

Jan. 15, 1952

E. POHLE
CATHODE GRID ASSEMBLY

2,582,454

Filed May 13, 1950

2 SHEETS—SHEET 1

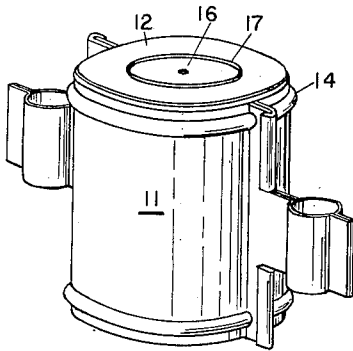


Fig. 1

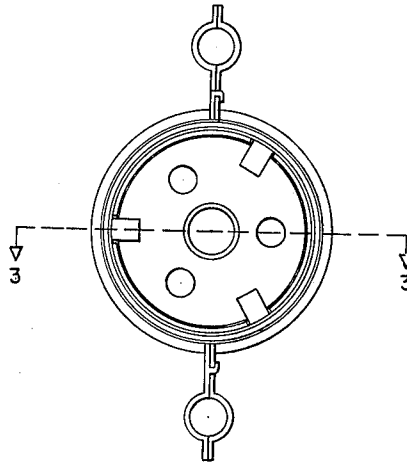


Fig. 2

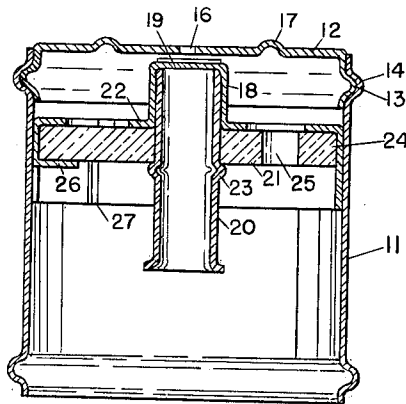


Fig. 3

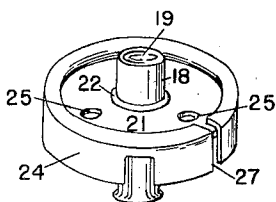


Fig. 4

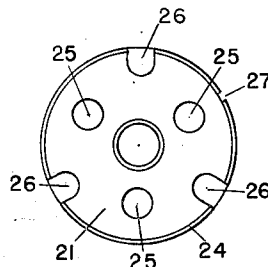


Fig. 5

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2 SHEETS—SHEET 2

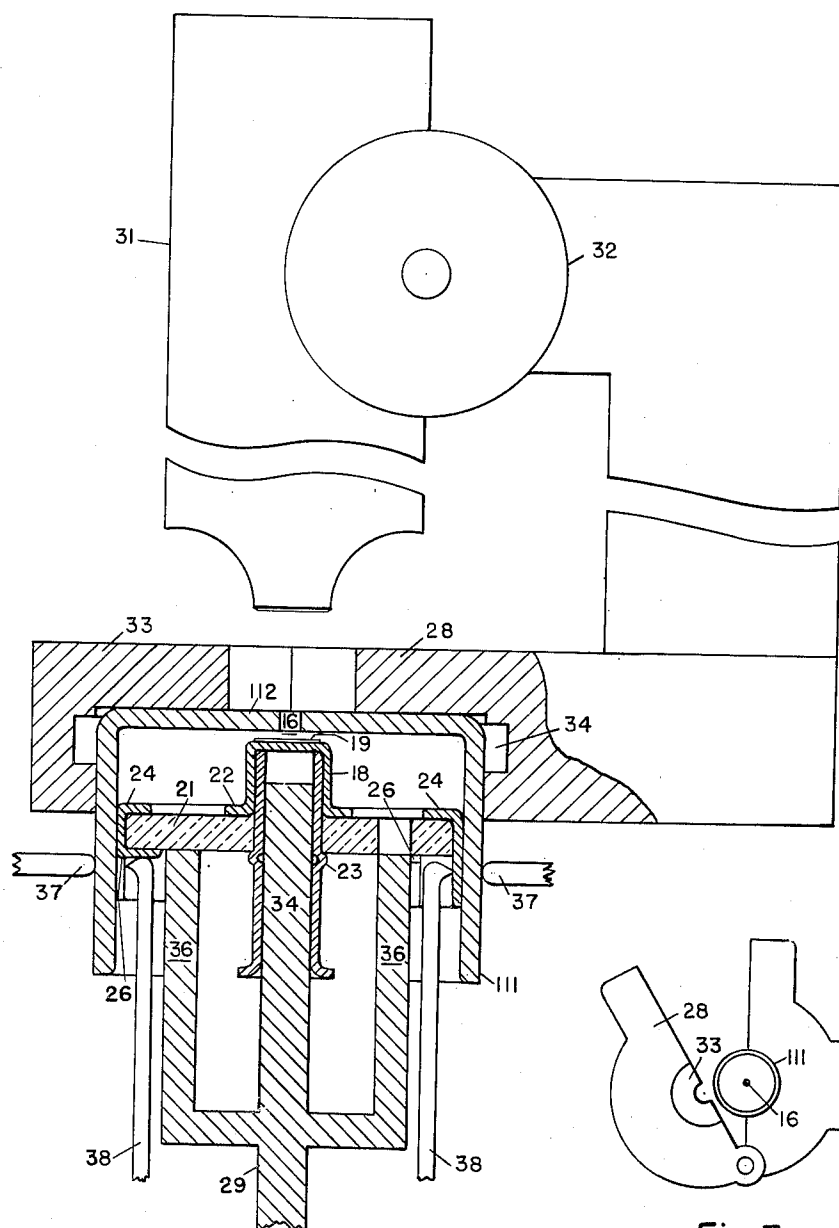


Fig. 6

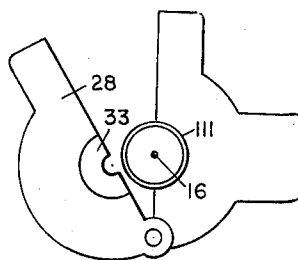


Fig. 7

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CATHODE GRID ASSEMBLY

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5 Claims. (Cl. 313-83)

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This invention relates to electron discharge devices and particularly to the electron gun portion of cathode ray tubes, and more particularly to the cathode grid assembly of said tubes.

In the manufacture of cathode grid assemblies for cathode ray tubes, a mechanical spacer has been used to fix the distance between the electron emissive coating on the cathode and the grid aperture. Since the distance to be controlled is of the order of .005 inch, a tolerance of +10% requires that these spacers vary in size no more than +.0005 inch. It is difficult to obtain pressed or drawn metal spacers having the required accuracy and a large percentage must be rejected. Furthermore, since the error is not entirely confined to the spacer but may be the result of incorrect stamping of other elements of the structure, it frequently happens that the complete cathode grid assembly is constructed before it is found to be outside of the tolerances thereby increasing the expense of the rejected part.

Other cathode grid assemblies which have been made without the use of mechanical spacers to determine the spacing between the cathode and grid, have been subject to a tilting of the axis of the cathode with respect to the grid. This cannot be controlled because of the inaccessibility of the cathode and cannot be determined until the cathode ray tube is completed and tested.

Consequently one object of my invention is to provide an improved cathode grid assembly.

A second object is to provide a cathode grid assembly, for a cathode ray tube, which can be rapidly and accurately assembled.

Other objects will be apparent from the specification and drawings in which:

Figure 1 is an isometric view of a cathode grid assembly;

Figure 2 shows a bottom view of the cathode grid assembly in Figure 1;

Figure 3 is a cross sectional view through 3-3 of the device in Figure 2;

Figure 4 shows a cathode thimble in its holder;

Figure 5 is a bottom view of the device in Figure 4;

Figure 6 illustrates apparatus used in one method of assembly of a cathode grid assembly; and

Figure 7 is a bottom view of one part of the device shown in Figure 6.

