

March 10, 1959

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ELECTRODE ASSEMBLY
Filed Aug. 25, 1955

2,877,370

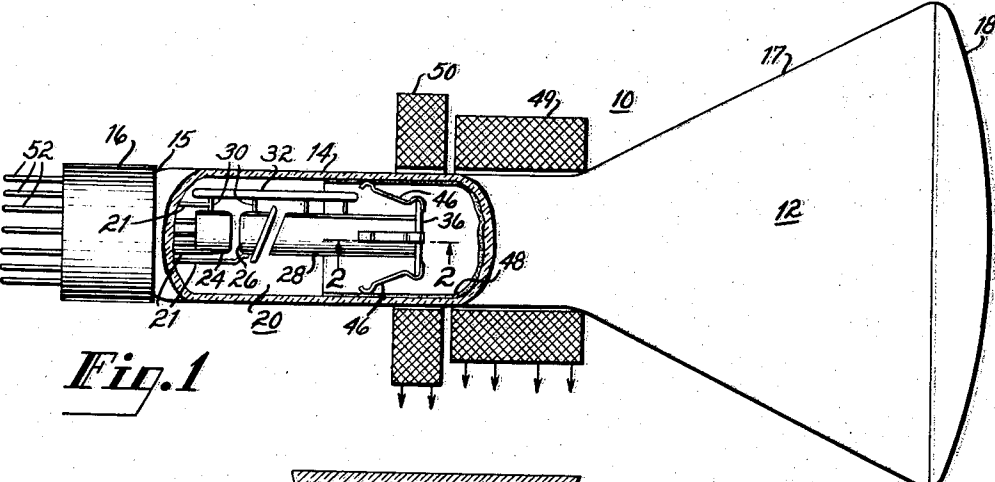


Fig. 1

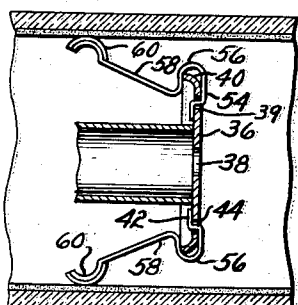


Fig. 2

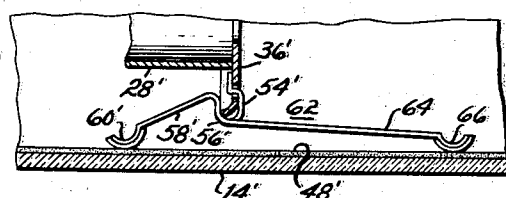


Fig. 3

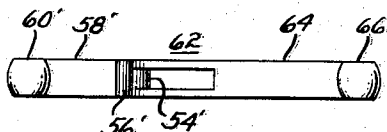


Fig. 4

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ELECTRODE ASSEMBLY

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Application August 25, 1955, Serial No. 530,531

6 Claims. (Cl. 313—82)

This invention relates to an improved electrode assembly and, particularly, to an improved means for supporting and mounting an electrode assembly within a container.

The principles of the invention may be embodied in electrode assemblies of the type employed in cathode ray tubes, photo-tubes, and the like. Normally, a cathode ray tube for television or other purposes includes an envelope having a large bulb portion and a tubular neck portion. Mounted within the tubular neck portion are a plurality of electrodes joined together to provide an electrode assembly or an electron gun for forming and focusing an electron beam along a path extending into the bulb portion. For optimum control of the electron beam in such a tube, the electron gun should be accurately and securely supported and centered within the neck portion of the tube.

There are many known methods and means for mounting an electron gun in the neck of a cathode ray tube. One type of mounting means includes elongated, flat, double-ended metal spring support elements or spacers having one end secured to one of the electrodes of the electron gun and having the other end pressing against the inner wall of the neck portion of the tube. Generally, it has been necessary to weld the support or spacer elements to the selected electrode of the gun in order to achieve a strong assembly. However, a welding operation is comparatively expensive and time-consuming and is generally undesirable in mass production operations. If welding is not employed, it has been found difficult to attach the spacers to the gun electrodes to provide positive support of the gun within the tube neck.

In addition, such spacers of the prior art undergo considerable bending when an electrode assembly is put together and then inserted into and adjusted within a container. Such manipulation cold-works the metal of the spacers and they become fragile and are easily broken.

Accordingly, an object of this invention is to provide an improved mounting and support means for an electrode assembly.

Another object of this invention is to provide improved means for centering and supporting an electrode assembly in a container, said means being easily and securely fastened to the assembly.

