June 7, 1938. V. L. RONCI 2,119,559

ELECTRON DISCHARGE DEVICE

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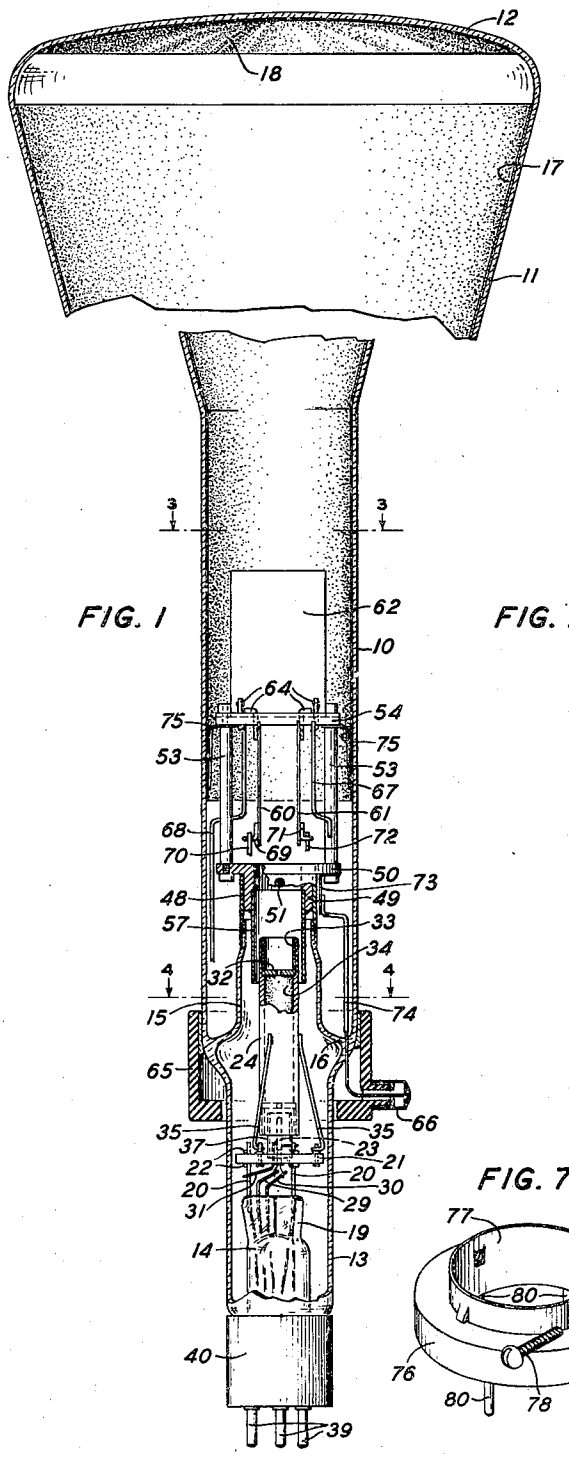


