Feb. 21, 1950 G. N. PHELPS 2,498,378

BASE MEMBER FOR ELECTRON DISCHARGE TUBES

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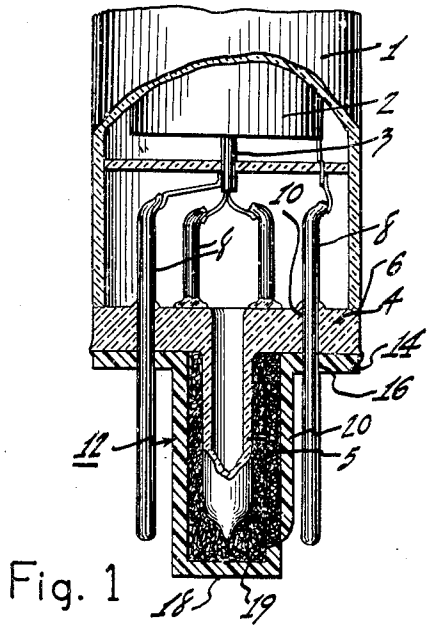



Fig. 1

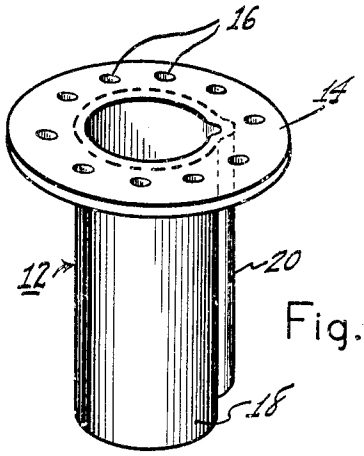



Fig. 2

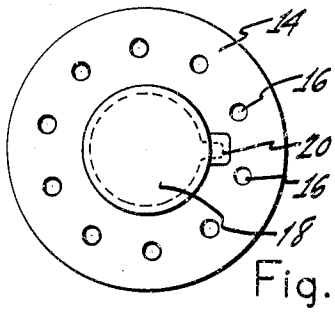



Fig. 3

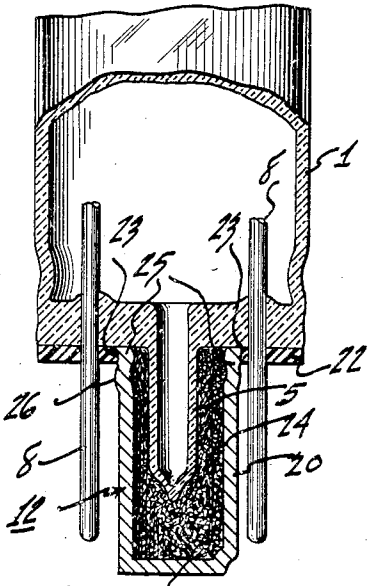



Fig. 4

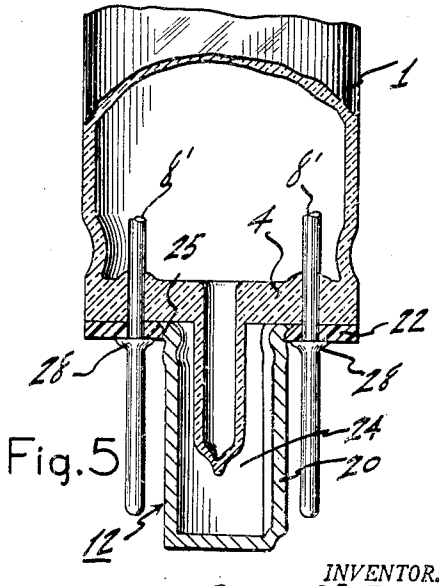



Fig. 5

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## BASE MEMBER FOR ELECTRON DISCHARGE TUBES

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3 Claims. (Cl. 250—27.5)

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This invention relates generally to vacuum tubes and more particularly to electron discharge tubes wherein the electrical leads from the electrodes are sealed in the stem and also extend through the stem to serve as external base contact pins.

In electron discharge tubes of this type, where the lead pins also serve as base contact pins, it has been found that there is frequent failure in the glass-to-metal seal of the tube stem caused by excessive or continuous strain being put upon the base pins during operation. In this type of electron discharge tube, the breakage of this glass-to-metal seal between metal lead pins and the glass stem of the tube is usually due to a lateral bending of the base pins. This bending causes the oxide layer of the pin to pull away from the glass or the metal to pull away from the oxide layer. This lateral bending can be caused by several factors such as continuous socket strain or bending by bumping or sharp blows. Other causes of seal breakage can be due to misalignment of the tube socket. Furthermore, some types of tubes wherein the stem leads form external base pins, also have a large and heavy envelope, such as a cathode ray tube, for example. In such cases, the weight of the tube may be supported by the tube socket directly and hence put considerable strain on the glass-to-metal seal in the tube stem.

