Aug. 3, 1943. W. W. WATROUS, JR 2,325,817

CONTACT MEMBER AND ELECTRICAL DEVICE

Filed Dec. 10, 1941

Fig. 1.

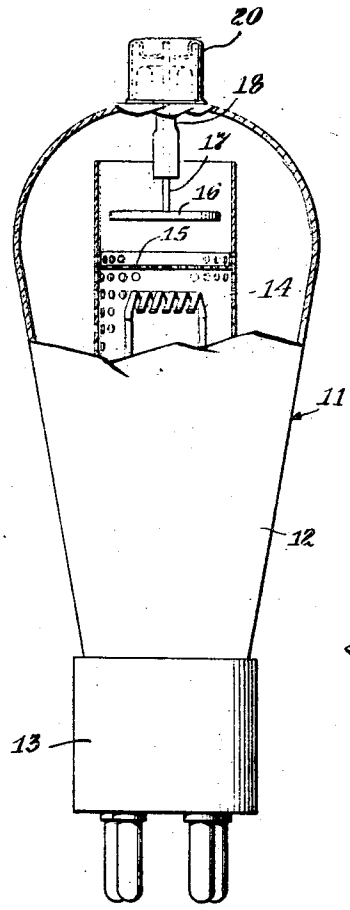


Fig. 2.

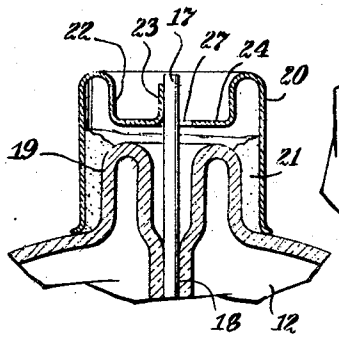


Fig. 3.

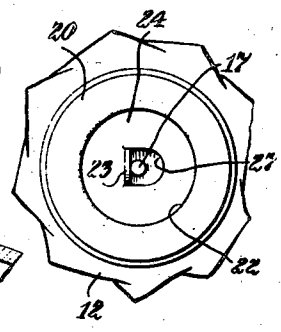


Fig. 4.

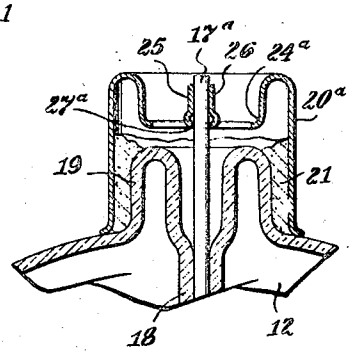


Fig. 5.

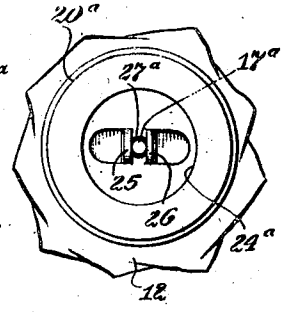


Fig. 6.

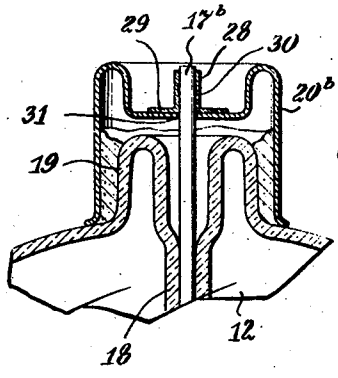
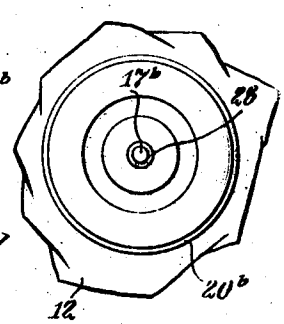


Fig. 7.



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UNITED STATES PATENT OFFICE

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CONTACT MEMBER AND ELECTRICAL DEVICE

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Application December 10, 1941, Serial No. 422,312

11 Claims. (Cl. 250—27.5)

This invention relates to electronic tubes and other electrical devices, such as rectifiers and amplifiers, and especially to the metal contact cap or base customarily cemented to the envelope or bulb of the device, and more particularly to the formation of a good electrical connection between such a contact cap and a lead wire.

