June 29, 1943. C. H. LANE, JR 2,323,140

MOUNT SUPPORT AND CONTACT FOR ELECTRON DISCHARGE DEVICES

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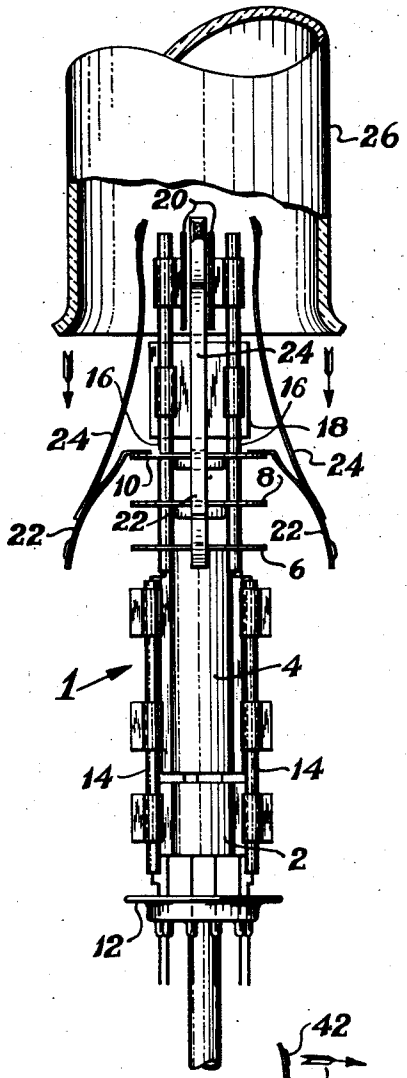


FIG. 1

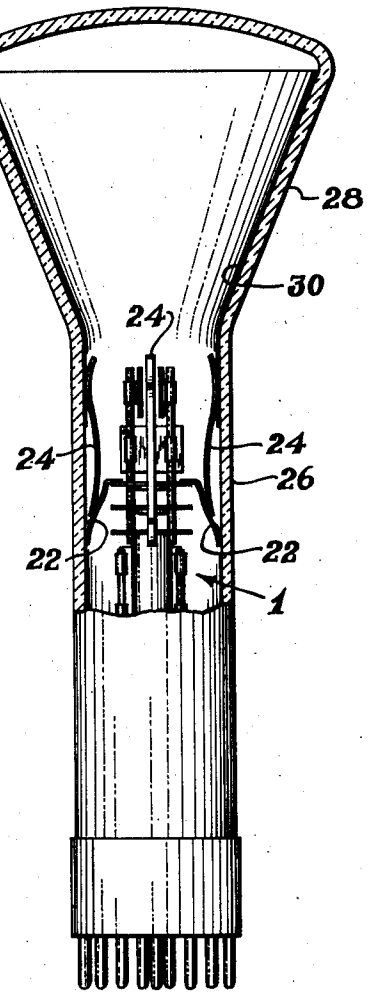


FIG. 2

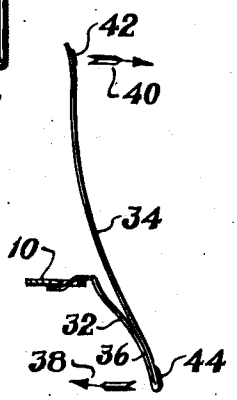


FIG. 3



FIG. 4

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MOUNT SUPPORT AND CONTACT FOR ELECTRON DISCHARGE DEVICES

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9 Claims. (Cl. 250—27.5)

My invention relates to electron discharge devices particularly of the cathode ray type and to electrode supporting and electrical contact means for such devices.

In many electron discharge devices there is provided a coating of electrically conductive material usually applied to the inner surface of the envelope wall. While it is possible to provide contact with this coating, such as by a lead sealed into and extending through the envelope wall, such a construction is expensive and often subject to failure due to vibrational effects and other causes. While it has been proposed to provide resilient metal fingers contacting the inner wall coating and simultaneously supporting the electrode structure against lateral movement, such arrangements are not altogether satisfactory in that the high compression of such spring fingers against the wall coating during assembly often strips the coating from the envelope wall so that in an assembled position these spring fingers make poor electrical contact with the coating.

It is an object of my invention to provide resilient contacts between electrode structures in electron discharge devices which will not become defective during use. It is another object to provide a resilient electrical contact which may be moved into contact-making position with an electrically conductive coating without damage to the coating. It is a further object to provide a resilient support for an electrode structure in combination with a resilient electrical contact and it is a still further object of my invention to provide improved supporting means for an electrode assembly that is easy to assemble, rugged in construction, inexpensive to manufacture and which at the same time provides good electrical contact with an electrically conductive wall coating. In accordance with my invention I provide resilient members affixed to a transverse support on the electrode mount assembly, preferably on opposite sides thereof, which are compressed by the envelope wall to center and resiliently support the mount assembly, the resilient members having integrally formed or attached spring contacts which when the resilient mount support members are unstressed lie close together so that the mount assembly may be inserted in an envelope without interference with the spring contacts but which engage the envelope upon compression of the mount support members. These and other objects, features and advantages of my invention will become apparent when viewed with respect to the following description and the accompanying drawing wherein—

Figure 1 is a full scale longitudinal view of an electrode mount structure incorporating my invention and suitable for use in a cathode ray tube;

Figure 2 shows a cathode ray tube incorporating the mount structure of Figure 1;

Figure 3 shows a combined mount support and electrical contact made in accordance with my invention, and

Figure 4 is a plan view of the support and contact shown in Figure 3.

