April 20, 1948. R. DENMARK ET AL 2,439,886

LEAD-IN CONSTRUCTION

Filed Aug. 17, 1945

Fig. 1.

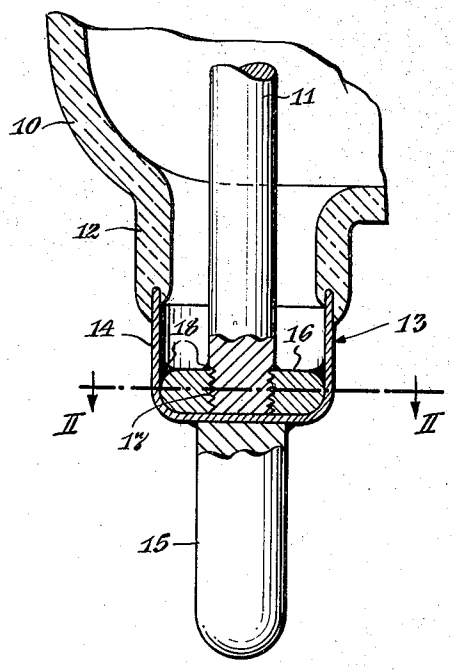


Fig. 2.

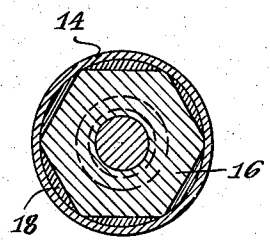


Fig. 3.

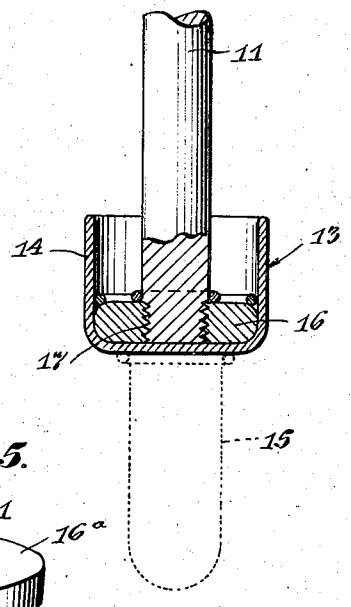


Fig. 4.

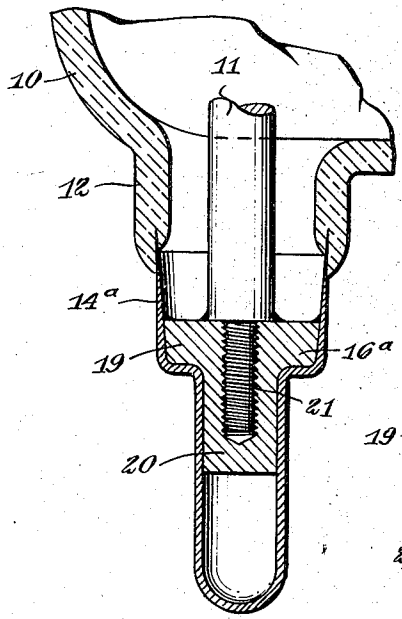
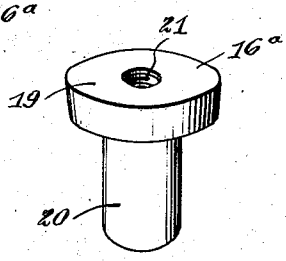


Fig. 5.



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Patented Apr. 20, 1948

2,439,886

UNITED STATES PATENT OFFICE

2,439,886

LEAD-IN CONSTRUCTION

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Application August 17, 1945, Serial No. 611,146

3 Claims. (Cl. 250—27.5)

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This invention relates to lead-in construction and more particularly for use in connection with the electronic art.

In view of the constantly increasing use of glass or other ceramic bowls and the like as the base portion of an electronic device, it has become increasingly desirable to improve the lead-in construction for electrical connections through the bowl. Exemplary of a prior art construction, reference is made to Patent 2,325,748 of August 3, 1943, setting forth an invention of Hampton J. Dailey and William J. Knochel. The present invention is an improvement thereover and for similar use in an electron discharge device.

