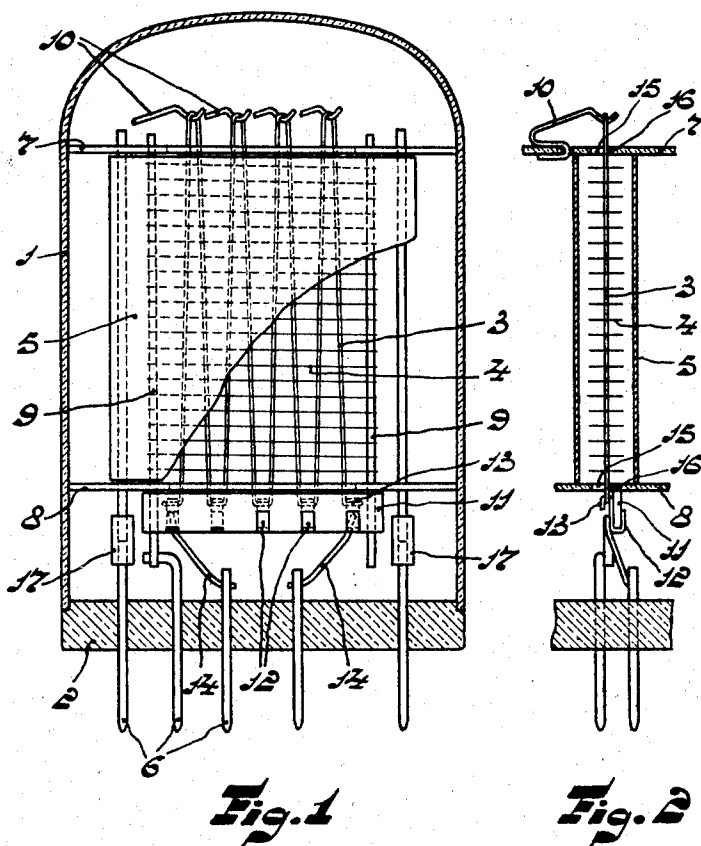


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ELECTRON DISCHARGE TUBE ASSEMBLY

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ELECTRON DISCHARGE TUBE ASSEMBLY

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1 Claim. (Cl. 29—25.18)

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This invention relates to a method of assembling electron discharge tubes and to a subassembly of a cathode for introduction into said tube as a separate unit.

In numerous cases and more particularly in transmitting tubes and output amplifying tubes use is made of cathodes which have been led upwards and downwards once or a number of times in zigzag form and which are kept taut by springs provided at one extremity of the electrode system. At the other extremity of the electrode system such cathodes are, as a rule, supported by the current supply conductors and, as the case may be, one or more support wires which are secured, for example, in a pinch or other sealing body. In mounting such a system it is necessary first to secure the cathode to the current supply conductors and support wires and, as the case may be, to cover the cathode with electron-emitting material and only then can the other electrodes, such as grids and anodes, be arranged about the cathode. The points of bending of the cathode which are required to be attached to the tensioning springs at the extremity of the system remote from the support wires cannot be fixed during these operations since otherwise it is not possible to arrange the other electrodes about the cathode. Since such a cathode is, as a rule, liable to deformation, difficulties arise in arranging the other electrodes, since the free parts of the cathode are caused to bend-over and may get entangled between the grid wires. Furthermore there is the danger that the electron-emitting material partly deposits on the grid and causes grid emission.

In order to obviate these difficulties, it would be possible for the cathode, after the other electrodes have been mounted, to be tacked through the system, but this method also occupies much time.

The said disadvantages are obviated if, according to the invention, in an electric discharge tube comprising an electrode system having a cathode bent and led upward and downward once or a number of times and kept taut by means of spring action at one extremity of the system, this cathode is held in position at the other extremity of the system by a securing member which does not form part of the tube wall and which comprises an insulating body provided with metallic parts to which the cathode is secured and which is adapted to be handled with the cathode as a subassembly. The member preferably comprises a strip of mica, surrounded by pinching with little metal strips to which the points of bending

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and extremities of the cathode are secured, for example, by pinching between bent-over extremities of the strips or by welding or sintering in position by heating at a temperature comprised between 1000 and 1200° C., the metal parts to be connected being pressed on one another.

