

[54] **LEAKAGE INHIBITING SHIELD**

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[22] Filed: **Aug. 3, 1972**

[21] Appl. No.: **277,617**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 216,111, Jan. 7, 1972.

[52] U.S. Cl. **313/313, 313/219, 313/239, 313/242, 313/335, 313/356**

[51] Int. Cl. **H01j 1/52, H01j 61/04**

[58] Field of Search **313/219, 239, 242, 313/313, 331, 333, 335, 356**

[56] **References Cited**

UNITED STATES PATENTS

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Primary Examiner—Ronald L. Wibert

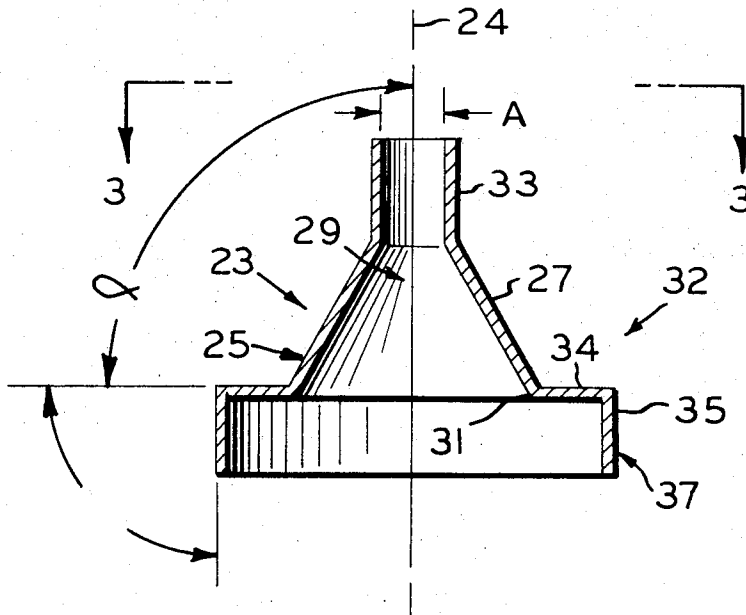
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[57] **ABSTRACT**

An improved shielding means, for inhibiting the formation of electrical leakage between the stem leads of an electron discharge device, is a substantially infundibular shaped member formed for umbrella-fashion-attachment to an individual lead to effect better shielding of the bead area surrounding the lead. A hollow conic section, extending below a tube-like attachment portion, has an annular basal-oriented projecting portion with a peripheral downturned portion therearound. The integral shaping of the downturned portion with the projection provides beneficial structural reinforcement and rigidity to the structure and effects improved shielding characteristics.

