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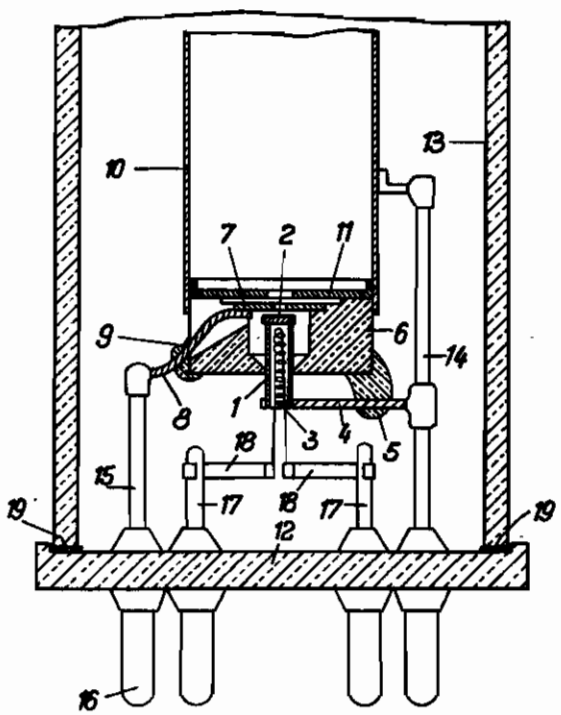

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ALIEN PROPERTY CUSTODIAN

CATHODE RAY TUBE

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The invention relates to cathode ray tubes, especially for television or oscillographic purposes, and more particularly of the type provided with a control electrode for influencing the intensity of the cathode ray beam.

Tubes of the kind heretofore used suffer from several disadvantages. Usually, the control electrode has the shape of a cylinder surrounding the cathode nearly completely and closed at its end by an apertured diaphragm. In this embodiment of the known type of cathode ray tubes, the capacity between the control electrode and the surrounding elements, especially the cathode, is by far too large for enabling the tube to be operated at high oscillation frequencies.

In these and other embodiments of known tubes, the cathode further is often supported by a centering member closely fitting round the cathode body. By this arrangement a considerable heat dissipation is involved and the requirement of heating power accordingly is comparatively high.

It is an object of the invention to provide a cathode ray tube wherein the capacity between the control electrode and the neighbouring elements is minimised.

It is another object of the invention to reduce the heat dissipation from the cathode body.

It is a further object of the invention to facilitate the manufacture of the electrode assembly and to shorten the axial length of the tube.

According to the invention, the control electrode has the shape of a small apertured disc or diaphragm and is mounted in a central recess of a ring-shaped centering member of insulating material which is closely fitted in and supported by the one end of a cylindrical electrode, while the cathode projects from the outside into the centering member to face the control electrode.

The invention will be better understood with the aid of and further features of the invention will be apparent from the following more detailed description and accompanying drawing, which in a purely diagrammatic fashion and by way of example illustrates a cross-section of the socket portion and of the cathode ray producing system of a tube according to the invention.

In the drawing, 1 is the equipotential body of a cathode bearing the emissive substance 2 at its front surface and adapted to be indirectly heated by the filament 3. The cathode body 1 is carried by a supporting member 4 which is fastened to a ring-shaped member 6, preferably by means of a glass bead 5. The surface of the joint between the cathode body 1 and the supporting member 4 is made as small as possible in order to reduce the heat conduction from the cathode. For the same purpose the member 4 may be shaped as a rod or wire of comparatively small cross-section.

The member 6 may consist of ceramic material, pressed glass, or preferably, burnt steatite. The control electrode indicated by 7 has the shape of a small apertured disc or diaphragm and is mounted in a central recess of the centering member 6.

The opening of the member 6, at the upper end of this element and along the greater part of its axial length, is preferably cylindrical and has a diameter which is considerably larger than that of the cathode body 1. At the base of the centering member the diameter of its opening is substantially equal to that of the cathode body, so that but a small play is left between the centering member 6 and the cathode body 1, just sufficient for pushing the cathode body through. Preferably, the opening of the annular member 6 has a narrowing towards its lower end, and the narrow portion of the member 6 is limited to a very short part of its axial length.