Using heavier and shorter leads on such tubes does not solve the problem. A more rigid pin would not have the required flexibility and thus would increase the danger of seal breakage. Furthermore, it is also desirable in most tubes of the miniature or cathode ray type to keep the stem or neck of the tube as small as possible. Large and heavy leads in tubes of these types would necessitate a crowding of the base pins and cut down desirable insulation between the leads. Also, it is expedient to keep down the cost of manufacture of these tubes by using pin sizes which conform to the apertures in standardized sockets.

It is an object of my invention, therefore, to provide an improved vacuum tube which overcomes the disadvantages of the prior art. In particular, the object of my invention is providing means to protect the glass-to metal seal around the stem leads so that should the lead pins outside of the tube be bent and straightened such treatment would not endanger the seal. An additional object of this invention is to provide a protective cap for the exhaust tube after it has been tipped off. A further object of the invention is providing an electrostatic shield for the base leads of the tube.

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Accordingly, my invention involves a vacuum tube having a glass stem through which are sealed a plurality of lead pins in a circle concentric with the center of the stem. The lead pins are of a type sufficiently rigid to serve as external contact or base pins. Due to several conditions as outlined above, for example, the glass-to-metal seal in the stem between the load pins and the glass stem is frequently broken. I have minimized this danger of seal breakage, by utilizing a ring-shaped plate of a plastic or similar insulating material. Apertures are drilled or punched through the plate of a diameter of the size of the wire being used as the base pins of the tube. When the plate is fitted over the pins and fixed tightly against the base of the tube, the glass-to-metal seal of the pins is protected against breakage. This is due to the fact that the bending of each base pin will take place at the bottom surface of the plate and thus remove the strain of bending from the glass-to-metal pin seal. A cup-like portion formed at the center of the plate may serve an an exhaust tube tip cover. This cup-like portion can be filled with a basing cement and the plate and cup member together can be fitted in an abutment against the bottom of the tube stem with the pins of the tube projecting through the apertures of the plate. Heat is then applied to bake out the cement and hold the base on the tube. The cup-like portion may also be made of a drawn metal part crimped or staked into the plastic plate. Thus, the cup-like portion can provide, if desired, an electrostatic shield for the pins. If there is no exhaust tube present, or if it is deemed unnecessary to cover it, a ring-shaped plate can be readily held in place mechanically by a slight crimping or straining action on the pins just below the plate. A lug may also be added to the cup-like portion to index the tube within its socket.

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 detailed elevational view partly in vertical section of a tube and base assembly according to the invention;

Figure 2 is an elevational view in perspective of the tube base according to the invention;

Figure 3 is a bottom plan view of the tube base according to the invention;

Figure 4 is a detailed elevational view partly in vertical section of a tube and base assembly according to a modification of the invention; and

Figure 5 is a detailed elevational view partly in vertical section of a tube and base assembly according to the further modification of the invention.

Referring to Figure 1 there is partly shown an electron discharge tube comprising a glass envelope 1 enclosing an anode plate 2 and a cathode electrode 3. Enclosing the lower part of the envelope 1 is a glass stem or header portion 4 sealed at 6 to the envelope. Lead pins 8 are sealed within the glass header at 10, for example. These pins extend through the header 4 to form external base contact pins for the tube. Normally, the stem or header portion 4 is a flat circular button-shaped disc and in which the lead pins 8 are sealed in a circle concentric with the center of the button stem. The button stem 4 may also be provided with an exhaust tubulation tip 5 extending outwardly from the bottom of the stem portion 4. Thus, the envelope 2 can be exhausted through the exhaust tip 5.

A base member 12 preferably of plastic is mounted on the bottom of the tube stem 4. This base member 12 includes a ring-shaped rigid plate 14 fixed in abutment against the bottom of the tube stem or header 4. In the rigid plate 14 are formed apertures 16 positioned in a circle to conform with the arrangement of the base pins in the stem. The apertures 16 are made to fit the base pins 8 of the tube within a very small clearance in the order of .003''–.004'', for example. With this arrangement, the plate 14 will tightly grip the pins 8 at the point where they leave the glass stem and thus provide a rigid support for the pins in this region immediately adjacent to the glass stem. With this plate structure 14 in place, tightly, against the bottom face of the stem 4, I have found that frequent lateral bending of the pins at any angle even until work hardening causes them to break will not excessively disturb the glass-to-metal seal at 10. I have found that this is due to the fact that the point of bending of the pin is at the edge of the bottom surface of plate 14. That is, the bending point of the pin is moved away from the glass seal in the glass header or stem 4 a distance equal to the thickness of plate 14. The glass-to-metal seal in the stem is able to withstand any strain that may develope in a direction longitudinally of the lead pins 8 during bending of the pins.

