Aug. 29, 1939. M. S. GLASS ET AL 2,170,944

MULTICATHODE RAY DISCHARGE DEVICE

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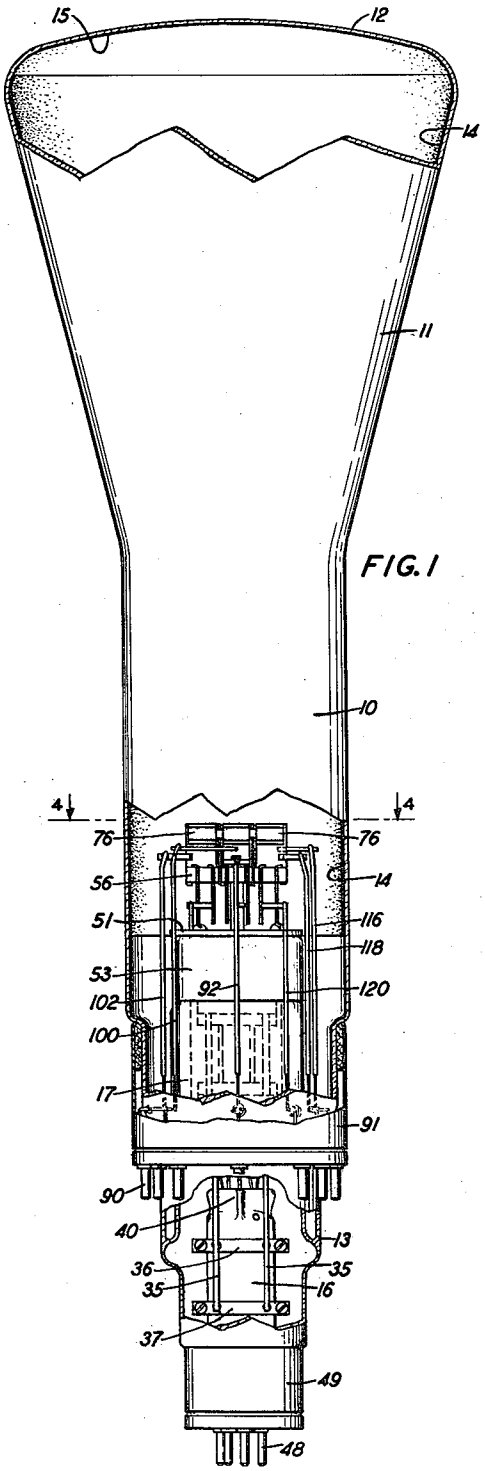