8 Claims, 6 Drawing Figures



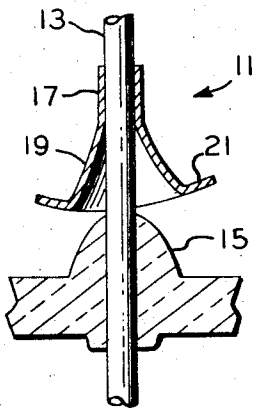


Fig. 1
PRIOR ART

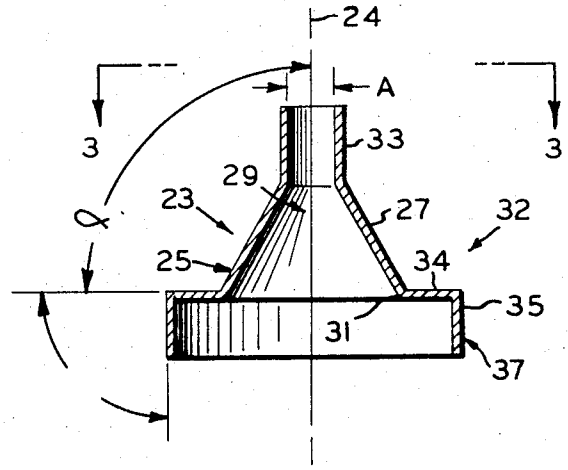


Fig. 2

Fig. 3

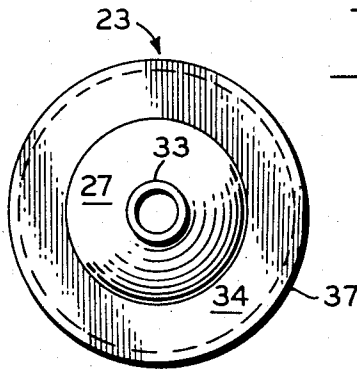


Fig. 4

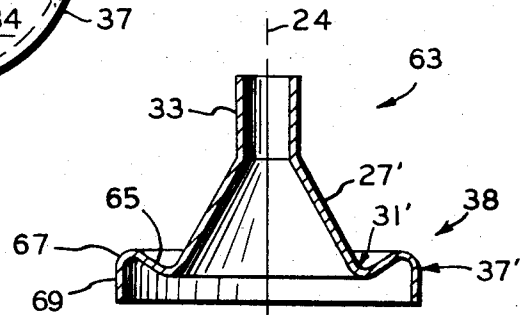
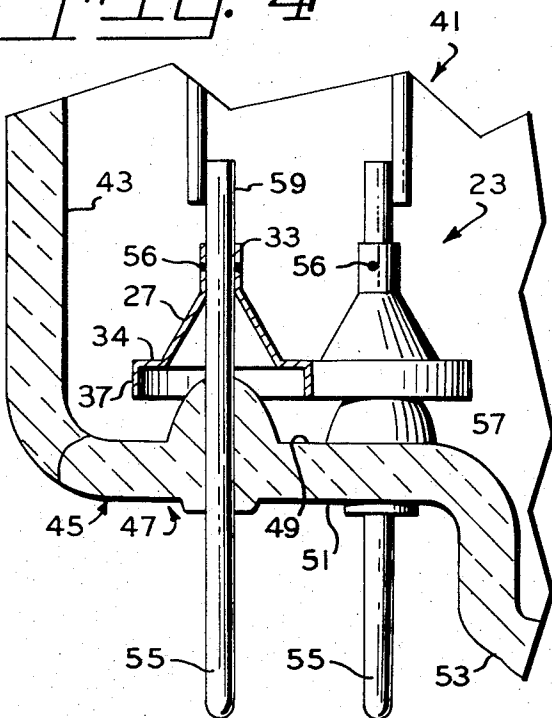


Fig. 5

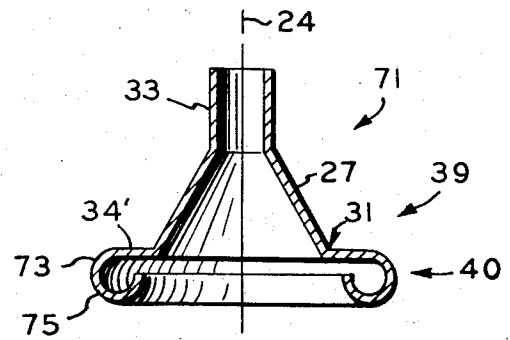


Fig. 6

LEAKAGE INHIBITING SHIELD

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of application Ser. No. 216,111, filed Jan. 7, 1972. Filed concurrently with this application, and assigned to the assignee of the present invention, is a related application Ser. No. 277,616, filed Aug. 3, 1972 also pertaining to the art of leakage inhibiting shields.

BACKGROUND OF THE INVENTION

This invention relates to shielding means for an electron discharge device and more particularly to improved means for reducing electrical leakage therein.

A problem commonly associated with electron discharge devices, and with electron tubes in particular, is that of electrical leakage paths developing on the enclosure surface between the supportive and connective leads of the device during fabrication processing and subsequent operation.

