July 22, 1941. C. F. MILLER 2,250,184

ELECTRON DISCHARGE TUBE

Filed Feb. 8, 1938 3 Sheets-Sheet 1

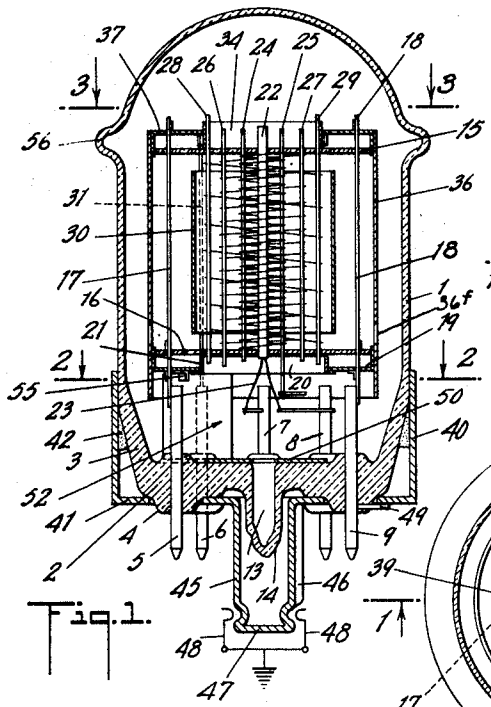


Fig. 1.

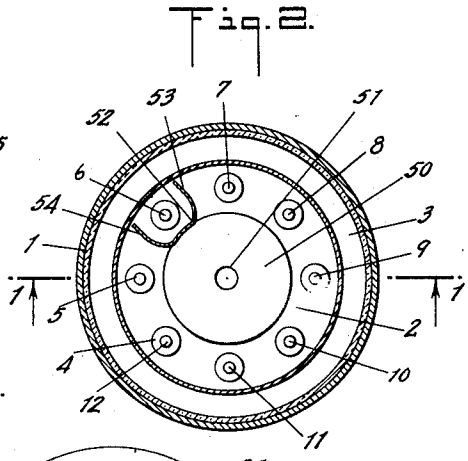


Fig. 2.

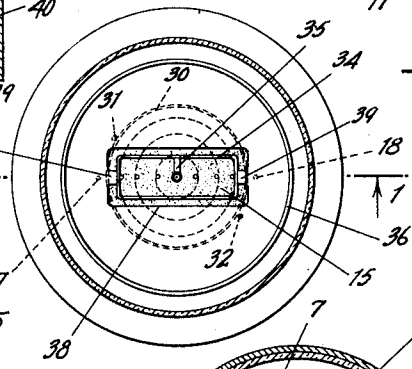


Fig. 3.

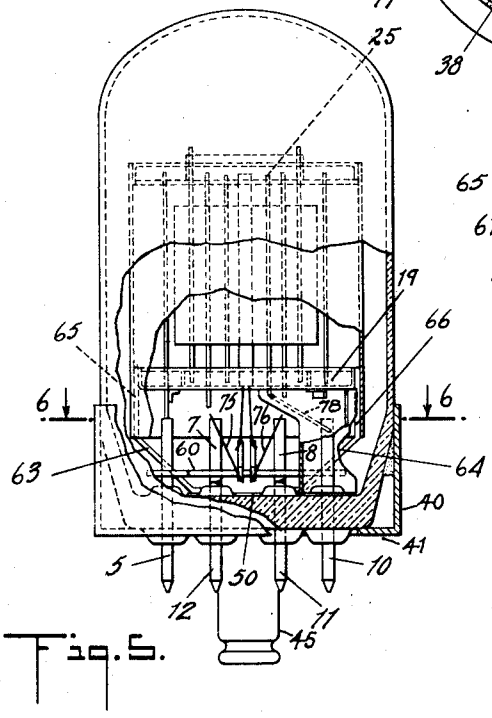


Fig. 5.