FIG. 1

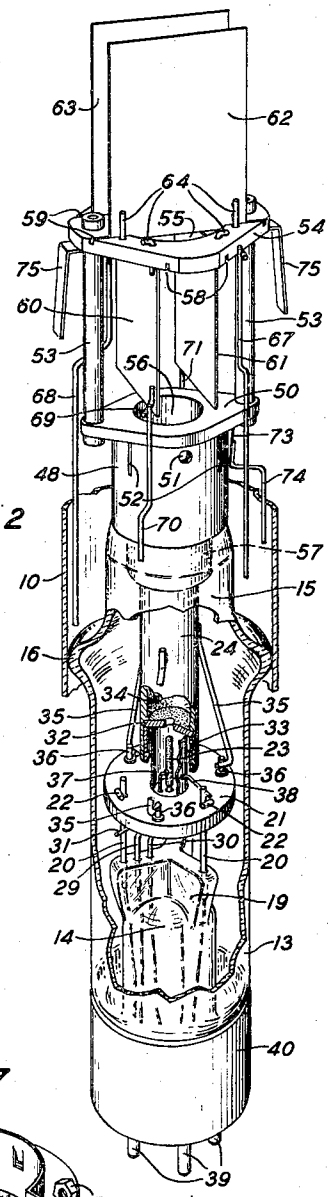


FIG. 2




FIG. 7

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FIG. 4

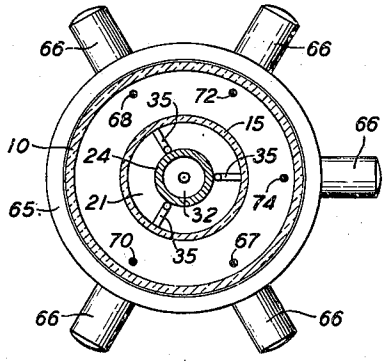



FIG. 5

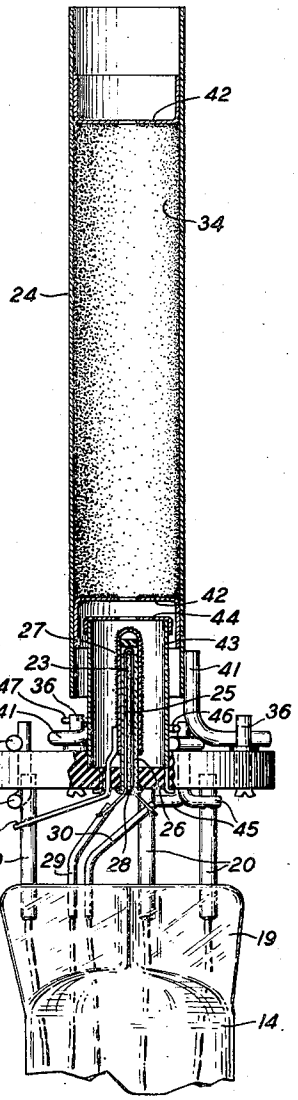



FIG. 3

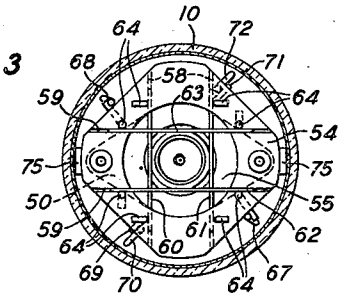
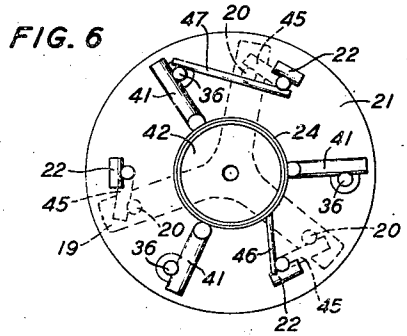



FIG. 6

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# UNITED STATES PATENT OFFICE

2,119,559

## ELECTRON DISCHARGE DEVICE

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Application July 25, 1935, Serial No. 32,985

22 Claims. (Cl. 250—27.5)

This invention relates to electron discharge devices of the Braun type in which an electron beam is projected toward a screen on the opposite end of the device.

An object of the invention is to facilitate the alignment of the electrodes in cathode ray discharge devices and to secure a rugged construction of the electrode mounts.

In accordance with the general aspect of this invention, the cathode ray discharge device comprises an electrode mount constructed as a unit and which is sealed into the end of a large vessel which contains the fluorescent screen. This assembly insures accurate alignment of the electrodes to facilitate the projection of the cathode ray beam along the axis of the vessel. Furthermore, the rugged construction of the electrode mounts increases the static characteristics of the device.

A feature of the invention relates to the assembly of the electron gun on a platform mounted on a stem. This assembly comprises an indirectly heated cathode fixed to an insulating base or platform with a cylindrical control or modulating electrode surrounding the cathode. An elongated focussing anode is also mounted on the platform and is provided with baffle members at opposite ends having aligned apertures for concentrating the electrons into a narrow beam.

Another feature of the invention relates to the mounting of the deflector plates in proper relation to the electron beam and to insure accurate alignment of the plates. This assembly comprises a tubular shell or sleeve sealed to the neck of the glass portion of the electrode unit, the shell forming a rugged support for an apertured block which carries an internal tubular metallic element located between the shell and the end of the anode. A pair of posts extend from the block and carry an apertured insulating platform having slots on both sides to receive a pair of depending deflector plates and a pair of extending deflector plates, one pair of plates being at right angles to the other pair of plates.