While I will describe my invention with particular reference to its application in cathode ray tubes, it will be appreciated that it is nevertheless equally applicable to other electron discharge devices where a combined electrode support and electrical contact means is desired. Referring to Figure 1 I have shown in actual size an electrode mount structure 1 comprising conventional electron gun electrodes merely as an example of a structure which it is desired to support within an envelope, the structure comprising a conventional centrally apertured grid electrode 2 enclosing the usual cathode and heater, not shown, a cylindrical anode 4 and a plurality of apertured anode discs 6, 8 and 10. The electrodes 2 and 4 are supported on a stem or press 12 by insulating rods 14, the disc electrode 6 being supported from the anode cylinder 4 by direct contact therewith, the anode discs 8 and 10 being in turn supported from the anode disc 6 by tubular insulators 16 which likewise may support two pairs of deflection plates 18 and 20 as well known in the art.

In accordance with my invention I provide a transverse member supported by the mount structure 1 such as the anode disc 10 and affix thereto a plurality of resilient mount support members which have integrally formed contact making springs or such springs attached thereto, and I so construct the mount supports and contacts that in an unstressed condition the contacts will not impede the entry of the mount structure into the tubular portion of an envelope. More particularly in accordance with my invention I provide a plurality of resilient mount supports or spacers 22 affixed to a transverse member such as the anode disc 10 and I attach or form integrally with each spacer a contact member 24 such that with the spacer 22 in an unstressed condition the free ends of the members 24 are closer together than the free ends of

the mount spacers 22, the purpose of this feature being apparent from an inspection of Figure 2.

Referring to Figure 2 which shows a cathode ray tube incorporating the structure of my invention and the mount structure shown in Figure 1, I have shown the tube as including an envelope 28 having a tubular portion 26 enclosing the electrode mount structure 1, only a portion of which is shown. In such tubes it is desirable to provide an internal envelope wall coating, such as a coating 30 of aquadag or other electrically conductive material. During assembling of the mount structure shown in Figure 1, the open end of the tubular portion 26 of the envelope is slipped over the mount structure, as shown by the two arrows in Figure 1. It is very desirable, particularly in automatic assembling and sealing of the tubular portion 26 to the stem or press 12, to obviate any manual or automatic means to contract portions of the mount structure to allow the envelope tubular portion to slip over the mount. The free ends of the contact members 24 in an unstressed position, that is prior to the assembly with the envelope, are relatively close together and transversely separted by a distance less than the internal diameter of the neck portion 26. Similarly the resilient mount spacers 22 are so formed that the free ends are separated by a transverse distance greater than the internal diameter of the neck portion 26. Consequently as shown in Figure 1 the envelope may be slipped over the mount structure without interference from the free ends of the contact members 24 and as the envelope is slipped over the mount, it compresses the mount spacers 22 forcing them inwardly about a fulcrum point on the anode disc 10, and compressing them against the wall of the envelope neck portion as shown in Figure 2. Simultaneously the free ends of the contact members 24 are forced outwardly into contact with the internal wall coating 30 and resiliently held against this wall coating by compressional forces exerted by the neck portion 26 through the mount support members 22. Thus the end of the short mount spacer acts as a fulcrum when the free ends are subjected to a bending moment thereby decreasing the radius of curvature of the spacer 22 and increasing the radius of curvature of the contact member 24.

To provide adequate support, the mount spacers 22 may be of relatively heavy flat metal strip and may bear on the neck portion with relatively heavy pressure. In the structures shown in Figures 1 and 2 I have found a pressure of twelve ounces adequate to properly support the mount when using four mount spacers 22 equally distributed around the transverse support such as the anode disc 10, only two of which are provided with the contact-making members 24. However, in accordance with my invention I obtain this high value of transverse support and at the same time provide a lighter pressure exerted between the free ends of the contact members 24 and the conductive coating 30 to prevent damage to this coating as the mount is inserted into the envelope. Consequently I provide the strip material of metal somewhat thinner than the metal strip of the mount spacers 22. I have obtained adequate support and good electrical contact throughout the life of the tube with a mount spacer strip 0.125 inch in width and 0.012 inch in thickness, and of similar width but 0.008 inch in thickness for the contact members 24 using an 80% nickel-20% chromium alloy for the metal strip material.