In general, a conventional form of an electron tube comprises an evacuated envelope wherein an electron source with elements for generating and controlling electrons is usually supported by a plurality of leads hermetically sealed in a wafer closure member and extended therethrough to provide electrical connections to associated external circuitry. The supportive and connective leads are conventionally spaced in close vertical array and extend through the closure member in a manner to conserve space, thereby keeping the physical magnitude of the tube structure to a desirable minimal size. Such compactness often creates a problem in achieving desired electrical isolation of the leads which individually conduct electrical potentials of different levels.

During the manufacture and subsequent operation of electron discharge devices, there is a tendency for conductive materials to spuriously sublime from the heated electron generating structure and deposit or collect on the adjacent closure surface. Continued sublimation results in the forming of an electrically conductive film on the surface of the closure bridging the interlead spacings thereby producing a detrimental electrical leakage condition which markedly interferes with the intended operation of the device. To insure and maintain a satisfactory level of operational performance, this electrical leakage film must be eliminated or made discontinuous between the individual leads in the closure member.

In certain types of electron tubes, such as for example, in cathode ray tubes, it is conventional practice to form beads at discrete areas on the interior surface of the closure member where the hermetically encompassed leads protrude therethrough. A lead-bead formation of this nature provides additional material and enhances the reliability of the hermetic bonding of the leads within the closure member, but usually the bead itself has no properties to inhibit the formation of a sublimed leakage film thereover. To deter the forming of a continuous sublimation film, a metallic shielding member or "eyelet", fashioned as a hollow substantially infundibular shaped article, is fitted on each of the several leads and attached thereto at a position proximal to the bead. The umbrella effect of the shielding means is intended to prevent the formation of a continuous leakage path between leads. The eyelet

shielding means of the prior art is of funnel-like construction having an annular ledge outstanding from the perimeter of the funnel. In bonding the shield to the lead, the cylindrical tube-like portion of the funnel is pressured against the lead and often deformed by the attaching procedure. Degrees of this reshaping pressure are transferred to the cone portion causing deformation thereof and a resultant bowing of the annular ledge. Such deformation of the shielding means reduces the protective efficiency thereof; as an elliptical shaping of the conic section and resultant upward bowing of the ledge diminishes the amount of desired shielding, thereby lessening the inhibition of leakage path formation.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the invention to reduce the aforementioned disadvantages and to provide an improved shielding means for inhibiting leakage between the stem leads of an electron discharge device thereby promoting greater reliability of operation.

Another object of this invention is to provide an improved shielding means embodying reinforcement and structural rigidity characteristics that are retained in the completed device to accomplish the intended protection results.

The foregoing objects are achieved in one embodiment of the invention by the provision of an improved shielding means that is a substantially infundibular shaped metallic structure formed to be attached in umbrella-fashion on each of several leads to effect shielding of the bead area surrounding the lead. The hollow conic section, extending below the tube-like attachment portion, has an annular projection outstanding from its basal perimeter. From the outer periphery of the projection, an integral downturned portion extends in a discretely shaped relationship to effect beneficial structural reinforcement and rigidity, and provide improved uniform shielding, thereby inhibiting the formation of deleterious electrical leakage paths between leads.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary sectional view showing a prior art shielding means oriented for utilization on the lead of an electron discharge device;

FIG. 2 is a sectional view illustrating an embodiment of the improved shielding means of the invention;

FIG. 3 is a plan view of the shielding means taken along the line 3—3 of FIG. 2;

FIG. 4 is a partial sectional view illustrating utilization of the above-cited embodiment of the invention in an electron discharge device; and

FIGS. 5 and 6 are sectional views showing additional embodiments of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

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

With reference to the drawings, there is shown in FIG. 1 a sectional view of a prior art funnel-like shielding member 11 oriented on a stem lead 13 adjacent to the bead area 15 surrounding the lead. During attachment to the lead, the encompassing cylindrical tube-like attachment portion 17 of the shielding member 11 was pressured against the lead 13 and somewhat deformed by the bonding procedure. In many cases, sufficient pressure from this deformation was transferred to cone portion 19 causing a substantially elliptical reshaping thereof and effecting a resultant upward bowing of the annular ledge 21. Such reshaping and bowing decreased effective shielding protection.