Another feature of the invention relates to the provision of resilient springs or fingers on the deflector plate mounting platform to form friction contacts for the conductive coating on the interior wall of the enclosing vessel.

A further feature of the invention relates to the sealing arrangement of the conductors of the deflector plates. In the assembly of the complete device these conductors are loosely arranged between a bulbous portion of the mount assembly and the neck of the enclosing vessel. After accurate alignment of the mount within the vessel the conductors are sealed in the glass by a flow method in which the neck of the vessel is united to the mount assembly and the conductors are spaced in an annuluar formation which forms a sealed joint between the vessel and the mount.

These and other features of the invention will be more clearly understood from the following detailed description when read with the accompanying drawings.

Fig. 1 is a cross-sectional view in elevation of a cathode ray discharge device made in accord ance with this invention and showing the rugged assembly of the electrode units in alignment to control the projection of a cathode ray beam toward a fluorescent screen on the end of the device;

Fig. 2 is an enlarged perspective view of the mount assembly of the electrodes with portions of the glass member and electrodes broken away to show various details of the construction;

Fig. 3 is a plan view in cross-section taken on the line 3—3 of Fig. 1 showing the arrangement of the deflector plate unit and its position in the enclosing vessel;

Fig. 4 is an enlarged plan view in cross-section of the base end of the device taken on the line 4—4 of Fig. 1 and showing the arrangement of the conductors of the deflector plate unit and the radial contacts on the external base;

Fig. 5 is an enlarged view in elevation of a modification of the invention pertaining to the electron gun assembly in which the electrodes are shown in cross-section to illustrate the detail construction;

Fig. 6 is a plan view of the assembly shown in Fig. 5 illustrating the symmetrical mounting of the elements; and

Fig. 7 is a perspective view of a modified ring base for the device shown in Fig. 1 with a clamp for connecting it to the vessel.

Referring particularly to Figs. 1 and 2, the discharge device, in one aspect of this invention, is embodied in an elongated enclosing vessel formed of a long tubular portion or neck 10, and an outwardly flared conical portion 11 which terminates in a dome portion 12. The long tubular portion 10 is joined to an extending tubular mount portion 13 having an inwardly projecting stem 14, a tubular end portion 15 reentrant with respect to the tubular portion 10 and an annular nodal or bulbous portion 16 which is fused to the end of the tubular portion 10. The tubular portion 10 has a section thereof and the conical portion

11 coated with a continuous opaque conductive material 17 such as "Aquadag", commonly known as colloidal graphite, to prevent the accumulation of electric charges on the glass wall of the vessel and to serve as an accelerating electrode. This coating also prevents reflection losses and therefore tends to increase the efficiency of the device in operation. A fluorescent coating material 18 is applied to the dome portion 12, to perform the function of a screen on which electric charges present a tracing of the electrical phenomena which is to be observed.

The efficiency of a device of the Braun type is dependent upon the intensity and concentration of a beam of electrons which is projected from one end of the device toward the fluorescent screen and it is obvious that in order to concentrate the beam of electrons along the axis of the device it is essential to coordinate the various elements which aid in concentrating the beam and in controlling the movement of the beam so that the highest efficiency may be obtained with a minimum of loss caused by divergence of the beam, misalignment of the controlling elements and variations in spacing of the controlling elements.

In accordance with this invention all the focussing and controlling elements cooperating to produce the concentrated beam of light along the axis of the vessel are combined in a single unit or mount which may be ruggedly constructed to insure constant and positive alignment of the electrode elements to obtain the highest efficiency in the device. In order to understand the detail construction of the electrode mount, attention is directed to Fig. 2 which shows this assembly in enlarged form. The stem 14 projecting within the lower end of the tubular member 13 is formed into a press 19 having three arms or wings radiating from a central point and equally spaced from each other. A support rod 20 extends vertically from the outer end of each arm of the press 19 and the three rods form a tripod support for a circular disc or platform 21, the platform being held in position on the rod by welding short stub wires to the rods 20 above and below the platform 21.

