

July 15, 1947.

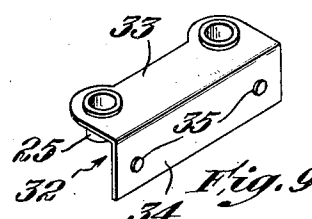
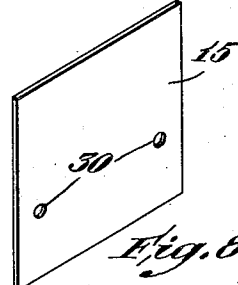
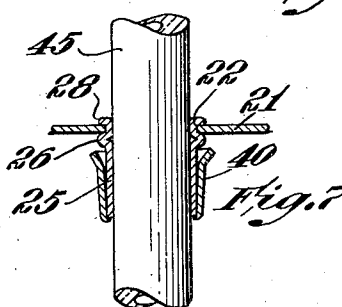
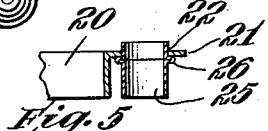
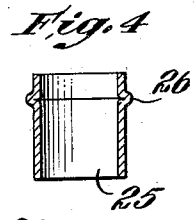
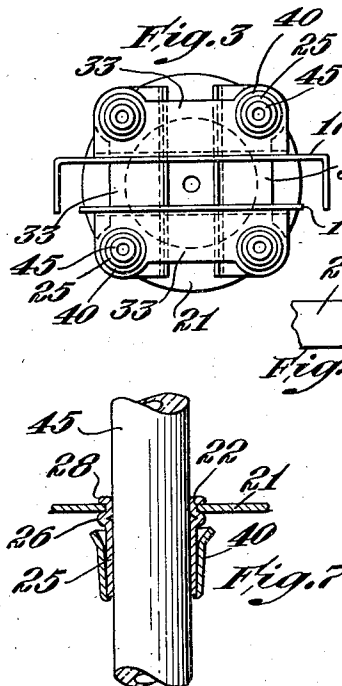
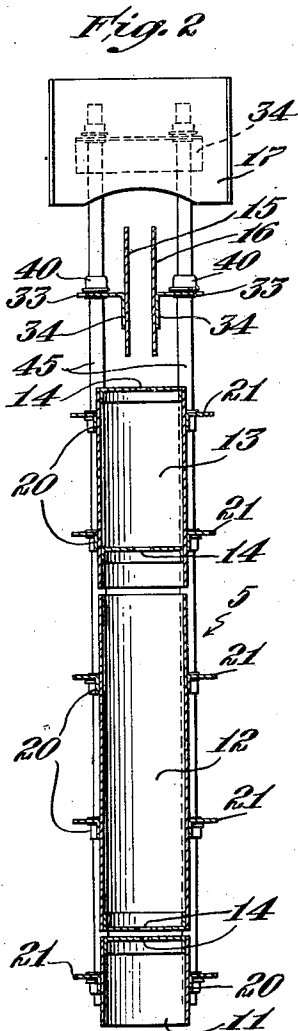
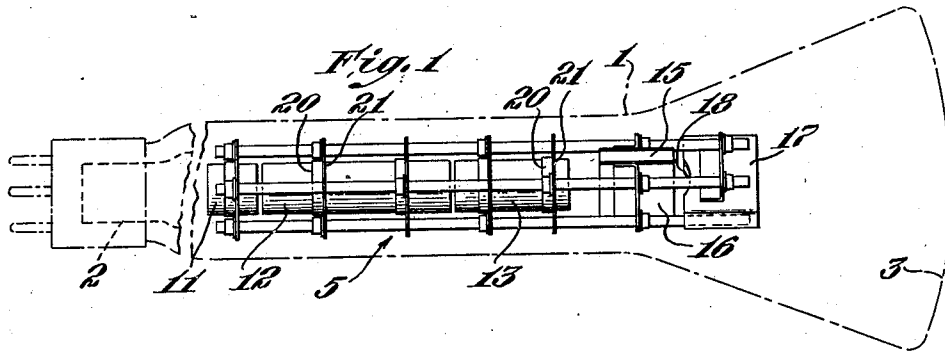
K. C. AUGENSTEIN ET AL

2,423,924

CATHODE-RAY TUBE

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2 Sheets-Sheet 1



Inventors
Karl C. Augenstein
Albert Rieth
by Robert Cushman Woodbury
Attys.