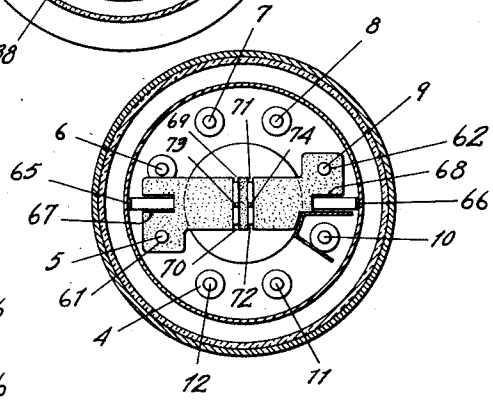


Fig. 6.

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ELECTRON DISCHARGE TUBE

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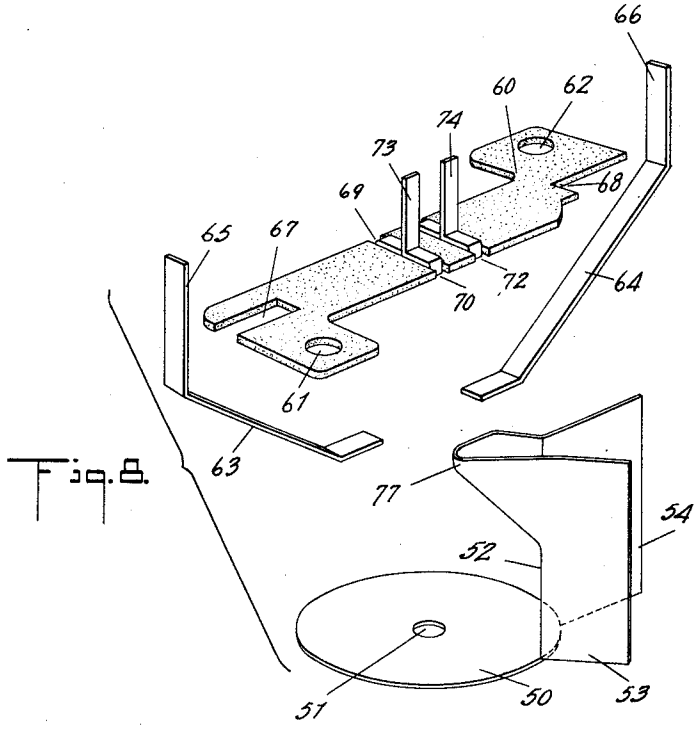


Fig. 8.

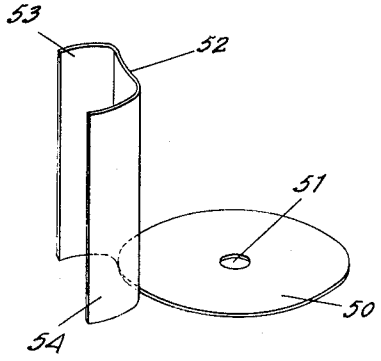


Fig. 2.

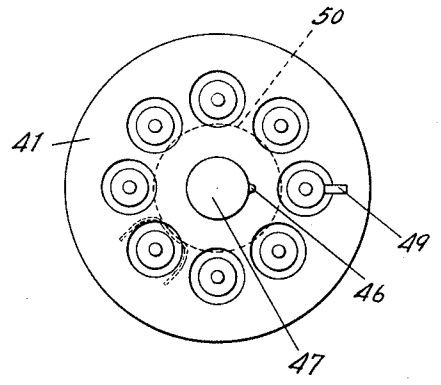


Fig. 4.

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July 22, 1941. C. F. MILLER 2,250,184

ELECTRON DISCHARGE TUBE

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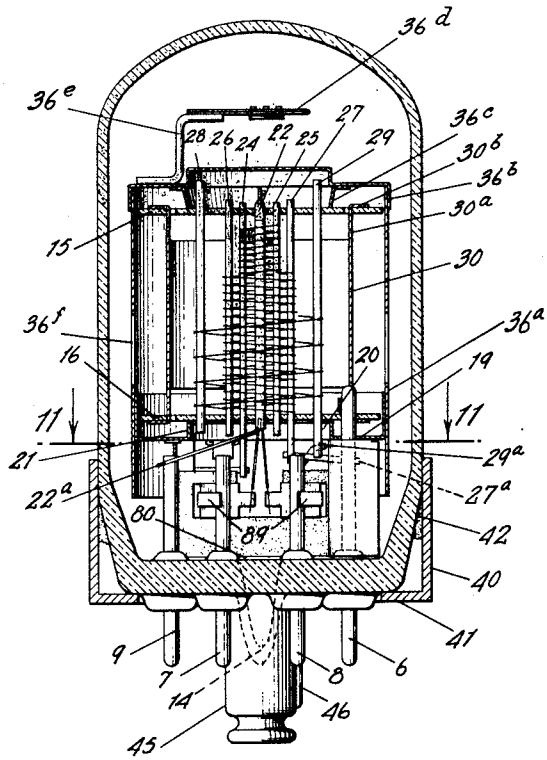


