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ELECTRON GUN POSITIONING STRUCTURE

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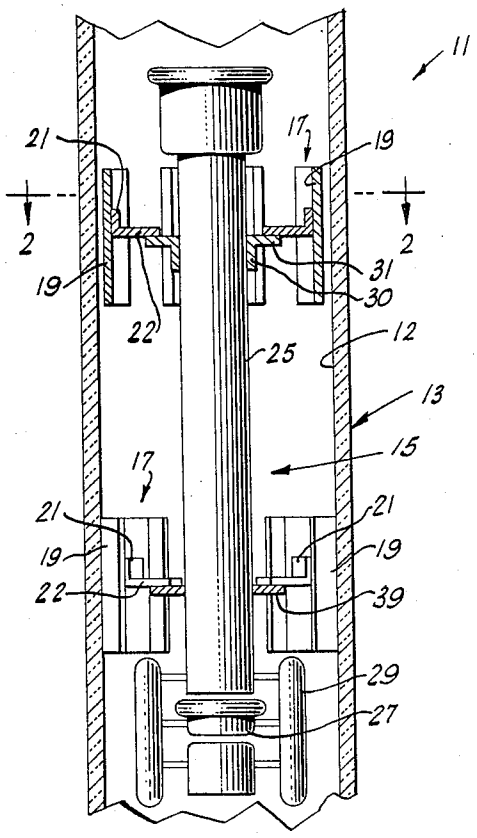


Fig. 1

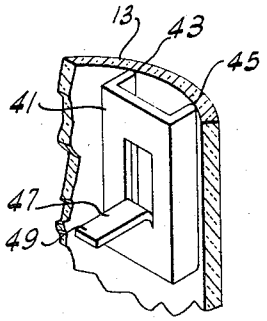


Fig. 3

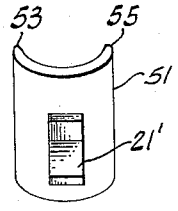


Fig. 4

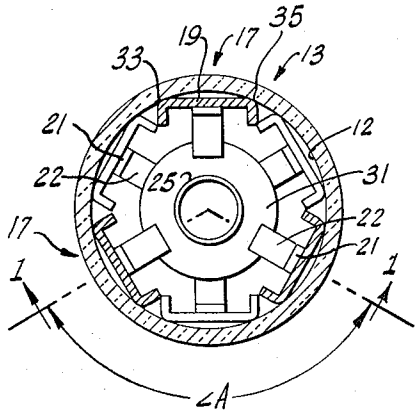


Fig. 2

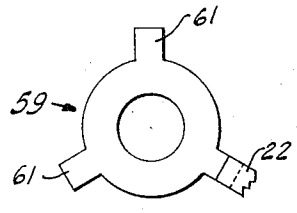


Fig. 5

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ELECTRON GUN POSITIONING STRUCTURE

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This invention relates to electron discharge devices, and more particularly to nonresilient positioning means for interiorly locating the electron generating and controlling assembly in specific alignment therein.

Many of the present-day electron discharge devices, such as radio and cathode ray tubes, use resilient type positioners, or snubbers, to center an electron generating and controlling assembly or gun, axially within an evacuated envelope. These conventional positioners are quite generally made of mica or metal having a certain degree of resiliency which compensates for manufacturing tolerances in envelope and gun parts.

In numerous applications, electron discharge devices are subject to severe shock and vibration operational conditions during normal usage. For example, a cathode ray tube of a type utilized in airborne equipment will be subjected to the severe environmental conditions just mentioned. Many of these cathode ray tubes for aerial applications have stringent electron gun-to-envelope alignment specifications to insure optimum performance. Tubes constructed with resilient gun positioners experience a relative motion of the gun with respect to the envelope under shock conditions. As a consequence, specified alignment of the gun to the envelope is at least temporarily out of specification, or may be permanently misaligned so as to make the tube operationally instable or permanently inoperable.

Accordingly, it is an object of the invention to reduce the aforementioned disadvantages and to provide nonresilient shock and vibration resistant positioning means for use in electron discharge devices.

Another object of the invention is to provide adjustable nonresilient positioning means compensative for manufacturing tolerances in envelope and electron generating and controlling assembly parts.

The foregoing objects are achieved in one aspect of the invention by the provision of electron gun-to-envelope positioning means in which nonresilient positioners affixed to the gun effect positive longitudinal contact with the inner surface of the envelope to provide desired gun-to-envelope alignment under severe shock and vibration operational conditions.

For a better understanding of the present invention, together with other and further objects, advantages, and capabilities thereof, reference is made to the following discloseur and appended claims in connection with the accompanying drawings in which:

FIG. 1 is a partially sectioned plan view showing a typical electron discharge device utilizing one embodiment of the invention;

FIG. 2 is a sectioned view showing the invention taken along line 2—2 of FIG. 1;

FIGS. 3 and 4 are perspectives illustrating other embodiments of the invention; and

FIG. 5 is a plan view showing a modified embodiment of support means.

