

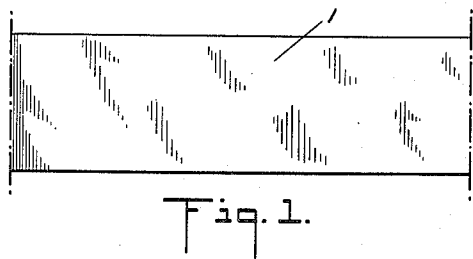
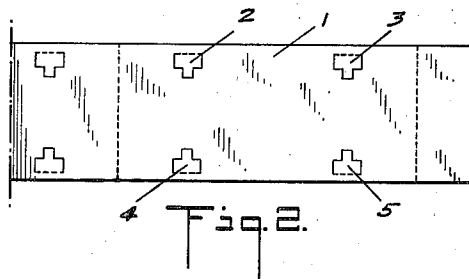
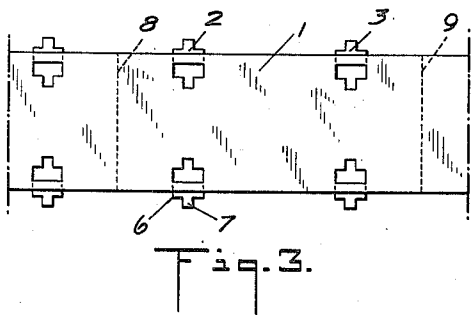
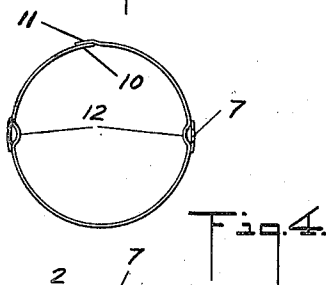
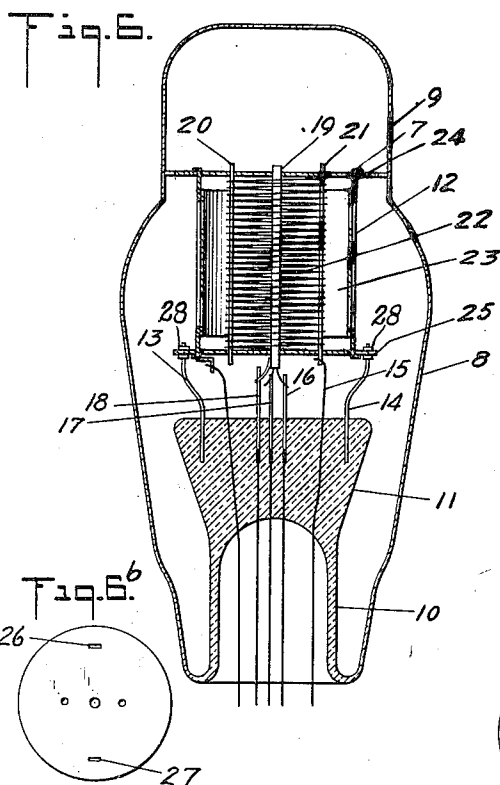
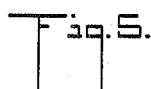
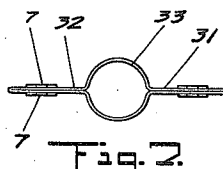
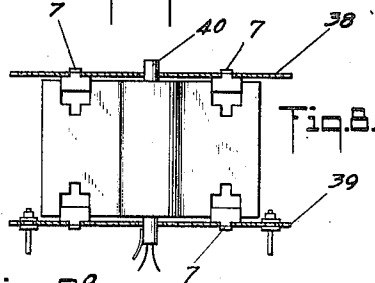
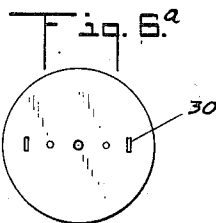
May 24, 1938.

C. F. MILLER

2,118,765

ELECTRODE FOR ELECTRIC DISCHARGE TUBES

Filed Oct. 6, 1937



Carl F. Miller
INVENTOR
BY John J. Logan
ATTORNEY

UNITED STATES PATENT OFFICE

2,118,765

ELECTRODE FOR ELECTRIC DISCHARGE
TUBES

Carl F. Miller, Emporium, Pa., assignor to Hygrade Sylvania Corporation, Salem, Mass., a corporation of Massachusetts

Application October 6, 1937, Serial No. 167,490

7 Claims. (Cl. 250—27.5)

This invention relates to electrode structures and more particularly to electrodes for such devices as radio tubes and the like and is in the nature of an improvement on the plate electrode structure of Patent No. 2,084,734.