Fig. 9.

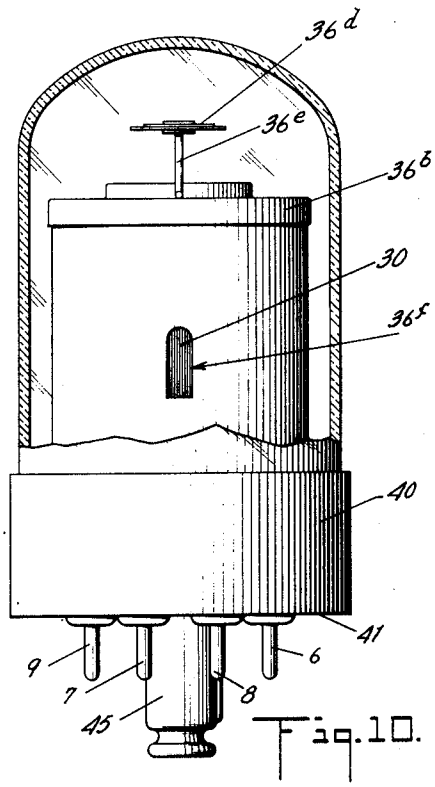


Fig. 10.

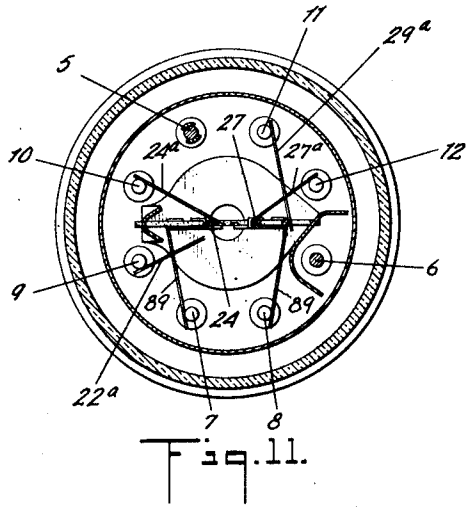


Fig. 11.

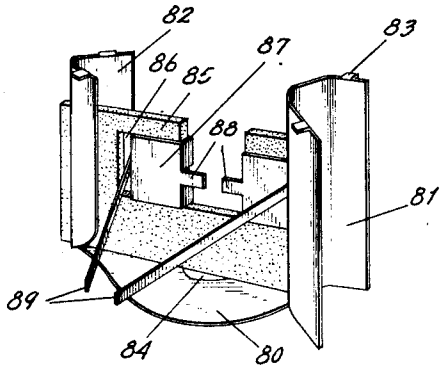


Fig. 12.

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Patented July 22, 1941

2,250,184

UNITED STATES PATENT OFFICE

2,250,184

ELECTRON DISCHARGE TUBE

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Application February 8, 1938, Serial No. 189,295

18 Claims. (Cl. 250—27.5)

This invention relates to electron discharge tubes and more especially to tubes of the electrostatically shielded type.

A principal object of the invention is to provide a tube of the glass envelope type having a minimum inherent input capacitance and a minimum inherent output capacitance.

