Nov. 2, 1948. C. V. LITTON 2,452,582

LEAD CONNECTOR FOR ELECTRONIC DISCHARGE DEVICES

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Fig. 1.

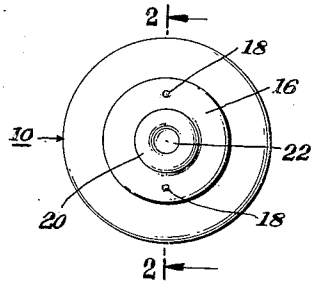


Fig. 3.

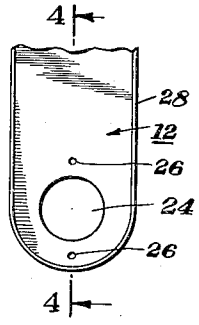


Fig. 6.

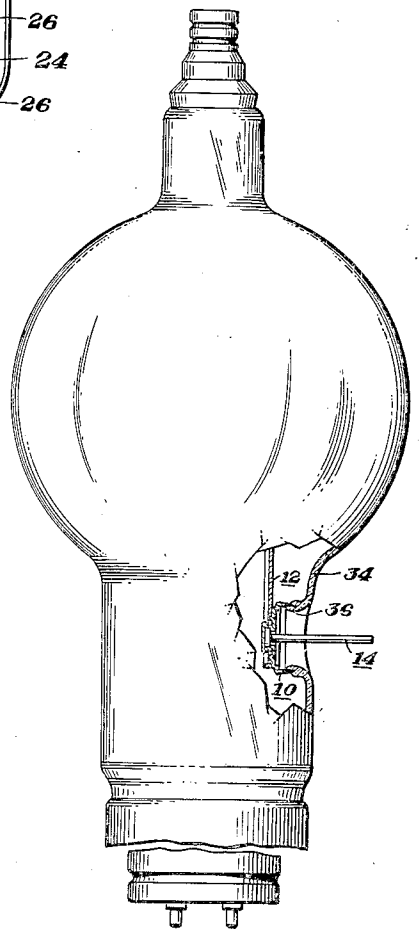


Fig. 2.

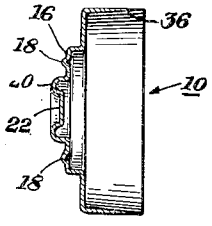


Fig. 4.

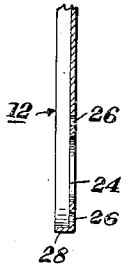
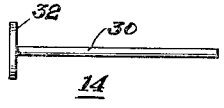


Fig. 5.



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Fig. 7.

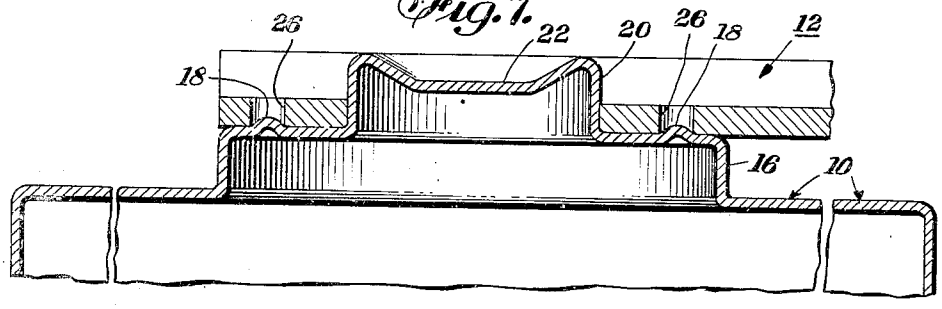


Fig. 8.