The invention has for a primary object of broad scope, the mechanical improvement of the prior art structures with simplification of manufacture, construction and assembly thereof.

More specifically, an object of the invention is to secure accurate centering and alignment of the supporting pin or post with the thimble portion of the lead-in construction.

A further object of the invention is to enable the thimble to have a cup portion of one material and a prong of different material.

Yet another object of the invention is to provide for use of strong material for attachment of the pin or post, heat responsive material expandable with the glass where the junction with glass occurs, and highly electrically conductive material for the prong.

Other objects of the invention will appear to those skilled in the art to which it appertains as the description proceeds, both by direct recitation thereof and by implication from the context.

Referring to the accompanying drawing in which like numerals of reference indicate similar parts throughout the several views:

Figure 1 is a sectional view of a portion of the base or bowl of an electron discharge device at the part thereof having the present invention applied, the same being shown in part in elevation and in part in longitudinal section;

Figure 2 is a cross-section on line II—II of Fig. 1;

Figure 3 is an elevational sectional view similar to Fig. 1 and illustrating the invention in course of assembly;

Figure 4 is another sectional elevation similar to Fig. 1 but showing a modified embodiment of the invention; and

Figure 5 is a perspective view of the pin attaching member or nuts as used in Fig. 4.

In said drawing there is shown a portion of a glass or other ceramic bowl 10 comprising a part

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of the envelope of an electron discharge device added detail of which corresponds to the showing of Patent 2,325,748. The pin or post 11 shown is both an electrical conductor to and a mechanical support for an electrode in the device. It is usual practice to employ molybdenum as the material constituting the pin 11, and as molybdenum is both hard and rigid, it is desirable to require a minimum of machine work thereon and to anticipate no correction of location to be performed by bending the pin in place. It is essential that the pin be preformed and that it be exactly positioned when mounted and thus require no adjustment or bending.

Where lead-in connection is to be made, the bowl is provided with a reduced neck 12 at the outer rim of which is sealed the margin of a thimble 13. In Figures 1–3, said thimble is shown as comprising a cup portion or head 14 from which coaxially projects a reduced portion or prong 15. Within the head or cup 14 is an attaching member or nut 16, preferably of steel, secured so as likewise to be coaxial to the cup. The end of the pin or post 11 is screw threaded, as at 17, and has threaded fit with the center hole of nut 16.

Describing the invention more in detail, it is preferable to utilize a material for cup 14 and a glass for bowl 10 which have substantially the same coefficient of expansion. These materials may be and preferably are those defined in the patent to Howard Scott No. 2,062,335 of December 1, 1936. The glass is known as boro-silicate glass and the metallic material is sold in commerce under the trade name of "Kovar." The cup shown preferably has a cylindrical side wall or skirt and a solid or closed bottom wall perpendicular to the axis of the cylindrical wall. The perpendicularity of the bottom wall may be made very precise and provides a surface from which accurate axial alignment of attached parts may be assured. Furthermore, the fact that the bottom wall is flat lends itself to securing a vacuum tight structure not likely to develop cracks, crevices or leaks.

The flat structure of bottom wall of the cup 14, bounded by its cylindrical wall, is conducive to readily mounting the same in a fixture during fabrication of the device and applying a prong 15 in end abutment thereagainst in the fixture to be welded, soldered or brazed on said cup flat wall in precise axial alignment with the cup. Preferably said prong is copper and being machined with a flat end perpendicular to its axis,

may be readily and accurately applied in the desired axial alignment with the cup.