It has been known for many years that in order to utilize the gain of a grid controlled electron discharge repeater tube to full advantage at high frequencies, it is necessary to shield the input electrodes from the output electrodes electrostatically. One example of such tube which has achieved wide utility in this respect, is the so-called screen-grid or shield-grid tube. While this type of tube has been found satisfactory for certain purposes, it represents a compromise with total electric shielding with the result that at ultra-high frequencies the tube's possible gain is not fully achieved. This compromise has been necessitated heretofore, by the difficulty of shielding the electrodes of the mount when arranged in the conventional manner, this conventional arrangement limiting the manner in which electrostatic shielding can be applied. As a matter of fact, in the well known shield-grid type of tube, because of the limitations of the shielding system, it has been necessary to remove the control-grid lead to the greatest possible distance from the plate lead, thus involving the use of a cap-contact which is located at the top of the glass bulb. Apart from the difficulty and expense of applying and fastening this special top cap, is the additional disadvantage that a separate flexible lead must be employed to make contact with the cap in order to connect the control-grid in circuit. In other words, a radio tube of the conventional shield-grid, top-contact type, cannot be completely connected in circuit merely by plugging the tube into its socket, but a separate operation of applying the flexible contact to the control-grid cap-contact is necessary. These flexible leads and top-caps have been the source of many annoying disturbances in the operation of the usual broadcast radio receiver and are especially disadvantageous in ultra-high frequency applications.

Accordingly, it is another principal object of this invention to provide a tube of the glass envelope type having a substantially totally electrostatically shielded mount, and with all the contact members disposed at one end of the tube.

Another object is to provide a radio tube having a series of contact prongs at its lower end together with improved shielding arrangements to shield electrostatically the major part of the prongs including the part actually intended to engage in the cooperating contact socket.

Another object is to provide a radio tube of the glass-bulb type having a bi-part electrostatic shield in the form of overlapping metal cup members one disposed on the interior of the bulb and the other disposed on the exterior thereof.

A feature of the invention relates to a radio tube of the enclosing glass-bulb type having a plurality of lead-in members sealed into the lower end of the enclosing bulb together with internal and external electrostatic shields to shield the mount throughout its entire length and to shield the portion of the lead-in wires within the bulb.

Another feature relates to a radio tube of the enclosing glass-bulb type having a plurality of rigid contact prongs sealed into the lower end of the glass-bulb, together with a cup-like metal base carried by the bottom of the bulb and a tubular metal shield within the bulb in electrostatic overlapping relation with the said metal base, for the purpose of completing the electrostatic shielding of the mount and unexposed parts of the contact prongs.

Another feature relates to a radio tube of the type having an enclosing glass-bulb with a substantially flat bottom and a plurality of rigid contact prongs sealed into and around the center of the flat bottom, together with electrostatic shields between said prongs on both the inner and outer faces of the bottom of the bulb.

A further feature relates to an improved organization of inner and outer electrostatic shields for a glass-bulb radio tube, whereby the maximum of electrostatic shielding is attained not only of the mount but also of the lead-in conductors or contact prongs.

A further feature relates to a novel form of shield for the lead-in conductors or prongs of a radio tube.

A still further feature relates to the novel organization, arrangement and relative location of parts which constitute an improved tube for ultra-high frequency work.

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 is capable of application to any type of radio tube having two or more

electrodes in the mount or electrode assembly, it is particularly advantageous in tubes wherein the control-grid or signal input electrode is to be totally shielded electrostatically from an anode or output electrode. While therefore, the invention will be disclosed herein as embodied in a radio tube of the pentode type, this is done merely for purposes of explanation and it will be obvious that various novel features can be applied to tubes having a greater or less number of electrodes. Accordingly in the drawings—

Fig. 1 is a vertical sectional view of a tube of the pentode type embodying the invention.

Fig. 2 is a horizontal sectional view of Fig. 1 taken along the line 2—2 thereof.

Fig. 3 is a horizontal sectional view of Fig. 1 taken along the line 3—3 thereof.

Fig. 4 is a bottom view of Fig. 1.

Fig. 5 is a modification of Fig. 1.

Fig. 6 is a horizontal cross-sectional view of Fig. 4 taken along the line 6—6 thereof.

Fig. 7 is an enlarged perspective view of the prong shield.

Fig. 8 is an exploded view of part of Fig. 5.

Figs. 9 to 12 are views of a preferred embodiment of the invention.

The invention is in the nature of an improvement upon the tube structure disclosed in U. S. Patent No. 2,238,025.

