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ELECTRON GUN CENTERING DEVICE FOR CATHODE-RAY TUBES

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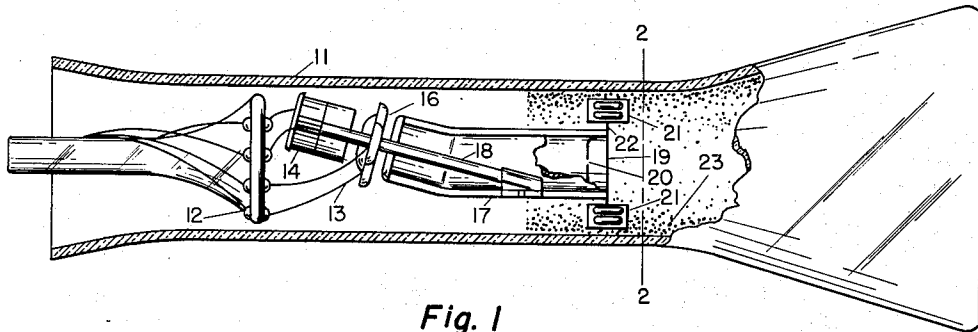


Fig. 1

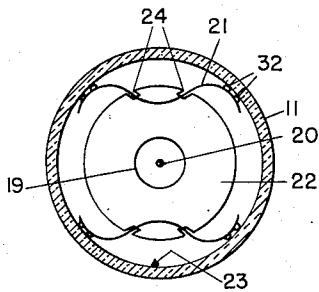


Fig. 2

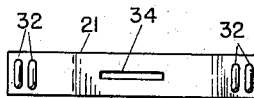


Fig. 3

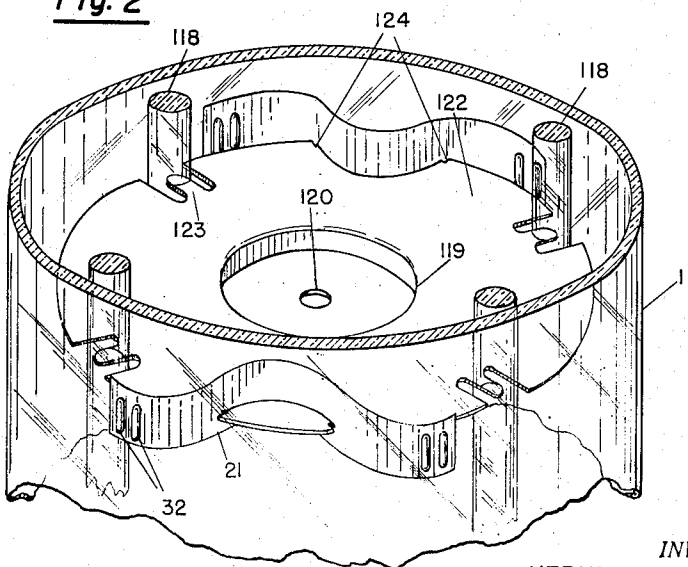


Fig. 4

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## ELECTRON GUN CENTERING DEVICE FOR CATHODE-RAY TUBES

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7 Claims. (Cl. 313—288)

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This invention relates to cathode ray tubes and particularly to resilient members for centering electron guns in the necks of cathode ray tubes.

One of the problems in manufacturing cathode ray tubes is to center the front end of the electron gun in the neck of the tube in order to prevent the cathode ray spot from moving about on the fluorescent screen in response to mechanical shocks received by the tube and in order to achieve and maintain symmetry of the electron optical system. It is necessary that this spring centering device maintain its resiliency, in spite of the electronic heating customarily applied to cathode ray tubes during the manufacturing process, not only for mechanical support but also because the centering device frequently is used as a conductive connection between one of the metallic electrodes in the electron gun and a coating on the wall of the tube.

It is one object of this invention to provide an improved electron gun centering device.

Other objects are to provide an improved centering device forming a conductive connection between the electron gun and the wall coating of the tube, to provide an electron gun centering device which can be easily inserted into the cathode ray tube during the manufacturing process without scraping the conductive coating from the neck of the tube, and to provide a simplified electron gun centering device for simplified assembly.

Still further objects will be apparent after studying the following specification and drawings in which:

Figure 1 shows the neck of a cathode ray tube containing the electron gun centering device of this invention;

Figure 2 shows a sectional view through 2—2 of the tube in Figure 1;

Figure 3 shows a featured element used with the centering device shown in Figures 1 and 2; and

Figure 4 is a perspective view of the neck of a cathode ray tube partially cut away showing an alternative centering device.

In the manufacture of cathode ray tubes it is the practice to insert the electron gun, which has been previously mounted on a stem, into the neck of the tube and position the gun so that the stem may be sealed to the neck of the tube. These elements are shown in Figure 1 in which only a portion of the neck 11 is shown. The electron gun structure, which is mounted on a glass stem 12 by means of a plurality of lead-in wires 13, comprises a control grid 14, a second

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grid 16, and an anode 17 all secured to a pair of support rods 18, only one of which is visible in this view. The end of the electron gun which is farthest from the stem 12 centered in the neck 11 by a resilient structure comprising a limiting aperture cup 19 having a pair of resilient members 21, which also make electrical contact between the anode 17 and a conductive coating 23 on the inner wall of the neck 11. The outer part of the limiting aperture cup 19 forms a skirt, or rim 22, while the center is depressed slightly to fit within the end of the anode cylinder 17. A central opening 20 in the depressed portion forms the limiting aperture which assists in the determination of the size of the electron beam.

