

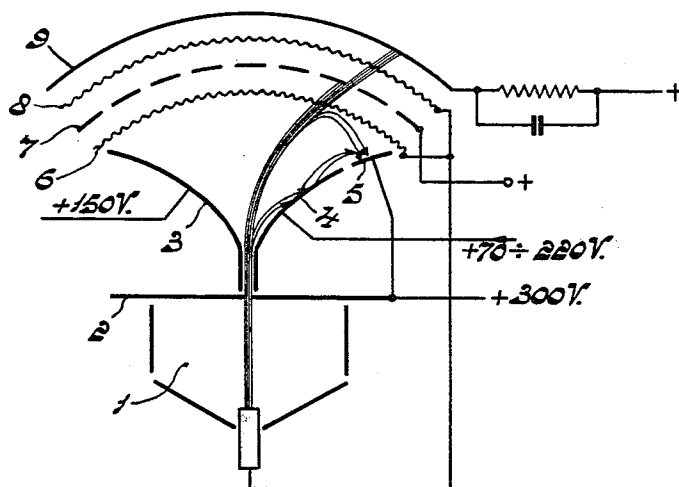
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K. RODENHUIS

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ELECTRON DISCHARGE DEVICE WITH DEFLECTION ELECTRODE

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INVENTOR
KLAAS RODENHUIS

BY *[Signature]*

AGENT

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ELECTRON DISCHARGE DEVICE WITH DEFLECTION ELECTRODE SYSTEM

Klaas Rodenhuis, Eindhoven, Netherlands, assignor to Hartford National Bank and Trust Company, Hartford, Conn., trustee

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3 Claims. (Cl. 315—17)

This invention relates to electric discharge tubes in which the electron beam is deflected by at least one deflection system, more particularly to tubes wherein the beam is band-shaped and the deflection system comprises deflection plates whose ends are bent away from each other, the deflection system being followed by an electrode maintained at a low potential or zero potential.

Deflection systems, notably those whose deflection plate ends remote from the cathode are bent away from each other and which are followed by an electrode which is maintained at a low potential or zero potential, suffer from the disadvantage that the primary electrons of the beam partly change their direction in front of the said electrode maintained on a low or zero potential and find their way to the deflection plates which then tend to carry current. This is particularly undesirable for a controlling deflection plate, since such a plate is connected to a control circuit so that the operation of the device is adversely affected.

The aforesaid phenomenon occurs more particularly at instants at which the controlling deflection plate is strongly positive so that the beam passes closely by it, and this phenomenon is still promoted by the fact that in this manner more stray electrons from the beam will find their way to the deflection plate.

According to the invention, these disadvantages are entirely obviated since in a device comprising an electric discharge tube whose electron beam is deflected to one or more collecting electrodes by means of at least two oppositely arranged deflection plates, of which at least one is supplied with the deflection control voltage and, viewed in the direction of travel of the electrons, an electrode maintained at a low or zero potential follows the said deflection system, at least one controlling deflection plate is subdivided into several parts by one or more slits extending at right angles to the direction of travel of the electrons, of which parts at least that nearest the said electrode maintained at a low or zero potential is supplied with a fixed positive voltage exceeding the highest positive voltage attained by the controlling parts of this deflection plate. In this manner it is achieved that if the beam is deflected in the direction of the controlling deflection plate, the primary electrons changing their direction in front of the zero-electrode are collected by that part of the deflection plate which is maintained at a high positive voltage. In addition, the advantage is obtained that the current produced by stray electrons in the controlling deflection plate parts can be neutralised, since the secondary electrons dislodged by said electrons from the said controlling parts also travel to the deflection plate parts maintained at a fixed potential. In the usual constructions, these secondary electrons return to the deflection plate, due to which the said compensation does not occur.

With unilateral deflection, so that only one of the deflection plates is connected to the controlling deflection voltage, preferably only the controlling deflection plate

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is subdivided, since a current carrying deflection plate maintained at a fixed potential is not objectionable.

In order that the invention may be readily carried into effect, an example will now be described in detail with reference to the accompanying drawing in which the sole figure shows an electron discharge device according to the invention. In the drawing, 1 designates an electron gun producing a band-shaped beam which emerges from the acceleration anode 2 and passes between the deflection plates 3 and 4, 5. To the deflection plate 3 a fixed positive voltage of, say, 150 volts is applied. The other deflection plate consists of two parts, of which part 4 is connected to the controlling deflection voltage which may, for example, vary between +80 and +220 volts. In this case, the deflection system is followed by a grid 6 maintained at a low or zero potential, a perforated positive electrode 7, a collecting grid 8 and an anode 9.

If the deflection voltage exceeds 150 volts the beam approaches nearer to the divided deflection plate 4, 5 than to plate 3. The electrons changing their direction in front of grid 6 now reach the plate 5, similarly to the secondary electrons dislodged from the plate 4 by stray electrons.