FIG. 1

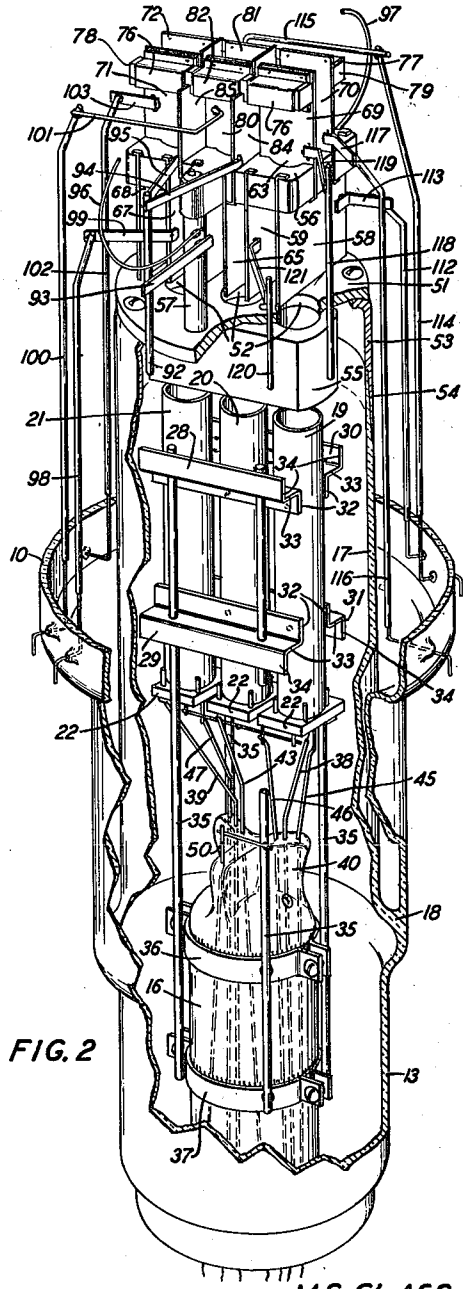

FIG. 2

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FIG. 3

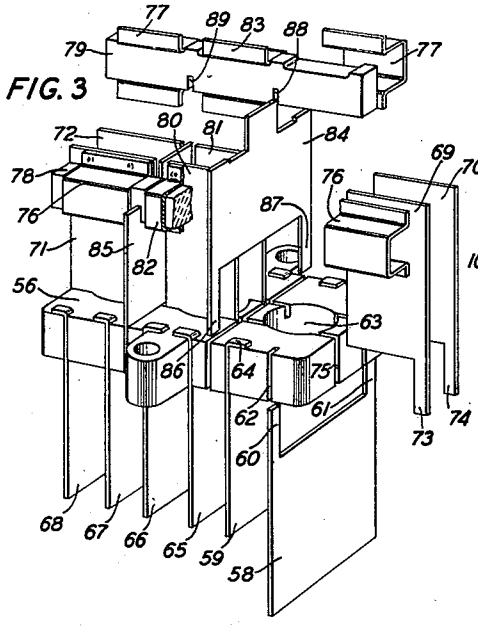


FIG. 4

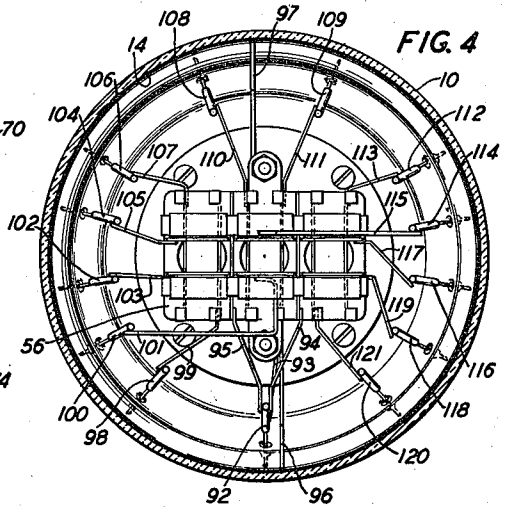


FIG. 5

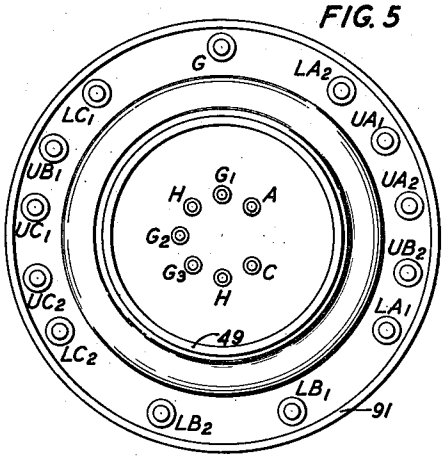


FIG. 6

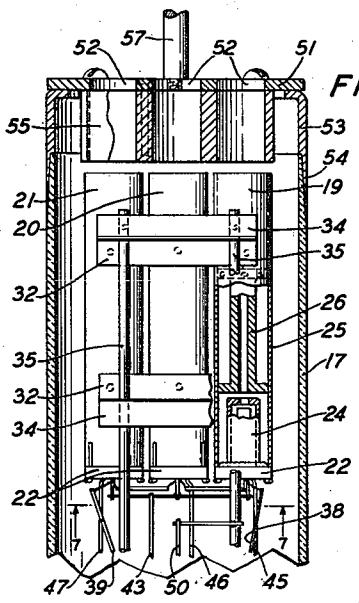


FIG. 7

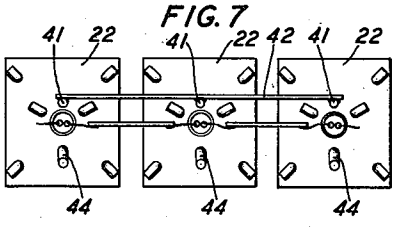
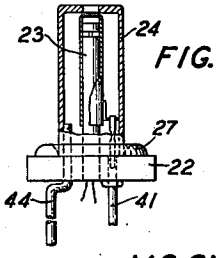


FIG. 8



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Patented Aug. 29, 1939 2,170,944

UNITED STATES PATENT OFFICE

2,170,944

MULTICATHODE RAY DISCHARGE DEVICE

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Application May 29, 1937, Serial No. 145,432

20 Claims. (Cl. 250—150)

This invention relates to multi-cathode ray discharge devices and more particularly to such devices for reproducing different phases of electrical phenomena or for providing multiple scanning beams for television purposes.

In the operation of cathode ray devices of the multi-unit type, it is advantageous to coordinate the cathode streams on the screen or other reproducing surface without distortion so that various aspects of the same or different phenomena may be accurately interpreted. In order to secure such distortionless operation it is essential to segregate the respective units and shield the individual streams against interaction in their travel to the screen which might influence the effect produced on the screen.