Another object of the invention is to provide improved centering and support means for an electrode assembly, said means being securely but removably fastened to said assembly.

A further object of the invention is to provide an improved means for mounting and supporting an electrode assembly, said means being adapted to absorb without adverse effect, the stresses ordinarily accompanying the positioning of said electrode assembly within a container.

Still another object of the invention is to provide an improved electron gun and means for mounting the same in an electron tube envelope.

In general, the principles and objects of the invention

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are accomplished by the provision of a plurality of electrodes secured together in an unitary assembly. One of the electrodes of the assembly has an apertured end plate which includes a peripheral rim. Support elements for supporting and centering the electrode assembly within a container such as the envelope of a cathode ray tube are secured to the peripheral rim of the last-mentioned electrode. The support elements include end portion which comprises a hook adapted to engage a hole just inside the peripheral rim of the end plate. The support elements also include a generally C-shaped spring clamp portion which is adapted to snap onto and securely grip the peripheral rim of the end plate. The C-shaped spring clamp portion also absorbs strains induced during manipulation of the assembly. In securing a support element to the apertured plate, the hook is first secured to the plate and then by pivoting the support element about the area of connection between the hook and the plate, the spring clamp portion is brought into contact with the peripheral rim and is snapped onto the rim. The support elements are also provided with one or more arms which are formed and adapted to press against the wall of the container in which the electrode assembly is mounted.

The invention is described in greater detail by reference to the drawing wherein:

Fig. 1 is an elevational view, partly in section, of a cathode ray tube including an electrode assembly embodying the principles of the invention;

Fig. 2 is a sectional view along the line 2—2 in Fig. 1;

Fig. 3 is a sectional elevational view of a portion of the electrode assembly of Fig. 1 and a modification of the invention employed therewith; and

Fig. 4 is a side elevational view of the embodiment of the invention shown in Fig. 3.

An electrode assembly embodying the principles of the invention may be employed in many different types of electrical apparatus. In the following description, the invention is embodied in a cathode ray tube.

As shown in Fig. 1, a cathode ray tube includes an envelope 12 comprising a generally tubular neck portion 14 having a closed end or stem 15 secured to a plastic base member 16. The envelope also includes an enlarged bulb portion 17 having a glass face plate 18 on the inner surface of which is formed a phosphor screen.

Mounted within the tubular neck portion 14 is an electrode assembly 20 which comprises an electron gun and which is supported in part by wire leads 21 welded thereto and secured in some suitable fashion to the stem 15. The electron gun 20 includes a cathode electrode disposed within an enclosing tubular control grid electrode 24. Accelerating electrodes 26 and 28 are provided for promoting the formation of an electron beam and for directing the beam toward the phosphor screen on the face plate 18. In one suitable construction, the electrodes 24, 26, and 28 are secured together by means of studs 30 extending from each electrode and embedded in an insulating rod 32 of glass or the like.

In one type of electron gun, the electrode 28 is employed as an electron accelerating electrode and comprises (Fig. 2) a tubular metallic member closed at one end by a circular plate 36 having a central aperture 38 and a generally smoothly rounded rim portion 40. The plate 36 is also provided with a plurality of generally rectangular openings 39 spaced apart equal distances on a common circumferential line. The electron gun 20 is secured and centered within the neck 14 of the envelope 12 by means of a plurality of support elements 46 which embody the principles of the invention and which are secured to the electrode 28. The support elements 46 contact a conductive coating 48 provided on the inner surfaces of the tubular neck 14 and the

bulb portion 17. Auxiliary apparatus such as a deflection yoke 49 and a focus coil 50 are provided for controlling the movement of the electron beam generated by the electron gun 20.

As shown in Fig. 2, the support elements 46 which support and center the electron gun assembly within the neck portion 14 of the cathode ray tube 10, are spaced apart equal distances about the axis of the gun and comprises thin, elongated resilient metal strips of nickel or the like. Each support element includes means for securing the element to the end plate and providing a pivot point around which the element is rotated when it is clamped to the end plate. The aforementioned means may comprise a hook 54 adapted to be secured to the end plate 36 by being inserted into one of the openings 39. The hook 54 includes two portions 42 and 44 offset from each other and extending in opposite directions.