Referring to the embodiment of Figs. 1 to 4, there is shown an evacuated glass bulb 1 having its lower end closed by a glass cup having a substantially flat bottom 2 and a rim 3. Preferably the bottom 2 is of much thicker glass than the wall 1 of the bulb, and the glass rim 3 preferably tapers in thickness from the bottom 2 to the wall 1 where it is sealed. The cup 2 and its rim 3 are preferably formed as a unit separate from the bulb 1, to which it is later sealed after the electrode assembly or mount has been assembled as described hereinbelow. Preferably the bottom 2 is formed wtih a series of integral bosses 4 in the regions where the rigid metal rods 5 to 12 inclusive, are sealed therethrough, and these rods are sealed into member 2 in a vacuum-tight manner as decribed in detail either in U. S. Patent No. 2,219,574 or in application Serial No. 175,619, filed November 20, 1937.

As shown, the rods 5 to 12 extend upwardly into the envelope to act as support or current lead-in members for the various electrodes of the mount; these rods also extend downwardly to act as rigid contact prongs whereby the tube when completely finished can be plugged into a suitable contact socket having a series of spring contacts to receive respectively prongs 5 to 12. Preferably, although not necessarily, the bottom 2 is of 705—AJ glass, and the rods 5 to 12 are of a special alloy which is capable of being directly sealed to the glass 2 in a vacuum-tight manner. As examples of such alloys may be mentioned, "Kovar" an alloy consisting substantially of Fe, Ni, Co; or "Fernico" an alloy consisting substantially of Fe, Ni, Co. Preferably the lower ends of prongs 5 to 12 inclusive are provided with rounded points to facilitate insertion of the tube into a socket.

As shown more clearly in Fig. 2, the contact prongs are arranged in a circle around the center of member 2, and the latter is provided with a central opening 13 which is in communication with the tipped-off exhaust tubulation 14. Supported on the inwardly projecting ends of rods 17 and 18, is any wellknown form of radio tube mount or electrode assembly. Preferably this assembly is of the unitary type, that is with the electrodes assembled as a unit between upper and lower mica discs 15 and 16. An example of a typical unitary mount is found in U. S. Patent No. 2,084,734. The main metal uprights 17, 18, pass through a shallow metal cup 19 and are welded at their lower ends to the prongs 5 and 9 respectively. Cup 19 is held in place on uprights 17 and 18 by means of downwardly projecting struck-out metal tabs which are welded to said uprights. The bottom of member 19 is provided with a longitudinal slot 20 to allow the side rods of the various electrodes as well as the cathode, to extend downwardly without being short-circuited by member 19. The ends of slot 20 are struck-up to form tabs 21 to support the lower mica disc 16 which is fitted within the rim of cup 19. Mica 16 is held in place in any suitable manner, for example by swaging the uprights 17 and 18 or by means of metal lugs or tabs welded to said uprights and bearing against the upper face of disc 16. In the wellknown manner disc 16 is provided with a series of perforations to receive the lower ends of the various electrode side rods and the cathode.

The drawings show an electrode assembly of the pentode type comprising a central electron-emitting cathode sleeve 22 having an insulated heater filament 23 on its interior, the ends of which are connected respectively to prongs 7 and 8. The electrode assembly also includes a control-grid in the form of a fine wire helically wound around the side rods 24, 25, the side rod 25 being connected at its lower end to prong 10; a shield-grid similar to the control-grid and wound around the side rods 26, 27 with side rod 26 connected at its lower end to prong 12; a suppressor-grid likewise in the form of a fine wire helically wound around side rods 28, 29; and a tubular metal plate 30 welded to side rods 31, 32. Side rod 31 extends downwardly through an enlarged opening (not shown) in member 19 so as not to be short-circuited therewith, and is welded to prong 6. The lower end of side rod 32 passes through mica 16 but does not reach member 19. The upper ends of plate side rods 31, 32 are provided with tabs (not shown) to support the top mica 15 which is similar to mica 16 and is provided with a similar series of side rod and cathode perforations.

It will be noted that the suppressor-grid side rods 28, 29, extend upwardly further than the remaining side rods, and welded to the side rods 28, 29 is a flattened tubular metal strip 34 which bears against the upper face of mica 15 to hold it in place. A short metal tab 35 connects the cathode sleeve 22 to member 34, consequently the suppressor-grid and the cathode are at the same shielding potential.