An object of this invention is to assemble the multi-unit system of a cathode ray discharge device in such a manner that distortion effects are substantially eliminated.

Another object of the invention is to fabricate the multi-unit system of such a device as a compact unitary structure so that it is rigidly maintained in position in the device.

In accordance with this invention a plurality of electron gun units are consolidated into a rigid unitary structure supported from a stem and are provided with a common accelerating electrode which sets up a uniform and identical field for each stream of electrons projected toward the screen of the device. The accelerating electrode also serves as a supporting base for a deflector plate unit for each gun unit to insure symmetrical alignment of the plates with respect to the gun units. The several sets of plates are electrically independent, in so far as they affect the adjacent electronic streams, since, in accordance with this invention, shields are interposed between the adjacent sets to avoid distortion of the streams or inefficient control in each deflector plate unit.

A feature of the invention relates to the rigid alignment of the several electron producing gun units as a consolidated assembly to insure that the beams will be in paraxial relation toward the screen on the end of the device. This is accomplished by joining the units together by connecting members which are attached to supports extending from a stem of the tube. This arrangement overcomes mechanical strains on the various conductors extending through the press of the stem which supply the voltages to the aggregation of elements comprising the plurality of electron gun assemblies and also avoids misalignment of the units due to mechanical stresses.

Another feature of the invention relates to the construction of the accelerating electrode assembly to insure efficient and collateral acceleration of the electron beams emerging from the electron guns. This assembly comprises a common metallic member having apertures corresponding to and aligned with the anodes of the electron gun units, which is secured to a tubular member supported on an extension of the vessel concentric with the stem and exterior wall of the device. This arrangement insures an accelerating field of equal magnitude for all the streams of electrons being projected toward the screen of the device and increases the efficiency of transmission by providing a field of uniform strength by virtue of the shielding effect of the tubular member.

A further feature relates to the rigid and compact assembly of the deflector plate unit and comprises a supporting member superimposed on the common accelerating member, which is provided with slots to receive the different pairs of transverse deflector plates to maintain them in uniform and cooperative relation to the electron passages in the accelerating electrode assembly. The main deflector plates depend from the supporting member, while the sweep or time-axis plates extend above the supporting member. The latter plates are accurately aligned in coplanar relation by connecting bars which are interlocked with transverse shielding plates located intermediate adjacent sets of sweep plates. These shields define the boundaries between the different streams projected toward the screen and avoid interaction between the streams in the vicinity of the deflecting electrodes where distortion is apt to occur. The interlocking arrangement of the plates insures a rigid and stable assembly which overcomes distortion caused by mechanical variations in spacing of the plates.

These and other features of the invention will be more clearly understood from the following description when considered with the accompanying drawings:

Fig. 1 represents a complete embodiment of the invention with different portions of the glass vessel broken away to show the internal assembly and relation of the multi-cathode stream electrode unit;

Fig. 2 is an enlarged perspective view of the electrode unit of this invention showing the detail assembly with respect to the portions of the vessel which are shown in broken lines in order to more clearly illustrate the structural elements of the assembly;

Fig. 3 is an enlarged perspective view of the deflector plate assembly, shown partly in exploded

fashion, to illustrate the detail components of the assembly;

Fig. 4 is a plan view of the position of the electrode assembly in the vessel and the various conductors of the electrodes and represents a view taken on the line 4—4 of Fig. 1;

Fig. 5 is a plan view of the terminals on the bases of the device shown in Fig. 1 in which the outer terminals accommodate the conductors shown in Fig. 4;

Fig. 6 is an enlarged view in elevation showing, partly in section, the gun assembly and the accelerating electrode.

Fig. 7 is a plan view of the mounting of the gun assembly taken on the line 7—7 of Fig. 6 and showing the connections to certain elements thereof; and

Fig. 8 shows in elevation the detail structure of a portion of one of the gun units of Fig. 6.

Referring to the drawings and Figs. 1 and 2 specifically, one embodiment of the invention is shown as applied to a tube organization for the production of multiple streams of electrons which impinge upon a fluorescent screen on the end of the vessel for visual observation, or for purposes of making a permanent record of the phenomena reproduced, for instance, by contact exposure of a photographic film.