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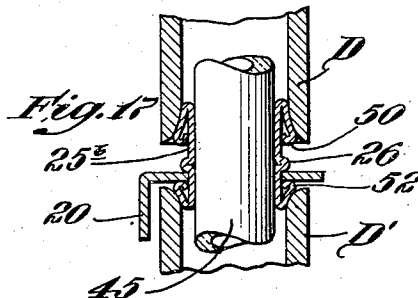
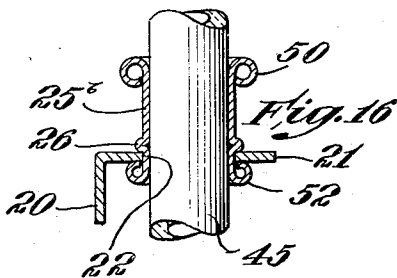
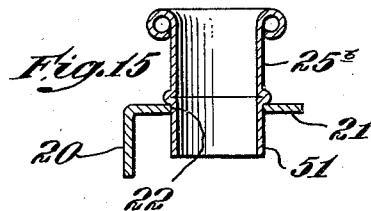
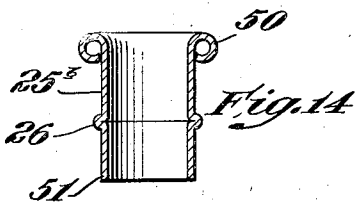
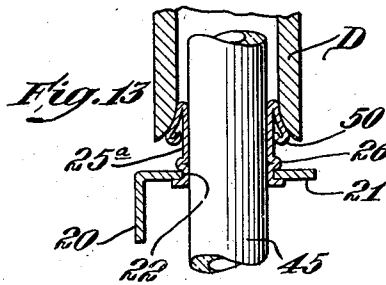
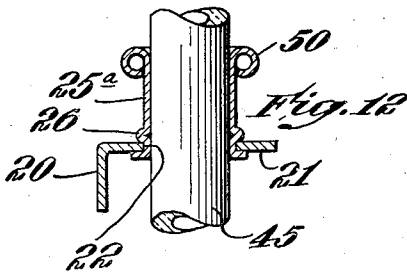
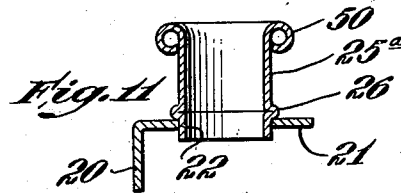
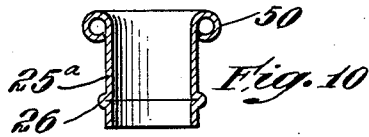
K. C. AUGENSTEIN ET AL

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CATHODE-RAY TUBE

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2 Sheets-Sheet 2



Inventors
Karl C. Augenstein
Albert Rieth
by Polak, Cushman & Hordbun
Att'ys.

UNITED STATES PATENT OFFICE

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CATHODE-RAY TUBE

Karl C. Augenstein and Albert Rieth, Cranston,
R. I., assignors to Speidel Corporation, Providence,
R. I., a corporation of Rhode Island

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3 Claims. (Cl. 250-162)

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This invention relates to the manufacture of cathode-ray tubes and the like electronic beam-translating devices.

Electronic tubes of this type usually comprise an electron-responsive surface or fluorescent screen, an electron gun spaced from the screen and including a cathode and associated grid capable of projecting a beam of electrons against the screen, one or more anodes and two pairs of deflecting plates interposed between the electron gun and screen and arranged so as to effect a conjoint control over the electron beam projected by the gun. In the manufacture of tubes of this type considerable difficulty is encountered in properly aligning the anodes and deflecting plates with the necessary degree of accuracy which is of the order of 0.001". It has been the usual practice to mount the anodes and deflecting plates on the porcelain supporting members by means of metal straps which are more or less flexible, one part of the straps being positioned about the porcelain and another part welded or otherwise secured to the body of the anode and deflecting plate. Due to the flexibility of these straps, the inaccuracies involved in assembling the parts and the distortions inherent in welding, it is difficult to align the anodes and deflecting plates with the required degree of accuracy. In such constructions inaccuracies encountered in the surfaces of the porcelains can not easily be compensated and hence slight surface irregularities of the porcelains tend to hold the anodes and deflecting plates out of alignment.

