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E. POHLE ET AL
ELECTRON GUN STRUCTURE

2,562,243

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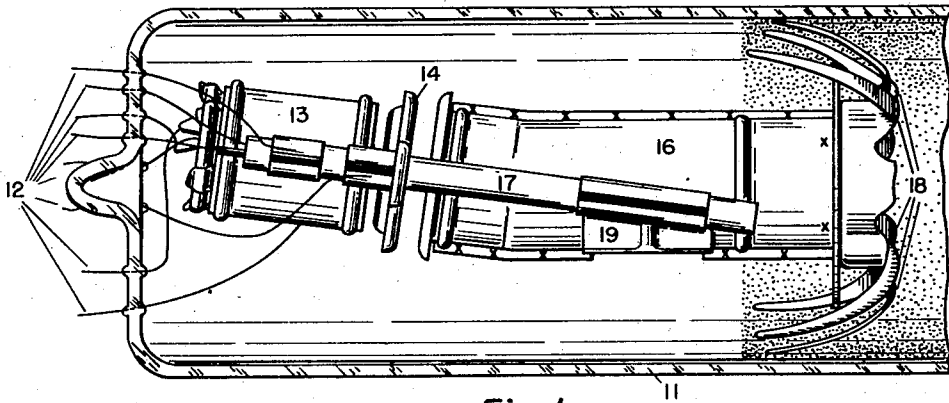


Fig. 1

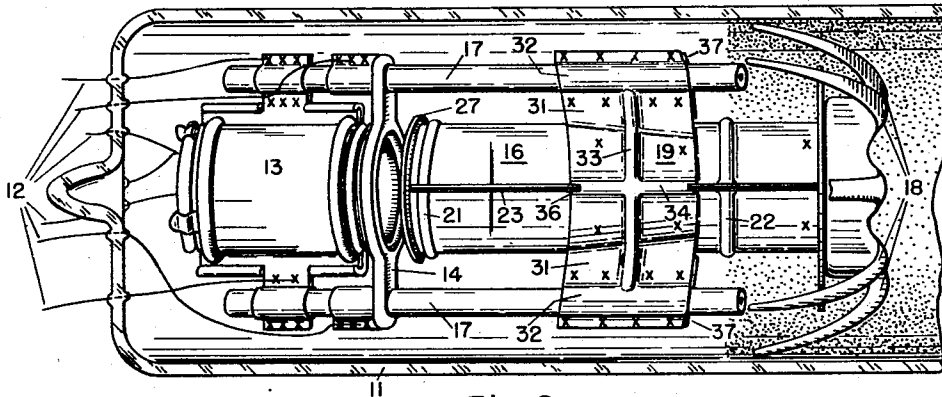


Fig. 2

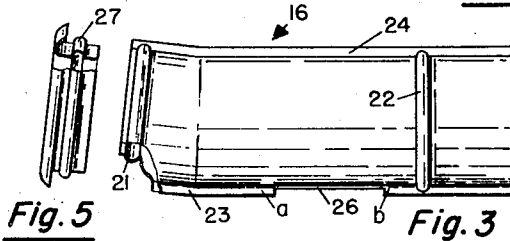


Fig. 5

Fig. 3

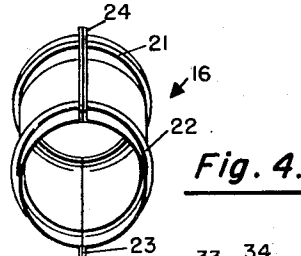


Fig. 4.

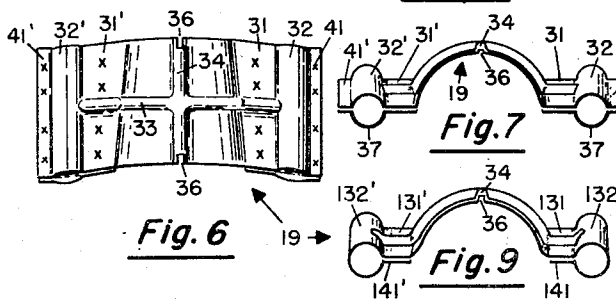


Fig. 6

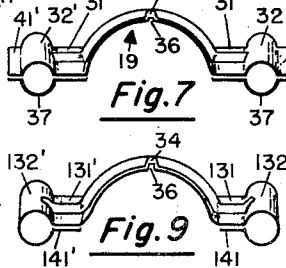


Fig. 7

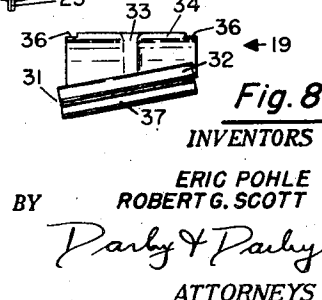


Fig. 8

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ELECTRON GUN STRUCTURE

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3 Claims. (Cl. 313-238)

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This invention relates to cathode ray tubes and more particularly to the electron gun portion of cathode ray tubes.

