April 9, 1957 W. T. MILLIS 2,788,503

ELECTRON DISCHARGE DEVICE BASE STRUCTURES

Filed July 27, 1953

Fig. 1.

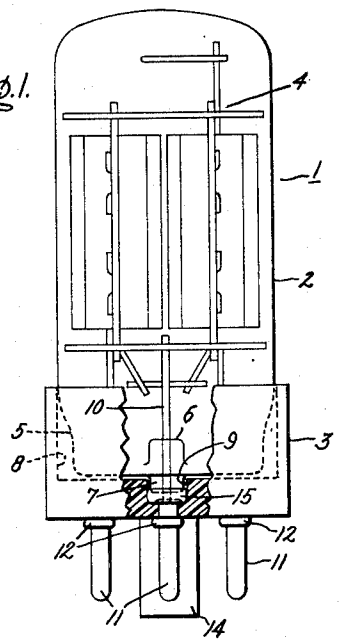


Fig. 4.

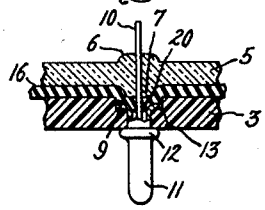


Fig. 3.

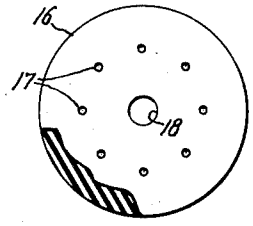
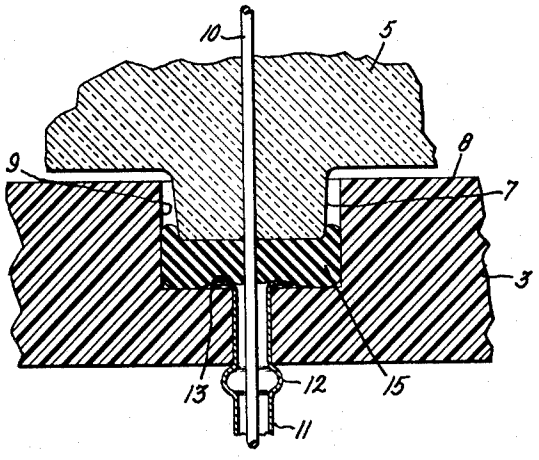


Fig. 2.



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ELECTRON DISCHARGE DEVICE BASE STRUCTURES

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Application July 27, 1953, Serial No. 370,548

3 Claims. (Cl. 339—94)

My invention relates to electron discharge devices and pertains more particularly to base structures therefor.

Air-borne radio apparatus is being carried to higher altitudes and is accordingly being exposed to greatly reduced atmospheric pressures. As a result of the reduced pressures, corona develops at relatively low voltages and seriously interferes with normal operation of the apparatus. Pressurizing of the apparatus to prevent corona development requires sealed containers which are costly and further requires complicated auxiliary equipment to maintain the pressure within the containers at desired values.

A particularly vulnerable location at which appreciable corona losses have been found is at the end of the base pins of glass and metal tubes at the points where the pins are riveted to the base. The riveting operation ordinarily leaves a rough sharp-pointed burr and arc over between the burrs of adjacent pins is greatly enhanced, particularly at the reduced pressures of high-altitude flight.

Heretofore, it has been proposed to reduce the deleterious effects of corona and arc over by forming wells and ridges in the tube base to increase the path length between adjacent leads. While such expedients have somewhat reduced danger of corona and arc over it has been found that for flight at higher altitudes, such as those achieved by modern unmanned craft, the effect cannot be sufficiently eliminated by prior known means.

It is, therefore, a principal object of my invention generally to improve the construction of base-lead assemblies of electron discharge devices.

Another object of my invention is to provide an improved electron discharge device base that incorporates means to prevent discharge between adjacent conductors even under conditions of low atmospheric pressure.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

In carrying out the objects of my invention I provide an electron discharge device comprising an envelope member including a header having a plurality of lead-in conductors sealed therethrough and an insulative base including a plurality of hollow terminal prongs extending through and secured in the base for receiving the lead-in conductors. Surrounding one or more of the lead-in conductors and compressed between the header and the base is resilient sheet insulating material for preventing discharge between the conductors.

