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ELECTRON GUN STRUCTURE FOR CATHODE RAY TUBES

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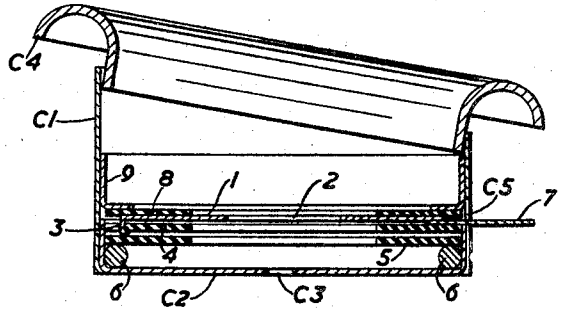



FIG. 2.

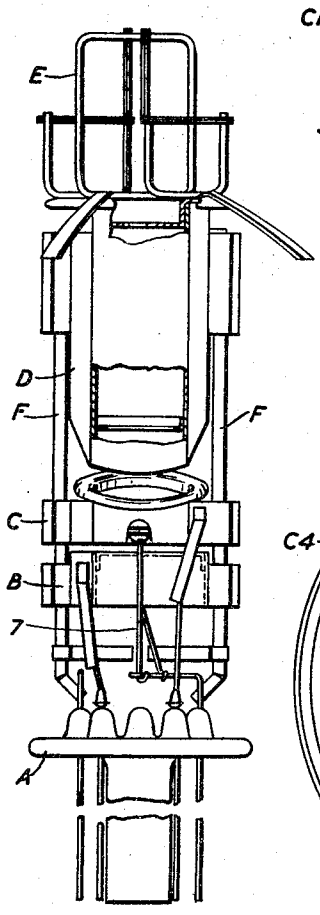



FIG. 1.

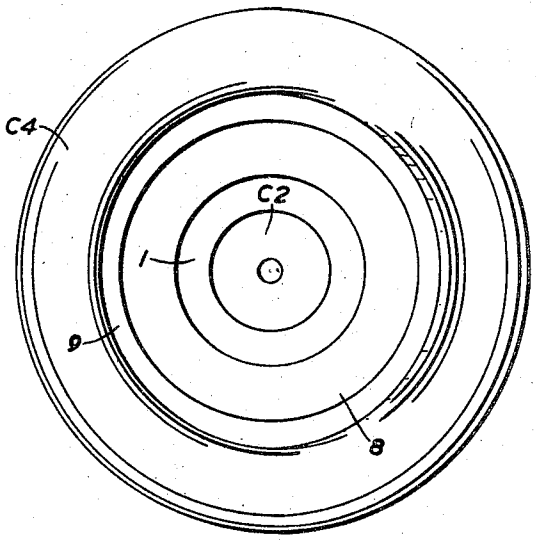



FIG. 3.

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# ELECTRON GUN STRUCTURE FOR CATHODE RAY TUBES

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1 Claim. (Cl. 313—82)

This invention relates to electron gun structures for cathode ray tubes and has for its object to provide improved gun structures adapted to produce a very sharp focus spot of the electron beam and which shall be of strong, rigid, and stable construction and of relatively small over-all length.

A common form of electron gun structure includes a cathode, a control electrode, an attracting anode and a main focusing or electro-static lens sysem. It is known, in such an electron gun structure to provide an additional apertured electrode (sometimes termed a pre-focusing electrode, but more properly termed a suppressor electrode) adjacent the attracting anode, either a little way in front of it or a little way behind it, for the purpose of producing a more sharply focused cathode ray spot than would be possible without it. Such an electrode will be hereinafter referred to as a suppressor electrode. The main disadvantages of a suppressor electrode as provided in known electrode gun structures are that it increases the overall length of the gun structure and also is difficult to position and maintain positioned with the required precision so that mechanical instability is apt to occur and the cost of manufacture is high. The present invention seeks to provide improved arrangements wherein the suppressor electrode involves no increase in overall length of the gun and wherein very accurate positioning of the said electrode is readily obtained and maintained.

According to this invention, an electron gun structure of the kind including a main focusing electrode system and an attracting anode preceding the same in the direction of propagation of the electron beam, is provided with an apertured suppressor electrode mounted within and insulated from the said attracting anode and positioned with respect thereto by insulating spacing means. Preferably, the suppressor electrode is of apertured disc-like construction and is spaced from the usual apertured bottom of the attracting anode by insulating spacing means.

Preferably, also, insulating spacing means are provided on both sides of the suppressor electrode and said spacing means, together with said electrode, are held in position by a positioning member fitting into the attracting anode on the side of the suppressor electrode remote from the bottom of said anode and fixed as by spot welding, clamping, or in any other convenient way to the said attracting anode.