The principal objects of the present invention are to overcome the aforementioned difficulties and to provide an improved mounting for the anodes and deflecting plates and an efficient method of making the same. Further objects relate to various features of construction and will be apparent from a consideration of the following description and accompanying drawings, wherein:

Fig. 1 is an elevation showing a cathode-ray tube embodying a mounting construction in accordance with the present invention;

Fig. 2 is an enlarged longitudinal section through the mounting shown in Fig. 1;

Fig. 3 is an enlarged top plan view of the mounting;

Fig. 4 is an enlarged section through a sleeve;

Fig. 5 is a fragmentary section showing the manner in which the sleeve and flange elements are assembled;

Fig. 6 is an enlarged section through a clamping element or tapered eyelet;

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Fig. 7 is an enlarged section showing the manner in which the supporting flange is secured to the porcelain;

Fig. 8 is a perspective of one of the deflecting plates;

Fig. 9 is a perspective of a supporting bracket or flange for a deflecting plate;

Fig. 10 is an enlarged longitudinal sectional view through a modified form of sleeve;

Fig. 11 is an enlarged longitudinal section showing the sleeve assembled with a flanged member;

Fig. 12 is a view similar to Fig. 11 but showing the lower end of the sleeve rolled against the flanged member;

Fig. 13 is a view similar to Fig. 11, but illustrating the manner in which the beaded edge is radially contracted about the porcelain support; and

Figs. 14 to 17 are views, corresponding to Figs. 10 to 13, but illustrating a further modification.

In accordance with the present invention the anode or anodes and the deflecting plates are rigidly secured to suitable supporting members which are preformed so as to provide rigid laterally projecting flanges, each having a plurality of accurately located sleeves defining spaced openings or recesses through which the insulating supports or porcelains project. The supporting members, being preformed and accurately fabricated preferably from suitable sheet metal, are assembled with the anodes and deflecting plates so as accurately to maintain the desired dimensional relationships between the axes of the anodes and those of the sleeves, and between the surfaces of the deflecting plates and the axes of the sleeves.

With the parts properly positioned and the assemblage firmly held in any suitable manner, the sleeves are firmly radially contracted about the support so as permanently to secure the parts in predetermined fixed position. To this end clamping elements or tapered eyelets may first be loosely applied about the sleeves and with the parts properly positioned and the assemblage firmly and accurately held in any suitable manner, the eyelets are then forced into telescopic relationship about the sleeves, thereby radially contracting the sleeves about the porcelains; or instead of using separate eyelets, one or both ends of the sleeves may be rolled outwardly to provide compressible annular beads which may, by the use of appropriate tools, be radially contracted about the porcelains, thus providing the functional equivalent of the clamping eyelets in

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permanently securing the parts in predetermined fixed position. In either case due to the rigidity of the supporting flanges and the slight degree of yieldability of both the sleeves and the porcelains, surface inaccuracies or irregularities of the latter do not materially affect the accuracy of alignment of the assemblage and hence in the completed mounting the anodes and deflecting plates are accurately aligned well within the permitted tolerances.

In the embodiment herein shown for the purpose of illustration the cathode-ray tube (Fig. 1) is provided with the usual envelope 1 (shown by the dot and dash lines) and an electron gun 2 at one end, which may include the usual cathode, control grids, etc., the details of which are not shown, a fluorescent screen 3, and a mounting 5 constructed in accordance with the present invention.