Adjacent to the hook 54, the support element includes a generally C-shaped spring clamp portion 56 adapted to snap onto the rim 40 of the plate 36 and to be retained in frictional locking engagement therewith. The support element also includes an arm 58 which extends from the C-shaped spring clamp portion to the other end of the element which makes intimate contact with the conductive coating 48 on the inner wall of the neck of the tube. The last-mentioned end of the support element is formed with a generally spherical or otherwise suitably shaped embossment 60, which insures intimate contact with the coating 48 without damaging the coating. Each support element 46 may most conveniently be attached to the rim 40 by first inserting the hook 54 into the opening 39 and then by bending the support element about the hook 54 as a pivot point. The C-shaped clamp portion 56 is snapped onto the rim.

There is shown in Fig. 3, a modified support 62 secured to an end plate 36' of an accelerating electrode 28'. The support element 62 is particularly suited for supporting and centering massive electron guns. The support element includes a hook 54', a C-shaped spring clamp portion 56', an arm 58' and an end embossment 60', all of which are the same as the corresponding parts of the support elements 46. The support element 62 also includes an arm 64 which is secured at one end to the C-shaped spring clamp portion 56' and extends therefrom in a direction opposite to that in which the arm 58' extends. The arm 64 also has an end embossment 66 for providing intimate contact with a conductive coating 48' on the inner wall of a neck 14'. Thus, the support member presses against the wall of the neck at two places and provides good support for the electron gun.

As shown in Fig. 4, the support element 62 may be conveniently made from a single strip of sheet metal having the arms 58' and 64 formed by suitable bending of the strip and having the hook 54' punched out of the strip just above the C-shaped spring clamp portion 56'.

Support elements of the type described herein provide secure engagement with an electrode assembly without being bonded thereto by welding or by some similar operation. In addition such support elements allow mounting and manipulation of an electrode assembly within a container without becoming detached and, within the container, they provide good support and accurate centering of the assembly. In addition, the invention provides electrode support elements which may be manipulated without becoming fragile from being cold-worked.

What is claimed is:

1. An electrode assembly including a plurality of electrodes axially aligned and secured together as a unitary assembly, one of said electrodes having a rim, and means for securing and centering said assembly within a container, said means comprising a plurality of resilient elongated metal strips having generally C-shaped spring clamp portions at one end in transverse

frictional gripping engagement with and substantially surrounding said rim of said one of said electrodes.

2. An electrode assembly adapted to be mounted in a container and including a plurality of tubular electrodes axially aligned and secured together as a unitary assembly, one of said electrodes having a rim, and means for securing and centering said assembly within a container, said means comprising a plurality of resilient metal strips having spring clamp portions in transverse frictional gripping engagement with and substantially circumjacent said rim of said one of said electrodes and spaced apart about the periphery thereof, said spring clamp having an internally offset end section engaging a surface of said electrode.

3. A cathode ray tube comprising an envelope having a neck portion, an electron gun disposed within said neck portion and including a plurality of electrodes axially aligned and secured together as a unitary assembly, one of said electrodes having a surface and a rim, and means for securing and centering said electron gun within said neck portion, said means comprising a plurality of resilient metal strips having generally C-shaped spring clamp portions at one end and a generally spherical embossment at the other end, said strips being spaced apart about the periphery of said one electrode with said C-shaped spring clamp portions surrounding and independently gripping said rim, said C-shaped spring clamp portion having a hook extending through and along the surface of said one electrode, said spherical embossments in contact with the wall of said neck portion.

4. A cathode ray tube comprising an envelope having a neck portion, an electron gun disposed within said neck portion and including a plurality of tubular electrodes axially aligned and secured together as a unitary assembly, one of said electrodes having a rim, and means for securing and centering said electron gun within said neck portion, said means comprising a plurality of resilient metal strips, each of said strips including a C-shaped spring clamp portion and a pair of arms extending therefrom in substantially opposite directions, each of said arms being in contact with the inner wall of said neck portion and said C-shaped spring clamp portion being secured to said rim.

5. An electron gun including a plurality of electrodes axially aligned and secured together as a unitary assembly, one of said electrodes having an end plate including a rim, and means for securing and centering said electron gun within the envelope of a cathode ray tube, said means comprising a plurality of resilient metal strips having spring C-clamp portions in frictional gripping engagement with transversely surrounding said rim of said one of said electrodes.

6. A support member for supporting an electron gun comprising a strip of metal including a hook-like process at one end thereof adapted to be engaged within an opening in one of the electrodes of said electron gun, a generally C-shaped spring clamp portion adjacent to said process and adapted to be secured in frictional locking engagement with a portion of said electron gun and a process at the other end for making contact with a wall portion of an electron tube, a pair of arms extending from said C-shaped portion in substantially opposite directions, and a process at the end of each of said arms for making contact with a wall of a cathode ray tube.

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