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ELECTRON GUN ASSEMBLIES FOR CATHODE-RAY TUBES

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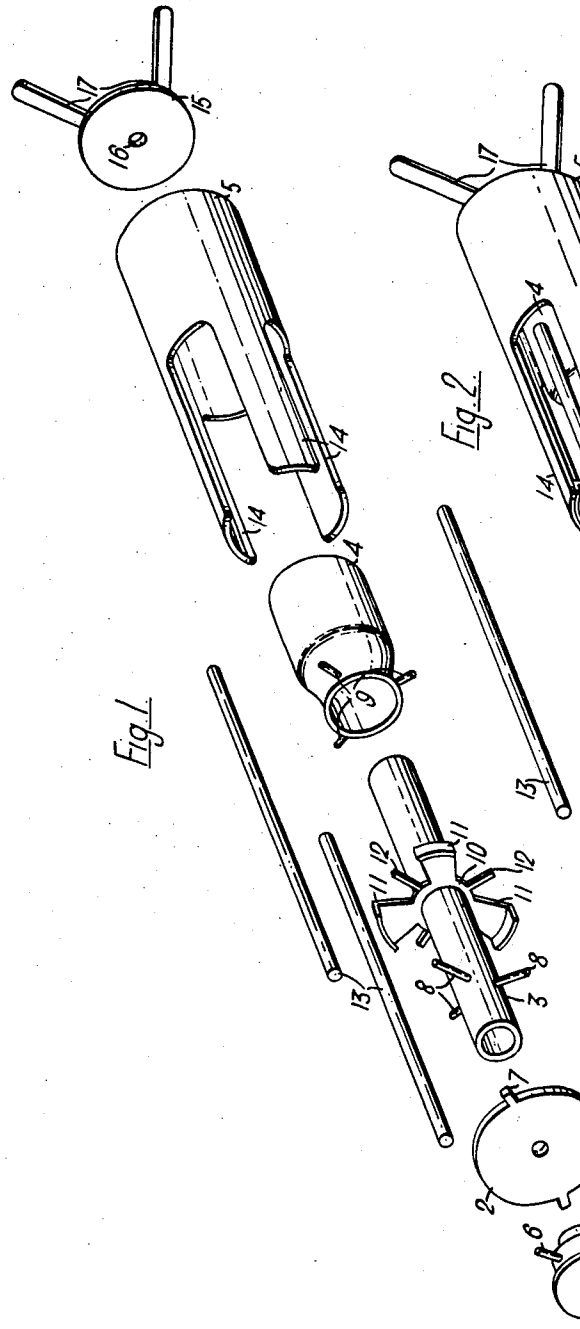

Fig. 1

Fig. 2

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ELECTRON GUN ASSEMBLIES FOR CATHODE-RAY TUBES

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This invention relates to electron gun assemblies.

Electron gun assemblies usually comprise a cathode supported within a grid electrode, and first, second and third tubular anodes which together form an electron lens for focusing the electron beam. It is usual to support all of these components from a number of rods of electrically non-conductive material, such as glass, either by clamps or by pins attached to the components and embedded in the rods. This method of support requires the rods to lie outside all of the components and if the assembly is to be mounted in a narrow necked cathode-ray tube the maximum diameter of each anode must be considerably less than the internal diameter of the neck of the tube thus limiting the aperture of the electron lens formed by the anodes.

It is an object of the present invention to provide an electron gun assembly in which the diameter of the third anode may be made only slightly less than the internal diameter of the neck of the tube in which the assembly is to be mounted.

According to the present invention an electron gun assembly includes a cathode supported within a grid electrode, a first tubular anode, a second tubular anode of larger diameter than said first anode, and a third tubular anode of larger diameter than said second anode, said grid electrode and said first and second tubular anodes being supported from at least two rods of electrically non-conductive material with said second anode overlapping said first anode, said third anode being supported to overlap said second anode by means of a plurality of laminar bridging pieces extending from said third anode to a spider rigidly mounted on said first anode.

Preferably said rods of electrically non-conductive material are disposed to lie within a projection of the outer surface of said third anode.

Said laminar bridging pieces may be in the form of tongues integral with said third anode and extending from one end thereof, in which case said spider may be metallic whereby said tongues and said spider form an electrical connection between said third and said first anode.

One embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 is an exploded perspective view of an electron gun assembly in accordance with the invention suitable for use in a cathode-ray tube, and

FIGURE 2 is an assembled perspective view of the assembly shown in FIGURE 1.