Referring to FIG. 1, there is shown a partial section of a typical electron discharge device in the form of a cathode ray tube **11** having an envelope neck portion **13** encompassing an electron gun assembly **15** for generating and controlling electrons and a plurality of positioning means **17** attached thereto for establishing and maintaining axial alignment of the assembly **15** within the neck **13**.

In greater detail, the illustrated portion of gun assembly **15** shows an elongated terminal electrode **25** and an adjacent electrode **27** both of which are suitably supported by a plurality of insulative ceramic beads **29**, two of which are shown. The substantially cylindrical terminal electrode **25** has spaced thereon and affixed thereto a collar portion **30** having an integral outstanding support member **31** extending toward but spaced from the inner surface of the envelope **13**. This outstanding support member **31** is suitably shaped for insertion into the neck of the envelope and has a centrally formed aperture in the collar **30** dimensioned to provide affixture of the terminal electrode **25** of the electron gun therein. Each positioning means **17** is comprised of a channelled contact member **19** having a substantially nonresilient L-shaped connecting member **21** attached thereto. The free portions or legs **22** of the several connecting members **21** are positioned and bonded in equispaced array about the outstanding support member **31** affixed on the terminal electrode **25** in a manner to provide longitudinal contact between the contact members **19** and the inner wall **12** of the envelope **13**. A jig, not shown, is utilized to adjust and position the connector legs **22** on the support member **31** to effect a no-movement axial alignment of gun **15** within envelope neck portion **13**.

As shown in FIG. 2, the three positioning means **17** are in spaced array of substantially 120 degrees apart as indicated by angle A. The longitudinal back edges **33** and **35** of each contact member **19** dually touch the inner wall **12** in two discrete longitudinal areas thereby providing six circumferential positioning contacts. More than three positioning means may be utilized if desired. Although not shown, it is evident that for small mounts in relatedly small dimensioned envelope necks, substantial support is effected by two positioning means **17** diametrically oriented to afford four positioning contacts with the envelope.

In FIG. 1 there is also shown additional positioning means **17** which are located on a plane longitudinally removed from the support member **31** as on an outstanding support shelf **39** which is an integral part of the terminal electrode **25**. This additional positioning is especially advantageous when long-gun structures are involved. In elongated mount structures several such support shelves with attached contact members can be advantageously utilized.

While support member **31** and support shelf **39** are shown and described as being oriented along terminal electrode **25**, they are not intended to be restricted to such positioning. They may be employed singly or plurally elsewhere on the gun assembly to facilitate resultant alignment as may be desired.

Although not shown, a plurality of substantially L-shaped support brackets may be attached to the electron gun in a manner similar to the support shelf **39**. These brackets are formed to accommodate individual positioning means **17**.

With reference to FIG. 2, there is shown a section taken along line 2—2 of FIG. 1. The longitudinal back edges **33** and **35** of each of the channeled contact members **19** are in touching adjacency with the inner wall **12** of envelope neck portion **13**. It is important that these back edges **33** and **35** be free of protrustions or sharpness. A substantial smoothness or roundness is desirable to avoid scratching or abrading the glas sof the envelope.

Another embodiment is shown in FIG. 3 wherein a second type of channelled contact member **41** is formed with substantially rounded longitudinal leading edges **43** and **45** touching the inner wall of the envelope portion

13. In this embodiment, an integral tab **47** is cut out and formed from the channelled member **41** as an outstanding connecting projection **49** to provide connecting means for adjustably positioning and affixing the channelled member **41** to a suitable support such as outstanding support member **31** or support shelf **39**.

Still another embodiment of the contact member is shown in FIG. 4 wherein a curved contact member **51** is formed with envelope contacting edges **53** and **55**. A connecting member **21'** is suitably affixed for support attachment as aforedescribed.

A modified embodiment of support means extended in a radial plane from the gun structure **15** is shown in FIG. 5. This planar support **59**, while basically similar to either support member **31** or shelf support **39**, has spaced connecting tabs **61** formed integral thereto and extended radially therefrom to provide integral connective means for the attachment of the connecting members **21'**, **22** or **49**.

Thus, there have been described several embodiments of an adjustable feature for affixing the nonresilient connecting members **21**, **21'**, and **47** to corresponding contact members **19**, **41**, and **51**, respectively to insure optimum predetermined axial alignment within an envelope of a gun structure having parts representative of normal manufacturing variations. Additionally, the use of such nonresilient connecting members insures positive placement and continued axial alignment of the gun assembly **15** within the envelope neck portion **13** despite severe environmental and operational conditions of shock and vibration.

The materials suitable for use in constructing the several aforedescribed contact members **19**, **41**, and **51** and connecting members **21**, **21'**, and **47** may be nickel, nickel alloys, stainless steels, or other materials well known for their conventional usage in electron discharge devices. Affixing of the several members can be by spot welding techniques or other bonding means well known to those skilled in the art. Although the alignment of a cathode ray tube electron gun has been shown and described, it is the intent of the invention to include assemblies which produce and control rays, beams, sheets, or clouds of electrons in other types of electron discharge devices intended for like environmental conditions.