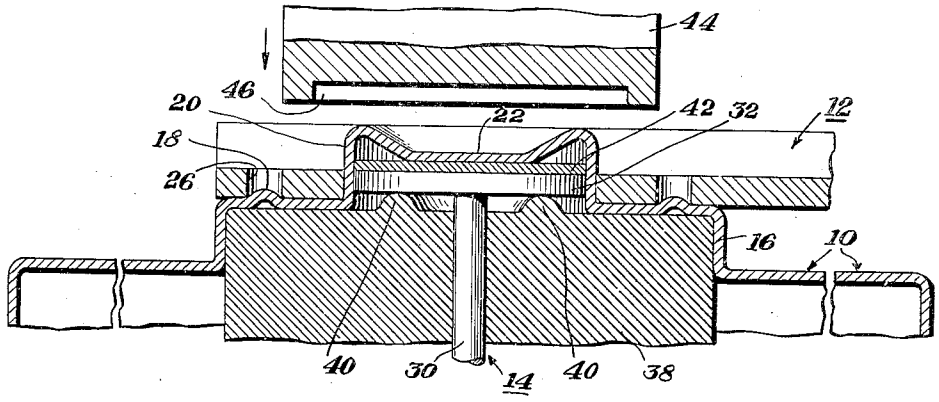
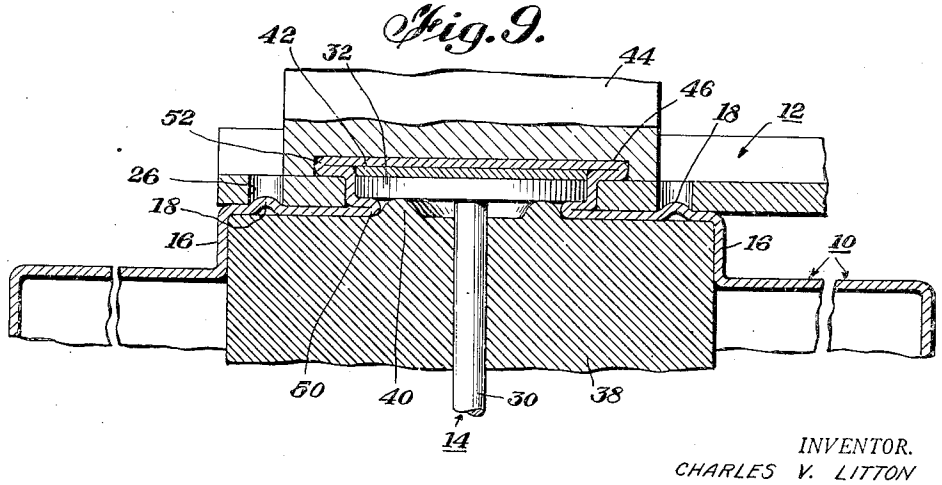


Fig. 9.



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LEAD CONNECTOR FOR ELECTRONIC DISCHARGE DEVICES

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Application December 22, 1943, Serial No. 515,268

17 Claims. (Cl. 250—27.5)

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This invention relates to improvements in lead connectors for electronic discharge devices and more particularly to a lead-in connector for use in conjunction with vacuum tubes, and the like.

An object of this invention is to provide a new, intermediate connector adapted to simultaneously mechanically join a support or other member on one side of a device, with a lead or similar member on the other side of the device, without making any opening through the wall of the device.

Another object of this invention is to provide an intermediate connector adapted to form part of or be joined to the walls of a closed device, which mechanically joins a support or other member on one side of the device to a lead or similar member on the other side of the device.

More specifically, it is an object of the present invention to form a connector which may be sealed to the walls of a vacuum tube, and which simultaneously mechanically and electrically interconnects a support within the tube to an external lead.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof, described for purposes of illustration, and shown in the accompanying drawings, in which:

Fig. 1 is a front elevation of an intermediate connecting device, formed in accordance with the present invention;

Fig. 2 is a transverse cross-sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a front elevation of one of the members to be connected;

Fig. 4 is a transverse cross-sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is a plan view of another member to be connected through the device of the present invention;

Fig. 6 is a front elevation, partially in section, illustrating the application of the instant invention as a lead-in connecting device for vacuum tubes;

Fig. 7 is an enlarged partial cross-sectional view illustrating a step in the method of forming the connection according to the present invention;

Fig. 8 is a similar cross-sectional view illustrating a succeeding step in the method; and

Fig. 9 is a similar cross-sectional view illustrating a further step in the method.

In the form of connector illustrated by way of example in the drawings, I have illustrated a specific form of such connector primarily adapted for use with vacuum tubes and like devices, where

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the problem of joining an external lead to an internal lead, and still maintain a proper air-tight seal, has long been of primary importance. The particular device according to the present invention is in the form of a generally cup-shaped member, seen most clearly in Figs, 1 and 2, which serves to interconnect an internal lead member 12 with an external lead member 14. The cup-shaped member 10 is preferably provided with a first cup-shaped extension 16 having, if desired, one or more integral protuberances 18 and a further cup-shaped extension 20 of smaller diameter having a central reentrant portion 22.

The internal lead member 12 may be in the form of a relatively wide support provided at one end with an opening 24 of substantially the same diameter as the outer diameter of the second cup-shaped member 20, and with smaller openings 26 adapted to receive protuberances 18, for aligning purposes. As illustrated, the lead member 12 may have bent-over edges 28 if additional strength is desired.

The external lead member 14, as shown in Fig. 5, may consist of a nail-like device having a shank 30 on one end of which is integrally formed or attached a head 32.