Referring now to the drawings, the electron gun assembly includes a cathode (not visible in the drawings) supported within a grid electrode **1**, a planar anode **2**, and first, second and third tubular anodes **3**, **4** and **5**. The grid electrode **1** has welded thereto three pins **6** equiangularly spaced and the planar anode **2** has three tabs **7** equiangularly spaced around its periphery. The first tubular anode **3** has welded thereto three pins **8** equiangularly spaced and the second tubular anode **4** has a reduced neck portion at one end to which are welded three pins **9** equiangularly spaced. The pins **6**, **8** and **9** and the tabs **7** are of such length that the free ends of corresponding pins and tabs on the respective components are in line.

A metallic spider **10** is mounted on the first tubular anode **3**. The spider **10** has three arms **11** equiangularly spaced and three tabs **12** spaced between the arms **11**, the tabs **12** being of such length that their free ends are in line with corresponding ones of the pins **6**, **8** and **9**. The grid electrode **1** and the anodes **2**, **3** and **4** and the spider **10** are supported from three glass rods **13** by means of the pins **6**, **8** and **9** and the tabs **7** and **12**. In assembly the grid electrode **1** and the anodes **2**, **3** and **4** are held in a jig with the anode **4** overlapping the anode **3** and with the pins **6**, **8** and **9** and the tabs **7** and **12** aligned. The glass rods **13** are heated until they are soft and they are then pressed onto the pins and tabs. Upon cooling the pins **6**, **8** and **9** and the tabs **7** and **12** remain embedded in the glass rods **13** which thus provide a rigid support for the grid electrode **1** and the first three anodes **2**, **3** and **4**.

The third tubular anode **5** has three metallic tongues **14** extending axially from one end for a distance greater than the length of the second tubular anode **4**. The tongues **14** form bridging pieces which are welded to the arms **11** of the spider **10** to support the anode **5**, which overlaps the second tubular anode **4**. The tongues **14** and the arms **11** of the spider **10** also form an electrical connection between the third tubular anode **5** and the first tubular anode **3**. The end of the anode **5** opposite the tongues **14** is closed by a disc **15** which contains a beam limiting aperture **16** and which carries three spring fingers **17** which serve to locate the assembly in the neck of a cathode-ray tube.

In the assembly described the glass rods **13** all lie within a projection of the third tubular anode **5** which may therefore have a diameter only slightly less than the internal diameter of the neck of the cathode-ray tube into which the assembly is fitted. Since the aperture of the electron lens formed by the anodes **3**, **4** and **5** is determined mainly by the diameters of the second and third tubular anodes **4** and **5** this means that, for a given neck diameter, a lens of larger aperture may be used than is possible with a known assembly in which the support rods have to lie outside all of the anodes, thus improving the quality of the lens.

The assembly described above may be varied in many ways. For example the tabs **12** need not be provided on the spider **10** and the pins **8** may be placed near the cathode end of the anode **3** thus decreasing the voltage stress along the glass rods **13** when high potential differences are applied between the first and second tubular anodes **3** and **4**. Also, the bridging pieces formed by the tongues **14** need not be integral with the anode **5** as described. They may, for example, be integral with the arms **11** of the spider **10**. Furthermore, the spider **10** need not be metallic since a suitable electrical connection may readily be made between the first and third anodes if desired. Furthermore, the electron gun has been described as a tetrode gun. It could however be a triode gun or a gun having a larger number of electrodes.

We I claim is:

1. An electron gun assembly including a cathode supported within a grid electrode, a first tubular anode, a second tubular anode of larger diameter than said first anode, and a third tubular anode of larger diameter than said second anode, said grid electrode and said first and second tubular anodes being supported from at least two rods of electrically non-conductive material with said second anode overlapping said first anode, said third anode being supported to overlap said second anode by means of a plurality of laminar bridging pieces extending from said third anode to a spider rigidly mounted on said first anode.

2. An electron gun assembly as claimed in claim 1 in

which said rods of electrically non-conductive material are disposed to lie within a projection of the outer surface of said third anode.

3. An electron gun assembly as claimed in claim 1 in which said laminar bridging pieces are metallic.

4. An electron gun assembly as claimed in claim 1 in which said laminar bridging pieces are in the form of tongues integral with said third anode and extending from one end thereof.

5. An electron gun assembly as claimed in claim 3 in which said spider is metallic whereby said laminar bridging pieces and said spider form an electrical connection between said third anode and said first anode.

6. An electron gun assembly as claimed in claim 4 in which said laminar bridging pieces and said spider are metallic, whereby said bridging pieces and said spider form an electrical connection between said third anode and said first anode.

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