

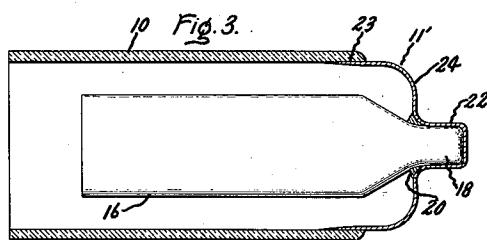
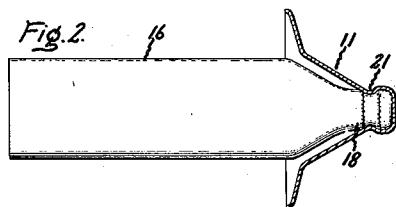
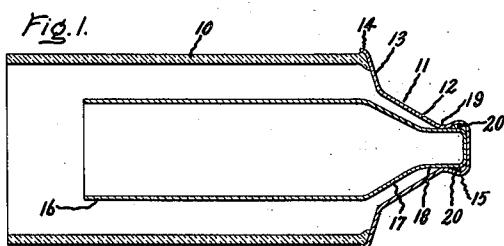
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ELECTRODE AND TERMINAL STRUCTURE FOR ELECTRIC DISCHARGE DEVICES

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ELECTRODE AND TERMINAL STRUCTURE
FOR ELECTRIC DISCHARGE DEVICESJohn O. Aicher, Cleveland Heights, Ohio, assignor
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2 Claims. (Cl. 176—126)

My invention relates to gaseous electric discharge lamp devices generally, and more particularly to electrode structures therefor. Still more particularly, my invention relates to improvements in the terminal structure of devices employing the so-called "cold" electrodes as exemplified by those employed in the well-known "neon" sign tubes.

In accordance with present practice, the tubular sheet metal electrode is connected to one or more lead-in wires which extend through a glass stem or a pinch seal at the end of the glass discharge tube or envelope. With such a construction, the electrode, lead-in wires and stem or pinch seal constitute an assembly which extends a considerable distance into the discharge tube and therefore requires a comparatively deep housing or receptacle. Moreover, the electrode usually requires some auxiliary support in addition to that furnished by the lead-in wires so as to hold it firmly in place spaced from the walls of the tube. Another disadvantage of such a construction is the presence of the external lead-in wires which are likely to break.

One of the objects of my invention is to provide a novel terminal structure which is of simple design and in which the electrode shell is rigidly supported at its end without the need of auxiliary supporting means. Another object is to provide a terminal structure which is of shorter length for a given electrode length or in which, for the same overall length, more electrode area is available to provide better performance or a higher current rating. Still another object is to eliminate the external lead-in wires, and even the internal lead-in wires, as well as the usual base cemented to the end of the tube. Further features and objects of my invention will appear from the following description of species thereof and from the drawing.

In the drawing, Fig. 1 is a longitudinal sectional view, on an enlarged scale, of a terminal electrode assembly comprising my invention, and Figs. 2 and 3 are longitudinal views, partly in section, of modifications.

Referring to the drawing, 10 is a glass tube which constitutes one end of the discharge tube of the finished lamp. The end of the tube 10 is closed by a metal cap 11 having, in this case, a frusto-conical portion 12 terminating at its larger forward end in a flare or flange portion 13 which has a forwardly turned lip 14 at its edge and is fused at its rim, by a butt seal, directly to the end of the glass tube 10. The cap 11 has a rearwardly extending upset and enlarged end

portion 15 over which a clip, similar to a battery clip, may be snapped to supply current to the lamp. The said cap 11 is preferably made of a metal or alloy having a coefficient of expansion similar to that of the glass tube 10, a chrome-iron alloy such as that known as "Allegheny 55" being preferred.

The tubular electrode shell 16 (of iron, for example) is tapered at 17 down from a point substantially opposite the seal at 14 to a reduced cylindrical end portion 18 which is shown as closed at its end, although it may be open. The said end portion 18 of the electrode fits snugly within the reduced end portion or cavity at 19 of the cap 11 so as to support the electrode and space it uniformly from the walls of the tube 10. The electrode 16 and cap 11 may be securely united by a quantity of brazing metal 20, preferably a nickel-manganese alloy such as that disclosed in application Serial No. 201,788, Eugene Lemmers, filed April 13, 1938, and assigned to the assignee of the present invention. The electrode 16 may be coated on its interior with an electron emissive material such as barium oxide.

25 It will be noted that the joint or union between the electrode and cap at 19 is located a substantial distance from the seal at 14 between the cap and the glass tube 10, due to the presence of the conical portion 12. This is an important feature 30 since, during exhausting of the lamp, the heat of the discharge striking the electrode 16 is conducted to the end of the cap 11 and heats it up very rapidly so that the said end portion of the cap tends to expand more rapidly than the peripheral portion 14. However, the intermediate 35 conical portion 12 of the cap absorbs much of the difference in expansion and thereby protects the glass seal at 14 from injury. Moreover, due to the presence of the said intermediate conical portion 12, the seal at 14 is brought closer to the electrode so that it receives considerable heat therefrom and tends to expand more uniformly with the end of the cap.

The modification shown in Fig. 2 is like that 45 shown in Fig. 1 except for the method of uniting the electrode and cap. In Fig. 2, the end portions of the cap and electrode are crimped, as shown at 21, to form annular grooves which lock the electrode in position.

50 In Fig. 3 is illustrated a modified cap 11' having a reduced cavity or end portion 22 separated from the sealing edge 23 by a rounded intermediate portion 24. The sealing edge 23 in this modification is shown as a tapered or feathered edge 55 fused to the side walls of the glass tube 10 as dis-

tinguished from the butt seal form of joint illustrated in Fig. 1. The reduced projecting end portion 18 of the electrode fits snugly within the cavity 22 so as to centrally locate the electrode 16 in the tube 10. The electrode and cap may be firmly united by brazing, as shown at 20, or by crimping the parts.

It will be understood, of course, that the drawing illustrates the electrode assembly for one end of the lamp and that the other end of the tube may carry a similar assembly, the tube being filled with an inert gas, such as neon or argon for example, at a pressure of about 1-10 mm. Hg or with a mixture of a rare gas or gases and a vaporizable metal such as mercury.

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

1. In a gaseous electric discharge device, a substantially cylindrical glass envelope, an electrode located in one end of said envelope and comprising a substantially cylindrical shell of sheet metal which is spaced a comparatively small distance from the inner wall of said envelope, said shell tapering down from a point substantially opposite the end of said envelope to a reduced end portion located a substantial distance beyond the end of said envelope, and a comparatively deep cup-shaped sheet metal cap member fused

5 at its periphery directly to the end of said envelope, said shell being secured to the bottom of said cap member and being rigidly supported directly therefrom and maintained in spaced relation from the inner wall of said envelope, the portion of the cap intermediate its periphery and its cavity being tapered down to conform to and closely surround the tapered portion of said shell.

10 2. In a gaseous electric discharge device, a substantially cylindrical glass envelope, an electrode located in one end of said envelope and comprising a substantially cylindrical shell of sheet metal which is spaced a comparatively small distance from the inner wall of said envelope, said shell tapering down from a point substantially opposite the end of said envelope to a reduced end portion located a substantial distance beyond the end of said envelope, and a comparatively deep cup-shaped sheet metal cap member fused at its periphery directly to the end of said envelope and having a cavity at its bottom fitting closely around the end of said shell to rigidly support said shell and maintain it in spaced relation from the inner wall of said envelope, the portion of the 15 cap intermediate its periphery and its cavity being tapered down to conform to and closely surround the tapered portion of said shell.

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