The mounting 5 comprises three cylindrical anodes 11, 12 and 13 (Figs. 1 and 2) formed with the usual axial apertures 14 which must be accurately aligned to obtain the desired sharp focusing of the electron beam, and two pairs of deflecting plates 15, 16 and 17, 18 (Figs. 1-3). Each anode is rigidly supported by one or more annular members 20 fabricated from sheet metal of a gauge sufficient to produce the desired degree of strength and rigidity. Each annular member 20 is formed with a laterally projecting annular flange 21 having four circumferentially spaced openings 22 (Figs. 5 and 7) which are accurately positioned relative to the center of the annular member 20. Each opening 22 receives a tubular sleeve 25 (Fig. 4) formed adjacent to one end with a circumferential bead 26 which provides a shoulder adapted to bear against the marginal portion of the opening 22, as shown in Fig. 5, and the adjacent end of the sleeve is rolled over the margin of the opening, as shown at 28 in Fig. 7, thereby providing a rigid connection in which the axis of each sleeve is maintained in the same predetermined dimensional relationship with the axis of the companion anode.

Each of the deflecting plates 15-18 is provided with a pair of spaced openings 30 (Fig. 8) and an angle-shaped supporting bracket 32 (Fig. 9) is provided for each deflecting plate. Each bracket 32 comprises a laterally projecting flange 33 and a vertical flange 34, the flange 34 being formed with a pair of spaced bosses or projections 35 positioned to correspond accurately with and fit snugly within the openings 30 in the companion deflecting plate. The laterally projecting flange 33 is formed with a pair of spaced openings positioned to correspond accurately with those in the annular flanges 21 so that proper alignment may be had. The deflecting plates 15-18 and their supporting brackets 32 are permanently secured in assembled relation preferably by spot welding about the bosses 35. Due to the interlocking engagement between the deflecting plates and attaching flanges and the proximity of the spot welds to the points of interlock, the welding operation does not produce any appreciable distortion. The openings in the flanges 33 receive sleeves 25 which are rigidly secured in the manner above described.

In the embodiment shown in Figs. 1 to 9 each of the sleeves 25, carried by both the supporting flanges for the anodes and those for the deflecting plates, is provided with a tapered eyelet or clamping element 40 (Fig. 6), the larger end of which fits loosely about the free end of the sleeve.

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With the anodes 11-13 and deflecting plates 15-18 properly secured to their respective supporting members and associated parts, they may then be assembled with the insulating rods or porcelains 45, each of which consists of an elongate tubular rod of ceramic or other suitable material, ground to provide a cylindrical surface relatively free from irregularities. The porcelains 45 are inserted through the sleeves 25 and thus assembled with the anodes, deflecting plates and associated parts, as shown in Figs. 1, 2 and 7. With the anodes and deflecting plates disposed in a predetermined fixed position along the porcelains and preferably held by a suitable clamping fixture, the eyelets 40 are then forced into telescopic relationship with the sleeves 25 so as to crimp or contract the sleeves about the porcelains, as illustrated in Fig. 7, thereby permanently securing the parts accurately in predetermined fixed position.

The embodiments illustrated in Figs. 10 to 17 are functionally identical to that of Figs. 1 to 9 and the same or corresponding reference numerals are applied to the same or similar parts. In the embodiment illustrated in Figs. 10 to 13 the sleeve 25^a is formed with a circumferential bead or rib 26, as in the previously described embodiment, but one end of the sleeve is formed with a rolled edge to provide a compressible annular bead 50. The opposite end is inserted in an opening formed in the flanged portion, here shown as the annular flange 21 of one of the members 20, so that the circumferential bead 26 bears against the marginal portion of the opening 22. The projecting end (Fig. 11) is then rolled or clamped over the marginal portion of the opening, as shown in Fig. 12, thereby providing a rigid connection in which the axis of each sleeve is maintained in the same predetermined dimensional relationship with the axis of the companion anode. The porcelain supports 45 may then be inserted through the sleeves 25^a and thus assembled with the anodes, deflecting plates and associated parts, as in the previously described embodiment, and with the assemblage firmly held by a suitable clamping fixture, a die or the like tool D is applied to each of the rolled edges 50 of the sleeves with sufficient force to contract them radially about the porcelains, as illustrated in Fig. 13, thereby permanently securing the parts accurately in predetermined fixed position.

