United States Patent

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[54] **ELECTRODE MOUNTING BRACKETS PRODUCING SHORTER ELECTRON GUN MOUNTS IN CATHODE RAY TUBES**
5 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **313/82,** 313/256, 313/289
[51] **Int. Cl.** **H01j 29/02,** H01j 1/88, H01j 19/42
[50] **Field of Search** 313/256, 82

[56] **References Cited**
UNITED STATES PATENTS

2,982,878	5/1961	Smith	313/256
3,265,920	8/1966	Fiore	313/82X

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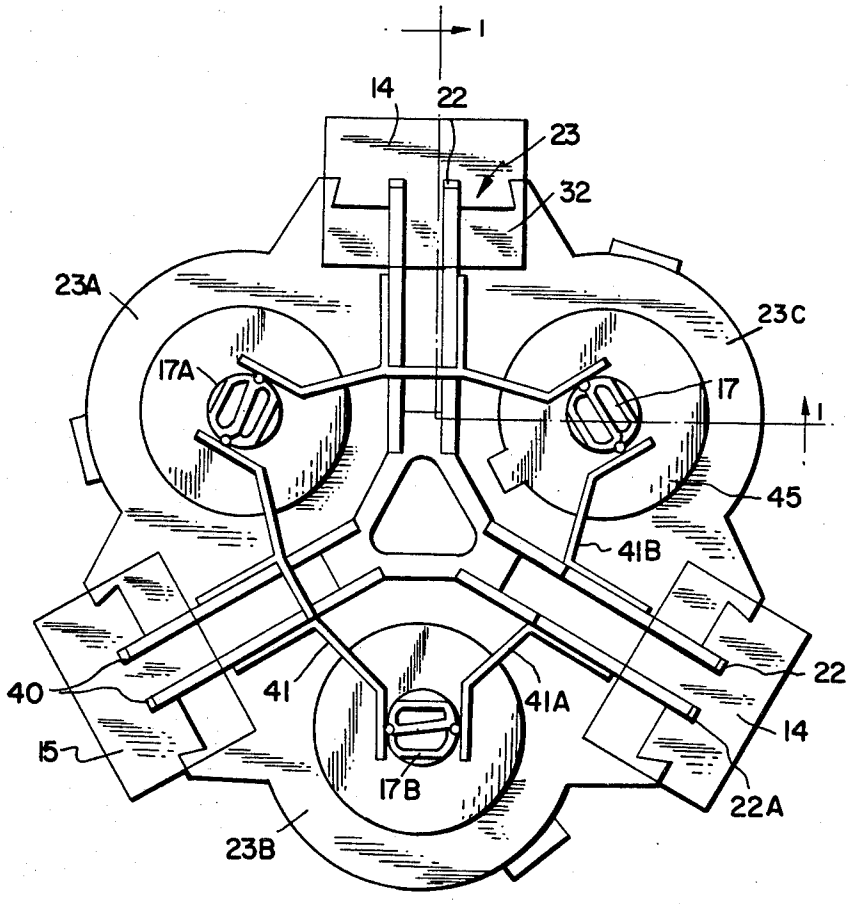
ABSTRACT: An electrode holding plate is provided for retaining a cathode sleeve or the like having arms for mounting into a glass bead support member with component members which extend in the glass bead in two directions generally normal to and axially with the electron beam path comprising a bent over substantially L-shaped terminal flange. By establishing the primary bracket dimension normal to the beam, a very short mounting space in the glass bead is permitted to thereby foreshorten the electron gun mounting space and the neck of the tube without decreasing mounting stability or permitting tilt and change under thermal stresses of critical parts affecting cathode-to-grid spacing and orientation.