To overcome the structural deficiencies and shielding inadequacies evidenced in the above-described prior art shielding member 11, an improved shielding means was produced to better inhibit the development of deleterious electrical leakage paths between the stem leads of an electron discharge device.

In FIGS. 2 and 3, there is shown an embodiment of the improved shielding means 23, which has a longitudinal axis 24 therethrough, is comprised of a hollow conic section 25 having a conical wall portion 27 with an open apex 29 and an opposed basal perimeter 31. Integral with the open apex 29 and extending longitudinally upward therefrom is a terminal cylindrical tube-like section 33 through which a stem lead is inserted for attachment. The tube-like section has an inner diameter A which is sufficiently larger than the diameter of the stem lead to facilitate insertion thereon. Outstanding from the aforementioned basal perimeter 31 is a projecting portion 32. In this embodiment the projection is in the form of a planar annular ledge 34 which extends in a manner substantially normal to the axis 24, as defined by $\angle \alpha$. The projecting ledge has a defined outer periphery 35 from which a downward turned portion 37 extends longitudinally beyond the plane of the basal perimeter 31. In the embodiment shown in FIGS. 2 and 3, the downward turned portion is formed as a closed skirt portion integral with the outer periphery of the annular ledge 34 extending therefrom in a substantially downstanding manner to preferably effect a substantially right angle relationship with the plane of the annular ledge, such being denoted by $\angle \beta$. This angular relationship between the skirt 37 and the ledge 34 provides beneficial structural reinforcement and rigidity.

In referring to FIG. 4, a partial sectional portion of a representative electron discharge device 41 is shown, which may be the basal end of a cathode ray tube though not necessarily limited to such. The envelope portion 43 is hermetically sealed to a substantially disc-shaped stem 45 which comprises a wafer member 47 having an interior surface 49 and an exterior surface 51. The wafer enclosure member 47 includes a concentrically located sealed exhaust tubulation 53 about which a plurality of spaced electrical conductors or leads 55 are vertically disposed in substantially circular array and hermetically sealed in the wafer member 47 in parallel alignment to extend through both surfaces 49 and 51 thereof. Also, forming an integral part of the wafer's interior surface 49 are a plurality of formed beads 57, each hermetically encompassing a section of each individual lead 55. As previously mentioned, a

function of the beads is to provide increased glass-to-metal seal area and also give support and impart rigidity to the leads 55. As shown, the aforedescribed improved shielding means 23 are attached, as by welds or swages 56, to the leads 55 in umbrella-fashion at a position thereon adjacent to the beads to provide adequate shielding protection to the bead areas 57. The interior terminal ends 59 of the leads 55 are suitably disposed for attachment to the mount structure or electron gun assembly, not shown, from whence sublimation emanates during device operation, a portion of which is directed toward the beads 57 and the interior surface 49 of the stem 45. It is evident that unless some protection is afforded, a sublimation film of conductive material spuriously emanating from the electron gun or emission source will result in the formation of electrical leakage paths on the interior surface 49 between the several leads 55 disposed therethrough.

The improved shielding means 23 is advantageously formed to retain its intended shaping. In the aforedescribed embodiment, the angular relationship between the annular ledge 34 and the downstanding closed skirt portion effects positive structural reinforcement and rigidity which minimizes distortion of the conical wall portion 27 and prevents bowing of the ledge 34.

Another embodiment of the invention 63 is shown in FIG. 5 wherein the annular projecting portion 38, extending substantially outward from the basal perimeter 31 of the conical wall portion 27', is shaped as a substantially continuous concentric depression 65 formed intermediate the basal perimeter and the outer periphery 67. The downward turned portion 37' integrally extending beyond the plane of the basal perimeter 31' is a closed skirt formation 69 projecting in a downstanding manner substantially parallel with the longitudinal axis 24.

