, which illustrates in sectional elevation a further modification, those suppressor portion edges which face one another across the "slot" when the said portions are assembled, may be provided with short straight flanges 6a' 6b' extending in the direction of the collector (not shown) and substantially at right angles to the general plane of the suppressor electrode as a whole.

Although in the drawing, circular suppressor electrodes have been shown, it will be obvious that other shapes—e. g. rectangular—may be adopted.

Referring to Fig. 7, there is shown a tube in accordance with my invention. A cathode 20 is positioned in the envelope of the tube 21 within the modulating electrode 22 which is apertured at 23 so as to form the electrons emitted there-through into a beam formation. Positioned immediately adjacent the aperture and the element 23 is an accelerating anode 24 having an aperture 25 formed therein in line with the aperture 23. A suppressor electrode consisting of

two mutually insulated sections 26 and 27 is positioned with the sections thereof placed relatively to each other so as to form a slot there-between through which the beam formation may pass. The elements 26 and 27 have flanged edges as illustrated at 28 and 29, and which have been shown in cross-section in Fig. 6 as elements 6a' and 6b'. The suppressor electrode member sections 26 and 27 are positioned between the accelerating anode 24 and the collecting anode 30, the latter being positioned at the end of the tube remote from the cathode.

What I claim is:

1. A discharge tube of the electron beam type including a cathode, a control electrode and an anode, an additional electrode adapted to accelerate the electrons toward said anode, and a suppressor electrode positioned between said additional electrode and said anode, said suppressor electrode being formed of two separate portions between which the electrons are directed to said anode.

2. A discharge tube of the electron beam type comprising a cathode, a control electrode and an anode, an additional electrode adapted to accelerate the electrons in the direction of said anode, said control electrode and said accelerating electrode being apertured to admit the passage therethrough of an electron beam formation, and a suppressor electrode positioned between said additional electrode and said anode, said suppressor electrode being formed of separate planar portions between which the electrons are directed to said anode, the apertures of the control electrode and the additional electrode being in alignment with the space between the portions of the suppressor electrode.

3. An electron beam discharge tube comprising a cathode, a control electrode, an accelerating electrode, a suppressor electrode and an anode, said electrodes being positioned in the order named, said control electrode and said accelerating electrode being provided with aligned apertures through which electrons from the cathode are adapted to be directed whereby they may be collected by said anode, said suppressor electrode consisting of two spaced portions, the space between the portions being in alignment with the apertures in the accelerating electrode and the control electrode.

4. A discharge tube as defined in claim 3 wherein said suppressor electrode portions are provided with short flanges at the edges which face one another across the space therebetween, said flanges extending in the direction of said anode.

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