The conventional method of forming such a connection is to solder the lead wire to the metal cap, but in actual practice this method is subject to certain disadvantages and inconveniences which include, in the first place, an inherent difficulty in making a good soldered connection, due to oxidation of the lead wires, such oxidation being usually unavoidable owing to the exhaust process to which the device is subjected.

In the second place, a gradual corrosion of the lead conductors occurs from the action of the residue of the flux used to remove the oxide on the lead wires in order to secure a good soldered connection. This may result in the development at the corroded region of:

(1) Excessive heat during operation of the device, which causes the cap to loosen by destroying the bond between the tube and the attaching cement, and

(2) An actual parting of the lead wire, which opens the circuit to one or more of the tube elements.

Another disadvantage of a soldered union is that if the cap be mounted upon the upper end of the device, the heat developed in the use of the latter rises and may destroy the union by melting the solder.

Under such conditions, it is a primary object of the invention to provide a method of making a good electrical connection between the lead wire and cap which will avoid the use of solder and corrosive material, thereby eliminating the disadvantages above enumerated, and which at the same time preserves the advantages of a permanent metallic union and good electrical connection of the lead wires to the cap.

A further object is to provide for welding the lead wire to a suitable metallic part of the cap structure, such part being either an originally integral portion of the cap, or else a metal part of suitable contour and disposition integrated with the cap, preferably by welding.

A still another object of the invention is to so construct the cap that the exterior terminal of the lead wire will be protected by a surrounding portion from casual mechanical contacts tending to deform it, but readily accessible for completing the intended electrical connection.

Other objects and advantages of the invention will become apparent as description proceeds.

In the drawing,

Fig. 1 is an elevational view of an electronic tube in which the invention has been embodied, part of the glass bulb or envelope being broken away to reveal inner structural details;

Fig. 2 is an axial sectional view on an enlarged scale, of the contact cap and adjacent part of the tube shown in Fig. 1;

Fig. 3 is a plan view of the cap of Figs. 1 and 2;

Fig. 4 is a view similar to Fig. 2 of a modified cap embodying the invention;

Fig. 5 is a plan view of the cap shown in Fig. 4;

Fig. 6 is a view similar to Figs. 2 and 4, showing another modification of the cap; and

Fig. 7 is a plan view of the cap shown in Fig. 6.

Referring now to the drawing in detail, there is illustrated in Figs. 1, 2 and 3 a Westinghouse grid glow tube 11 of the type designated KU 636. It comprises a bulb 12 and a conventional base 13 for the cathode 14 and grid 15. The anode 16 has a supporting or relatively heavy or rigid lead 17 sealed through the glass, as indicated at 18, on a re-entrant portion of the bulb depending from a top hollow boss 19. A contact cap 20 is placed over said boss 19 and secured thereto by cement 21, and the cap is formed with a re-entrant cup-shaped portion 22 defining a recess in which is disposed the lead 17, in a central protected position as shown, with its exterior terminal standing somewhat below the plane of the surrounding rim of the cap, readily accessible for such electrical connections as it may be desired to make therewith, but guarded against undesired physical contacts likely to deform it.

In pursuance of the invention, provision is made for perfecting a sturdy mechanical connection, and a good electrical connection, by welding the lead 17 directly to a suitable metal part of the cap, and this may be carried out in various ways, of which a desirable construction is shown in Figs. 1, 2 and 3; another in Figs. 4 and 5; and still another in Figs. 6 and 7; these forms having the common purpose of making it possible to accomplish conveniently and positively a welding operation, preferably in a suitable electrical welding machine, that will provide a rigid centrally disposed metallic union between the lead 17 and cap 20, with all the advantages of a permanent and good electrical connection which accompany such a metallic union.