The platform 21 serves as a rigid base for mounting the elements of an electron gun assembly for projecting a concentrated beam of electrons along the axis of the device toward the fluorescent screen 18 on the dome portion of the enclosing vessel. The electron gun consists principally of a central cathode or emitter 23 and an elongated tubular focussing anode 24. The detail assembly of the cathode 23 is shown more clearly in Fig. 5 and comprises an internal heater element 25 surrounded by an insulating sleeve 26 which is substantially enclosed by a metallic thimble 27, coated with electron emissive material, such as barium and strontium oxides. The cathode assembly 23 is mounted in the axis of the platform 21 with the lower end of the insulating sleeve 26 projecting through an aperture therein and held in position by a cement joint 28. The ends of the heater element 25 projecting below the platform are secured to short leading-in wires 29 and 30 and a connecting wire 31 is joined to the lower end of the thimble 27 and extends through the platform 21 to be connected to one of the tripod wires 20 projecting from the stem. The focussing anode, as shown in Fig. 2, comprises a long metallic cylinder or tubing, preferably of nickel silver, having opposite ends undercut by increasing the inner diameter of the tubing wall for about one-half inch in length to form an annular seat within each end of the anode. An apertured disc or baffle partition 32 fits into each enlarged end of the tubing and rests against the annular seat formed by the cutting operation. The baffle discs or partitions are held securely against their seats by a tubular metallic insert 33 which fits into the increased diameter of the ends of the tubing and is held therein by spinning over the outer wall of the end sections of the tubing.

The interior wall of the tubular anode and the inner faces of the baffle partitions are coated with an electron collector material 34, such as colloidal graphite, to prevent the liberation of secondary electrons from the anode. The anode 24 is arranged in position so that the central apertures in the baffle discs 32 are in alignment along the axis of the cathode 23 in order to project the beam of electrons along this line. The anode 24 is elevated from the platform 21, to space the lower baffle disc 32 in the anode in suitable relation to the end of the cathode thimble 27. In order to support the anode in this position three tangential braces 35 have their upper ends secured to the anode intermediate the ends thereof and extend outwardly to the circumference of the platform 21 with the lower ends of the braces bent inwardly and secured to flanged pins 36 which are staked in the platform 21 with each pin equally spaced between the projecting ends of the tripod rods 20. A cylindrical metallic electrode 37 coaxially surrounds the cathode 23 and is overlapped by the lower end of the anode 24. This electrode is seated in a circular recess of the platform 21 and is held in position by staked pins extending through the platform. The cylindrical electrode 37 may serve as a shield to prevent the escape of electrons from the cathode or a suitable potential may be applied to the cylindrical electrode 37 to serve as a control electrode or a modulating electrode. When the cylindrical electrode 37 serves as a controlling electrode a suitable connection is necessary to apply the desired potential thereto. As shown in Fig. 2, a connecting wire 38 is secured to the cylindrical electrode 37 and welded at the other end to one of the tripod rods 20. Since a high potential is applied to the focussing anode 24 a suitable leading-in conductor may be provided for this electrode by connecting one of the braces 35 to the remaining tripod rod 20, the tripod rods having suitable leading-in conductors extending through the hollow portion of the stem 14 and connected to terminals 39 on a base 40 which is secured to the lower end of the tubular extension 13. The heater wires 29 and 30 are also provided with leading-in conductors through the stem and connected to other terminals on the base 40. The assembly of the electron gun provides a rigid structure which prevents the escape of electrons in a lateral direction to the glass wall of the tubular extension and insures the projection of the electron stream along the axis of the focussing anode to produce a concentrated bundle of cathode rays which is focussed to a high degree by the baffle partitions in the elongated anode.

A modification of the electron gun assembly of this invention is also shown in Fig. 5 in which the anode 24 is formed of light metal tubing which is supported from the pins 36 by metallic elbows 41. A pair of baffle partitions 42 are situated in opposite ends of the anode and are formed of flanged metallic members welded or brazed

to the inner surface of the anode and provided with aligned central apertures for focussing the electron beam. A cylindrical control electrode or shield 43 surrounds the cathode and is provided with a closure cap 44 having a central aperture in alignment with the apertures in the partitions 42 and the end of the cathode 23. In this arrangement the platform 21 is seated on the tripod rods 20 and an L-shaped wire 45 passing through the platform is secured to each tripod rod and a short stub wire 22 is fastened to the L-shaped wire above the platform. The control electrode 43 is provided with a connector 46, as shown in Fig. 6, which is welded to one of the L-shaped wires 45 and a similar connector 47 joins the anode to another L-shaped wire 45.

