June 8, 1937. G. M. ROSE, JR 2,082,848

STEM FOR ELECTRON DISCHARGE DEVICES

Filed Nov. 9, 1934

Fig. 1

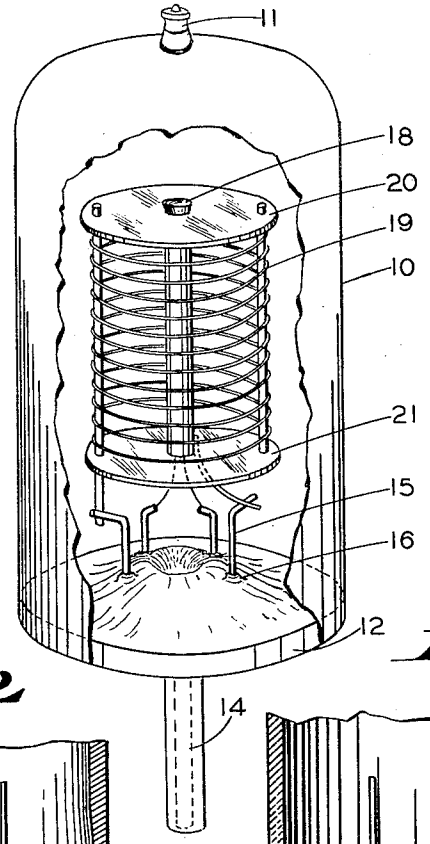


Fig. 2

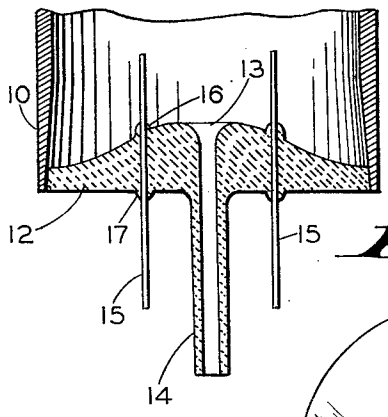


Fig. 3

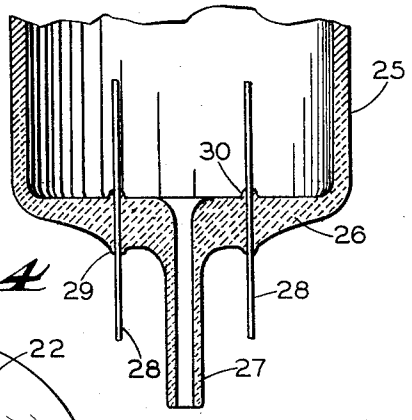
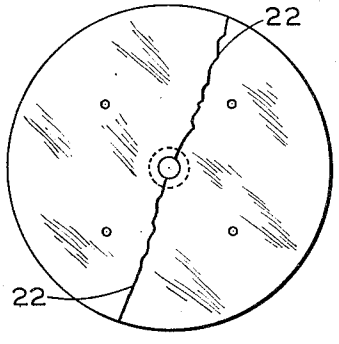


Fig. 4



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2,082,848

STEM FOR ELECTRON DISCHARGE DEVICES

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Application November 9, 1934, Serial No. 752,237

5 Claims. (Cl. 250—27.5)

My invention relates to electrical devices comprising sealed containers such as electron discharge devices and similar articles, and more particularly to a stem for such devices.

It is desirable in certain types of electron discharge tubes, particularly those of small dimensions, to use a glass stem having a flat disc press. In one form of such a stem, the flat disc press is molded from plastic glass and provided with a central opening communicating with an exhaust tube perpendicular to and hermetically sealed to the press. Leading-in wires are embedded in the press around the exhaust tube and the edge of the press is hermetically sealed to the tube envelope, the electrode assembly being supported inside the envelope on the leading-in wires extending thru the press.

In a stem using this type of press its is desirable that the press be relatively thick and of considerable mass to provide rigidity and strength and to permit easy molding. However, the sealing of such a press to an envelope of either glass or metal is difficult. A press thin enough to facilitate sealing may be so weak that cracks may develop across the press and ruin the finished tube where a metal envelope is used.

It is, therefore, an object of my invention to provide an improved glass stem of the type described, having a flat press which is strong and rigid and which at the same time can be hermetically sealed to a glass or metal envelope with ease.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims, but the invention itself will best be understood by reference to the following description taken in connection with the accompanying drawing in which Figure 1 is a perspective view with parts broken away of an electron discharge device having a metal envelope and a stem made in accordance with my invention; Figure 2 is a vertical cross section of the stem shown in Figure 1; Figure 3 is a side view partially in section of an electron discharge device having a glass envelope and a modified form of stem made in accordance with my invention; Figure 4 is a plan view of a stem having a flat disc press and illustrating the type of crack which sometimes develops across the press when the stem is used with a metal envelope.