The embodiment illustrated in Figs. 14 to 17 is generally similar to that of Figs. 10 to 13, except that each of the sleeves 25^b is provided with an extended lower end 51 which projects through the opening 22 of the flange 21 a greater distance than does the sleeve 25^a of the previously described embodiment. When the sleeve 25^b is applied to the flange 21, as shown in Fig. 15, the end 51 may then be rolled back to form an annular bead 52, as shown in Fig. 16. With the porcelains 45 inserted through the sleeves 25^b and the assemblage firmly held, a pair of dies D and D' are applied to the beaded edges 50, 52, respectively, with sufficient force not only to contract the sleeves radially about the porcelains, but also firmly to clamp the marginal portions about the openings 22 between the circumferential bead 26 and the lower bead 52, as shown in Fig. 17, thereby permanently securing the parts accurately in predetermined fixed position.

It will be observed that when the porcelains are assembled with the anodes, deflecting plates and associated parts, the sleeves, being accurately positioned as above described, may be easily

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held in proper alignment and hence the anodes and deflecting plates are likewise accurately positioned with respect to one another. Due to the rigidity of the flanges 21 and 33 the alignment may be maintained during the final operation in which the sleeves are contracted about the porcelains, it being noted that inaccuracies of the surface of the porcelains may be compensated by the slight degree of yieldability of the sleeves and porcelains. Consequently in the completed structure the active surfaces of the anodes and the deflecting plates are properly positioned and the apertures in the anode are accurately aligned.

The completed mount may be assembled with the other elements of the cathode-ray tube in accordance with conventional practices and the usual electrical connections (not shown) may be made and the tube completed in the customary manner.

While I have shown and described one desirable embodiment of the invention, it is to be understood that this disclosure is for the purpose of illustration and that various changes in shape, proportion and arrangement of parts, as well as the substitution of equivalent elements, for those herein shown and described, may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

We claim:

1. In an electronic beam translating device of the type having an electron-responsive surface, an electron gun spaced from said surface and including an emissive cathode capable of projecting a beam of electrons toward said surface, one or more anodes, and deflecting plates interposed between said surface and electron gun, means for rigidly mounting said anode and deflecting plates in predetermined alignment, said means comprising at least one annular member fitting about each anode, each annular member being formed with a laterally projecting flange having circumferentially spaced openings adjacent to its periphery, a laterally projecting flange secured to each deflector plate and formed with spaced openings aligned with those in the flanges of the annular members, accurately aligned sleeves fitting within said openings and rigidly secured to their respective flanges, rod-like insulating members projecting through said sleeves so as to support each anode and the deflecting plates in a predetermined spaced aligned position, and tapered eyelets fitting about and contracting said sleeves so as rigidly to hold the annular members and flanges in said predetermined aligned position.

2. In the manufacture of an electronic beam translating device of the type having an electron-responsive surface, an electron gun spaced from said surface and including an emissive cathode capable of projecting a beam of electrons toward said surface, one or more anodes, and deflecting plates interposed between said surface

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and electron gun, the method of mounting the anode and deflecting plates in a predetermined aligned position, which method comprises securing to the anode and deflecting plates preformed flanged members having sleeve positioned so as to define accurately aligned spaced openings extending about the anode and deflecting plates, applying tapered eyelets about said sleeves, inserting through the openings in said sleeves supporting members of insulating material, and forcing said eyelets into telescopic relation about said sleeves so as to contract the sleeves about the supporting members, thereby rigidly securing the parts in predetermined aligned position.

3. In the manufacture of an electronic beam translating device of the type having an electron-responsive surface, an electron gun spaced from said surface and including an emissive cathode capable of projecting a beam of electrons toward said surface, one or more anodes, and deflecting plates interposed between said surface and electron gun, the method of mounting the anode and deflecting plates in a predetermined aligned position, which method comprises securing to each anode an annular member having a preformed laterally projecting flange provided with spaced sleeves defining openings extending about the anodes, securing to each deflecting plate a preformed laterally projecting flange provided with a plurality of spaced sleeves defining openings adapted to be aligned with those of the sleeves carried by the annular members, applying tapered eyelets about said sleeves, inserting rod-like supporting members of insulating material through the openings in said sleeves, and forcing said eyelets into telescopic relation to said sleeves so as to contract the sleeves about said supporting members, thereby rigidly securing the parts in predetermined aligned position.

KARL C. AUGENSTEIN.
ALBERT RIETH.

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