For a better understanding of my invention reference may be had to the accompanying drawing in which

Fig. 1 is an elevational view of an electron discharge device partially broken away to illustrate one form of my invention incorporated therein;

Fig. 2 is an enlarged fragmentary sectional view illustrating in detail the form of my invention shown in Fig. 1;

Fig. 3 is a plan view of a gasket employable in a second form of my invention; and

Fig. 4 is fragmentary sectional view illustrating in detail the second form of my invention.

Referring to the drawing, I have shown in Fig. 1 an electron discharge device generally designated **1**. The device **1** comprises a generally tubular envelope member **2** and a base **3**.

The envelope member **2** is formed of any suitable material such as glass, and hermetically houses an electron discharge structure generally designated **4**. The structure **4** will not be described in detail herein since it may be any one of numerous types of structures employable in electron discharge devices such as that indicated by **1**. One end of the envelope member **2** is formed to include a header **5**. Formed on the inner and outer faces of the header **5** are registering pluralities of bosses **6** and **7**, respectively. The bosses **6** and **7** correspond in number to the number of conductors to be led into the member **2** for connection to the structure **4**. However, in order to simplify illustration only one of each of the bosses **6** and **7** have been shown.

The base member **3** is formed of any suitable rigid insulating material such as Bakelite or Micanol and includes a recess **8** for receiving the header **5** of the envelope member **2**. Further formed in the base member **3** and in the bottom of the recess **8** is a plurality of other recesses or wells **9**. The wells **9** correspond in number to and receive the bosses **7** formed on the outer face of the header **5**. As best seen in Figure 2, the diameter of the bosses **7** is less than that of the wells **9** and the bosses extend into the wells an extent less than the depth of the wells. Thus, the bosses are spaced from all of the walls of the wells, the purpose for which will be brought out hereinafter.

Provided for being electrically connected to the structure **4** in the member **2** and extending through the bosses **6** and **7** in a sealed manner is a plurality of lead-in conductors **10**. Provided for receiving and having the external portions or ends of the lead-in conductors **10** electrically connected therein is a corresponding plurality of hollow terminal prongs **11**. As seen in the drawing, the external portions of the conductors **10** are relatively longer than the prongs **11**, and thus the conductors **10** are adapted for maintaining the header **5** spaced from the bottom of the recess **8** in the base **3**. The purpose for this will also be brought out hereinafter. The terminal prongs **11** each extend through the base member **3** at the bottom of one of the wells **9** formed therein. As best seen in Fig. 2 the prongs **11** are secured to the base member through riveting. This is accomplished by forming the shanks of the prongs with shoulders **12** for engaging the exterior of the base and by upsetting the edges or marginal portions of the prongs inside the wells **9**, in the manner indicated by **13**. Thus, the marginal portions of the prongs **13** are extended outwardly for engaging the face and cooperating with the shoulders **12** to secure the prongs in the base. Also formed on the base **3** is an aligning plug **14** which is well-known in the art and facilitates insertion of the prongs in a socket.

In the arrangement described to this point the prongs **11** are electrically connected to the lead-in conductors **10** which in turn are similarly connected to the structure **4**, adapting the device for current flow into and out of the envelope member through the lead-in conductors **10**. Now, when the above-described device is subjected to greatly reduced atmospheric pressure, as when employed in air-borne equipment carried to relatively high altitudes, there is a tendency for corona to develop and arc over to result between the lead-in conductors **10** at relatively low voltages. This undesirable tendency is greatly en-

hanced by the sharp-pointed burrs formed on the marginal edges 13 of the prongs by the riveting operation.

It will be seen that in the arrangment described to this point the deleterious effects of corona and arc over will be minimized by the wells 9 which increase the path lengths between adjacent lead-in conductors. To prevent the development of corona and arc over or discharge between the leads and thereby increase the altitude range of equipment including the device 1, I have provided means for increasing the electrical resistance between adjacent leads.

The just-mentioned means for preventing discharge between the lead-in conductors comprises resilient material, such as silicone rubber, in sheet form surrounding one or more of the lead-in conductors and compressed in the space provided between the header and the base.

