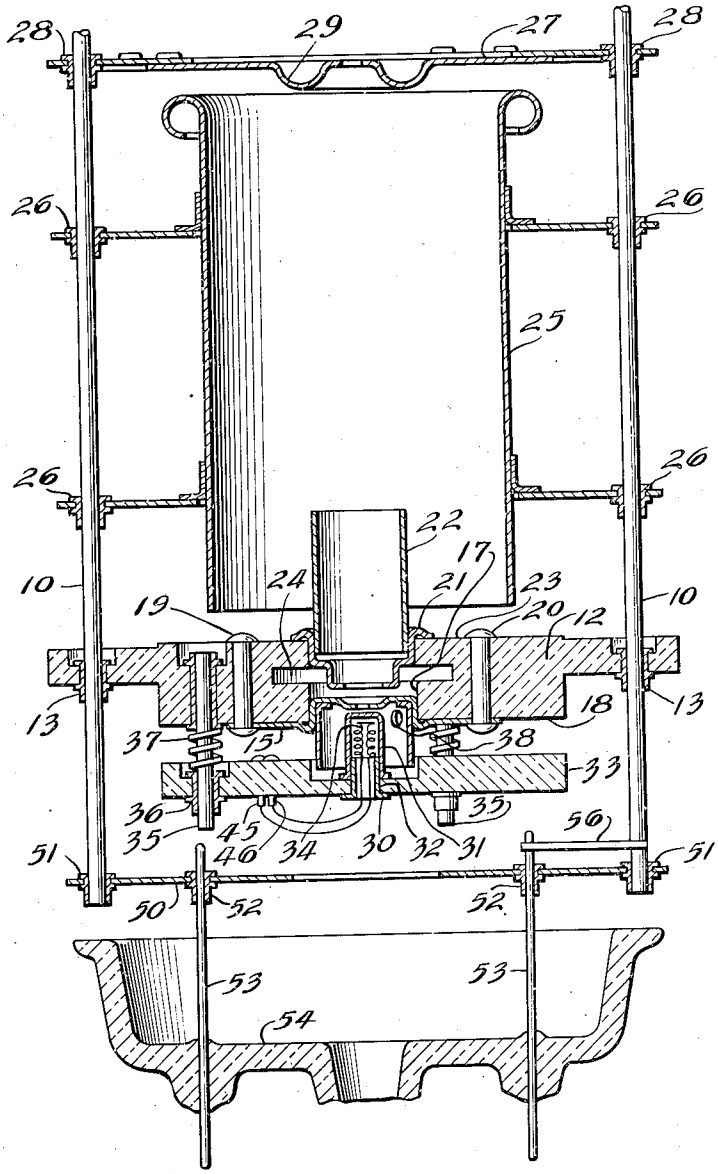
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ELECTRON GUN STRUCTURE

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ELECTRON GUN STRUCTURE

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This invention relates to cathode ray tubes and more particularly to an electron gun structure elected for use in cathode ray tubes.

A principal purpose of the invention is to provide an electron gun structure which is cheap and efficient for mass production.

Another object of the present invention is to simplify the process of producing an electron gun structure for cathode ray tubes.

A further object of the present invention is the provision of a cathode ray gun structure, including a number of separate sub-assemblies.

Still another object of the present invention is the reduction of aberration in the electron lens structure of cathode ray tubes.

The foregoing objects, and others which may appear from the following detailed description, may be accomplished, for example, by utilizing a number of accurately ground ceramic bodies having parallel faces as supports for the gun electrodes of a cathode ray tube. The ceramic bodies are supported in their desired position by temporary spacers while the bodies are assembled on and secured to a supporting rod assembly. After the bodies are fixed in place the spacers are removed.

The present invention will be more fully understood by reference to the following detailed description which is accompanied by a drawing showing in its single figure a cross-sectional view of an electron gun structure which embodies a preferred form of the present invention.

The electrodes which constitute the preliminary triode, i. e. the cathode, grid and first anode, are all supported from a single circular ceramic body 12, which in turn is supported from the main support rods 10 through eyelets 13. The rods 10 may be actually four in number; but, for the sake of clarity, only the two on the plane of section are shown.

The grid and first anode are each in the form of a flanged cup with an aperture in the centre of the bottom of the cup. The grid consists of two pressings 15 and 16 of sheet metal, which are welded together. The circular central hole 17 in ceramic body 12 is accurately ground, and grid member 15 is a close fit therein. The surface 18, against which grid member 15 beds, is also accurately ground. The grid member 15 is secured against this surface by two rivets 19, 20, arranged diametrically opposite from each other. The first anode comprises a pressing 21 of sheet metal and a tubular metal member 22 welded thereto. The first anode is secured to ceramic body 12 by rivets identical with rivets 19 and 30,

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but lying in the diametrical plane perpendicular to the plane of the figure. The surface 23 of ceramic body 12 is accurately ground as well as hole 17, and thus the first anode is very accurately located relative to the grid.

A groove 24 is ground from the inner surface of hole 17 in order to increase the length of the leakage path between the first anode and the grid. No great accuracy is required in the grinding of this groove.

It is necessary to space the cathode very accurately from the grid. The cathode is built up of two flanged tubular members 30, 31. Member 30 is inserted through an accurately ground hole 32 in a ceramic disc 33. Member 31 fits closely upon member 30, and after being placed in position is welded thereto. The heater 34, when inserted is retained by the shoulder formed by the upper end of member 30. The leads for this heater are taken to two rivets 45, 46 secured in ceramic disc 33. A coating of emissive material is applied to the outside of the closed upper end of tube 31, to form the actual cathode surface.