An object of the invention is to provide an improved plate electrode for radio tubes and similar devices, as well as an improved method of forming such electrodes.

Another object is to provide an improved form of plate electrode for "unitary mount" radio tubes.

A feature of the invention relates to a simple, cheap and expeditious method of forming a plate electrode with integral ears or tabs.

Another feature relates to an improved plate structure for radio tube mounts, whereby the plate is supported without the usual plate side-rods.

A further feature relates to the novel organization, arrangement and relative location of parts which constitute a simple and economically manufactured tubular plate electrode for radio tubes and the like.

Other features and advantages not specifically enumerated will be apparent after a consideration of the following detailed descriptions and the appended claims.

While the invention will be illustrated as embodied in plate electrodes of certain particular shapes it will be understood that it is not necessarily limited thereto, and that such illustrations are merely typical of preferred manners of embodying the invention. Accordingly in the drawing,

Figs. 1, 2 and 3 are views to illustrate successive steps in forming a plate electrode according to the invention.

Fig. 4 is a top plan view of an electrode according to the invention.

Fig. 5 is a side elevational view of the electrode of Fig. 4.

Fig. 6 shows the electrode of Figs. 4 and 5 embodied in a typical radio tube.

Fig. 6a is a plan view of one of the spacer members of Fig. 6.

Fig. 6b is a plan view of a modified form of spacer member.

Fig. 7 illustrates a modified form of plate electrode according to the invention.

Fig. 8 shows the electrode of Fig. 7 embodied in a radio tube mount.

Referring more especially to Figs. 1, 2 and 3, the plate electrode according to the invention is formed from an elongated metal strip of nickel, molybdenum or other metal customarily employed for the plate electrodes of such devices as radio tubes. Strip 1 is fed past a set of four punching tools (not shown) whereby the strip is punched with a set of four tongues 2, 3, 4 and 5 each being of substantially T-shape as shown. The tongues

strip so that when they are bent back as shown in Fig. 3, the shoulder portions 6 and the lug portion 7 extend outwardly beyond the strip edge. For this purpose the punched strip is fed to another position where suitable bending tools (not shown) engage the previously punched tongues and bend them back against the face of the strip as shown in Fig. 3. It will be understood of course that instead of moving the strip for this latter operation, the bending tools may be moved into place to effect the bending operation. Preferably, although not necessarily, all the struck-out tongues are bent back against the same face of the strip although it will be understood that if desired, some of the tongues may be bent against one face of the strip, and the remaining tongues may be bent against the opposite face of the strip.

The strip is then severed along the lines 8 and 9 and the severed section is formed around a suitable mandrel with the overlapping edges 10 and 11 welded or otherwise firmly united. Preferably, although not necessarily, the plate is channeled vertically in alignment with the tabs as indicated by the numeral 12, so as to strengthen it to the required degree. The finished completed electrode is therefore substantially tubular in shape and the upper edge is provided with a pair of diametrically disposed upstanding tongues each having a shouldered portion 6 and a lug portion 7. Likewise the lower edge of the electrode is provided with a similar pair of bent-back tongues at diametrically opposite parts of the electrode. It will be understood of course that the invention is not limited to the positioning of the tongues on opposite diameters, for example the tongues on the upper edge of the electrode may be circumferentially staggered with relation to the tongues on the lower edge of the electrode.

Referring to Fig. 6 there is shown a typical radio tube embodying the plate electrode of Fig. 5. The numeral 3 represents any well known form of enclosing envelope, preferably, although not necessarily, having a substantially cylindrical dome portion 9 of the "ST" type. Sealed to the bottom end of the envelope is a stem 10 terminating in a press 11 into which are sealed the relatively heavy wires 13, 14 and the lead-in wires 15 to 18 inclusive. Merely for purposes of explanation the mount is shown as of the triode type comprising any well known form of electron-emitting cathode such for example as the indirectly heated cathode 19 which is connected at its lower end to the wire 18. The terminals of the usual cathode heater wire are connected to the wires 16, 17. Surrounding the cathode is any well known form of foraminous grid comprising for example the side rods 20, 21 to which are fastened the grid turns 22. The cathode and

grid are assembled in concentric relation within the tubular plate 23 which is provided on its upper and lower ends with the integral struck-out tongues as described in the foregoing figures. In order to preserve the spacial relations of the electrodes there are provided upper and lower spacer members 24, 25 of mica or other suitable insulation. Each mica member is provided with a set of perforations to receive the end of the cathode 19, the ends of the grid side rods 20, 21 and the lugs 7. Preferably, although not necessarily, the perforations in each mica are in alignment across the mica, and the various side rods are assembled in the same plane.