A tube according to the invention may be built up in accordance with the following procedure. The cathode, which may be filiform and of the directly heated type, but which may alternatively be constituted by a tubular conductor enclosing one or more conductors with the interposition of insulating material, in which event the cathode is of the indirectly heated type, is wound on a templet, whereafter the points of bending and the extremities at one side of the templet are attached to a member according to the invention. The cathode is subsequently coated with electron-emitting material in some manner or other, for example by cataphoresis, before the templet is removed. After the cathode has been coated with electron-emitting material, it has acquired sufficient rigidity so that deformation of the cathode substantially no longer occurs after the templet has been removed, in contradistinction to the known cathodes formed by bending of wire preliminarily coated with electron-emitting material. The electrode system may be assembled to form an electrode package, for example between two centering members, wholly independently of the cathode. Afterwards the cathode is introduced through slots into the centering members. The free points of bending of the cathode are then secured to resilient members so that at the opposite extremity of the electrode system the member according to the invention is drawn against a centering member which may thus come to bear against the backbones of a grid. The cathode parts are centered with respect to the other electrodes owing to the slot-like apertures in the centering members being provided a little out of the center in such manner that one edge of each of the apertures lies exactly in the plane of the cathode. After being stretched, the cathode parts are pulled against the said edges of the apertures so that the cathode is provided directly in the correct plane relative to the other electrodes without requiring particular corrections.

The important advantage of the invention is that the electrode package is adapted to be mounted independently of the cathode and that the cathode may be arranged rapidly and in a very simple manner. The extremities of the cathode may be connected to the current supply

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conductors by means of flexible strips welded to the metal parts of the member according to the invention, thus avoiding the risk of damage or deformation of the cathode in connecting the latter to the current supply conductors. A particular attachment of the insulating member according to the invention is not required since, owing to the tension force of the springs of the cathode, this member is pulled with sufficient firmness against a centering member for the electrode system and may thus engage the backbones of one or more grids.

In order that the invention may be clearly understood and readily carried into effect, it will now be described more fully by reference to the accompanying drawing, in which:

Fig. 1 is an elevation view and

Fig. 2 is a side-view of one form of tube according to the invention.

In Fig. 1, reference numeral 1 indicates the bulb of a tube which is closed by a base 2. The electrode system comprises a cathode 3, in this instance a directly-heated cathode, which has been led upwards and downwards a number of times so as to form a plurality of V's. The cathode 3 is surrounded by a grid 4 and an anode 5, which are attached to support wires 6 sealed into the bottom of the tube. The electrodes are spaced by means of centering members 7 and 8 consisting, for example, of mica. The grid is wound on backbones 9. At the top of the system the cathode 3 is kept taut by means of springs 10, which may be secured in the centering member 7. The lower extremity of the cathode 3 is attached to a member 11 according to the invention by means of metallic strips or ribbons 12. As shown in Fig. 2, the said strips are pinched about the member 11, the extremities and the points of bending of the cathode being pinched or welded under tags 13 formed by one of the extremities of the strips. The strips connected to the cathode ends are provided with flexible current supply strips 14. The cathode, which is adapted to be handled with the member 11 as one unit or subassembly, is introduced through the slot 15 of the centering member 8 into the electrode package which has preliminarily been assembled completely, whereupon the points of bending are suspended on the tops of the springs 10. The member 11 is thus caused to be pulled firmly against the centering member 8, whilst the cathode limbs are pulled against the edges 16 of the apertures 15 in the centering members 7 and 8 and are thus centered. The electrode package is subsequently secured to the bottom of the tube, for example, by means of sleeves 17 which are slipped on the anode supports and the support wires 6.

The cathode can now be mounted in a very simple manner. After the cathode core has been wound on a templet, the points of bending and the extremities are secured, at one side, to the metal strips 12 of the member 11. The cathode

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is then dipped to a determined depth into a bath and coated therein with electron-emitting material, for example by the cataphoretic process. Next, the assembly is taken out of the bath to such extent that only those parts of the cathode which stand above the system are hanging in the bath. These parts are deprived again from the electron-emitting substance by reverting the sense of the current, since it is undesirable that parts of the cathode projecting beyond the system can emit electrons. After removal of the templet the cathode is completed and constitutes one assembly which is substantially not liable to deformation on account of the rigidity of the electron-emitting layer, in contradistinction to those processes in which use is made of wire which is preliminarily coated with electron-emitting substance and wound on a templet.

What we claim is:

In the assembling of an electron discharge tube of the type comprising an envelope and within the envelope a multiple electrode system including a zigzag-shaped cathode, the method of making a cathode subassembly for independent introduction into a previously assembled electrode package, comprising the steps of winding the cathode-forming wire on a templet for temporarily supporting said wire, securing the extremities and points of bending of said wire at one side to a securing member independent of said envelope electrophoretically coating the cathode wire with electron-emitting material in an electrolytic bath, moving the coated wire out of the bath to such an extent that will leave within the bath those parts of the wire, which in the completed tube project above the electrode system, reversing the sense of the electric current so as to remove the coating from the last-mentioned parts of the wire, and removing the templet from the subassembly.

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