The manner in which such a device when assembled, is utilized in a vacuum tube structure, is shown best in Fig. 6. The lip of the cup-shaped member 10 may come to a knife-edge 36 for sealing with a glass envelope 34, the lead member 12 extending upwardly within the tube (or in any other desired direction), preferably for connection with and/or as a support for an electrode or similar element within the tube. The lead 14 projects radially outwardly from one side of the tube and, obviously, is suitable for connection to or with any external device.

The manner in which the elements 10, 12 and 14, forming the complete connection, are joined together is more clearly illustrated in enlarged views, Figs. 7, 8 and 9. In Fig. 7, there is shown simply the first assembly step, which may be placing of the lead member 12 on one side of the cup-shaped member 10, with the cup-shaped extension 20 of the latter projecting through the opening 24 in the former, and the protuberances 18 extending into the openings 26 for positioning purposes.

The nail-shaped lead 14 may then be mounted upon a base die 38 having an opening to receive the shank 30 and provided with a spacing ring 40 to raise the nail head 32 from the top of this base. A small amount of brazing material, in the form, for example, of a disk 42 may be placed on the

top of the nail head 32 and the cup-shaped member 16 inserted into the lead member 12 is then placed on top of the base 38 with the nail head 32 within the cup-shaped extension 20.

A movable die 44 containing a suitable forming opening 46 is then pressed against the top of the cup-shaped extension 20 squeezing the excess metal in this cup-shaped extension outwardly and downwardly over the surface of the lead member 12, squeezing the latter, in turn, against the bottom of the cup-shaped extension 16 lying on the base die 38. Since, however, the outward movement of the metal in the cup-shaped member 20 is limited by the walls of the opening 46 in the movable die 44 some of the excess metal will be pressed downwardly alongside and against the periphery of the nail head 32 with additional metal being squeezed beneath the under surface of the head 32, between it and the top of the base die 38. Thus, the nail head 32 is held between the bottom of the now compressed cup-shaped member 20 and the bead 50 which is formed on the underside of the nail head. It was for this reason that the underside of the nail head was spaced from the top of the base die 38 by the ring 40.

When the connection is removed from the die it will thus be seen that the lead member 12 is clamped between the outwardly distorted portion 52 of the cup-shaped member 20 and the bottom of the cup-shaped member 16, while the nail head 32 of the lead 30 is also joined in this combination, as a unit, being held between the bead 50 on the one side and the inner surface of the distorted cup-shaped member 20 on the other side. The connection may be later heated at suitable temperature to braze the top of the nail head 32 to the inside of the cup-shaped member 20 by fusing of the brazing material 42.

It will be seen that the device described is admirably suited for forming a connection through the glass envelope of a vacuum tube, but obviously has application to the formation of a connection through any wall or partition, where it is desired to make a through, leak-proof connection. While the use of a deformable cup-shaped portion extending through one of the devices to be connected forms an essential feature of the instant invention, the remaining portion of the intermediate connector device can have any desired form, depending upon the manner in which it is to be used. In the broader sense, the remaining portion of this intermediate member may form the walls of a dividing partition itself.

While the protruding cup-shaped portion of the intermediate member has been shown with reentrant design, this formation is not necessary, but only provides an excess of material which permits the formation of the outwardly radially extending flange and the inwardly extending lead when the device is compressed. Any structure which provides the necessary excess material which will be sufficient to form the two joints upon the application of pressure will be suitable for the purpose in mind.

Accordingly, while I have described above the principles of my invention in connection with one specific application, it is to be clearly understood that this description is made only by way of example and not as a limitation on the scope of my invention as set forth in the objects and the accompanying claims.

I claim:

1. In an electronic discharge device, an envelope, an internal lead member positioned within said envelope, said lead member having a plane surface portion provided with a generally circular opening therethrough, an external lead member having a disc-shaped portion, a metal cup whose closed bottom is provided with an extension protruding through and beyond the opening in said internal lead member and on its inner side surrounding said disc-shaped portion, a portion of said extension beyond said opening extending outwardly to overlap part of the plane surface of said internal lead member, and another portion of said extension extending inwardly to overlap part of the disc-shaped portion of said external lead member so as to attach said lead members to said metal cup, and means sealing the lip of said metal cup to an opening in said envelope.

2. The combination according to claim 1, in combination with further means rigidly connecting the inside of the closed bottom to the adjacent side of said disc-shaped portion.

3. The combination according to claim 1, in which said extension is cup-shaped and the bottom of said cup-shaped extension is formed with one or more protuberances positioned radially outwardly from said cup-shaped extension, and openings in said internal lead member receiving said protuberances.