The invention will be described with reference to Figure 3, in which a cathode ray tube grid cylinder 11 is shown, made in accordance with known principles. One end of the cylinder 11 is capped by a disc 12 having a ring 13 on the rim thereof clasped by the matching rib 14 on the cylinder 11. The disc 12 has a central aperture 16 and a stiffening rib 17.

The cathode comprises a cap 18 on which the emitting material 19 is located and a sleeve 20 inserted in and preferably welded to the cap 18

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to form the complete cathode structure. This structure is mounted in the centrally located hole of a ceramic disc 21 and is held in place by the flange 22 of cap 18 on one side and by a bead 23 pressed into the cylinder 20 on the other side of the disc 21.

Figures 4 and 5 show the disc 21 held in a metallic rim 24 by means of a plurality of fingers 26 which are cut from the cylindrical side of the rim 24. The openings 25 in the disc 21 assist in the evacuation of the cathode grid structure during the final construction of the cathode ray tube. The rim 24 has a slot 27 therein for a purpose to be hereinafter explained.

Figure 6 shows a cathode grid similar to the one in Figure 3 in position for sealing the rim 24 to the grid cylinder 111. The reference characters 111 and 112 indicate that the parts so designated are electrically equivalent to parts designated 11 and 12 in Figure 3. They differ mechanically in that the cylinder 111 and the disc 112 are integrally formed from a single piece of metal. The two types of grid cylinders 11 and 111 are interchangeable for welding.

A microscope 31 mounted on a stand, which may be part of a vise 28, moved vertically by means of a knob 32, may be used to locate accurately the cathode with respect to the anode. In assembling the cathode grid structure, the vise 28 is opened as shown in Figure 7, which is a bottom view, and the cylinder 111 is slipped in place. The cylinder 111 is locked in place with the disc 112 against the shoulder 33 of the vise 28. Space 34 is provided for the rim 14 if a structure such as that shown in Figure 3 is used.

If a one piece grid cylinder 111 and disc 112 is used, the focus of the microscope 31 can be fixed on a point which is below the top surface of the disc 112 by a distance equal to the thickness of the disc 112 plus .005 inch, or the desired spacing. If a grid structure such as is shown in Figure 3 is used, the stiffening ring 17 forms the abutting surface for the disc 12 against the shoulder 33. Since the height of the rib 17 may vary, it is necessary first to focus the microscope 31 on the top surface of the disc 12 adjacent the aperture 16 and then refocus on a second point the required distance below the first point. Any of a number of well known gauging techniques may be used to determine the relation between the first and second focussing points.

Having fixed the microscope 31 at the second focussing point, the cathode assembly is then inserted into the grid cylinder 111. A mounting device 29, mounted on guides (not shown) which allow it to slide coaxially into the cylinder 111, may be used to insert the cathode assembly into the position where the emissive material 19 is at the second focussing point. The device 29 has a central pole 34, which fits snugly into the cathode cylinder 20 to keep it from tilting with respect to the grid cylinder 111, and arms 36, which may be in the form of an open ended cylinder.

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The arms 36 form the abutting surfaces since they rest on the comparatively sturdy insulating disc 21, while the central pole serves as the guide.

When the cathode assembly is properly positioned within the grid cylinder 111, the welding electrodes 37 and 38 spot weld the rim 24 to the cylinder 111 to complete the construction of the cathode grid assembly.

The purpose of the slot 27 in the rim 24 (Figs. 4 and 5) is to allow the rim 24 to be made with a slightly larger external diameter than the internal diameter of the cylinder 111. This results in some friction, which is desirable, when the cathode assembly is inserted in the cylinder 111. This friction, if not excessive, aids in positioning the cathode assembly properly within the cylinder 111 by resisting relative movement between the rim 24 and the cylinder 111, thus holding the disc 21 tightly against the arms 36. Standard manufacturing tolerances for the cylinder 111 and rim 24 make this slot feature desirable.