The location of the resilient supports 21 on the rim 22 of the cup 19 is shown more clearly in Figure 2. As may be seen, the resilient members are formed from a thin strip of resilient metal with the two ends bent and the center section bowed, all in the same direction. A narrow slot 34 is provided running longitudinally through the bowed portion. Small protuberances are formed in the outer surface of the rounded end portions providing the bearing surfaces that make contact with the wall 11. These protuberances 32 are formed with rounded edges to prevent any of the coating 23 from being scraped off of the wall 11 during the insertion of the electron gun. The center slot 34 is of sufficient width to slip over the edge of the rim 22, with the edges thereof snapped into or engaging a pair of complementary notches 24 in the rim.

One of the steps in the construction of the cathode ray tube consists in heating the cup 19 in order to drive out any occluded gases, particularly in the area adjacent the aperture 20, in order to prevent these gases from being liberated by the electrons impinging on the surface of the cup 19 around the limiting aperture. The heat generated in the cup 19 during this manufacturing process is not limited to the immediate vicinity of the aperture but is carried to all adjacent parts which are capable of conducting heat. Since the clips 21 make contact with the rim 22 in a very limited area around the notches 24, but no appreciable amount of this heat is conducted from the cup 19 to these clips, and the resiliency of the clips is therefore not affected. This limited area, however, is sufficient to conduct the small electrical current encountered in the normal operation of the tube.

Figure 4 shows a modified type of centering device in which the rim 122 of the apertured electrode 119 has a plurality of support lugs 123. In

the construction of an electron gun using this type of spring centering device, the lugs 123 are forced into the sides of glass support rods 118 which have been suitably softened by heating. After cooling, the glass support rods 118 which extend longitudinally of the neck of the tube with other gun structure parts secured thereto, provide a rigid support for the electrode 119 with respect to the rest of the electron gun. The spring clips 21 are attached to the rim 122 in the same way as described above.

Although a specific embodiment of the invention has been described, it will be understood by those skilled in the art that modifications can be made within the scope of the following claims.

What is claimed is:

1. In an electron gun structure for a cathode ray tube, an electrode and a centering device for said structure, said centering device comprising a plate forming a part of said electrode extending radially outwardly therefrom, and a resilient metal strip member, said member being bowed in the center portion thereof having a longitudinal slot therein and curved end portions presenting a rounded surface on the outer ends thereof, said resilient member being attached to said plate with a portion of the end of said plate extending through said slot.

2. An electron gun comprising an electrode, a resilient centering device comprising a plate forming a part of said electrode and extending radially outwardly therefrom, said plate having a pair of notches in the outer periphery thereof, a resilient metal strip member, said member having a transverse bend at the center thereof and a longitudinal slot therein, the width of said slot being greater than the thickness of said plate and the length of said slot being approximately equal the chordal distance between an adjacent pair of said notches, said resilient members being clipped to said plate with a portion of said plate between said pair of said notches extending through said slot with the end edges of said slot engaging said pair of notches.

3. An electron gun comprising a tubular electrode, and a resilient centering device comprising a centrally apertured plate attached to one end of said tubular electrode, said plate having a central depression fitted within one end of said anode, said plate extending radially outwardly from said electrode and having a plurality of notches in its outer periphery, a plurality of bowed resilient sheet metal members, each of said members having a longitudinal slot therein, said slot having a width greater than the thickness of said plate and a length greater than the chordal distance between an adjacent pair of said notches, each of said members being clipped to said plate with a portion of said plate between an adjacent pair of said notches extending through said slot with the ends of said slot engaging said pair of notches.

4. A cathode ray tube having a cylindrical neck and an electron gun comprising a tubular electrode axially disposed in said neck, a limiting aperture plate secured to one end of said tubular electrode and extending outwardly therefrom, a plurality of notches in the outer periphery of said plate, a plurality of resilient metal ribbon clips, each of said clips having a longitudinal slot therein, the width of said slot being greater

than the thickness of said plate and the length of said slot being greater than the chordal distance between an adjacent pair of said notches, said ribbon clips being bent transversely in one direction in the region of said slots and being bent back in the other direction near the outer ends of said clips, said clips being attached to said plate with a portion of said plate between an adjacent pair of said notches extending through said slot with the ends of said slot engaging said pair of notches, the turn back ends of said clips bearing resiliently on the interior of said neck.

5. In an electron gun comprising an electrode, a plate extending radially from said electrode, said plate having in the outer edge thereof a plurality of notches and a plurality of radial cuts, said cuts defining a plurality of tongues, a plurality of vitreous support rods, the ends of said tongues being secured to said support rods to support partially said electrode, a plurality of resilient sheet metal members, each of said members having a longitudinal slot therein, said slot having a width greater than the thickness of said plate and a length greater than the chordal distance between an adjacent pair of said notches, each of said members having a transverse bend across said slot, each of said members being clipped to said plate with a portion of said plate between an adjacent pair of said notches extending through said slot with the ends of said slot engaging said pair of notches.

6. In an electron gun structure for a cathode ray tube, a centering device comprising a plate member extending radially of the longitudinal axes of said gun, said plate having adjacent slots in its peripheral edge, said slots extending along axes generally chordally of said plate, and a resilient strip member having a bowed center portion with a longitudinal opening therein, said strip being attached to said plate with the ends of said opening engaging the ends of said adjacent slots.

7. In an electron gun structure for a cathode ray tube, a centering device comprising a plate member extending radially of the longitudinal axes of said gun, said plate having adjacent slots in its peripheral edge, said slots extending along axes generally chordally of said plate, and a resilient strip member having a bowed center portion with a longitudinal opening therein, said strip being fixedly secured to said plate with the shortest distance between the ends of said opening less than the shortest distance between the openings of said adjacent slots.

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