While there have been shown and described what are at present considered the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the scope of the invention as defined by the appended claims.

What is claimed is:

1. In an electron discharge device having an evacuated envelope encompassing an assembly for generating and controlling electrons therein, nonresilient positioning means for said assembly comprising:

a plurality of spaced nonresilient positioners affixed by differential nonresilient connective means to said assembly and extended therefrom to contact the inner surface of said envelope to provide longitudinal alignment of said assembly in said envelope.

2. In an electron discharge device having an evacuated envelope with an integral neck section encompassing an electron gun therein, positioning means for said gun comprising:

a substantially outsanding support member extended from said gun structure and shaped for insertion within said neck section;

a plurality of nonresilient connecting members bonded in spaced array to said support member and extended therefrom toward the inner surface of said neck section; and

a plurality of contast members attached to said connecting members and having portions formed to touch said inner surface in discrete areas to provide alignment of said gun in said neck.

3. In an electron discharge device having an evacuated envelope with an integral neck section encompassing an electron gun therein, positioning means for said gun comprising:

a substantially wafer-shaper outstanding support member integral to said gun structure and diametrically smaller than the internal diameter of said neck section;

a plurality of nonresilient L-shaped connecting members bonded in spaced array to said support member and extended therefrom toward the inner surface of said neck section; and

a plurality of channel-like contact members attached to said connecting members and having portions formed to touch said inner surface in discrete areas to provide alignment of said gun in said neck.

4. In a cathode ray tube having an evacuated envelope with an integral neck section encompassing an electron gun therein, positioning means for said gun comprising:

a substantially wafer-shaped support shelf being diametrically smaller than the internal diameter of said neck station and having a centrally formed aperture in the form of a collar dimensioned to provide affixture of said electron gun therein;

at least three nonresilient L-shaped connecting members positioned and bonded in equispaced array to said support member and extended therefrom toward the inner surface of said neck section; and

at least three channel-like contact members attached to said connecting members and having portions formed to longitudinally touch said inner surface in discrete areas to provide alignment of said gun in said neck.

5. In an electron discharge device having an evacuated envelope with an integral neck section encompassing an electron gun therein, positioning means for said gun comprising:

a planar support extended in a radial plane from said gun structure, said support being diametrically smaller than the internal diameter of said neck section, said planar support having spaced connecting tabs formed integral thereto and extended radially therefrom;

a plurality of nonresilient connecting members bonded in spaced array to said connecting tabs and extended therefrom toward the inner surface of said neck section; and

a plurality of channel-like contact members attached to said connecting members and having portions formed to touch said inner surface in discrete areas to provide alignment of said gun in said neck.

6. In an electron discharge device having an evacuated envelope with an integral neck section encompassing an electron gun therein, positioning means for said gun comprising:

a plurality of nonresilient L-shaped connecting members bonded in spaced array to said electron gun and extended therefrom toward the inner surface of said neck section; and

a plurality of channel-like contact members attached to said connecting members, each of said contact members having longitudinal back edge portions formed to dually touch said inner surface in discrete areas to provide alignment of said gun in said neck.

7. In an electron discharge device having an evacuated envelope with an integral neck section encompassing an electron gun therein, positioning means for said gun comprising:

a plurality of nonresilient L-shaped connecting members bonded in spaced array to said electron gun and extended therefrom toward the iner surface of said neck section; and

a plurality of channel-like contact members attached to said connecting members, each of said contact members having longitudinal leading edge portions formed to dually touch said inner surface in discrete

areas to provide alignment of said gun in said neck.

8. In an electron discharge device having an evacuated envelope with an integral neck section encompassing an electron gun therein, positioning means for said gun comprising:

a plurality of nonresilient L-shaped connecting members bonded in spaced array to said electron gun and extended therefrom toward the inner surface of said neck section; and

a plurality of curved contact members attached to said connecting members, each of said contact members having longitudinal leading edge portions formed to dually touch said inner surface in discrete areas to provide alignment of said gun in said neck.

9. In an electron discharge device having an evacuated envelope with an integral neck section encompassing an electron gun therein, positioning means for said gun comprising:

a plurality of substantially L-shaped support brackets dimensioned for insertion within said neck section, said support members spacedly affixed to said electron gun;

a plurality of nonresilient connecting members bonded to said support brackets and extended therefrom toward the inner surface of said neck section; and

a plurality of contact members attached to said connecting members and having portions formed to touch said inner surface in discrete longitudinal areas to provide alignment of said gun in said neck.

10. Electron gun positioning means according to claim 2 wherein said nonresilient connecting members are formed as integral tabs extending from the backs of said contact members as nonresilient outstanding connecting projections for attachment to said support member.

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