By this means the heat conduction from the cathode to the centering member is minimised, and stray electrons can hardly manage to penetrate into the discharge space.

The position of the control diaphragm 7 is further secured by a lead-wire 8 passing through a slit of the centering member 6. Preferably, the conductor 8 is fastened to the member 6 by means of a further glass bead 9.

The centering member 6 is closely fitted in the lower end of a cylindrical electrode 10 and may be secured to this electrode by a glass bead (not shown in the drawing) connecting the two elements.

It is advantageous to use the member 6 at the same time as a spacing means. This feature can be realized in a particularly simple manner when, as it is usual, the control electrode 7, in the direction of the electron movement, is followed by a first anode diaphragm 11 mounted within the cylinder 10. In this case it is merely necessary to shape the member 8 in such a way that the correct position of the control electrode 7 and the diaphragm 11 with respect to one another is obtained, when the member 6 is just closely adjoining to the diaphragm 11. In more general cases the member 6 may be provided with a flange or shoulder to fix its correct position with respect to the cylindrical element 10.

The electrode assembly as described above is

preferably supported by and fixed to supporting rods 14 and 15 as indicated in the drawing. In a preferred embodiment of the invention the supporting rods 14 and 15 are directly embedded in the socket portion 12 of the tube envelope which is formed by a base plate consisting of pressed glass. The base plate 12 may be sealed to the bulb portion 13 of the tube envelope by means of a glass flux 19. Further supporting rods pressed in the glass base may be provided for supporting other elements of the electrode system, which are not illustrated in the drawing.

Preferably, at least a part of the supporting rods passes through the base disc 12 and is provided at the ends outwardly projecting from the base disc with socket pins or similar contact pieces 16 so that the supporting rods at the same time can be used as lead-in conductors. In the example illustrated by the drawing, the supporting rod 14 is at the same time the lead-in conductor for the cylindrical electrode 10. In this case, insulation between the cathode 1 and the electrode 14 may be required, which can easily be obtained, for example by making the supporting member 14 at least partly of insulating material. The supporting rod 15 is used as the lead-in conductor for the control potentials.

Additional lead-in rods 17 are provided if necessary. The lead-in rods are also directly embedded and pressed in the glass flux of the base plate 12. As shown in the drawing, the lead-in rods 17 serve for supplying the cathode filament 3 with the heating current. Intermediate conductive strips 18, preferably consisting of elastic metal, may be provided.

Preferably, the materials of the lead-in or supporting rods and the glass base 12 are selected to have the same heat expansion coefficient. Likewise, care should be taken that the heat expansion coefficients of other metallic elements, for example the cathode 1, the control electrode 7, the cylinder 10, and the diaphragm 11, are substantially equal to the heat expansion coefficients of the adjoining insulating elements, for example the centering member 8.

It may be stressed once more that the drawing is purely diagrammatic and not on scale. Especially the distance between the cathode body 1 and the base plate 12 is considerably smaller and can be reduced in practical embodiments of the tube according to the invention to a few millimetres. By the way a remarkably short length of the tube system is obtained.

In the manufacture of a tube according to the invention it is advantageous to proceed as follows: With the aid of a spacing and centering means the cathode body 1 and the control electrode 7 which are already provided with their supporting members 4 and 8, are brought into their correct position with respect to the centering member 6. The assembly is secured by means of the glass beads 5 and 9 and the auxiliary spacing and centering means are removed. This structural unit is slipped into the cylinder 10. Hereafter the heating element 3 may be introduced into the cathode body 1.

The lead-in and supporting rods are directly embedded in the molten glass flux of the base disc 12 during the pressing process of the latter.

The electrode assembly is mounted on the base member and the single elements are fixed to their supports and connected to their lead-in conductors, preferably by soldering in vacuo.

The base portion carrying the electrode system is then sealed to the glass envelope by means of the glass flux 19 which preferably consists of a molten glass powder applied to the bulb portion 13.

Further steps of the process which are not mentioned in the above, for example degassing and evacuating the tube, may be carried out in any known fashion. Further, it need not be mentioned that the complete electrode system of the tube may comprise electrodes, for example wall coatings and similar elements, which are not supported by and conducted through the base portion of the tube.

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