In addition to the projection of a concentrated beam of electrons to the fluorescent screen to produce a sharply defined spot of light thereon, it is essential to provide a group of deflector plates in order to control the sweep of the electron stream over the whole surface of the fluorescent screen. A feature of this invention is to mount the deflector plate unit in coaxial alignment with the electron gun assembly and to decrease the dimensional area of the mount for the deflector plate unit so that the unit will fit into the tubular portion 10 of the vessel so that the highest efficiency may be attained with the conductive coating 17 on the wall of the vessel. Furthermore, it is preferable to mount the deflector plate unit on the end of the member in which the electron gun assembly is supported in order to obtain the highest degree of efficiency between the two units.

In accordance with this invention the tubular section 15 of the tubular extension which is reentrant with respect to the tubular portion 10 of the enclosing vessel is fused to a knife-edge portion of a copper sleeve, shell or collar 48 to form a rigid joint for the support of the unit. A metallic ring 49 having an oval-shaped flange 50 is supported on the collar 48 with the ring being surrounded by the collar and the flange seated on the edge of the collar, the ring being secured to the collar by screws 51. The collar 48 is provided with longitudinal slots 52 to compensate for slight variations in the diameters of the collar 48 and the ring 49, thereby preventing mechanical strain on the seal between the metallic collar and the glass tubular portion 15. The flange 50 supports two parallel pillars or posts 53 which support a rectangular platform 54, of insulating material, the platform having a central aperture 55 coaxial with the aperture 56 in the ring 49 and the end of the anode 24. A cylindrical accelerating anode or second anode 57 is suspended from the ring 49 and closely surrounds the end of the focussing anode 24. This arrangement prevents the escape of any electrons from the beam projected through the electron gun until it reaches the deflector plate unit where it is controlled in accordance with well-known practice. Furthermore, the special arrangement of the second anode and the focussing anode insures an accurate alignment of the deflector plate unit and the electron gun assembly due to the overlapping of the anode 57 with respect to the end of the anode 24.

The insulating platform 54 is provided with parallel slots or guideways 58 formed on the lower surface thereof and extending across one diameter of the platform and a second pair of guideways or slots 59 are formed on the upper surface of the platform and these slots extend across a diameter thereof at right angles to the slots 58. A pair of rectangular metallic plates 60 and 61 are arranged in the slots 58 of the platform 54 and a similar pair of plates 62 and 63 are arranged in the slots 59 of the platform to form a bounded passageway, as shown in Fig. 3, for the projection of the electron beam which is to be controlled by the deflector plates in its passage between the plates. Each of the plates is provided with two extending wires 64 which project through the platform 54 adjacent its respective slot, the wires being bent around the opposite surface of the platform to rigidly support the plates in position. This arrangement insures accurate parallelism between adjacent pairs of plates and true alignment of the two pairs of plates since all the plates are mounted from a single member, namely the insulating platform 54.

A ring type base 65, of insulating material, surrounds the end of the tubular portion 10 of the vessel and encloses the sealed junction of the bulbous portion 16 and the end of the tubular portion 10. This base is provided with a plurality of radial terminals 66 for applying suitable potentials to the deflector plates, individually, the accelerating anode 57, and the conductive coating 17 on the interior of the vessel wall. The deflector plates are connected to the terminals 66 by rigid conductors extending from the plates and sealed through the junction of the bulbous portion 16 and the end of the tubular portion 10 of the vessel in alignment with the terminals 66 on the annular base 65. The top front plate 62, as shown in Fig. 2, is provided with a long wire conductor 67 which is attached to the bent end of the stub wire 64 of the plate and extends downwardly to the bulbous portion 16 of the tubular extension where it is sealed in the junction of the bulbous portion and the tubular portion 10 in alignment with one of the terminals 66, as shown in Fig. 4. The top rear plate 63 has a conductor 68 similarly connected to the bent securing wire thereof and extending in alignment to the terminal 66 on the base. The lower left-hand plate 60 is provided with a bent connecting wire in the forward lower end thereof which is joined to a longitudinal conductor 70 arranged in alignment with another terminal 66 on the base 65. The right-hand plate 61 is provided with a bent connector 71 in the lower rear corner and this connector is joined to a conductor 72, which is affixed to a terminal 66 on the base.