Referring now more particularly to Figs. 2 and 3, it will be seen that the structure therein illustrated provides a metallic flange or tab **23** formed desirably by striking up the sheet metal inwardly embossed bottom portion **24** of the cap or cup-shaped contact device or base **20**. Through the opening **27** so made, the lead wire **17** passes to position to be conveniently, accurately and rapidly spot-welded, brazed, or otherwise suitably united metallically to the upstanding tab **23**, it being understood that the operation selected shall be performed without the use of metal of low melting point, such as solder, and soldering fluid or other corrosive material.

In the structure illustrated in Figs. 4 and 5, two such tabs are shown at **25** and **26**, having been struck up in position facing each other, being thus adapted to embrace and be united metallically to the lead wire **17ª** which is first passed through a centrally disposed aperture **27ª** in the bottom of the cup-shaped re-entrant portion **24ª** of the base cap **20ª**.

It is to be understood that in describing the tab **23** of the Figs. 1, 2 and 3 structure, and the tabs **25** and **26** of the Figs. 3 and 4 structure as of integral, struck-up formation, it is not intended to exclude the provision of separately formed uprights or tabs, which will themselves be united metallically to the base cap as well as to the lead wire.

As an example of one such separately formed upright metal part, I have illustrated in Figs. 6 and 7 an eyelet or hollow boss **28**, welded to the bottom of the base cap **20ᵇ** as at **29**, the central bore **30** of this boss being in registry with a central aperture **31** in the bottom of the base cap, through which aperture and bore the lead wire **17ᵇ** is thrust, preparatory to being welded, substantially in the manner hereinbefore described in connection with the structures shown in Figs. 1 to 5 inclusive.

From the foregoing disclosure, it will be readily apparent to those skilled in the art, that by the provision of a permanent metallic union between the lead wire **17**, **17ª** or **17ᵇ** and the base or cap **20**, **20ª** or **20ᵇ**, respectively, by welding the lead wire in each instance directly to an integral or welded metal part of the base cap, as to the tab **23** of the structure of Figs. 1, 2 and 3, the tabs **25** and **26** of the structure of Figs. 4 and 5; or the eyelet or hollow boss **28**, itself integrated metallically with the base cap, as in Figs. 6 and 7, I have accomplished the various objects of the instant invention, as set forth in the opening paragraphs, and provided a permanently good mechanical and electrical connection between the base or cap and lead wire, free from such latent sources of deterioration as corrosive fluid which is used in making soldered connections. Such soldering fluid results in deterioration of the connection, unless all is removed.

I have obviated in particular the disadvantage encountered heretofore when the cap is disposed at the top of a tube, where solder or other readily fusible material is apt to be melted, destroying the connection. I have also effected a labor saving over the use of a soldered joint as spot welding may be performed in considerably less time, possibly about 50%, as compared with making a soldered joint.

Although preferred embodiments of my invention have been disclosed, it will be understood that other modifications may be made within the spirit and scope of the appended claims.

I claim:

1. A contact member for the vitreous envelope of an electrical device comprising a metal cap for connection to said envelope around the exterior portion of a lead wire therefrom, the central portion of said cap being offset inwardly from the peripheral portion, providing a re-entrant cup-shaped portion, the base of said re-entrant portion having a part extending therefrom, terminating short of the plane of the outer surface of said peripheral portion, for welding to said lead beyond said aperture, thereby making it possible to avoid the use of readily fusible and corrosive materials which might result in deterioration of the connection.

2. A contact member for the vitreous envelope of an electrical device comprising a metal cap for connection to said envelope around the exterior portion of a lead wire therefrom, the central portion of said cap being offset inwardly from the peripheral portion, providing a re-entrant cup-shaped portion, the base of said re-entrant portion having a tab struck therefrom, terminating short of the plane of the outer surface of said peripheral portion, for welding to said lead beyond said aperture, thereby making it possible to avoid the use of readily fusible and corrosive materials which might result in deterioration of the connection.

3. A contact member for an electrical device which has a vitreous envelope, comprising a generally cup-shaped metallic member adapted to fit said envelope and having an outstanding part adjacent an aperture to receive an electrode supporting lead wire therefrom to be integrated metallicly with said part by a relatively high melting point joint free from solder and corrosive fluxes.