Ceramic disc 33, carrying the cathode, is supported from ceramic body 12 by three support rods 35 equally spaced from each other. These rods 35 are initially fixed in body 12 but eyelets 36, which are fixed to ceramic disc 33, are slidable upon rods 35. Coil springs 37 tend to push the cathode structure away from the grid.

A hole 38 in grid member 16 allows the grid-cathode spacing to be viewed through a microscope. The gun is set up by raising the ceramic disc 33 by means of a ring (not shown), which is advanced relative to body 12 by a screw. When the spacing is correct, the eyelets 36 are welded to rods 35.

It will be noted as one of the advantageous features of this design that between the cathode 31 and grid 15 the leakage path over the surface of the insulating and other members between the two is of great length. Again, the depending tubular member 16 forming part of the grid and surrounding the cathode 31 shields the upper surface of the ceramic disc 33 from the deposition thereon of nickel evaporated from the cathode: metal so deposited has the effect of reducing very considerably the resistance of the leakage path between cathode and grid.

In the gun structure shown, the third anode 27 is an aperture disc electrode, while the second anode 25 is a tubular electrode of large diameter. Each of these electrodes is conventionally supported from rods 10 through the medium of mica discs. The apertured disc for the third anode

is formed with a concentric circular groove 29 of semi-circular cross-section.

It has been found that the use of a wide tubular second anode reduces the aberration of the electron lens between the second and third anodes.

A further advantage of the large diameter is that it provides for greater accuracy in the alignment of the gun electrodes. In the assembly of the gun, the eyelets 28 for the third anode are first welded to the support rods 10. Spacers are then temporarily inserted between the upper edge of the second anode 25 and the third anode disc 27; and thereafter the eyelets 26 are welded to the support rods 10, and the spacers are removed. Further spacers are placed between the lower edge of second anode 25 and the ground surface 23 of ceramic body 12; eyelets 13 are welded to rods 10 and these spacers are removed. The possible degree of tilt of the preliminary triode relative to the second and third anodes is thus reduced to a minimum.

The axial location of the whole gun structure in the envelope is effected by mica 52, eyelets 51 and 52, and base wires 53. The base wires 53, which are sealed through the pressed glass base member 54, may be about twelve in number and equally spaced in a circle around the axis; for the sake of clarity only two are shown. These base wires 53 provide the leads-in to the various electrodes; a feature which is diagrammatically illustrated by the connection 56 between one of these wires and one of the support rods 10, which may be connected to one of the deflector plates (not shown). Eyelets 51 are welded to support rods 10, and eyelets 52 to base wires 12, and axial movement of the gun relative to the pressed glass base is thus prevented.

The gun which has been described has been found to operate satisfactorily with a first anode potential of 3,000 volts, a second anode potential of 2,000 volts maximum, and a third anode potential of 8,000 volts, all relative to cathode.

It will be evident that the utility of this gun structure is independent of the form of target employed and that it is therefore applicable, for example, to electron beam valves as well as to cathode ray tubes employing fluorescent screens.

I claim:

1. In a cathode-ray tube, a unitary subassembly comprising a ceramic body having a pair of accurately spaced parallel faces, and a pair of opposed electrodes secured to said body, one against each of said faces.

2. In a cathode-ray tube, a unitary subassembly comprising a ceramic body having accurately spaced parallel faces and a central aperture, and a pair of electrodes secured to said body, one against each of said faces and in mutual alignment, said electrodes having extensions in said aperture for accurately assuring said alignment.

3. In a cathode-ray tube, a unitary subassembly

comprising a ceramic body having accurately spaced parallel faces and a central bore, and a pair of electrodes having centrally apertured cup portions, the outside diameter of the cup portions substantially equalling that of said bore, said electrodes being secured to said body, one against each of said faces with the cup portions in said bore.

4. In a cathode-ray tube, a triode subassembly comprising a primary ceramic body, a grid and an anode secured to said body on opposite faces thereof, a second ceramic body, a cathode secured to said second body, and plural initially telescopic rods and sleeves secured to said ceramic bodies and fixed against relative movement supporting said cathode accurately in relation to said grid.

5. In a cathode-ray tube, a triode subassembly according to claim 4 including plural parallel supporting rods, and plural eyelets in said primary ceramic body, said eyelets being secured to said rods rigidly supporting said triode subassembly.

6. In a cathode-ray tube, a triode subassembly according to claim 4 wherein the faces of the primary ceramic body to which said grid and first anode are secured are parallel and accurately spaced apart.

7. In a cathode-ray tube, a subassembly according to claim 4 wherein said grid includes a tubular member laterally surrounding said cathode for deposition of metal evaporated from said cathode.

8. In a cathode-ray tube, a plurality of parallel supporting rods, and a plurality of electrodes secured to an insulating supporting body and at least one further electrode, said supporting body and said further electrode each having eyelets welded to said rods rigidly fixing the spacing of said electrodes along said rods and in mutual axial alignment.

9. The combination, in a cathode-ray tube, of a triode subassembly having a supporting body, and a cathode, a grid and a first anode carried by said body, a plurality of main supporting rods, and at least one electrode, said body and said electrode being secured to said rods in accurate spaced relationship and in accurate mutual alignment.

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