An alternative way of welding the rim 24 to the control grid cylinder 111 is to utilize the arms, or outer cylinder 36 as the inner electrodes in place of the electrodes 38. In order to do this it will be, of course, necessary to increase the outer diameter of the cylinder 36 to conform with the inner diameter of the skirt portion of the rim 24. The fingers 26, instead of the ceramic 21, will then rest on top of the arms 36, but since the center aligning rod 34 maintains the alignment of the cathode, the assembly will not be misaligned.

A third way of welding the rim 24 to the cylinder 111 is to utilize only the welding electrodes 37 in which case the mounting device 29 need not even be constructed of conducting material. This last mentioned type of welding consists in applying one polarity of the welding potential to one of the electrodes 37 and the other polarity to the other electrode 37. Welding then takes place at the areas of contact of the rim 24 and the cylinder 111 closest to the two electrodes 37.

Although I have illustrated this invention by specific examples of cathode grid assemblies and manufacturing devices, obvious alternatives will occur to those skilled in the art, and therefore I do not desire to be limited except by the following claims.

What is claimed is:

1. A cathode grid assembly for a cathode ray tube, said assembly comprising a cathode in the form of a cylinder closed at one end with the outer surface of said closed end being coated with an electron emissive material, a grid in the form of a cylinder closed at one end and having a central aperture in said closed end, said cathode being mounted coaxially within said grid with the closed ends in the same longitudinal direction and supported therein by an insulating disc secured thereto, and a mounting rim around the outer edge of said disc pressing against the inner surface of the sides of said grid preventing relative longitudinal movement between said cathode and said grid.

2. A cathode grid assembly for a cathode ray tube said assembly comprising a cathode comprising a hollow tube open at one end and closed at the other end by a heat conducting cover, said cover having a coating of electron emissive material on the surface thereof which is external to said tube and perpendicular to the axis of said tube, an insulating disc to which said tube is secured, a metallic rim around the perimeter

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of said disc, an intumed flange on said rim to restrict said disc from moving axially with respect to said rim in one direction, and projections from said rim to restrict said disc from moving axially with respect to said rim in the opposite direction, a control electrode comprising a hollow cylinder closed at one end in the form of a flat, apertured plate, said rim being secured coaxially within said cylinder and positioned to locate the closed end of said cathode nearest said apertured plate and the open end of said cathode tube nearest the open end of said cylinder.

3. A cathode grid assembly for a cathode ray tube said assembly comprising a cathode comprising a hollow tube open at one end and closed at the other end by a heat conducting cover, said cover having a coating of electron emissive material on the surface thereof which is external to said tube and perpendicular to the axis of said tube, an insulating disc to which said tube is secured, a metallic rim around the perimeter of said disc, an intumed flange on said rim to restrict said disc from moving axially with respect to said rim in one direction, projections from said rim to restrict said disc from moving axially with respect to said rim in the opposite direction, a control electrode comprising a hollow cylinder and a flat, apertured plate on one end of said cylinder, said rim being welded inside said cylinder and coaxially therewith and positioned to locate the closed end of said cathode nearest said apertured plate and the open end of said cathode ray nearest the open end of said cylinder.

4. The apparatus of claim 3 in which said rim has a longitudinal slot forming an opening to create resiliency of said rim.

5. A cathode grid assembly for a cathode ray tube said assembly comprising a cathode comprising a hollow tube open at one end and closed at the other end by a heat conducting cover, said cover having a coating of electron emissive material on the surface thereof which is external to said tube and perpendicular to the axis of said tube, an insulating disc to which said tube is secured, a metallic rim around the perimeter of said disc, an intumed flange on said rim to restrict said disc from moving axially with respect to said rim in the opposite direction, a control electrode comprising two semi-cylindrical sections joined along the sides thereof to form a hollow cylinder, and a flat, apertured plate attached to one end of said cylinder, said rim being welded inside said cylinder and coaxially therewith and positioned to locate the closed end of said cathode nearest said apertured plate and the open end of said cathode tube nearest the open end of said cylinder.

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