May 15, 1956
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2,745,979
ELECTRON GUN, PARTICULARLY FOR CATHODE RAY TUBES
Filed Oct. 1, 1952

Fig. 1.

Fig. 2.

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PATENTED MAY 15, 1956

2,745,979

ELECTRON GUN, PARTICULARLY FOR CATHODE RAY TUBES

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Application October 1, 1952, Serial No. 312,536
Claims priority, application France October 9, 1951
4 Claims. (Cl. 313 — 82)

Cathode-ray tubes for television comprise an electrode system having a cathode, of which the surface heated by a filament wire is of small size, a control-electrode forming a metal plate having a small aperture, and a cup-shaped electrode, the bottom of which also has a small aperture, and which is termed the acceleration anode to distinguish from an additional, mostly cylindrical final anode, which is aligned with the first anode.

The mounting and adjustment of the electrodes to one another is an accurate operation; special care must be taken that the control-electrode and the acceleration anode are accurately parallel to one another and spaced apart by the prescribed distance, whilst the apertures in the electrodes should be centred with respect to the cathode. The fastening of the electrodes to glass rods or to stay rods by means of mica plates does not sufficiently safeguard the maintenance of the accurate adjustment obtained by means of jigs.

The invention has for its object to provide a structural improvement, so that the number of required parts is reduced, the manufacture may be carried out more rapidly and the centring is facilitated. It is particularly of importance for television tubes having a small beam spot, as used for 819 lines, the beam astigmatism being reduced.

According to the invention, the centring grid and the accelerating plate provided is made of a plate of ceramic insulating material, which keeps the electrodes spaced apart by the prescribed distance, a second plate of ceramic insulating material being provided on the side of the centring grid remote from the anode, provision being made of fastening means connecting the acceleration anode to the second plate.

In one embodiment of a cathode-ray tube according to the invention the fastening means may be constituted by studs connected to the anode, extending through recesses in the plates of insulating material and provided with clamps, which bear on the free surface of the second insulating plate.

In order that the invention may be readily carried into effect, it will now be described in detail with reference to the accompanying drawings, in which:

Fig. 1 shows the parts required for the system in a perspective view and separately and, moreover, the centring studs of a jig.

Fig. 2 shows the assembled system in a perspective view and

Fig. 3 shows a view of the complete mounting jig comprising the parts of the electrode system between the centring studs.

Referring to the figures, the acceleration anode is designated by A1. It is constituted by a cup-shaped electrode, the bottom of which has a small aperture 1. Round about the cylindrical part of the anode is made of two metal strips which are soldered to the wall by soldering; the ends of these strips are bent away from the electrode and form two opposite clamping strips 3. Four studs 4 of non-magnetic material are secured to the metal strips at regular intervals along the periphery. The control-electrode G is constituted by a flat metal disc, having the aperture 5 and three small radial extensions 6. A fourth extension 6a, which is slightly longer, serves to secure a supply wire to the electrode.

The plate 7 of ceramic material is provided between the acceleration anode A1 and the control-electrode G. This plate has an aperture 8a and four recesses 8 along the periphery.

A second plate 9, also of ceramic material, has the aperture 10a and the recesses 10 along the periphery. It is provided on the other side of the control-electrode G as the disc 7. The surface facing this electrode has two grooves 11 at an angle of 90°.

The two discs 7 and 9 and the intermediate plate G are slipped on the studs 4 of the acceleration anode A1, the studs protruding through the recesses and being so long a manner that the diameter of the disc G is greater than the ends. These are tightly pressed against the plate 9 and then secured to the studs 4, for example, by soldering.

The system is then secured, by means of the clamping strips 3, to the stay rods 15.

By means of clamping strips 14, the cathode, which is not visible in Fig. 2, extends as it passes through the aperture 10 of the plate 9, is secured to the stay rods 15 in a similar manner. To these rods are also secured the fastening means for the filament wire F, having supports 16.

The stay rods finally support also the final anode A2.