In Figure 1, a cup-like portion 18 is formed integral with the plate 14. This portion 18 is so constructed as to fit over the exhaust tubulation tip 5 and provides a protective cap for the tubulation. Furthermore, a projecting rib 20 may be formed on the cup 18 to index the tube within its socket as is well known in the art.

A preferred method for attaching the base member 12 to the bottom of header 4 of the vacuum tube is to fill the cup-like portion 18 with a basing cement 19 and place the base member against the stem portion 4 of the tube, so that the lead pins 8 pass through the apertures in the plate 14 and the exhaust tubulation fits into cup portion 18. Heat is then applied to bake out the cement, thus firmly fixing plate portion 14 in abutment against the bottom of the glass header or stem 4 of the tube.



Often, it is desirable to electrostatically shield the electrode parts of a discharge tube from each other. To complete the shielding effect in the region of the base pins of the tube, I propose to modify my invention as disclosed in Figure 4. This modification includes a rigid ring-shaped plate 22 corresponding to plate 14 of Figure 1. A cup-like portion 24 is formed of metal to act as an electrostatic shield between the several lead pins 8. This cup portion 24 is attached at its upper end to the inside edge 23 of plate 22 by means such as crimping 25 and 26. To effect the necessary electrostatic shielding, the cup is grounded, preferably by an electrical connection to the particular pin 8, which, during operation of the tube, is connected to ground or some suitable base potential. Cup 24 may be used as a protective cap for tubulation 5 and may also be provided with an indexing rib 20 similar to the same features of Figure 1. The tube base 12 shown in Figure 4 may also be cemented to the exhaust tubulation 5 in order to firmly fix plate 22 in abutment to the tube stem.

Some types of discharge tubes do not have an exhaust tubulation in the tube stem. In such cases, the method of cementing the tube base 12 to the bottom of the vacuum tube cannot be used. I have provided other mounting means for locking the rigid plate to the bottom of the stem portion 4. In Figure 5, I disclose a type of base member 12 with a rigid plastic plate 22 and a metal shield cup 24 similar to that which is illustrated in Figure 4. I propose to lock plate 22 directly to the lead pins 8'. The preferred fastening means disclosed in this Figure 5 comprise a crimped or flattened portion 28. On each lead pin 8' this crimped or flattened portion 28 is placed just below the plastic plate 22 in such a way that the plate is held tightly under pressure against the tube stem 4. In this modification cup portion 24 may be either of plastic material formed integral with the plate as shown in Figure 1, or a separate metal cup as described in Figures 4 and 5. Whatever the type of cup portion used in the base members shown in Figures 1 to 5 inclusively, an indexing rig 20 may be formed within the cup to properly position the tube in its socket.

Portion 18 in Figures 1 to 3 and portion 24 in Figures 4 and 5 have been disclosed as a cup-like structure. However, it is evident that this cup-like portion may take any desired form such as an open cylinder or a simple plate structure in order to provide an electrostatic shield. If the shielding effect of the base member 12 is not necessary or desired, portion 18 or portion 24 may be dispensed with. In this case the rigid plate member may be fixed directly to the tube by means shown in Figure 5, for example.

While certain specific embodiments have been illustrated and described, it will be understood that various changes and modifications may be made therein without departing from the spirit and scope of the invention.

What I claim is:

1. An electron discharge tube including a stem portion, a base member comprising a plate structure and a metal cup attached thereto, means fixing said plate structure in abutment against said stem portion, a plurality of lead pins sealed in said stem portion and extending through said plate and terminating beyond said plate in adjacent relationship with said cup, a portion of said cup positioned between two of said lead pins to provide electrostatic shielding therefor,

said plate structure tightly embracing said lead pins intermediate the ends thereof.

2. An electron discharge tube including an envelope comprising a flattened stem portion closing one end thereof and an exhaust tubulation projecting outwardly from said flattened portion, a base member fixed to said flattened portion and including a cup portion enclosing said tubulation and a plate structure having a surface abutting said flattened stem portion, a plurality of lead pins sealed through said flattened stem portion and extending through said plate at the abutting surface thereof, said lead pins terminating beyond said plate, said plate tightly gripping said lead pins intermediate the ends thereof.

3. A base member, for an electron discharge tube having a plurality of lead pins sealed in the stem of the tube, comprising a plastic ring-



shaped plate structure, said plate structure having apertures therethrough to fit over said base pins and tightly grip said pins intermediate their ends when said plate structure is mounted in abutment against the stem of the tube, a metal cup fastened to said plate structure for electrostatically shielding said pins.

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