The attaching member 16 within the cup is preferably a hexagonal nut the diameter of which across the nut from one angular edge between two facets to an opposite angular edge between diametrically opposite facets, is substantially equal to the inside diameter of the cup. It is preferred that the nut engage tightly within the cup with the said edges between facets of the nut having substantially line engagement with the cylindrical wall of the cup and thereby securing both an accurate centering of the nut coaxial with the cup and a frictional retention of the nut within the cup. The bottom face of the nut is forced into intimate juxtaposition to the flat bottom face of the cup and thereby assures precise axial alignment of the nut and cap. The nut may be welded in place, or otherwise retained as by soldering or brazing. By virtue of the central threaded hole in the nut, the threaded pin may be applied to the nut and will necessarily be coaxial to the cup and perpendicular to the bottom flat wall thereof. The regions between the facets of the nut and the curved wall of the cup afford cavities which will receive solder or brazing material 18. If desired, solder rings may be applied in the cup, one next the cylindrical and one next the pin and the assembly heated to melt the solder and obtain the desired retention of the nut and pin in place in the cup. At the same time, a similar use of a solder ring on the prong next its engagement with the cup may be employed for completing the unification thereat between those parts.

In event a one-piece copper feather edged nipple is preferred such as shown in said Patent 2,325,748 and duplicated in Fig. 4 hereof, advantage may be taken of the hollow interior of the cup and prong and the internal taper of the cup wall. As may be seen in the drawing, cup 14*a* of this showing is integral with a hollow prong, both preferably being copper, but with a flat shoulder disposed perpendicular to the axis at the junction of cup and prong, and for purposes of this invention constituting the flat end wall of the cup. The inside surface of the cup's cylindrical wall tapers or flares to larger diameter toward the rim of the cup. In this instance we have shown the attaching member or nut 16*a* as having a frusto conical disc-like head portion 19 the peripheral face whereof engages the tapered inside surface of the cup and obtains a frictional and centering engagement therewith. The under side of head 19 is flat next the periphery and engages flatwise against the shoulder or flat wall of the cup, thereby assuring coaxial alignment of cup and attaching member. Said attaching member is preferably of steel for purposes of rigidity. Furthermore, in this instance a central stem 20 depends from the underside of head 19 of the attaching member, this stem projecting coaxially within the hollow prong and preventing the prong from becoming bent in use. The attaching member has a central threaded hole 21 therein for reception of the threaded end 17 of pin or post 11. As before, the attaching member may be soldered or brazed to the cup and the pin soldered or brazed to the attaching member.

In both forms of the invention shown, the assembly is readily accomplished and coaxial alignment is assured. The method employed as well as the assembled parts are conducive to a strong lead-in construction, and one of low electrical resistance for both direct current and radio frequency. The use of expensive, complicated brazing fixtures is avoided and yet concentricity or coaxial alignment is simply and effectively obtained. The problems of strength, conductivity, sealing and alignment have been so coordinated as to avoid sacrifice of one to achieve another, and thus all have been satisfactorily solved resulting in a far greater percentage of successful devices produced with less spoilage and failures than in the prior art construction.

We claim:

1. A lead-in construction comprising a cup portion having an outer cylindrical wall with an open end and having a transverse flat wall remote from said open end, an attaching member secured in said cup portion and centered by said cylindrical wall and coaxially aligned by engagement against said flat wall, and a post carried by and projecting coaxially from said attaching member and projecting from the said open end of the cylindrical wall.

2. A lead-in construction comprising a cup portion of material effectually sealed to glass, said cup portion having a cylindrical wall and a flat wall perpendicular to the axis of the cylindrical wall, an attaching member of material of greater strength than said cup portion, said attaching member having centering engagement at its periphery with said cylindrical wall and having flatwise engagement with said flat wall and coaxially aligned with and secured in said cup portion, and a prong projecting from said flat wall of the cup portion at the opposite side thereof from said attaching member.

3. A lead-in construction comprising a cup portion having a cylindrical wall with an open end and having an integral flat wall perpendicular to the axis of the cylindrical wall remote from the said open end, an attaching member secured within said cylindrical wall having centering engagement therewith and flatwise engagement with said flat wall, said attaching member having a coaxial threaded hole therein, and a post having a threaded end engageable in and coaxially supported by said attaching member and projecting from the said open end of the cylindrical wall.

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