The accelerating anode or second anode 57 which is mechanically and electrically connected to the metallic ring 49 and flange 50 is provided with a terminal conductor by securing a strap 73 between the nut and the flange 50 adjacent one of the supporting posts 53 and this strap is connected to a conductor 74. The conductor 74 is sealed in the junction between the bulbous portion 16 and the end of the tubular portion 10, as shown in Fig. 1, and connected to its aligned terminal 66 on the base 65. The accelerating anode 57 is usually operated at a high voltage, of about 2500 volts, to accelerate the electrons projected through the focussing anode 24. In order to continue the influence of the high voltage of the accelerating anode on the electron beam along the whole length of the vessel to the screen, this potential is also applied to the graphite coating 17 on the interior wall of the conical portion 11 and the tubular portion 10 of the vessel. This is accomplished by providing resilient contact fingers 75 which are mounted on the posts 53 between the posts and the insulating

platform 54. These fingers or contacts extend downwardly, as shown in Fig. 2, and are bent outwardly to form a friction contact so that when the electrode mount is inserted in the enclosing vessel, as shown in Fig. 1, the resilient fingers 75 engage the graphite coating 17 on the wall of the vessel. The contact fingers also provide dual aligning springs for the unit during the sealing of the tubular mount to the tubular portion 10 of the vessel.

A modification of the base for the terminals of the deflector plates and accelerating anode is shown in Fig. 7 and provides an arrangement which permits the attachment of the base to the vessel without the use of cement. Furthermore, the lateral arrangement of the terminal pins on the base facilitates the support of the device in a ring type socket mounted on a platform. In this arrangement an annular insulating ring 76 is provided with a split collar 77 which is clamped to the tubular portion 10 of the vessel adjacent the seal by a screw 78 and nut 79. A plurality of terminal pins 80 are spaced around the lower surface of the insulating ring 76 and extend parallel to the axis of the collar and ring. The base may be applied to the device so that the terminal pins 80 are aligned with the respective leading-in conductors sealed through the juncture of the bulbous portion 16 and the neck 10.

While the invention has been disclosed as embodying all the elements described, it is, of course, understood that the scope of the invention is not limited to the particular combination since it is apparent that discharge devices may be constructed in which some of the elements are omitted. Furthermore, the invention is not intended to be limited to the specific assembly described since various embodiments may be evolved from the present disclosure and, therefore, the invention is only to be limited within the scope of the appended claims.

What is claimed is:

1. In combination, a mount for an electron discharge device comprising a tubular member having a larger diameter portion at an intermediate point thereof and an inwardly projecting stem at one end, an electron gun supported on said stem, a group of deflector plates supported on the opposite end of said tubular member coincident with the axis of said electron gun, a plurality of conductors connected to said deflector plates and extending outwardly toward said larger diameter portion, and an elongated vessel having a neck portion fused to said larger diameter portion and forming a sealed joint around said conductors.

2. In combination, a mount comprising a tubular member having an inwardly projecting stem, said tubular member having an annular nodal portion intermediate the ends thereof, an electron gun supported on said stem, a group of deflector plates supported on said tubular member coincident with the axis of said electron gun, an elongated vessel having a neck portion of substantially the same diameter as said nodal portion and sealed thereto, and a plurality of conductors leading to said deflector plates, said conductors having parallel straight portions arranged in a circular boundary intermediate said neck portion and said tubular member and projecting outwardly from said vessel through the sealed joint between said neck and nodal portions.

3. An electric discharge device comprising a vessel having a fluorescent screen at one end and a neck portion at the other end, a tubular member secured to said neck portion and having a reentrant stem at one end thereof, an electron gun assembly projecting from said stem toward said screen, and a metallic tubular element supported by said tubular member remote from said stem, said element overlapping the projecting end of said electron gun assembly.