4. A contact member for an electrical device having a vitreous envelope, comprising a metal cap adapted to be cemented to said envelope around the exterior portion of a lead wire, the central portion of said cap being offset inwardly from the peripheral portion, providing a re-entrant cup-shaped portion, a pair of tabs struck from said central portion, and an aperture between said tabs in position to receive said lead, whereby said tabs may be welded to opposite sides of said lead.

5. A contact member for an electrical device having a vitreous envelope, comprising a generally cup-shaped metallic portion, with an inwardly offset bottom which is provided with an upright boss welded thereto, shorter than the offset distance, and having a central bore in communication with an aperture in said bottom, said boss being provided to receive a lead wire and afford a convenient metal part to which it may be welded.

6. An electrical device comprising a vitreous envelope, electrodes enclosed therein, a lead wire extending from one of said electrodes through a seal in said envelope, a contact member cemented to said envelope around the exterior portion of said lead, said contact member comprising a metal cap having a base with an inwardly offset portion, an outstanding projection on said offset portion and an adjacent aperture receiving said lead wire, said lead wire being welded to said projection beyond said aperture, thereby avoiding the use of readily fusible and corrosive materials which might result in deterioration of the connection.

7. An electrical device comprising a vitreous envelope, electrodes enclosed therein, an electrode

supporting lead wire extending from one of said electrodes through a seal in said envelope, a contact member cemented to said envelope around the exterior portion of said lead, said contact member comprising a metal cap having a tab struck out from an inwardly offset base portion thereof and providing an aperture receiving said lead wire, said lead wire being welded to said tab beyond said aperture, thereby avoiding the use of readily fusible and corrosive materials which might result in deterioration of the connection.

8. An electronic device comprising a vitreous envelope, electrodes enclosed therein and including a cathode, an anode comprising a plate, a relatively heavy lead wire extending therefrom, a grid, and a conventional lower base for said cathode and grid, said lead wire extending through a seal in the upper portion of said envelope, whereby when in operation a relatively large amount of heat is transmitted through said seal to the outer end of said lead wire, and a contact member for said lead wire comprising a metal cap cemented to said envelope around the exterior portion of said wire, the base of said cap being inwardly offset and having an aperture receiving said lead wire and providing a metal part outstanding from said offset base and adjacent said lead wire, said lead wire being welded to said part beyond said aperture, thereby avoiding the use of readily fusible and corrosive materials which might result in deterioration of the connection.

9. A metal cap adapted to function as a contact member for connection with a projection on the vitreous envelope of an electrical device around the exterior section of a lead wire therefrom, said cap having generally cylindrical and outer end portions, the central part of said outer end portion being offset inwardly from the outer periphery of the cap, providing a reentrant or outwardly opening cup-shaped portion, the base of said reentrant portion having an aperture one side of which is defined by a flange struck therefrom to provide said aperture, said flange allowing for welding said lead thereto beyond said aperture to avoid the use of readily fusible and corrosive materials which might result in subsequent deterioration of the connection.

10. An electrical device comprising a vitreous envelope, electrodes disposed therein, a lead wire extending from one of said electrodes through a seal in said envelope, said wire being surrounded by an outstanding projection on said envelope, and a contact member cemented to said projection, said contact member comprising a hollow cylindrical metal portion open at one end to receive said projection and the other end terminating in a wall, the central portion of which is offset inwardly from the periphery to provide an outwardly opening cup-shaped portion, a portion of the base of said cup-shaped portion being struck out to provide an aperture and adjacent flange, said lead wire being welded to said flange between the base of said cup-shaped portion and the un-offset portion of said wall, thereby avoiding the projection of any portion beyond the outline of said contact member and the use of readily fusible and corrosive materials which might result in deterioration of the connection.

11. A contact member for an electrical device having a vitreous envelope, comprising a generally cup-shaped metallic portion adapted to telescope with a portion of said envelope, the central portion of the bottom of said metallic portion being offset inwardly, apertured to receive a lead wire, and provided with an upright metallic extension shorter than the offset distance and to which said wire may be welded.

WARD W. WATROUS, JR.