4. In an electronic discharge device, an envelope, a metal cup sealed over an opening of said envelope, said metal cup encircled by a first lead member and surrounding a second lead member, the closed botom portion of said metal cup overlapping said first lead member, and a part of the bottom portion of said cup overlapping said second lead member to attach said first lead member to the outside of said metal cup and said second lead member to the inside of said metal cup.

5. In an electronic discharge device, an envelope, a metal cup sealed over an opening of said envelope, the outside of said metal cup being turned towards the inside of said envelope, said metal cup being encircled by an internal lead member and surrounding an external lead member, the closed bottom portion of said metal cup overlapping said internal lead member and a part of the bottom portion of said metal cup overlapping said external lead member to attach said internal lead member to the outside of said metal cup and said external member to the inside of said metal cup.

6. A device according to claim 5, in which said internal lead member comprises a flat portion having an opening fitting over said metal cup.

7. A device according to claim 5, in which said external lead member comprises a disc fitting into the inside of said metal cup and a wire attached to the center of the disc.

8. A device according to claim 5, in which said external lead member comprises a disc fitting into the inside of said metal cup and a wire attached to the center of the disc and a soldered layer arranged between said disc and the closed top of the metal cup.

9. A device according to claim 12, wherein said metal cup consists of a half-closed top cylinder extending through a perpendicular wall into an open bottom cylinder of larger diameter, and wherein said first lead member consists of a lead plate having an opening fitting over the outside of said top cylinder, and said second lead member consists of a disc-shaped plate fitting into the inside of said top cylinder, a wall portion of said

top cylinder, extending above said first lead plate, being folded together to overlap radially a portion of said first lead plate, and another wall portion of said top cylinder, extending below said first lead plate, being folded together to overlap radially said second lead plate.

10. A device according to claim 4, wherein said metal cup consists of a half-closed top cylinder extending through a perpendicular wall into an open second cylinder of larger diameter, said second cylinder extending through a perpendicular wall into a third cylinder of still larger diameter, and wherein said first lead member consists of a lead plate having an opening fitting over the outside of said top cylinder, and said second lead member consists of a disc-shaped plate fitting into the inside of said top cylinder, a portion of the wall of said top cylinder extending above said first lead plate being folded together to overlap radially a portion of said first lead plate and a portion of the wall of said top cylinder extending below said first lead plate being folded together to overlap radially said second lead plate, the lip of said third cylinder being sealed over the opening of said envelope.

11. In an electron discharge device, an envelope, a partitioning member forming part of the envelope and having a plane surface and a hollow, cup-shaped projection extending therefrom, a first conductor connected thereto having opposed plane surfaces, one lying against the plane surface of said partitioning member, and provided with an opening through which said cup-shaped projection extends, said cup-shaped projection having an outwardly radially deformed portion contacting the opposite plane surface of the conductor and holding this conductor against the plane surface of the partitioning member, a second conductor including a disc-like portion positioned with one surface lying against the inside of said cup-shaped projection, said partitioning member having a further deformed portion extending radially inwardly about the opposite surface of said disc-like portion to hold the latter against the inside of the bottom of the cup-shaped projection.

12. A connection according to claim 11, in which the plane surface of said partitioning member is formed with one or more protuberances about said cup-shaped projection, and in which the first conductor is provided with openings aligned with said protuberances.

13. A connection according to claim 11, in combination with further means rigidly joining the inside of the bottom of said cup-shaped extension with the one surface of said disc-like portion.

14. An electrical through-connection for a partition comprising a member having a substantially plane surface and a hollow cup-shaped projection extending therefrom, a first conductor lying against the plane surface of said partitioning member and having an opening through which said cup-shaped projection extends, a radially deformed portion on said cup-shaped projection overlapping and holding said conductor against the plane surface of the partitioning member, a second conductor having a disk-like portion within said cup-shaped projection and a radially deformed portion on said cup-shaped member overlapping and holding said disk-like portion against the inside of the cup-shaped portion.

15. An electrical through-connection for a partition comprising a pair of conductors having edges in concentric relation, and a supporting and connecting element adapted to form part of the partition folded over the edge of one conductor and folded beneath the edge of the other whereby to support them in assembled conducting relation.

16. An electrical through-connection for a partition comprising a pair of conductors having edges in concentric relation, and a supporting and connecting element adapted to form part of the partition having a flange over the edge of one conductor and having a flange beneath the edge of the other whereby to support them in assembled conducting relation.

17. An electrical through-connection for a partition comprising a pair of conductors having edges in concentric relation, and a supporting and connecting element adapted to form part of the partition having a flange over the edge of one conductor and having an oppositely directed flange beneath the edge of the other whereby to support them in assembled relation.

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