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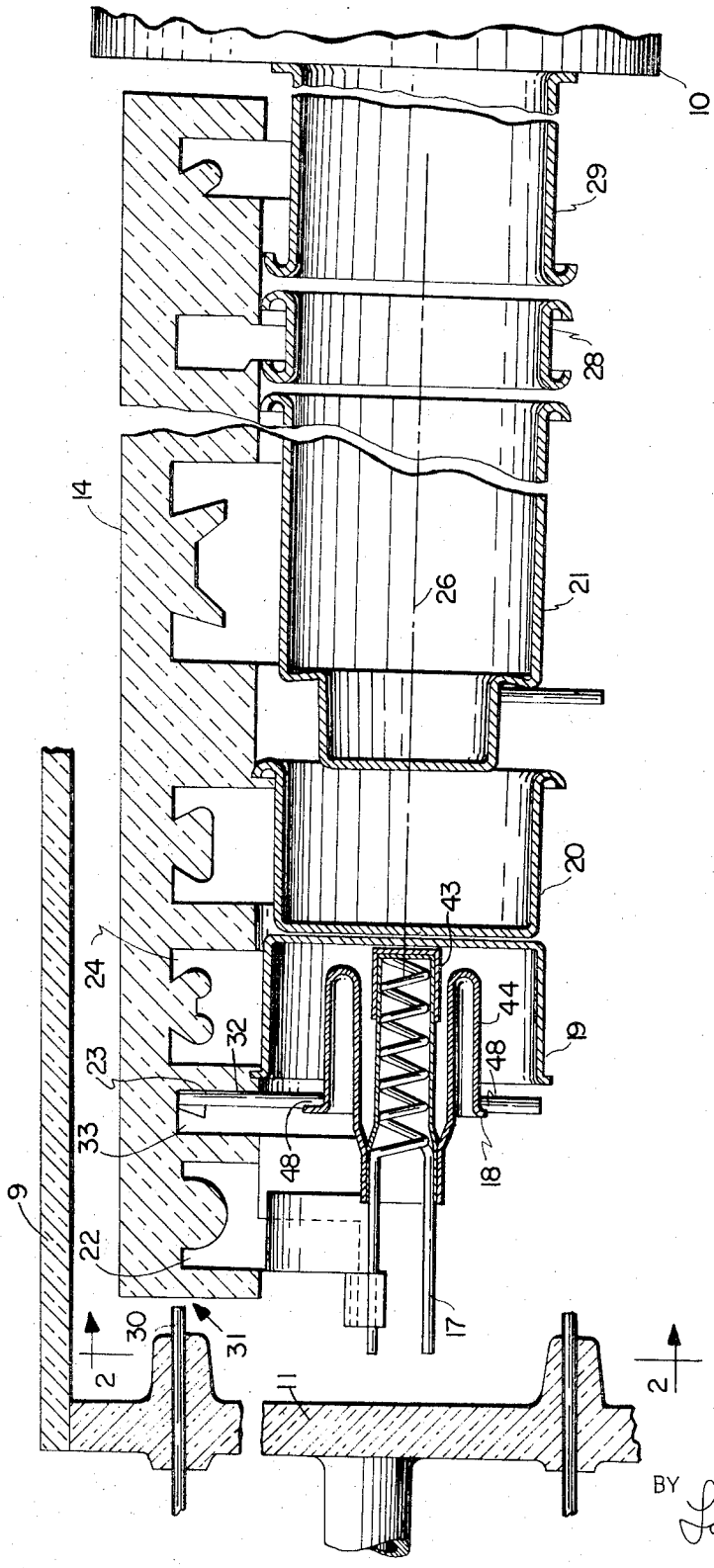

FIG. 1

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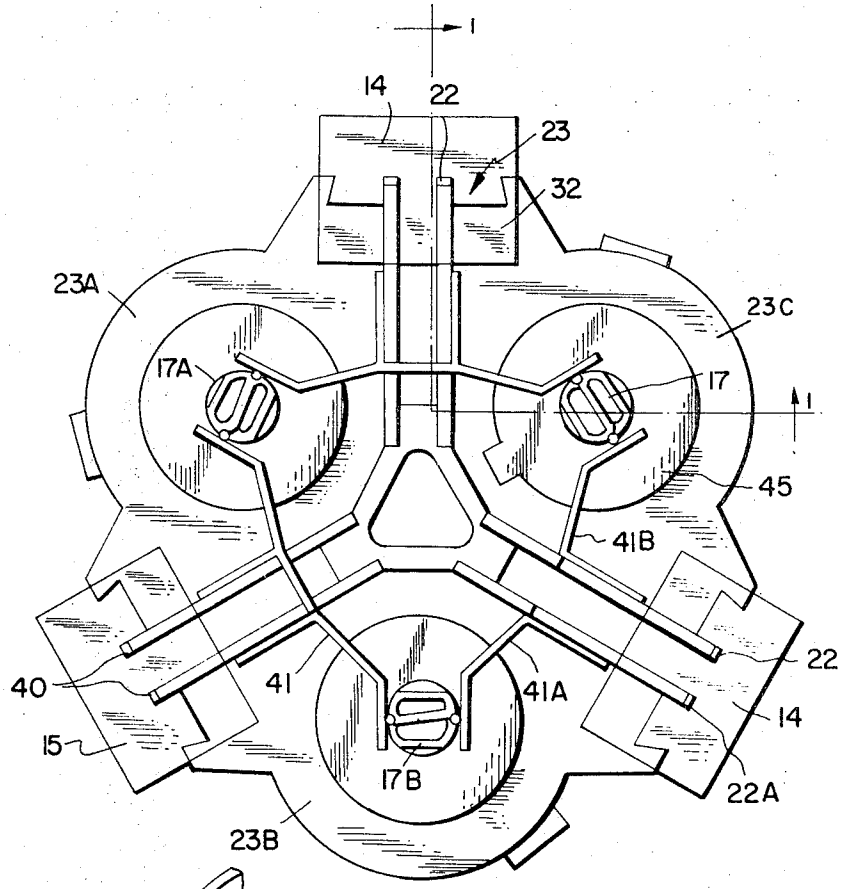
FIG. 2