The invention is particularly effective if the deflection plates are bent away from each other at the end remote from the cathode, since then the part 5, maintained at a fixed high potential, of the controlling deflection plate has little influence on the direction of the beam.

With parallel deflection plates the influence of the part maintained at a fixed positive voltage may reach an undue value so that undesirable deviations of the beam may occur. The part maintained at a fixed positive potential will then be made as narrow as possible. This has, in turn, the disadvantage that the action of attraction of the returning electrons is reduced. The position and construction may, however, be made such that the returning electrons are substantially directed or focussed onto the said positive part of the control electrode. Furthermore, the deflection plates arranged opposite each other need not be of equal length. The parts maintained at a fixed potential may be considered to belong to a deflection plate if these parts practically constitute a natural extension of this deflection plate. As an alternative, the deflection plate 4, 5 may be subdivided into several parts and these parts may alternately be connected to the controlling voltage and a fixed positive voltage. If control voltages are applied to both deflection plates, both of them may advantageously be subdivided.

What I claim is:

1. An electron discharge device comprising means at one end to produce and project a flat ribbon-shaped electron beam along a given path, an anode disposed at the other end for receiving said beam, a grid electrode disposed on the side of said anode facing said beam producing means and in the path of said beam, a pair of similar outwardly flaring deflecting plates disposed between the grid electrode and the beam producing means and symmetrically arranged on opposite sides of the path of the electron beam, at least one of said deflecting plates comprising at least two electrically-insulated portions spaced apart by a slit-shaped aperture extending in a direction perpendicular to the path of the beam including one portion adjacent the grid electrode and another portion remote from the grid electrode, means to apply a relatively low potential to said grid electrode, means to apply a relatively high potential to said anode, means to apply a beam control potential including a maximum potential to at least said other portion of said one deflecting plate, and means to apply a fixed potential exceeding said maximum potential to said one portion of said deflecting plate, whereby electrons returned by the low potential on the grid are collected by said one portion of said one deflecting plate.

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2. An electron discharge device comprising means at one end to produce and project a flat ribbon-shaped electron beam along a given path, an anode disposed at the other end for receiving said beam, a grid electrode disposed on the side of said anode facing said beam producing means and in the path of said beam, a pair of similar outwardly flaring deflecting plates disposed between the grid electrode and the beam producing means and symmetrically arranged on opposite sides of the path of the electron beam, one of said deflecting plates comprising at least two electrically-insulated portions spaced apart by a slit-shaped aperture extending in a direction perpendicular to the path of the beam including one portion adjacent the grid electrode and another portion remote from the grid electrode, said one portion having a dimension parallel to the path of said beam substantially shorter than the corresponding dimension of said other portion, means to apply a relatively low potential to said grid electrode, means to apply a relatively high potential to said anode, means to apply a fixed potential to the other half of said deflecting plates, means to apply a beam control potential including a maximum potential to said other portion of said one deflecting plate, and means to apply a fixed potential exceeding said maximum potential to said one portion of said one deflecting plate, whereby electrons returned by the low potential on the grid are collected by said one portion of said one deflecting plate.

3. An electron discharge device comprising means at one end to produce and project a flat ribbon-shaped electron beam along a given path, an anode disposed at the other end for receiving said beam, a grid electrode disposed on the side of said anode facing said beam pro-

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ducing means and in the path of said beam, a pair of similarly outwardly flaring deflecting plates disposed between the grid electrode and the beam producing means and symmetrically arranged on opposite sides of the path of the electron beam, one of said deflecting plates comprising two electrically-insulated portions spaced apart by a slit-shaped aperture extending in a direction perpendicular to the path of the beam including one portion adjacent the grid electrode and another portion remote from the grid electrode, said two portions of said one deflecting plate constituting jointly the counterpart of the other of said deflecting plates, means to apply a zero potential to said grid electrode, means to apply a relatively high potential to said anode, means to apply a fixed potential to said other deflecting plate, means to apply a varying beam control potential including a maximum potential to said other portion of said one deflecting plate, and means to apply a fixed potential exceeding said maximum potential to said one portion of said one deflecting plate adjacent said grid electrode, whereby electrons returned by the low potential on the grid are collected by said one portion of said one deflecting plate.

References Cited in the file of this patent

UNITED STATES PATENTS

2,069,460	Ogloblinsky	Feb. 2, 1937
2,076,086	Ladner	Apr. 6, 1937
2,139,854	Ruska	Dec. 13, 1938
2,159,818	Plaistowe et al.	May 23, 1939
2,236,860	Van Overbeek	Apr. 1, 1941
2,273,546	Van Weel	Feb. 17, 1942
2,553,735	Adler	May 22, 1951