An additional embodiment 71 is illustrated in FIG. 6 wherein the annular projecting portion 39 outstanding from the basal perimeter 31 is formed as a substantially planar projection or annular ledge 34'. The downward turned portion 40, extending from the periphery 73 of the planar portion, is formed as an inwardly turned annular roll 75.

In referring to the embodiments 63 and 71 referenced in FIGS. 5 and 6, it is within the scope of the invention to incorporate the inwardly turned annular roll 75 of embodiment 71 as an alternate formation for the downward turned portion 37' in the second embodiment 63.

In considering the several embodiments disclosed, there is provided in each instance improved rigidity and structural reinforcement that is not evidenced in the prior art. Additionally, the several forms of the downward turned portion each provides increased shielding of the beads.

Thus, there is provided a markedly improved shielding means for more positively inhibiting the formation of sublimation induced electrical leakage paths between the several stem beads in an electron discharge device, thereby assuring greater reliability of operation.

While there has been shown and described what is at present considered the preferred embodiment 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. Metallic shielding means for inhibiting leakage between the stem leads of an electron discharge device employing a wafer closure member wherethrough a plurality of supportive and electrical connective leads are hermetically disposed in a spaced array, said shielding means being a substantially infundibular shaped member formed for separate attachment to individual leads of said wafer and comprising:

a hollow conic section having a conical wall portion, an open apex, an opposed basal perimeter and a longitudinal axis extending therethrough;
an integral terminal section extended from said open apex to provide a lead attachment provision;
an annular projecting portion extending substantially outward from said basal perimeter, said projecting portion having a defined outer periphery; and
a downward turned portion integrally extending from the outer periphery of said annular projection, said projection and said downward turned portion being of an integral shaping extending longitudinally beyond said basal perimeter to provide structural reinforcement and rigidity, and improved shielding.

2. Improved shielding means according to claim 1 wherein said annular projecting portion is formed as a planar ledge extending in a manner substantially normal to said axis.

3. Improved shielding means according to claim 2 wherein said downward turned portion is formed as a skirt downstanding from said periphery in a manner substantially normal to the plane of said annular projecting ledge.

4. Improved shielding means according to claim 2 wherein said downward turned portion is formed from the periphery of said planar projecting portion as an inwardly turned annular roll.

5. Improved shielding means according to claim 1

wherein said annular projecting portion is shaped as a substantially continuous concentric depression formed intermediate said basal perimeter and said projection outer periphery.

6. Improved shielding means according to claim 5 wherein said downward turned portion is formed as a closed skirt downstanding from the periphery of said annular projecting portion.

7. Improved shielding means according to claim 5 wherein said downward turned portion is formed from the periphery of said annular projecting portion as an inwardly turned annular roll.

8. In a cathode ray tube having a wafer closure member wherethrough a plurality of electrical connective and supportive leads are arranged to accommodate an electron gun, said leads being hermetically disposed in spaced array whereof each of said leads has an encircling bead of glass therearound integral to the interior surface of said closure member; a plurality of substantially infundibular shaped metallic shielding members individually attached to separate leads proximal to said beads for inhibiting electrical leakage between said leads, each of said shielding members comprising:

a hollow conic section having a conical wall portion, an open apex, an opposed basal perimeter and a longitudinal axis extending therethrough;

an integral terminal section extended from said open apex to provide a channel for accommodating a respective lead whereat attachment is effected;

an annular projecting portion extending substantially outward from said basal perimeter, said projecting portion having an outer periphery; and

a downward turned portion integrally extending from the outer periphery of said annular projection, said projection and said downward turned portion being of an integral shaping extending longitudinally beyond said basal perimeter to provide beneficial structural reinforcement and rigidity,

and improved leakage inhibition by effecting increased shielding of the bead area.

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