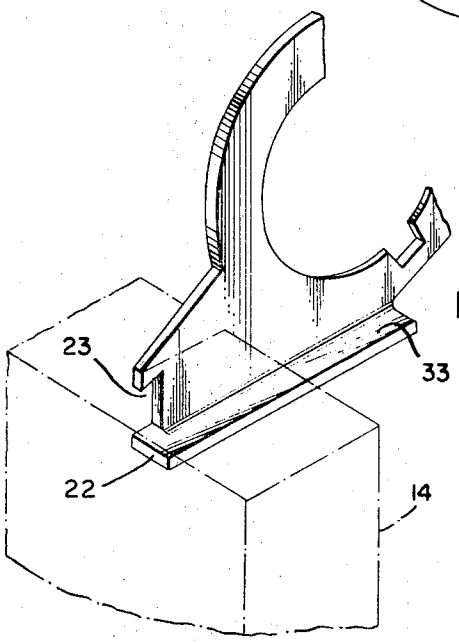


FIG. 3

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ELECTRODE MOUNTING BRACKETS PRODUCING SHORTER ELECTRON GUN MOUNTS IN CATHODE RAY TUBES

This invention relates to cathode-ray tubes, and, more particularly, it relates to mounting of electrodes by encompassing electrode bracket arms in a glass bead electrode support member.

The required depth of cabinets for television sets required to include a cathode-ray tube has been objectionable, thus causing the art for many years to search for techniques permitting a shorter tube neck that will operate satisfactorily without detriment to mechanical or electrical characteristics of the critical electron gun orientation and spacing. It is particularly difficult to find a proper mounting arrangement for the filament-cathode-first grid assembly because of proximity to the stem and the critical aspects of mounting from both a mechanical stability and electronic characteristic viewpoint. Filaments need be mounted with precision within cathode cylinders in a manner conveniently connected to supply terminals in the tube stem, and cathode-to-grid spacing is more critical than any other electrode spacing. Also, this assembly is adjacent the stem with its various leads and crowded region of the tube which must be guarded against arc overs and signal losses or interference. Thus, the critical spacing with high strength and close tolerances in this region has in the past seemed inconsistent with the reduction of size of mounts and length of the assembly within the neck of the tube.

Typical tube mounts in these regions as used by various companies are shown in U.S. Pat. Nos. 3,265,920; 3,351,792 and 3,254,251. In each of these structures, however, a considerable length of tube neck and glass bead is used to mount the grid, cathode and filament assembly.

It is therefore a general object of this invention to provide a foreshortened cathode-ray tube gun assembly.

It is a more specific object of this invention to provide improvements in brackets for mounting electrodes in a cathode-ray tube gun.

Another specific object of the invention is to provide a cathode, filament grid assembly mounting arrangement of high precision and high strength in a foreshortened space.

Thus, in accordance with this invention there is provided a special bracket mount in the cathode region which has arms entering the glass bead with right angle orientation components extending from a major surface substantially normal to the electron beam axis. This has been found to decrease the bead length and gun length with improved strength or precision in establishing and holding critical dimensions. In this manner the neck of the tube may be shortened or the other electrodes in the gun can be extended within the same neck dimensions such as when a fourth grid is required in a zero focus electron gun configuration for example.

Further objects, features and advantages of this invention will be illustrated by reference to a preferred embodiment set forth in the accompanying drawings, wherein:

FIG. 1 is a partial elevation view, partly in section of an electron gun of a cathode-ray tube;

FIG. 2 is a plan view of said electron gun looking in at lines 2–2; and

FIG. 3 is a perspective partial view, partly in phantom, showing the L-shaped bracket tab arrangement afforded in this invention.

In FIG. 1 one of the three guns of a color picture tube 9 is shown with a convergence electrode 10 and stem 11. Three guns are arranged as shown in FIG. 2 for mounting to glass beads 14, 15 and 16. The illustrated gun is a zero focus type with successive electrodes spaced from the stem 11 in the successive order comprising filament 17, cathode assembly 18, first grid 19, second grid 20, third grid 21, fourth grid 28, fifth grid 29 and convergence assembly 10. It is necessary to establish and keep the spacing of these electrodes within critical distances and this is done by inserting the terminal ends of the bracket tab arrangement 22, 23, 24, etc., of the electrode mounting brackets into a heated glass bead 14 which holds the electrodes in place.