The device, as shown in Fig. 1, embodies a highly evacuated enclosing vessel of glass having a cylindrical body portion 10, a conical projection portion 11 which terminates in a large diameter dome portion 12 and an extension portion 13 forming a continuation of the body portion 10. The cylindrical portion 10 and the conical portion 11 are provided with an interior coating 14, preferably of a conductive substance, such as graphite, which is applied to the walls of the tube as a colloidal mixture and dried thereon. The dome portion of the vessel 12 is provided with a fluorescent coating 15, such as willemite, calcium tungstate, zinc silicate, or mixtures thereof, or any other suitable fluorescent substance or composition. The extreme end of the tubular extension 13 is provided with a reentrant stem 16 and also provided with a coextensive but longer inner tubular wall 17 which is joined to the extension 13 at the point 18 and extends into the tubular portion 10 of the enclosing vessel. The tubular wall 17 and the stem 16 provide an axial chamber at one end of the device for mounting the electron gun unit of this invention so that the multiple beams or streams therefrom are projected in paraxial relation toward the screen 15 on the opposite end of the device.

In Fig. 2 is shown three parallel gun units 19, 20 and 21. Each unit comprises a platform 22 in the center of which is mounted a cylindrical heater type cathode 23 surrounded by a cup-shaped modulating or control electrode 24, as shown in Fig. 8, which is surrounded by an elongated tubular anode or focusing electrode 25 having an internal collimating element 26 spaced from the control electrode, as shown in Fig. 6. The anode 25 and the collimating element 26 have passageways that are coaxially aligned with an aperture in the control electrode 24 by the integral convex abutment 27 on the platform 22. These combined elements on the platform 22 form the electron gun unit and each unit is identical in structure. The dimensional configuration, spacing and functional operation of the electron gun unit above described is more clearly set forth in U. S. Patent 2,139,678, issued December 13, 1938, to M. S. Glass.

The three gun units are assembled as a consolidated structure by joining them together with transverse connecting members 28, 29, 30 and 31 having inner flange portions 32 welded to points on the cylindrical surfaces of the anodes of the guns, a shelf portion 33 extending outwardly from the inner flange and an outer flange portion 34 extending parallel with the inner flange, but in a reverse direction. The connecting members are attached to the gun units in pairs on opposite diametrical points of the anodes with the upper pair having the outer flanges extending in parallel relation toward the terminations of the gun units, while the lower pair have the outer flange portion extending downwardly toward the platform 22 of the gun units. The consolidated gun unit is mounted in the chamber portion of the vessel, as shown in Fig. 2, with the axis of the center gun unit coextensive with the axis of the chamber and the axes of the outer units in paraxial relation to the axis of the chamber. This relationship is insured by a rigid supporting structure involving four straight rods 35 which extend in parallel relation from two collars 36 and 37 embracing the stem 16, the rods projecting through the shelf portions 33 of the connecting members and being welded to the flange portions 34 thereof. The difference in diameters between the gun units and the stem is compensated by the wide shelf portions of the connecting members so that the units are under no mechanical strains which might affect their paraxial relationship with respect to the chamber axis. Furthermore, the stem supporting arrangement for the gun assembly overcomes the necessity of relying on the leading-in conductors of the various units for supporting the assembly and, therefore, these conductors are relieved of stresses which might cause fracture at the sealing-in points thereof, or cause a slight change in space relation of the electrodes to which they are attached.

The various electrodes of the gun unit are attached to the leading-in conductors of the tube, as shown in Figs. 2, 7 and 8, collectively, in which the heater elements of the cathode 23 may be connected in parallel or in series, as shown in Fig. 7, and joined to conductors 38 and 39 which are sealed in the arms of a press 40 formed on the inwardly extending stem 16. The cathodes 23 are connected to short extensions 41 which may be joined by a wire strap 42 and connected in parallel to a conductor 43 which extends through the press 40. If desirable the cathodes may be connected in parallel relation. The control electrodes 24 are connected to stub wires 44 and these wires are connected to separate leading-in conductors 45, 46 and 47, respectively, which are also sealed in the press 40. All the conductors extend through the stem and are joined to terminal pins 48 on a base 49 cemented to the end of the tubular extension 13 of the enclosing vessel. A leading-in conductor 50 in the press 40 is connected by a strap to one of the straight rods 35 and since these rods are electrically connected with the anode 25 of each gun unit, a suitable potential may be applied thereto through this conductor. The terminals 48 on the base 49 are shown in Fig. 5 and arranged in a counterclockwise direction with designations corresponding to the various electrodes so that the leading-in conductors passing through the

stem 16 do not cross one another and thereby cause difficulty in the operation of the device. The common anode terminal A is connected to the leading-in conductor 50, G_1 is connected to conductor 45, H is connected to one of the heater conductors 38, G_2 is connected to the conductor 46, G_3 is connected to conductor 47, H is connected to the other conductor 38 of the heater elements and C is connected to the common cathode conductor 43.