4. An electric discharge device comprising an enclosing vessel having a fluorescent screen at one end and a neck portion at the other end, a tubular extending portion forming a mount sealed to said neck portion, said tubular portion having a stem, a platform mounted on said stem, a cathode and an elongated tubular anode coaxial therewith supported from said platform, a plurality of deflector plates supported beyond the end of said tubular extending portion, and a plurality of conductors extending from said plates, said conductors being sealed in the junction between said neck and said tubular portions.

5. An electric discharge device comprising an enclosing vessel having a fluorescent screen at one end and a neck portion at the other end, a tubular extending portion forming a mount sealed to said neck portion, said tubular portion having a stem at one end, a metallic collar extending from the other end of said tubular portion, an apertured block secured to said collar, an apertured insulating platform rigidly mounted on said block, a pair of spaced deflector plates suspended from said platform, a second pair of spaced deflector plates extending from said platform in opposed relation to the first pair, a cathode and a tubular anode supported from said stem, and a suspended metallic member extending from said block and interposed between said collar and said anode.

6. An electric discharge device comprising a vessel having a fluorescent screen at one end and a neck portion at the other end, a tubular member having a bulbous portion of substantially the same diameter as said neck portion and sealed thereto, a portion of the tubular member being coaxially positioned within said neck portion, an annular ring secured to said tubular member within said neck portion, a tubular metallic element suspended from said ring, and an electron gun assembly including an elongated anode supported in said tubular member, said anode having a portion extending into said tubular element.

7. In an electron discharge device, an electron gun assembly comprising a stem, a platform supported by said stem, a cathode supported by said platform along the axis thereof, a cylindrical electrode surrounding said cathode and mounted on said platform, and an elongated tubular anode projecting beyond said cylindrical electrode and having a portion overlapping the ends of said electrode and said cathode.

8. In an electron discharge device, an electron gun assembly comprising a stem, a platform supported on said stem, a cathode supported by said platform along the axis thereof, a cylindrical electrode surrounding said cathode and mounted on said platform, an elongated tubular anode projecting beyond said cylindrical electrode and having a portion overlapping the ends of said electrode and said cathode, and a plurality of supports connecting said anode to said platform.

9. In an electron discharge device, an electron gun assembly comprising a stem, a platform supported on said stem, a cathode supported by said platform along the axis thereof, a cylin-

drical electrode surrounding said cathode and mounted on said platform, an elongated tubular anode projecting beyond said cylindrical electrode and having a portion overlapping the ends of said electrode and said cathode, and a plurality of equally spaced tangentially arranged braces projecting from said platform and connected to said anode intermediate the ends thereof.

10. In an electron discharge device, an electron gun assembly comprising a stem, a platform supported on said stem, a cathode supported by said platform along the axis thereof, a cylindrical electrode surrounding said cathode and mounted on said platform, an elongated tubular anode projecting beyond said cylindrical electrode and having a portion overlapping the ends of said electrode and said cathode, and a pair of apertured baffle partitions adjacent opposite ends of said anode.

11. In an electron discharge device, an electron gun assembly comprising a stem, a platform supported on said stem, a cathode projecting from the center of said platform, a cylindrical electrode surrounding said cathode and mounted on said platform, an elongated anode projecting beyond said cylindrical electrode, said anode having inner undercut portions at opposite ends to form ring seats therein, a baffle plate having a central aperture engaging each ring seat, and a retaining ring within each of said undercut portions abutting against each of said baffle plates.

12. In an electron discharge device, an electron gun asembly comprising a stem, a platform supported on said stem, a cathode extending from the center of said platform, an elongated tubular anode projecting beyond said cathode, baffle partitions adjacent opposite ends of said anode, and a nonreflecting coating on the surfaces of said anode and said baffle partitions enclosed thereby.

13. In an electron discharge device, an electron gun assembly comprising a stem, a platform supported on said stem, a cathode extending from the center of said platform, an elongated tubular anode projecting beyond said cathode, apertured baffle partitions adjacent opposite ends of said anode, and a colloidal graphite coating on the inner surfaces of said anode and said baffle partitions.

14. A mount for an electron discharge device comprising a tubular member having a cylindrical sleeve at one end, an apertured platform spaced from said sleeve, and pairs of deflector plates supported by said platform, one pair of plates projecting above said platform and the other pair of plates extending below said platform.