Conventional mounting claws 22 and 24 are fashioned to bite into the heated glass bead for a significant distance along the tube axis 26 in order to make a rigid mount preventing any electrode misalignment or spacing variation with stresses due to temperature changes, etc. The brackets with mounting tabs must provide adequate mounting stiffness and strength, and must react with the heated glass bead to stay in place without twisting or changing location. As provided for in the U.S. Pat. No. 3,239,708 to Jay H. Johnson, improvements may be afforded in mounting two laterally spaced electrode tabs in a glass bead to produce greater mounting stability. However, that technique is subject to the same deficiency as with claws 22 and 24 in that in the filament, cathode, grid assembly region, the length of the glass bead 14 along the axial dimension is greater than desired, forcing the neck of the tube 9 to be longer particularly when the end of the stem leads 30 with their connection wires crowd near the end 31 of the bead 14. Therefore, in accordance with this invention the L-shaped flange arrangement of the bracket tab claws as identified at 23 is supplied to foreshorten the bead 14 and the tube neck with increasing the mounting strength and stability, which is extremely critical in the region of the cathode 43 and first grid 19. Any tilt or difference in spacing can cause drastic changes in tube characteristics.

This particular mounting bracket tab arrangement 23 provides a rather extensive flat section 32 normal to the axis 26 of the beam for entering the bead. This is coupled with a bent over portion 33 along the axis 26 of the beam to form a substantially L-shaped flange thus giving support in two normal dimensions. This is shown better by the view of FIG. 3. Yet this takes up a very short space in the critical axial dimension so that the long sought objective to shortening the tube is accomplished. For example, in a zero-focus gun of the type shown, the addition of the fourth electrode 28 may take place without increasing the standard tube length by foreshortening the stem in the cathode-grid region of means of this novel claw mounting combination in bracket tab arrangement 23.

As may be seen in FIG. 2, this mounting structure requires a claw 22 extending over a substantial axial distance for counting the filaments 17, 17A and 17B. This shortening of all three beads 14, 15, 16 as provided by this invention does not detract from the convenient connection of filaments 17, 17A and 17B in series, where two single brackets 22 and 22A are affixed into three beads 14, 15 and 16. Thus, from two single brackets connections 41 and 41A are made to the filaments of two adjacent guns to provide a series filament array.

As noted, the cathode assembly has a cathode 43, a shield 44 and bracket tab arrangement 23 which comprises a planar sheet holder with an aperture 45 coaxial with the electron beam axis. Three such separate holders identified by characters 23A, 23B and 23C to shown they include the bracket tab arrangements 23 constitute sectors substantially filling a complete circular and planar array, but being insulated from each other. These holder assemblies 23A, 23B and 23C are spot welded at several positions 48 to the cathode support terminating in shield 44 to hold it firmly in place in fixed orientation.

It is evident therefore that the state of the art is improved by reducing a critical spacing in a manner long sought while improving structural strength or electric tube characteristics.

Having therefore described the nature of the invention and a preferred embodiment, those features believed to describe its spirit are defined with particularity in the appended claims.

I claim:

1. Improvements for a cathode-ray tube comprising in combination, an electrode for mounting adjacent other electrodes mounted along the electron gun axis in a glass bead mounting support member within an electron gun of a cathode-ray tube including a bracket extending from said

electrode having two arms for extending into said glass bead to hold the electrode in place adjacent to another electrode mounted in said bead, the arms having terminal ends for entering the beads from a bent over substantially L-shaped flange giving support in two normal dimensions, said flange extending over a region in mounted position from a position inside said glass bead to a position outside said glass bead coupled to said electrode in a manner assuring said two dimensional support to the electrode to discourage twisting of the electrode from alignment along the electron gun axis and permitting support of the electrode over a very short length of the glass bead along the gun axis.

2. An electrode mount as defined in claim 1, wherein the electrode extending from the bracket is a cathode and the bracket comprises a holder with an aperture coaxial with the axis of at least one electron beam in said tube, said aperture adapted to receive in registration therewith an assembly including said cathode.

3. An improvement as defined in claim 2, including a glass bead with said bracket mounted with the terminal ends enveloped in said bead between two adjacent brackets respectively welded to grid and filament electrodes.

4. An improvement as defined in claim 3, wherein the electron gun is of the zero-focus type having a fourth grid and intermediate grids with brackets commonly affixed into said bead.

5. An improvement as defined in claim 3, wherein the tube is a three gun color picture tube with three glass beads, and wherein at least one bracket for mounting the filament electrode is affixed into each bead, and including connection from two of said latter brackets to the filaments of two adjacent guns.