The centring and the assembling of the separate parts of the electrode system, to which the invention refers, is carried out by means of the mounting jig shown in Fig. 3. It comprises two conical studs 17 and 18. The stud 17 is tightly fixed in the body of the jig by means of the screw 19 and the stud 16 is seated freely rotatable on a spindle 26, which may be displaced in an axial direction by turning a screw 21.

Two centring studs 22 and 23 are used and shown in Fig. 1. The stud 22 has a thin pin 24, extending in the centring spindle, its diameter corresponding to the size of the apertures 1 and 5 in the acceleration anode A1 and the control-electrode G. The studs 23 has a small centring sleeve 25, the outer diameter of which corresponds to the size of the aperture 10a in the disc 9, whereas the pin 24 at the stud 22 fits exactly in the aperture of the sleeve 25.

During the mounting operation the acceleration anode A1, the plate 7 and the control-electrode G are arranged in succession on the pin 24 and the plate 9 is arranged on the sleeve 25. The centring studs 23 and 24 are then arranged in the jig in line with one another between the conical studs 17 and 18, after which the stud 16 is shifted forwards by means of the nut 21 until the centring studs 22 and 23 are clamped. Care must be taken that the pin 24 extends in the sleeve 25. In this case the acceleration anode A1 and the control-electrode G are centred relative to one another, and since they engage the accurately worked plate 7, they are at the prescribed distance from one another. Then the clamps 13 are secured to the ends of the studs 4, so that the various parts are united. The extensions 6 of the control-electrode are bent about the edge of the disc edge 7, so that this electrode is prevented from shifting.

The system can then be removed from the mounting jig and mounted on the stay rods 15. At the same time the cathode is secured thereto; since the cathode is introduced into the aperture 10a of the disc 9, it is centred. The correct distance from the control-electrode G may be adjusted, since the front surface of the cathode is adjustable through the grooves 11. The connection to the filament wire F is established by the supply wires 16, which are secured by clamps to the stay rods 15.

Owing to the small number of parts for mounting, the
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3 capacity between the anode and the control-electrode and that between the control-electrode and the cathode appear to be very small and appreciably lower than in corresponding known systems. At the same time there is no risk that variations in the relative distance should occur during the heating required for degrading the electrodes or that the centring should be disturbed.

To the cathode-ray tubes to which the invention relates belong not only television tubes, but also tubes for measuring purposes, cathode-ray oscillographs and tubes for reproducing radar signals.

What we claim is:

1. An electron gun structure for a cathode-ray tube comprising a control grid and an acceleration anode, said control grid comprising a flat plate having a central aperture, a first flat plate of ceramic insulating material having a central aperture and recesses therein and disposed between said grid and anode and defining the spacing therebetween, a second flat plate of insulating material having a central aperture and recesses therein and disposed on the side of the grid remote from the anode, a plurality of studs connected to said anode and free of said control grid and passing freely through the recesses in said first and second plates, and means for clamping the ends of said studs against the free surface of said second plate to thereby urge the anode and second plate against one another and against the grid and first plate, whereby a unitary system is obtained.

2. An electron gun structure as claimed in claim 1 in which the studs are constituted of non-magnetic metal, and the clamping means comprises a rivet slipped on the free end of these studs and secured thereto by solder means.

3. An electron gun structure as claimed in claim 1 in which the control grid is disc-shaped and has radial extensions which are bent around and grip the edge of one of said plates to insure against movement therebetween.

4. An electron gun structure for a cathode-ray tube comprising a cathode, a disc-shaped control grid having a central aperture and an acceleration anode, a first flat plate of ceramic insulating material having a central aperture and recesses therein and disposed between said grid and anode and defining the spacing therebetween, a second flat plate of insulating material having a central aperture and recesses therein and disposed on the side of the grid remote from the anode, the surface of said second plate adjacent the grid having a pair of radial grooves at right angles to one another communicating with the central aperture therein, said cathode extending into the aperture of said second plate and being visible through said grooves, a plurality of studs connected to said anode and free of said control grid and passing freely through the recesses in said first and second plates, and means for clamping the ends of said studs against the free surface of said second plate to thereby urge the anode and second plate against one another and against the grid and first plate, whereby a unitary system is obtained.

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