In a preferred form of construction, the suppressor plate electrode is formed with peripheral tags which are bent over to embrace the slotted edge of an insulating annular spacer so that said disc and said suppressor electrode constitute a pre-formed mechanical unit structure.

The invention is illustrated in the accompanying drawings in which Fig. 1 is a highly simplified schematic elevation of one form of electron gun structure in accordance with the invention, and Figs. 2 and 3 are respectively a sectional elevation and plan view of the attracting anode and suppressor electrode arrangement used in the gun of Fig. 1, and which embodies the present invention. Since



the embodiment of the invention is really shown in Figs. 2 and 3, and Fig. 1 serves merely to show the general position of the electrode system of Figs. 2 and 3 in the gun as a whole, no attempt is made to show this detail in Fig. 1.

Referring to the drawings and first to Fig. 1, the electron gun system therein generally shown is mounted upon the usual insulating base A through which the various connector leads pass and includes a first grid or control electrode B, an attracting anode C within which is the suppressor electrode, a main focusing electrode system generally designated D, and the customary "getter" assemblies generally designated E, the various parts being held in spaced relation as in the conventional way by longitudinal support rods F. Except for the arrangement of the suppressor electrode inside the attracting anode C, the gun of Fig. 1 is of well known construction and requires no further description here.

The attracting anode with the suppressor plate electrode inside it is separately shown to a larger scale and in considerably more detail in Figs. 2 and 3.

Referring to these figures, the attracting anode itself is of more or less usual construction, and comprises a metal cylinder C1 with a disc bottom piece C2 having a central aperture C3 for passing the beam. The cylinder C1 has attached to it at the end remote from the bottom C2 an oblique thimble member C4 constituting an anti-corona ring and which, in association with cylinder D (Fig. 1) provides a tilted lens which, in conjunction with an externally fitted lens (not shown) forms an ion trap. Inside the attracting anode is the suppressor electrode which is in the form of a metal disc 1, having a central aperture 2, and formed with three peripheral radially projecting tags at 120°. Disc 1 has an external diameter a little less than the internal diameter of the attracting anode, and it is attached to a mica or other insulating spacer annulus 4 of such diameter as to fit inside the bottom piece C2 of the attracting anode. The attachment is achieved by providing three slots at 120° in the edge of the annulus 4 and bending over the radial tags of the suppressor electrode to pass through these slots and then bending them round over the back of the annulus. One of these tags, bent over to hold the annulus 4 appears at 3. The other two do not appear in Fig. 2 since they are out of the plane of section. A second mica or other insulating spacer annulus 5 also adapted to fit inside the attracting anode is provided as shown and is pressed against a metal distance wire or ring 6 which is inside the bottom corner of the attracting anode. A lead 7 fixed to the suppressor electrode passes through an aperture C5 in the attracting anode and is connected to the cathode lead so as to hold the suppressor plate electrode at cathode potential. This lead appears in Fig. 1.

On the other side of the suppressor electrode from the parts already described is a further insulating spacing annulus 8 and a dished metal positioning member 9 adapted to fit into the attracting anode cylinder C1 as shown.

The parts 1 and 4 are fixed together by bending over the tags 3 and then, together with the parts 5, 6, 8 and 9, are placed inside the attracting anode as shown in Fig. 2, the part 9 being pressed down towards the bottom of the attracting anode so as to make a firm, rigid and mechanically very stable structure with the suppressor plate electrode precisely positioned with respect to the attracting anode as determined by the dimensions of the parts between it and the bottom plate C2. The positioning member is then fixed with respect to the cylinder C1, e. g. by spot welding. In the drawing, a space is shown between the tag 3 and the disc 5 in order that the drawing may be clearer. In practice, as already stated, the various parts inside the attracting anode are pressed against one another to make a firm and "solid" structure.

I claim:

An electron gun structure for a cathode ray tube comprising a main focusing electrode system and a pre-focusing electrode system, said pre-focusing electrode system preceding the main focusing system in the direction of the electron beam and comprising a substantially cylindrical anode and a pre-focusing electrode, said anode terminating in a substantially cup-shaped member and having an apertured bottom portion, said pre-focusing electrode being formed as an apertured metal disc and mounted within but insulated from said anode, an insulating annulus, the pre-focusing electrode being fixed to said annulus whereby said elctrode is insulated from the interior sides of the anode, further annular insulating means being located on both sides of the insulating annulus, a



dished metal positioning member fitting into said anode on the side of the apertured pre-focusing electrode remote from the bottom portion of said anode, the further annular insulating means together with said pre-focusing electrode being held in position by said dished metal positioning member and means for fixing said member with respect to said anode.

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