As seen in Figs. 1 and 2 the resilient sheet insulating material can be formed as grommets 15. In grommet form the insulating material is fitted around one or more and preferably each lead-in conductor 10 and compressed between the corresponding bosses 7 and the bottoms of the corresponding wells 9. It will be noted that compression of the grommet results in the forcing of insulating material into the space between the side-wall portions of the bosses and wells, thereby enhancing the insulative action. Thus, the rough marginal portions or rivet ends 13 of the prongs 11 and the portions of the lead-in conductors between the ends of the bosses 7 and the bottoms of the wells 9 are encased or embedded in the resilient insulating material of which the grommets 15 are formed, whereby discharge between the lead-in conductors is prevented.

The resilient sheet insulating material can also be formed as a single gasket 16 in the manner shown in Figs. 3 and 4. The gasket 16 may be punched or cut to the configuration of Fig. 3 and to include a plurality of apertures 17 corresponding to and adapted for receiving the lead-in conductors 10. The gasket 16 may also include a central aperture 18 for receiving an exhaust tube (not shown) on the header 5. In the gasket form the insulating material has one or more and preferably all of the lead-in conductors 10 extending therethrough and is compressed between the header 5 and the base 3. In this form, portions of the gasket 16, indicated by 20, are disposed and compressed between the bosses 7 and the wells 9. Thus, as in the form of Figs. 1 and 2 the rough marginal portions or rivet ends 13 of the prongs 11 and the portions of the lead-in conductors between the bosses and the bottoms of the wells are encased or embedded in the resilient insulating material of which the gasket is formed whereby discharge between the lead-in conductors is prevented. Additionally, in the form of my invention including the gasket 16 additional resistance to discharge between the lead-in conductors is afforded by the portions of the gasket surrounding the portions 20 and compressed between the bottom and top sides of the header 5 and the base 3, respectively.

While I have shown and described specific embodiments of my invention I do not desire my invention to be limited to the particular form shown and described and I intend by the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electron discharge device comprising; a generally tubular envelope member including a header at one end having a plurality of lead-in conductors sealed therethrough, a base of rigid insulating material including a plurality of hollow terminal prongs extending therethrough with the marginal portion of said prongs extending outwardly and engaging said base, said lead-in conductors having external portions extending respectively into different ones of said terminal prongs and having the ends of said external portions secured to said terminal prongs, said external portions of said conductors being relatively longer than said prongs, thereby to maintain said header completely spaced from said base, and resilient sheet insulating material surrounding one or more of said lead-in conductors and compressed between said header and said base for preventing discharge between said conductors.

2. An electron discharge device comprising; a generally tubular envelope member including a header having a plurality of bosses formed thereon, a plurality of lead-in conductors extending through and sealed in said bosses, a base of rigid insulating material including a plurality of wells receiving said bosses, said bosses being smaller in diameter than said wells and extending into said wells an extent less than the depth of said wells, whereby said bosses are positioned in said wells in spaced relation to all of the walls thereof, a plurality of hollow terminal prongs extending through said base at the bottoms of said wells with the marginal portions of said prongs extending outwardly and engaging said base, said lead-in conductors extending respectively into different ones of said terminal prongs, and a compressed gasket of resilient sheet insulating material interposed between said header and base, said gasket including portions surrounding one or more of said lead-in conductors and being compressed between the corresponding bosses and wells for preventing discharge between said conductors.

3. An electron discharge device comprising; a generally tubular envelope member including a header having a plurality of bosses formed thereon, a plurality of lead-in conductors extending through and sealed in said bosses, a base of rigid insulating material including a plurality of wells receiving said bosses, said bosses being smaller in diameter than said wells and extending into said wells an extent less than the depth of said wells, whereby said bosses are positioned in said wells in spaced relation to all of the walls thereof, a plurality of hollow terminal prongs extending through said base at the bottoms of said wells with the marginal portions of said prongs extending outwardly and engaging said base, said lead-in conductors extending respectively into different ones of said terminal prongs, and individual grommets of resilient sheet insulating material surrounding each of said lead-in conductors, said grommets being disposed and compressed between said bosses and the bottoms of said wells for preventing discharge between said conductors.

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