For the purpose of shielding the electrodes and the contact prongs electrostatically and for preventing undesirable radiation from the electrode system, there is provided an inverted metal cup 36 having a top metal closure 37 with a longitudinal slot 38 in registry with member 34. The ends of slot 38 are provided with struck-up lugs 39 which are welded to the suppressor-grid side rods 28, 29. The shield 36 extends downwardly beyond, but in close fitting engagement with, the rim of member 19 to which it is welded at a plurality of points around its periphery. It should also be noted that member 36 extends downwardly a sufficient distance to overlap the prongs 5 to 12 inclusive, and to over-

lap the rim 40 of a metal cup member within which the tube is seated. This metal cup member is preferably of the construction disclosed in detail in application Serial No. 145,198, filed May 28, 1937, and comprises a spider-like base 41 having a series of circular openings to receive the glass bosses 4 and the several contact prongs. The base is held in place on the tube in any well known manner as for example by a ring of cement 42.

Preferably, the member 41 carries centrally thereof a hollow tubular metal member 45 which performs the double purpose of a protective housing for the glass tubulation 14, and a supplemental electrostatic shield between the various contact prongs. Member 45 may be formed with a longitudinal guiding rib or key 46 to facilitate insertion of the tube into its socket and member 45 may also be formed with a circumferential locking groove 47 adapted to engage a suitable grounded contact spring 48 in the contact socket (not shown). Preferably the prong 9 which is connected to members 19, 36 and to the suppressor-grid, and cathode is connected by a strap 49 to the member 41. In order to complete the electrostatic shielding of the contact prongs, there is provided a metal disc 50 (Fig. 7) having a central opening 51 in registry with the tubulation opening 13. Member 50 also has a vertical metal extension 52 adapted to enclose the plate prong 6 as shown more clearly in Figs. 1, 2 and 4. Extension 52 is provided with wings 53, 54, which are interposed between the plate prong 6 and the adjacent prongs 5 and 7. Member 52 is electrically connected to the mount shield by means of metal tabs 55 welded to member 19 and member 52.

By the foregoing construction, the entire mount as well as the contact prongs are substantially completely electrically shielded. The mount is substantially entirely enclosed within the members 19, 36 and 37 and the contact prongs are shielded by the member 36, which overlaps the member 40, and by the members 41, 50 and 52 as well as by the member 45. The arrangement disclosed reduces to the smallest practical extent the separation between the lower end of the mount and the exposed ends of the various contact prongs and even the portion of the contact prongs between the base of the bulb and the mount are substantially entirely shielded. Consequently, the tube is very well adapted to use in high frequency work and with the structure disclosed, interelectrode capacitances lower than 0.004 mmfd. have been obtained. Thus it is possible to construct a tube of the shield grid, pentode or similar type with all the connections at the lower end of the tube and avoiding the usual flexible lead for connecting the control grid in circuit. If desired, the bulb portion of the envelope may be provided with a peripheral bead 56. While Fig. 1 shows a shield for the plate prong, it will be obvious that a plurality of shields similar to member 52 may be carried by disc 50 each shield enclosing an appropriate one of the prongs.