In order to space the mica members away from the edges of the plate 23 each mica is provided with a pair of slits 26, 27 (Fig. 6a) to receive the lugs 7. Preferably the slits 26, 27 are just long and wide enough to accommodate the lugs 7 so that each mica disc is seated against the shoulders 6 on each of the tongues. The lugs 7 are bent at right angles to secure the micas against the respective shoulders 6. When the mount with its mica spacers has been assembled as above described it may be anchored to the rods 13, 14 by eyelets 28 or in the manner illustrated for example in Patent No. 2,075,761.

While the foregoing embodiment shows the plate electrode assembled with the lugs 7 in a line at right angles to the line joining the grid side rods, it will be understood that the said plate may be assembled so that the lugs are at right angles to the grid side rods. In this latter embodiment it will then be necessary to provide the mica discs with perforations 30 as shown in Fig. 6b. It will also be understood that if desired, more than two lugs may be formed on each edge of the plate so as to space the mica discs at more than two places from the edge of the plate electrode.

The invention is not limited to plate electrodes of the type shown in Fig. 6, but may be embodied in other well-known plate electrode shapes. For example it is shown in Figs. 7, 8 embodied in a plate electrode of the wing type. The manner of forming and bending the struck-out portions to form the lugs 7 is the same as that described in connection with Figs. 1 to 3. However instead of shaping the punched blank to simple cylindrical form, the blank is bent back upon itself as shown in Fig. 7 to form substantially flat wing portions 31, 32 joined by a substantially cylindrical portion 33 which acts as the plate electrode proper. The blank is preferably folded so that the lugs 7 on the upper and lower edges are positioned adjacent to each other in pairs, as shown more clearly in Fig. 7. The mica spacer members 38, 39 are provided with perforations to receive the ends of the cathode sleeve 40, and the lugs 7. The mount with the mica spacers may be held in place on the support rods 13, 14, by wire members in the manner described in detail in said Patent No. 2,075,761, and the lugs 7 are bent back at right angles against the face of the mica members.

The foregoing described arrangements have amongst others the following advantages. The elimination of the usual extra supports on the plate; the spacing of the plate which is shorter than the enveloped grids without having recourse to swaging or extra spacers; the manufacture of the finished plate on high speed ma-

chinery and with a minimum waste of raw material; elimination of curved or twisted mount supports and an increase in the rigidity of the mount as a whole.

While the plate electrode is shown embodied in a unitary mount of the triode type, that is one with a single grid, it will be understood that this is done merely for purposes of simplicity and that a greater number of grids may be employed between the cathode and plate so as to form a unitary multi-grid mount which can be attached as a preassembled unit to the support rods 13, 14. For example, in the case of a pentode tube, three grids similar to grid 22 may be provided and supported between the mica members 24 and 25, the suppressor grid being connected directly to the cathode in the well-known manner as indicated in the drawing. The grid 22 is prevented from shifting vertically by the end turns engaging the micas 24 and 25. If desired, the grid may be held in place by eyelets (not shown) similar to the manner in which the rods 13 and 14 are fastened to the disc 25. Likewise, while the invention is shown as embodied in a tube of the reentrant press type, it will be understood that it is also applicable to the tubes of the type employing a substantially flat base or header such as is employed in so-called metal radio tubes.

Various changes and modifications may be made in the particular embodiments disclosed without departing from the spirit and scope of the invention.

What I claim is:

1. A plate electrode for a radio tube comprising a tubular metal strip having a plurality of tongues struck out therefrom and bent back against the face of the electrode to project beyond an edge thereof.

2. A plate electrode according to claim 1 in which each tongue has a lug portion and a shoulder portion extending beyond the edge of the plate.

3. A plate electrode according to claim 1 in which each edge of the plate is provided with at least two of said struck-out tongues.

4. A plate electrode comprising a metal strip bent back upon itself to form a central tubular electrode member having a pair of lateral wing portions, each of said wing portions having a plurality of tongues struck out therefrom and bent back against the wing surface to project beyond the edge thereof.

5. A plate electrode according to claim 4 in which each wing is provided at its upper and lower edges with a pair of said tongues with the tongues of each pair adjacent to each other.

6. A radio tube mount including an electron-emitting cathode, a tubular plate electrode enveloping said cathode, said plate having a plurality of tongues struck out therefrom and bent back against the face of the plate to project beyond the edge thereof each of said tongues having a shoulder also projecting beyond the plate edge, and an insulator spacer member having a plurality of openings through which said tongues project and being seated against said shoulders.

7. A mount according to claim 6 in which the tongues project through the openings in said spacer member and are bent back against the face thereof.

CARL F. MILLER.