The chamber in which the gun units are located is provided with a closure member or disc 51 having three apertures 52 having the same diameter. The apertures are coincident with the hollow openings of the gun units 19, 20 and 21. This closure member is secured to the chamber wall 17 by a metallic sleeve 53 which is hermetically sealed to the glass by a knife edge seal 54. The closure member 51 is placed adjacent the exit of the electron guns to serve as an accelerating electrode and increase the velocity of the electron beams passing through it. In order to accelerate the electron beams passing through the disc 51, a suitable high positive potential is applied thereto and since this potential is also applied to the shield or sleeve member 53, it has been found that when the disc 51 is widely spaced with respect to the ends of the electron gun units, difficulty is experienced with the electron beams in the end units 19 and 21, due to the attracting field of the shield 53. This causes considerable distortion of the paths and of the focus of the beams in the end units. This difficulty can be avoided by inserting a metallic mass or other lengthening member 55 between the disc 51 and the ends of the electron gun units, the mass having passageways corresponding to the apertures 52 in the accelerating disc electrode 51 and the ends of the anodes of the gun units. This arrangement provides uniform and identical field relations for the three gun units so that the electron beams emanating from the guns extend in paraxial relation through the mass 55 and the accelerating electrode 51.

While this arrangement is satisfactory in the construction shown, the mass is not essential in the embodiment of the invention since the same effect may be secured by extending the tubular members of the gun units up to a position near the accelerating disc 51, but retaining the short space relation between the gun units and the disc 51 in the same manner as shown in Fig. 6, in which the space relationship is shown between the gun units and the end of the mass 55. The assembly of the gun units and the common accelerating electrode in combination with the chamber wherein the electron beams are originated provide an organization in which the rigidity of the electrode elements is assured and the protected arrangement of the gun units in the chamber insures parallel beams of high intensity and efficiency so that all phases of electrical phenomena depicted on the screen 15 will be of equal intensity so that the indications will have a high actinic value and accurate recording may be made of the complex figures produced thereon.

While the multi-unit assembly may find application in a large field such as television, electromedical investigation and in aircraft for radio beam indicators, there is also a large field of use for service equipment and laboratory measurement in which it is desirable to sweep the various beams over the whole area of the fluorescent screen simultaneously to reproduce different phases of electrical phenomena. In the latter field it is essential to provide deflecting elements, preferably in the device, and the prevalent custom is to produce this deflection by electrostatic influence. This is produced most efficiently by suitable deflector plates arranged laterally with respect to the electron beams projected toward the screen of the device.

In accordance with this invention, all the electron beams are electrostatically controlled by a deflector plate unit which is rigidly mounted beyond the accelerating electrode 51 and is secured to the disc in such a manner that a compact and rigidly assembled structure is provided. Furthermore, this assembly also includes separating shields between adjacent sets of deflector plates to prevent distortion of adjacent beams, yet at the same time permitting the beams to sweep the complete area of the screen at the end of the vessel.

This is accomplished in accordance with this invention by mounting an insulating platform 56 above the accelerating disc electrode 51 and connecting the platform to the disc by posts 57 arranged at diametrical points. The platform 56 is provided with three apertures corresponding to the apertures 52 in the accelerating electrode 51 and the gun units 19, 20 and 21, and a plurality of bisecting slots on opposite surfaces to form guides for the various sets of plates attached to the platform. Reference is made to Fig. 3 in describing the assembly of the deflector plate unit in which the main deflector plates are shown depending from the platform 56 while the sweep or time-axis plates are shown extending above the platform. This relationship is not essential in the operation of the device since the same effect may be secured by reversing the positions of the plates with respect to the gun units. All the depending deflector plates are of the same construction except that they are arranged in different sets, but all in parallel relation. Plates 58 and 59 are provided with end extensions 60 and 61 which extend through end slots 62 and a longitudinal slot on the bottom surface of the platform 56 to rigidly position the plates with respect to the aperture 63 in the platform, the ends of the extensions being bent over as shown at 64. Plates 65 and 66 are arranged adjacent the center aperture in the platform and similarly attached to the platform while the plates 67 and 68 are arranged adjacent the third aperture in the platform and have their extensions bent over the top of the platform in a direction opposite to that of plates 58 and 59. The slots in the platform and the extensions on the plates insure rigid positioning of the plates and uniform parallel relation with respect to the axis passing through each aperture 63 in the platform.