Instead of shielding the plate prong, the grid prong may be shielded. Such an arrangement is disclosed in Figs. 5, 6 and 8. In this embodiment the tube envelope, mount and base and other parts are similar to the corresponding parts of Fig. 1 and these corresponding parts bear the same designation numerals. However, this embodiment differs from that of Fig. 1 in the manner of making connection to the filament wires and in the manner of shielding the grid prong. In view of the proximity of the lower end of the mount to the upper ends of the contact prongs, it is sometimes difficult to weld the free ends or terminals of the filament or heater to the corresponding prongs. This difficulty is overcome in the embodiment of Figs. 5, 6 and 8 by providing a mica bridge 60 as shown in detail in Fig. 8. Member 60 is provided with perforations 61, 62, whereby it can be assembled over the prongs 5 and 9 as shown in Fig. 6, prior to assembly of the mount in place. Before assembling the bridge in place, the shield disc 50 is positioned against the upper face of member 2 and with the pin shield extension 52 and wings 53, 54 enclosing the control grid prong 10. The disc also carries two metal strips or tabs 63, 64, which are welded at their end 65, 66 to the lower end of shield member 36. After assembling the mount in place, members 63 and 64 therefore serve as supporting means for the mount in addition to effecting an electrical connection between the various parts of the composite shielding system. The mica bridge 60 is provided with a notch 67 to accommodate the arm 63 and also with a shoulder 68 to accommodate the arm 64. In order to carry the shielding of the grid lead-in to the maximum possible extent, the wings 53 and 54 (Fig. 8) instead of extending vertically straight as in Fig. 7, are provided with an inclined or trough-like portion 77 which extends upwardly into engagement with the metal cup 19 to which it may be welded by suitable tabs similar to the tabs 55 of Fig. 1. The trough-like portion 77 of the shield encloses the metal strap 78 which connects the lower end of control-grid side rod 25 to its contact prong 10. With this arrangement the control-grid and its entire lead-in connection are completely shielded electrostatically from the plate lead both interiorly and exteriorly of the tube, the external shielding being effected by members 40, 41 and 45.

The central portion of bridge 60 is provided on opposite edges with pairs of notches 69, 70; 71, 72, to receive the T-shaped metal strap members 73, 74, to which the ends of the filament are welded. The filament prongs 7 and 8 are connected by wires 75, 76 to members 73, 74. The connection of the remaining electrodes to their respective contact prongs is the same as already described in connection with Fig. 1. In the embodiment of Fig. 5, the provision of the mica bridge with the straps 73, 74, enable the filament prongs 7 and 8 to be electrically connected to member 73 and 74 prior to assembly of the mount in place, and the final welding of the filament ends to the upwardly projecting members 73, 74, can be effected readily and effectively. Where the filament ends are welded directly to the prongs 7 and 8 as in Fig. 1 for example, the alloy of the prongs and their mass may render it very difficult to secure a satisfactory weld. Furthermore, the heat of such direct welding may result in undesirable strains being set up in the regions of member 1 where the prongs are sealed in. These disadvantages are overcome with the structure of Figs. 5 to 8.

Referring to Figs. 9 to 12, there is shown a preferred modification which combines certain of the structural advantages of the preceding embodiments. The parts of Figs. 9 to 12 which are identical with those of the preceding embodiments are designated by the same numerals. Thus the glass enclosing envelope comprises a

tubular portion 1 which is sealed to a cup-shaped glass base 2 having a rim 3 of tapered thickness. Base 2 is provided with a circularly arranged series of bosses 4 through which the rigid metal rods or contact prongs 5 to 12 are directly sealed in a vacuum-tight manner.

The electrode assembly or mount includes the central indirectly heated cathode 22 which is coated with electron-emitting material as indicated, the cathode being connected by wire 22a to prong 9. The filament insulatingly supported inside the cathode sleeve has its terminals connected to prongs 7 and 8 by a special connecting arrangement to be described. The first or control grid is wound around side rods 24 and 25, side rod 24 being connected by wire 24a to prong 10. The second or shield grid is wound around side rods 26 and 27, side rod 27 being connected by wire 27a to prong 12. The third or suppressor grid is wound around the side rods 28 and 29, rod 29 being connected by wire 29a to prong 11. The plate 30 is directly connected to prong 6.

The electrodes are assembled between the upper and lower mica spacer discs 15, 16, preferably to form a unitary assembly. For this purpose, the upper and lower edges of plate 30 may be provided with integral shouldered spacer tabs 30a which have their ends bent back against the mica discs, as disclosed for example in U. S. Patent No. 2,118,766.

The entire electrode assembly is enclosed within an electrostatic shield consisting of tubular metal member 36a completely closed at its upper end by a metal cap 36b to which it is preferably welded. Preferably cap 36b is circularly recessed as shown in Fig. 9, and a downwardly depending annular flange 36c is welded to the cap and rests against the top mica 15. If desired, a getter cup or carrier 36d may be supported centrally above the mount by a doubly bent wire 36e welded to cap 36b and to the getter cup as shown.