In cathode ray tubes having an electrode or electrodes which must be rotationally fixed with respect to a given axis, such as ion trap tubes of the type described in copending application, Serial No. 129,260, by Kenneth A. Hoagland, assigned to the same assignee, one of the principal problems is to devise a rigid electron gun structure. Having conceived a sturdy design, it then becomes necessary to translate this design into a set of simple easily fabricated parts that may be rapidly assembled. Although it has commonly been the practice to assemble parts of the electron gun in one or more jigs, using great care to achieve the proper alignment and welding the parts or cementing them with molten glass in order to fix their relative positions, it is desirable that the parts be so constructed as to fit only in the desired way in order to reduce the number of jigs and achieve the fastest and most accurate assembly of the cathode ray tube.

Consequently one object of this invention is to provide an improved cathode ray tube.

Other objects are to provide an easily assembled ion trap type cathode ray tube, to provide an inexpensive bent gun structure for a cathode ray tube, to provide a cathode ray tube having an accurately aligned, bent electron gun, to provide an improved structure for bent gun ion trap cathode ray tubes, to provide an electrode support structure for an electron gun, and to maintain structural control during manufacture over the shape and rigidity of the electrodes in an electron gun.

Other objects will be apparent after a study of the specification and drawings, in which:

Figure 1 is a side elevational view of an electron gun structure embodying this invention and mounted in the neck of a cathode ray tube;

Figure 2 is a plan view of the gun structure of Figure 1;

Figures 3, 4 and 5 are details of construction of the anode portion of the gun structure;

Figures 6, 7 and 8 are details of a mounting strap used on the gun structure; and

Figure 9 is a front view corresponding to Figure 7 and showing a modification thereof.

In Figure 1 an electron gun is shown located within the neck 11 of a cathode ray tube and attached thereto by the lead in and support wires 12. The electron gun comprises a thimble shaped control grid 13, a dish shaped second grid 14, and a tubular anode 16 all secured to a pair of in-

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5 sulating support rods 17. The tubular anode 16 having a portion bent to extend axially at an angle to the remaining body portion as shown, is partially supported at one end by a centering device 18, known as a spider, having metal legs which contact the side wall of the tube 11, for mechanical support and electrical contact to a conductive coating 19 on the wall of tube 11.

10 Figures 3, 4 and 5 show the anode 16 in more detail. The body of the anode 16 preferably comprises two longitudinally semi-circular members stamped out of flat, sheet metal, although it may be made as a continuous cylinder by other well known processes. The ribs 21 and 22, which serve both as stiffening braces and as mechanical interlocks for such associated apparatus as the anti corona ring 27, and the flanges 23 and 24, are formed and a section of the flange 23 is cut away to form the notch 26. In Figures 3 and 5 respectively, one corner of the anode 16 and the anti corona ring 27 are shown broken away to illustrate the construction.

20 Figures 6, 7 and 8 illustrate, in detail, one embodiment of the strap 19 in which the flanges 31 have semi-cylindrical channels 32 embossed therein near the outer edges thereof. A rib 33 is embossed on the strap 19 transversely between the channels 32 for stiffening the strap although the stiffening brace need not be the particular form shown. Another raised rib 34 extends longitudinally or axially, having notches 36 cut in the ends thereof. A pair of semi-cylindrical channelled plates 37 is attached to the flanges 31 by spot welding for instance, at the points marked X in Figure 6.

35 In one method of assembly of the electron gun the anode 16 may be constructed separately. If a support strap of the type shown in Figure 6 is to be used, the main portion is first positioned in a jig consisting of a pair of rods similar to the rods 17 in Figure 1. The channelled plates 37 are slipped into place adjacent the flanges 31 and welded thereto by their inner edges. The corona prevention ring 27, if one is used, is laid in place in the groove 21 and the two halves of the anode 16 are held together and fastened by welding together the flanges 23 and 24 on each thereof, or by crimping the edges as shown on the control grid 13 in Figure 2. The resultant anode 16 is electrically equivalent to a section of cylindrical tubing cut to size and bent at the proper angle but is considerably less expensive.

45 The strap 19 is then inserted in the notch 26 so that the channels 32 lie in axial alignment with the bent tubular portion of the tube. In this posi-

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tion the portions *a* and *b* of the flange 23 at the ends of notch 26, fit into the slots 36 in the rib 34 while the rib 34 fits over the portion *c* of flange 23 forming the bottom of the notch 26. Alternatively the notch 26 may extend through the flange 23 to the tubular portion of the anode 16 in which case the rib 34 would be unnecessary. The notches 36 in the strap 19, provide an inherent indexing of the strap on the tubular anode 16, thus eliminating the need of an additional jig which otherwise would be necessary to hold the strap and the anode in correct angular relation while they are welded together. If the anode 16 were made from a piece of seamless tubing without the flange 23 and the notch 26, a more complicated jig would be necessary to determine the longitudinal as well as the angular location of the strap 19.