In Figures 1 and 2, the metal envelope **10** which may serve as an electrostatic or electromagnetic shield or as the anode of an electron discharge device may be provided at its upper end with a terminal **11** and has a stem which is made in accordance with my invention. This stem has a flat disc-like press **12** with a central exhaust opening or hole **13** communicating with the perpendicular exhaust tube **14** hermetically sealed to the press **12** and sealed off after exhaust. Leading-in wires **15**, each have a portion embedded in the press **12** and pips **16** and **17** may be formed around the leading-in wires on either side of the press to increase the length of the seal between the glass and the leading-in wires and to compensate for any weakness in the press which might be introduced by the leading-in wires extending thru the press. The leading-in wires may be such as are commonly used for radio tubes or lamps, or may be of chrome-iron alloy proportioned to have a coefficient of thermal expansion so that the wires make a hermetical seal with the stem glass. An electrode assembly comprising a unipotential cathode **18** and grid **19** mounted between insulating spacers **20** and **21**, preferably of mica, is supported on leading-in wires **15**.

In order to facilitate sealing-in it has been usual to provide the stem with a thin flat press, which because of its small mass is rather difficult to mold without introducing strains. When such thin flat presses are used with metal envelopes such as iron or copper diametrical cracks, such as shown in Figure 4 at **22**, sometimes developed in the press. While I do not wish to be limited to any particular theory, I believe that these cracks were due to stresses set up across the press when the metal envelope shrunk on cooling.

In accordance with one preferred embodiment of my invention the press **12** is comparatively thin at the edge and gradually increases in thickness from the edge of the press to the exhaust tube **14** and opening **13** as best shown in Figure 2. This lenticular shaped construction of the press facilitates sealing, provides sufficient mass for proper molding and also provides the desired strength and rigidity in the finished press. I have found that a metal envelope having an edge, such as illustrated in Figure 2, approximately .002" thick at the lower surface of the press and .004" thick at the upper surface of the press can be sealed to a stem made in accordance with my invention and having a diameter of about .700", a thickness at the edge of about .075" and a maximum thickness of about .150", and that not only can a successful seal be made, but cracking of the press is entirely eliminated.

In Figure 3 is shown a modified form of a press used in an electron discharge device having a glass envelope **25**, the stem being provided with

a disc press 26 of the form shown and provided with an exhaust tube 27 communicating with the exhaust opening in the press. This press at its edge is of approximately the same thickness as the glass envelope and increases in thickness toward the exhaust tube. The lead wires 28 have intermediate portions embedded in the press and have formed on opposite sides of the press the pips 29 and 30 to increase the length of the seal and to strengthen the press at the points where the lead wires extend thru the press.

In one form of my invention the press is approximately .025" thick at the edge and about .088" thick at the thickest portion in which the lead wires are embedded. This construction provides a press which not only has a mass sufficient to retain heat for properly molding the press, but also facilitates sealing of the envelope and press.

While I have indicated the preferred embodiments of my invention of which I am now aware and have also indicated only one specific application for which my invention may be employed, it will be apparent that my invention is by no means limited to the exact forms illustrated or the use indicated, but that many variations may be made in the particular structure used and the purpose for which it is employed without departing from the scope of my invention as set forth in the appended claims.

What I claim as new is—

1. An electron discharge device having a metal envelope and a vitreous stem having a disc-like press provided with a central opening, an exhaust tube projecting perpendicularly from said press and communicating with said central opening, leading-in wires spaced in a circle around the central opening and hermetically sealed into said press with pips formed on opposite sides of said press around said wires, said press having a comparatively thin edge and increasing in thickness from the edge to the exhaust tube, the thin edge of the press being hermetically sealed to said metal envelope.

2. An electron discharge device having a metal envelope and a vitreous stem including a disc-like press hermetically sealed at its edge to the metal envelope and having a central exhaust opening, an exhaust tube sealed to said press perpendicularly to the press and communicating with said central exhaust opening, leading-in wires hermetically sealed into said press and spaced around said opening, said press having a thin edge and a thicker central portion in which said lead wires and said exhaust tube are sealed, the press increasing in thickness gradually from the thin edge to said thicker central portion.

3. An electron discharge device having a metal envelope and a vitreous stem including a disc-like press hermetically sealed at its edge to the metal envelope and having a central exhaust opening, an exhaust tube sealed to said press perpendicularly to the press and communicating with said central exhaust opening, leading-in wires hermetically sealed into said press and spaced around said opening, said press being lenticular shaped to provide a thin edge to which the envelope is sealed and a thicker central portion in which said lead wires and said exhaust tube are sealed.

4. An electron discharge device having a metal envelope provided with an opening, the envelope being tapered to a thin edge around the opening, and a vitreous stem closing said opening, said stem having a disc-like press hermetically sealed at its edge to the thin edge of the metal envelope and having a central exhaust opening, an exhaust tube sealed to said press perpendicularly and communicating with said central exhaust opening, leading-in wires hermetically sealed into said press and spaced around said opening, said press being thickest adjacent the exhaust tube and decreasing in thickness toward the edge sealed to the metal envelope.

5. An electron discharge device having a metal envelope provided with an opening, the envelope being tapered to a thin edge around the opening, and a vitreous stem closing said opening, said stem having a disc-like press hermetically sealed at its edge to the thin edge of the metal envelope and provided with a central exhaust opening, an exhaust tube sealed to said press to communicate with said exhaust opening, leading-in wires hermetically sealed into said press and spaced around said exhaust tube, electrodes mounted within said envelope and connected to the leading-in wires, said disc-like press having a thin edge and gradually increasing in thickness from said edge to said exhaust tube.

GEORGE M. ROSE, JR.