It will be appreciated that instead of using two separated strips of metal for forming the mount spacers and contact members, that a single strip of metal may be utilized. Referring to Figures 3 and 4 I have shown such a combined spacer and contact comprising a spacer portion 32 and a contact portion 34 supported on a transverse member such as the anode disc 10. While this arrangement practically requires the use of a uniform thickness metal strip, I have found that satisfactory results may be obtained without exerting too much pressure at the electrical point of contact with the wall coating 30, while still maintaining sufficient compression against the tubular portion of the envelope to provide adequate mount support. In forming the combined spacer and contact member shown in Figures 3 and 4, it is particularly necessary to provide a relatively large area of contact between the spacer portion 32 and the contact portion 34 such as over an area 36 so that the pressure exerted by the envelope wall does not tend to deflect the free end of the contact portion 34 away from the conductive coating 30. Thus, as the portion 32 is compressed inwardly toward the mount axis in the direction of the arrow 38, it is necessary that the contact portion 34 move outwardly at its free end as shown by the direction of the arrow 40, Figure 3. To provide smooth engagement between the conductive coating 30 and the contact member as the mount is slipped into the neck portion, I prefer to emboss or rib the contact area of the contact member as shown at 42 and such embossing or ribbing may likewise be provided at the opposite end as shown at 44.

While I have described only two specific embodiments of my invention, and have described their use in tubes of the cathode ray type, it will be appreciated that various other modifications may be made and various other uses contemplated without departing from the scope of my invention as set forth in the appended claims.

I claim:

1. An electron discharge device comprising an envelope having a tubular portion, an electrode supporting structure within said tubular portion, a transverse member on said structure, and a resilient envelope spacer supported by said member and contacting two longitudinally separated points along the said envelope tubular portion, said spacer being spaced from said tubular portion between said points of contact.

2. An electron discharge device comprising an envelope having a tubular portion, an electrode mount structure extending within said tubular portion, an electrically conductive coating covering a section of said tubular portion, a transverse member on said structure, and an electrically conductive resilient mount spacer supported by said member and held in compression by said envelope portion at two longitudinally separated points along said envelope tubular portion, said spacer making electrical contact with said coating at one of said points of contact.

3. An electron discharge device comprising an envelope having a tubular portion, an internal electrically conductive coating over a section of said tubular portion, an electrode mount structure within said tubular portion, a transverse member supported by said mount structure,

an electrically conducting envelope spacer supported by said transverse member, said spacer contacting said tubular portion and said conductive coating on opposite sides of said transverse member, the point of contact with said conductive coating being more remote from said transverse member than the point of contact with said tubular portion.

4. An electron discharge device comprising an envelope having a tubular portion, an internal electrically conductive coating over a section of said tubular portion, an electrode mount structure within said tubular portion, a transverse member supported by said mount structure, an electrically conducting member including a mount spacer portion supported by said transverse member extending longitudinally of said envelope portion and a contact portion supported by said spacer portion on one side longitudinally of said transverse member and extending longitudinally of said envelope and making electrical contact with said conductive coating on the opposite side longitudinally of said transverse member.

5. An electron discharge device comprising an envelope having a tubular portion, an electrode mount assembly axially supported within said envelope tubular portion, a conductive coating over a section of said tubular portion, said coating extending within close proximity of said mount assembly, a transverse member on said mount assembly and a plurality of resilient mount spacers supported by said transverse member each of which is in resilient compressive contact at opposite ends thereof and on opposite sides of said transverse member with said conductive coating and said tubular portion, the compression acting at opposite ends of said spacers being such that when said mount assembly is withdrawn from said tubular portion the ends of said spacers originally in contact with said conductive coating move closer to the longitudinal axis of said mount assembly.

6. An electron discharge device comprising an envelope having a tubular portion of predetermined diameter, an electrode mount assembly axially supported within said envelope tubular portion, a conductive coating over a section of said tubular portion, said mount assembly telescoping within said conductive coating, a transverse member on said mount assembly and oppositely disposed resilient mount spacers supported by said transverse member each of said spacers being in resilient compressive contact at opposite ends thereof with said conductive coating and said tubular portion, the compression exerted at the end of said spacers contacting said coating being less than the compression exerted at the opposite end of said spacers, the form of said spacers being such that when said mount assembly is withdrawn from said tubular portion the ends of said spacers originally in contact with said conductive coating are separated by a distance less than the internal diameter of said envelope tubular portion.

7. An electrode mount spacer and electrical contact adapted to engage separated points along a wall of an enclosing envelope comprising a resilient member having two portions of different length joined near on end and extending in one direction from said one end, the other end of the shorter portion being intermediate the ends of the longer portion and acting as a fulcrum when said shorter portion is distorted by a force adjacent the junction of said two portions.

8. An electrode mount spacer for contacting separated points along the wall of an enclosing envelope comprising a resilient member having two arced portions of different length joined near one end back-to-back and extending in one direction from said one end, the other end of the shorter portion being intermediate the ends of the longer portion and acting as a fulcrum when said shorter portion is subjected to a force tending to decrease the radius of curvature of the shorter arced portion.

9. An electrode mount spacer for contacting separated points along the wall of an enclosing envelope comprising two resilient arced members of different length joined back-to-back near one of the ends thereof, the other end of the shorter member serving as a fulcrum when the said members are subjected to a bending moment applied at the said joined ends thereof.

CLIFFORD H. LANE, JR.