The sweep or time-axis plates projecting above the platform are mounted in a slightly different manner from the lower plates to insure a rigid construction and avoid conduction between the various sets of plates. The end plates 69, 70, 71 and 72 are of similar construction, but are arranged in parallel coplanar relation above the platform 56 in transverse position with respect to the lower corresponding sets of plates. These plates are provided with extensions 73 and 74 which fit into end slots 75 in the platform 56 while the lower edges of the plates fit in slots which are formed across the outer boundary of the aperture 63, the ends of the extensions being bent over on the lower surface of the platform

to rigidly secure the plates in position. These plates are also provided with channel extensions 76 and 77 on the outer surfaces thereof to engage portions of a pair of locking bars 78 and 79, of insulating material, which are provided with undercut portions corresponding to the length of the channel extensions 76 and 77. The center plates 80 and 81 are not provided with extensions similar to the end plates 69 and 72, inclusive, since these extensions would make contact with the lower center plates 65 and 66. Therefore, the center plates are supported in parallel relation by being interconnected with the end plates by channel extensions 82 and 83, which embrace the locking bars 78 and 79. The lower edges of the plates 80 and 81 are arranged in guiding slots on opposite sides of the center aperture. It is evident that these plates are thus rigidly secured to the platform 56. The upper plate assemblies are further strengthened by shielding plates 84 and 85 which are arranged between adjacent parts of upper deflector plates and are provided with extensions 86 and 87 which register with side slots in the platform 56 and are locked in position at their lower ends by bending over the ends of the extensions on the lower surface of the platform. The shielding plates are further provided with undercut portions which register with slots 88 and 89 in the locking bars to insure constant spacing between the coplanar sweep plates and also to provide a compact interlocking arrangement of the various sets of plates and shields without endangering the individual sets of plates and at the same time avoid distortion between adjacent electron beams projected through the various sets of plates. This arrangement insures a rigid and compact assembly in which the various plates are maintained in their proper spacial relation with respect to each other and with respect to the electron streams passing between them. Furthermore, the rigid assembly of the deflector plate unit from the rigid chamber structure of the tube insures accurate alignment of the deflector plates with respect to the gun units mounted within the chamber.

Each of the deflector plates is provided with a terminal conductor in order to apply appropriate potentials to the different sets of plates to influence the electron beams passing through the passageways formed thereby. In order to correlate the conductors leading to the various deflector plates, said plates are designated as sets, i. e., plates 58 and 59 being designated the lower plates of "A" set, while plates 69 and 70 are the upper plates of "A" set, the similar plates of the center set being the "B" set, while the last plates 67, 68, 71 and 72 constitute the "C" set. With these designations it is believed that the connections of the appropriate terminals 90, shown on a base 91, in Fig. 1, to the deflector plate conductors can be followed more clearly from the following description. Fig. 5 shows the terminals 90 in positive relation with respect to the radial conductors of the deflector plates shown in Fig. 4.

The terminals shown on base 91 in Fig. 5 are provided for the twelve individual deflector plates mounted in the vessel and also for the application of a suitable potential to the accelerating electrode 51 and the conductive coating 14 on the interior wall of the cylindrical and conical portions 10 and 11, respectively, of the vessel. These terminals are connected to the various elements in the following manner, the description progressing in a counter-clockwise direction beginning with terminal G. This terminal is connected to conductor 92 which is sealed at one end through the wall of the vessel and connected to one of the posts 57 by a strap 93. This conductor is also connected to the shield plates 84 and 85 by additional straps 94 and 95. The posts 57 supporting the deflector plate unit are also provided with curved springs 96 and 97 which engage the graphite coating 14 on the interior wall of the vessel. In this arrangement the accelerating electrode 51 and the conductive coating 14 may be supplied with a high positive potential to accelerate the electrons in the beams passing through the various units and at the same time a ground connection may be connected to this terminal in order that the shields 84 and 85 may be grounded and to avoid the effect of a large difference of potential between the accelerating electrode and the adjacent deflector plates with respect to ground potential. Terminal LC_1 is connected to conductor 98, sealed through the wall of the vessel at one end and connected by a strap 99 to lower plate 67 of the "C" set of deflector plates. Terminal UB_1 is connected to conductor 100 and joined by a connecting wire 101 to the first upper plate 80 of the "B" set of plates. Terminal UC_1 is connected to conductor 102 which is joined by a strap 103 to the first upper plate 71 of the "C" set of plates, while terminal UC_2 is connected to conductor 104 having a strap 105 connected to the upper second plate 72 of the "C" set of plates. Terminal LC_2 is connected to conductor 106 which is joined to a strap 107 connected to the second lower plate 68 of the "C" set of plates and terminals LB_2 and LB_1 are connected to conductors 108 and 109 which are joined by straps 110 and 111 to the lower plates 66 and 65, respectively, of the "B" set of plates. Terminal LA_1 is connected to conductor 112 which is attached to a strap 113 joined to the first lower plate 58 of the "A" set of plates. Terminal UB_2 is connected to conductor 114 which carries a strap 115 joined to the upper second plate 81 of the "B" set of plates. Terminal UA_2 is connected to conductor 116 having a strap 117 connected to the second upper plate 70 of the "A" set of plates, terminal UA_1 is connected to conductor 118 having a strap 119 attached to the first upper plate 69 of the "A" set of plates, and terminal LA_2 is connected to conductor 120 having a strap 121 attached to the second lower plate 59 of the "A" set of plates. This arrangement insures adequate insulation resistance between all the various conductors for the deflector plates and provides a separate terminal for applying suitable potentials to the various deflector plates either in combination or individually to influence the various electron beams passing between the plates.