When the strap 19 is in place, it may be welded to the anode 16 at the spots marked X in Figure 2. The spider 18 or any of the other well known centering devices may be attached to the end of the anode 16 adjacent the stiffening rib 22 by suitable means.

The final assembly of the electron gun consists in attaching the anode 16 to a pair of ceramic rods, or similar insulating members, by means of the support strap 19, the second grid 14, and the control grid 13. The gun is assembled with the aid of temporary inserts to maintain the correct spacing between the three electrodes while they are clamped to the rods 17 by having their outermost flanges 41 welded as shown. In Figures 6 and 7, these flanges 41 appear as the outer edges of flanges 31. When the rods 17 are inserted in the cylindrical spaces provided by the channels 32, a small gap is left between the outermost edges 41 of flanges 31 and 37 as shown. This gap is closed by pressure during the welding operation resulting in a tight grip on the rods 17.

Figure 9 shows a support strap similar to the strap 19 in Figure 6 with like parts having the same reference numbers. In accordance with this modified form, the end portions of the strap are bent back on themselves to form a loop 132 with laterally extending flat sections 131 and end flaps 141 which are welded to the sections 131 when the electron gun is being assembled.

In addition to the self indexing property of the notched strap 19, certain other advantages result from this form of construction. The prior art half collar support straps of the type shown in U. S. Patent No. 2,429,824 used to support the end of the anode 16, nearest the second grid 14, provided a short length of the rods 17 between the two electrodes. Since the potential difference between these two electrodes is normally of the order of 10,000 volts, breakdown could occur more easily than the structure herein described. Furthermore, there would be a greater tendency for the anode 16 to stretch the half collar support straps sufficiently to cause the end thereof to be out of alignment with the second grid 14. A further advantage of the strap 19 over the half collars is that the strap 19 is sufficiently wide to prevent the anode 16 from twisting in any direction with relation to the rods 17, whereas the half collars, which could not be any wider than the length of the comparatively short rear tubular portion of the anode 16, could not have the same rigidity.

Although this invention has been illustrated by

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specific examples, it will be obvious to those skilled in the art that modifications may be made without departing from the scope of the invention.

What is claimed is:

1. In an electron gun for a cathode ray discharge device, a substantially tubular electrode, a flange extending longitudinally thereon having a notch therein and a support member for said tube, said support member conforming circumferentially to said tubular electrode and fitting in said notch, and having a longitudinally extending notch therein into which said flange fits.

2. In an electron gun for a cathode ray discharge device a tubular electrode comprising a pair of longitudinally semi-circular members in complementary abutting position to form said electrode, said members having a radially flared edge extending longitudinally forming the abutting surfaces and having a gap therein, and a support member for said tube, said support member comprising a strap having a surface conforming circumferentially to the tubular form of said electrode in the area adjacent said notch, said support member having longitudinally extending notches in the ends thereof into which fit portions of said flanges adjacent said gap.

3. In an electron gun for a cathode ray discharge device a bent tubular electrode comprising a pair of longitudinally semi-circular members in complementary abutting position to form a tube, said tube having one end portion bent axially at an angle with respect to the other end portion and having a radially extending flanged edge extending longitudinally along the side thereof, said flanged edge forming the abutting area of said pair of members and having a gap therein in one of said portions, a metallic support strap for said tube positioned in said gap, a portion of said strap being shaped to conform to the portion of said tube adjacent said gap and having longitudinally extending notches in each longitudinal end thereof, into which fit the ends of said flanged edge forming said gap, and flared ends extending radially outwardly therefrom secured to supporting rods.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,211,613	Bowie	Aug. 13, 1940
2,393,057	O'Larte	Jan. 15, 1946
2,461,728	Gessford	Feb. 15, 1947
2,423,924	Augenstein	July 15, 1947
2,429,824	Koch	Oct. 28, 1947
2,432,037	O'Larte	Dec. 2, 1947
2,436,264	O'Larte	Feb. 17, 1948
2,436,265	Pohle	Feb. 17, 1948
2,525,737	Tolson	Oct. 10, 1950
2,544,934	Nase	Mar. 13, 1951

OTHER REFERENCES

"The Negative-Ion Blemish in a Cathode-Ray Tube and Its Elimination," by R. M. Bowie; Proceedings of the Institute of Radio Engineers, vol. 36, No. 12, December 1948 (pp. 1482-1486).