15. A mount for an electron discharge device comprising a tubular member having a cylindrical sleeve at one end, an apertured platform spaced from said sleeve, said platform having a pair of parallel slots extending across one diameter on one side thereof and another pair of parallel slots extending across a transverse diameter on the other side thereof, and pairs of plates seated in said slots, each pair of plates extending in opposite directions from said platform and arranged parallel to the axis of said mount.

16. A mount for an electron discharge device comprising a tubular member having a cylindrical sleeve at one end, a deflector plate unit including a pair of apertured platforms, a pair of posts for spacing said platforms and aligning the apertures therein, a pair of plates on one of said platforms extending toward the other platform and a second pair of plates projecting above both platforms, and means for mounting said unit on said sleeve.

17. A mount for an electron discharge device comprising a tubular member having a cylindrical sleeve at one end, a deflector plate unit mounted on said sleeve including a pair of apertured platforms, a pair of posts for spacing said platforms and aligning the apertures therein, a pair of plates on one of said platforms extending toward the other platform, a second pair of plates projecting above both platforms, and a cylindrical metallic member extending within said sleeve from the lower platform.

18. An electron discharge device comprising an enclosing vessel having a tubular portion and a conical portion terminating in a dome portion, said dome portion having a fluorescent coating thereon, said tubular and conical portions having an opaque conductive coating thereon, a tubular extension on said tubular portion and projecting from the end thereof, said extension having a stem, an electron gun assembly supported by said stem, a deflector plate unit suported by said tubular extension and projecting into said tubular portion, and friction contact fingers mounted on said deflector plate unit and engaging the conductive coating of said tubular portion.

19. An electron discharge device comprising an enclosing vessel having a tubular portion and a conical portion terminating in a dome portion, said dome portion having a fluorescent coating thereon, said tubular and conical portions having an opaque conductive coating thereon, a tubular extension on said tubular portion and projecting from the end thereof, said extension having a stem, an electron gun assembly supported by said stem, an apertured platform supported from said tubular extension within said tubular portion, spacing posts extending from said platform, a second apertured platform supported on said posts, pairs of deflector plates extending in opposite directions from said second platform, and conductors attached to said plates being sealed between the junction of said tubular portion and said tubular extension.

20. A cathode ray discharge device comprising an enclosing vessel having a dome portion, a conical portion, a tubular portion and a tubular extension having an intermediate bulbous portion sealed to said tubular portion to form a coaxial inner tubular member within said tubular portion, a coating of carbon on said conical and tubular portions, the extreme end of said tubular extension having a reentrant stem, a circular platform supported on said stem, an indirectly heated cathode mounted on said platform, a cylindrical modulating electrode surrounding said cathode and seated on said platform, an elongated tubular focussing anode extending beyond said platform and having apertured baffle discs at opposite ends thereof, a plurality of braces supporting said anode out of contact with said platform and in alignment with said cathode and electrode, a copper sleeve sealed to the edge of said inner tubular member, a metallic platform having a ring extension fitted into said sleeve and secured thereto, a hollow accelerating anode carried by said ring overlapping one end of said focussing anode, a pair of posts extending above said platform, an insulating platform secured to said posts and having an aperture in alignment with the aperture in said metallic platform, a pair of parallel deflector plates extending from said insulating platform toward said metallic platform, a second pair of deflector plates ex-

tending from said insulating platform toward said dome portion and arranged transversely to said first pair of plates, metallic spring members secured to said insulating platform and engaging the coating on said tubular portion, individual conductors for each of said plates, and an additional conductor secured to one of said posts, all of said conductors being sealed in the junction of said tubular portion and said bulbous portion.

21. In an electron discharge device, an electron gun assembly comprising a stem, a platform supported by said stem, a cathode supported above said platform along the axis thereof, and an elongated tubular anode projecting beyond said cathode and having a portion surrounding one end of the cathode.

22. In an electron discharge device, an electron gun assembly comprising a stem, a platform supported by said stem, a cathode supported above said platform along the axis thereof, an elongated tubular anode of larger diameter than said cathode surrounding and projecting beyond said cathode, and a plurality of equally spaced diagonal braces attached to said anode intermediate the ends thereof and connected to said stem.

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