While the device herein described may contain all the features enumerated, it is to be understood that the invention is not limited to such a specific combination, since under certain operating conditions certain features may be omitted without departing from the scope of the invention. For instance, in television devices the screen may be omitted if the invention is to be employed as a multiple beam device. Similarly, in other fields of operation the deflector plates may be omitted. Therefore, in accordance with this invention it is to be understood that the disclosure is only to be limited within the scope of the appended claims.

What is claimed is:

1. A multi-beam projection device comprising an enclosing vessel having a cylindrical reentrant portion forming an internal chamber, a plurality

of beam producing units arranged in parallel relation in said chamber, a metallic electrode common to all said beam producing units in cooperative relation to said chamber and said units, sets of deflector plates arranged in transverse pairs individual to each beam producing unit, and means supporting said sets of plates from said metallic electrode.

2. A multi-beam projection device comprising an enclosing vessel having a cylindrical reentrant portion forming an internal chamber, a plurality of beam producing units arranged in parallel relation in said chamber, a metallic electrode common to all said beam producing units in cooperative relation thereto, sets of plates arranged in transverse pairs individual to each beam producing unit, a support for said plates carried by said metallic electrode, and shielding means between the aligned edges of adjacent sets of said plates.

3. A multi-beam projection device comprising an enclosing vessel having a cylindrical reentrant portion forming an internal chamber, a plurality of beam producing units arranged in parallel relation in said chamber, a metallic electrode common to all of said beam producing units in cooperative relation thereto, and a tubular shielding extension superimposed on said reentrant portion and forming a support for said metallic electrode.

4. A multi-beam projection device comprising an enclosing vessel having a cylindrical reentrant portion forming an internal chamber adjacent one end of said vessel, a plurality of beam producing units arranged in parallel relation in said chamber for projecting colateral beams toward the opposite end of said vessel, a set of deflector plates adjacent each corresponding unit, and means supported by said reentrant portion and interposed between said units and deflector plates and closely spaced with respect to said units to provide uniform concentrated field relations for the colateral beams emerging from said units.

5. A multi-beam projection device comprising an enclosing vessel having a cylindrical reentrant portion forming an internal chamber adjacent one end of said vessel, a plurality of beam producing units arranged in parallel relation within said chamber for projecting colateral beams toward the other end of said vessel, a set of deflector plates adjacent each corresponding unit, and a common surrounding electrode mounted on an end of said chamber and separating said units from said sets of plates.

6. A multi-beam projection device comprising an enclosing vessel, a plurality of beam producing units arranged in parallel relation at one end of said vessel for projecting colateral beams toward the other end thereof, a set of deflector plates adjacent each corresponding unit, an electrode common to said units surrounding the upper ends thereof and separating said units from said sets of plates, and a metallic mass secured to the common electrode and having apertures in alignment with said units.

7. A multi-beam projection device comprising a vessel having a reentrant insulating chamber portion and a projection portion, a metallic closure member attached to said chamber portion having a plurality of apertures, and a plurality of electron gun units in said chamber corresponding to the apertures in said closure member, said units being aligned with said apertures for projecting simultaneous beams of electrons through said projection portion.

8. A multi-beam projection device comprising a vessel having a reentrant insulating chamber portion and a projection portion, a metallic sleeve member sealed to said chamber portion, a metallic closure member engaging said sleeve member and having a plurality of parallel openings therein, and a plurality of parallel electron gun units in said chamber aligned with said openings, said units projecting within the limits of said sleeve member.

9. A multi-beam projection device comprising a vessel having a reentrant insulating chamber portion and a projection portion, a metallic sleeve member carried by said chamber portion, a metallic closure member engaging said sleeve member and having a plurality of parallel openings therein, a plurality of parallel electron gun units in said chamber aligned with said openings, and sets of deflector plates corresponding to said openings adjacent thereto and supported by said chamber portion, said gun units being isolated from said sets of deflector plates except through said openings in said closure member.

10. In a multi-beam projection device a vessel having a reentrant insulating chamber portion, a stem projecting therein, a plurality of electron gun units in said chamber arranged in parallel relation to the axis of said stem and chamber, straight spaced supporting rods extending from said stem, metallic strap members connected to said units and rods, said members compensating the difference in diameters between said units and said stem, and a metallic closure member mounted on the end of said insulating chamber portion, said closure member having openings aligned with the units in said chamber.

11. In a multi-beam projection device, an enclosing vessel having a chamber portion, a stem therein, a plurality of coextensive electron gun units positioned beyond said stem in said chamber, a collar on said stem, rigid supports extending from said collar parallel to said units, flanged connecting straps joined to said units and having a shelf portion extending outwardly for engagement with said supports, a metallic sleeve sealed to said chamber portion, and a disc member secured to said sleeve having passageways aligned with the units within said chamber portion.

12. A multi-cathode ray discharge device comprising a vessel having a fluorescent screen at one end, a plurality of parallel electron gun units directed toward said screen and supported in the opposite end of said vessel, a tubular member surrounding said gun units, an accelerating electrode forming a closure for said tubular member and having apertures aligned with said units, an insulating member spaced beyond said accelerating electrode and supported thereby, said insulating member having apertures corresponding to the apertures in said electrode, a plurality of sets of deflector plates extending below said insulating member, a like number of deflector plates extending above said member, said plates forming separating passageways in line with the apertures in said insulating member and accelerating electrode, and a shield plate between adjacent pairs of deflector plates.

13. A multi-cathode ray discharge device comprising a vessel having a fluorescent screen at one end, a plurality of electron projection systems mounted at the other end, each system including an electron gun unit and a set of deflector plates, an enclosing chamber for the gun units, and a mounting for all the deflector plates supported by said chamber, said mounting comprising an

insulating plate having openings aligned with said gun units and slots adjacent said openings on opposite sides of said plate for supporting said sets of deflector plates in relative positions for controlling the direction of the separate streams of electrons projected toward said screen.

14. In a multi-beam projection device, an electrode assembly including three electron gun units arranged in parallel relation, and an associate unit of deflector plates for said gun units, said associate unit comprising an insulating support having openings corresponding to said gun units, a pair of deflector plates adjacent each opening and extending downwardly from said support, a second pair of deflector plates extending from the opposite side of said support adjacent each opening, extensions on the end pairs of said latter plates to secure them to said support, and a connector extending between the end plates, said connector being secured to the intermediate deflector plate to prevent displacement thereof.

15. In a multi-beam projection device, an electrode assembly including three electron gun units arranged in parallel relation, and an associate unit of deflector plates for said gun units, said associate unit comprising an insulating support having openings corresponding to said gun units, a pair of lower deflector plates adjacent each opening in said support, a pair of upper deflector plates extending from said support adjacent each opening, extensions on the end pairs of said latter plates to secure them to said support, channel extensions on the free ends of said upper plates, an insulating rod extending through said channel extensions, and transverse shielding plates interposed between each pair of upper plates and engaging said support and said insulating rod in interlocking relation to form a rigid unit.

16. An electronic discharge device of the multi-beam type comprising an enclosing vessel having a plurality of electron gun units, a fluorescent screen adapted to indicate simultaneous traces of all the electron beams projected by said units, a metallic disc member having apertures therein corresponding to the number of units within said vessel and separating said units from said screen whereby said beams can only reach said screen through said apertures, a deflector plate mounting between said disc and said screen, said mounting including a platform and individual sets of deflector plates for each gun unit, certain plates of each set being arranged in parallel relation and supported between said disc and said platform, and the remaining deflector plates being arranged transverse to the other plates on the opposite side of said platform in pafred coplanar relation, and metallic shields between adjacent pairs of coplanar deflector plates.

17. A multi-beam projection device comprising a vessel having a reentrant chamber therein, a plurality of beam producing units therein, an apertured electrode forming a closure for said chamber, a plurality of sets of deflector plates mounted on said electrode, shields between adjacent sets of said plates, and interlocking means connecting said plates and shields into a rigid assembly.

18. A multi-beam projection device comprising a vessel having a fluorescent coating on one end and a reentrant chamber at the other end, a plurality of beam producing units within said chamber, and a metallic electrode substantially closing said chamber and forming a barrier between said units and said screen except through openings individual to each unit.

19. A multi-beam projection device comprising a vessel having a fluorescent coating on one end and a reentrant chamber at the other end, a plurality of beam producing units within said chamber, a metallic electrode substantially closing said chamber and forming a barrier between said units and said screen except through openings individual to each unit, sets of deflector plates for each of said units mounted on said electrode, and conductors for said plates and said electrode extending longitudinally between said chamber and the wall of said vessel.

20. A multi-beam projection device comprising a vessel having an internal reentrant cylindrical chamber, a stem therein, a metallic disc electrode supported on the edge of said chamber and substantially closing the same, said disc having a row of apertures therein, a plurality of electron gun units within said chamber, and a metallic frame projection from said stem and mounting said units in aligned relation to the row of apertures in said disc electrode.

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