Shield 36a is completed adjacent its lower end by the cup-shaped metal member 19 which has its rim welded to the shield. For this latter purpose, the shield is provided with two small diametrically opposite slots 36f to allow a suitable welding tool to be inserted. If desired, the slots 36f may be closed by a metal flap or cover (not shown) after the welding is effected. Cup 19 is provided with a longitudinal slot 20 to allow the various side rods and the cathode to project downwardly without being short-circuited, and mica disc 16 preferably rests on the up-turned ends 21 of this slot.

As described in connection with Fig. 1, shield 36a extends downwardly so that it overlaps the metal rim 40 of the cup-shaped metal base which has a spider-like bottom 41 as shown more clearly in Fig. 4. Preferably, the contact prong 5 is electrically connected to base 41 as described in connection with Fig. 4. Preferably also, shield 36a does not extend down so far that it interferes with the welding of the various wires to the prongs.

The electrostatic shielding of the mount is completed by a metal disc member 80 (Fig. 12) having a pair of vertical channeled extensions 81, 82, each extension being provided with a pair of tabs 83 which are welded to the metal cup 19. The disc 80 is provided with a central opening 84 so as not to obstruct the exhaust tubulation 14 during the evacuation of the tube. The member 81 is disposed so that it encloses the plate prong 6 and the member 82 is disposed so that it shields the cathode prong 9 from the grid prong 10.

Each of the members 81 and 82 are provided with a vertical slit to receive a mica bridge member 85 having a pair of openings 86. Strapped around an edge of each of the openings 86 is a metal strap 87 having a lug 88 and a flexible connecting tab 89. The lugs 88 are connected to the ends of the heater filament as shown more clearly in Fig. 9, and the tabs 89 are welded or otherwise connected to the prongs 7 and 8 as shown more clearly in Fig. 11. Preferably, as described above, the base member 41 has electrically fastened thereto a downwardly depending hollow metal boss or keying member 45 having a vertical key 46. The member 45 is adapted to be grounded or connected to a suitable source of base potential when the tube is inserted in a corresponding contact socket, it being understood that the base 40 is fastened to the tube in any well known manner for example by a ring of basing cement 42.

While specific embodiments of the invention have been illustrated, 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 tube comprising, an enclosing glass-envelope formed of a bulb portion sealed to a non-reentrant cup-shaped portion, a plurality of rigid metal rods sealed into and through the bottom of said cup-shaped portion and extending outwardly to form rigid contact prongs, and means to shield said prongs electrostatically comprising a metal disc member located inside said envelope and adjacent the inner surface of said cup-shaped portion and surrounded by said prongs, and a central metal plug-in member carried by the lower end of the tube said plug-in member being many times wider than said prongs and extending downwardly between said prongs for electrostatically shielding the control grid prong from the plate prong throughout substantially their entire external length.

2. In combination, a radio tube mount, a plurality of lead-in conductors to said mount, and means to shield said mount and said conductors, the last mentioned means including a tubular metal member substantially entirely closed electrostatically at its upper and lower ends, a metal disc supported in spaced relation below the bottom of said tubular member and surrounded by said conductors, said disc being electrically connected to said tubular member, and a vertical shield member connecting said disc and the bottom of said tubular member for electrostatically shielding one of said conductors from the remaining conductors.

3. The combination according to claim 2 in which the vertical shield member is channeled and has portions disposed between said one of said conductors and the adjacent conductors.

4. In combination, a glass base having a plurality of rigid metal contact prongs sealed therein and extending beyond opposite faces thereof, a radio tube mount connected to the upwardly projecting ends of said prongs, a tubular metal shield for the mount extending above the upper end of the mount and below the lower end of the mount, a metal closure member for the upper end of said shield, a metal closure member for the lower end of said shield, and means to shield the portions of said contact prongs between said base and the mount, the last mentioned means

including a metal disc seated on said base and surrounded by said prongs, said disc being connected to said tubular shield.

5. The combination according to claim 4 in which the last mentioned means also includes a vertical metal shield member between the said lower closure member and said disc, said vertical member having portions interposed between adjacent contact prongs but in spaced relation thereto.

6. In combination, a glass base having a plurality of rigid metal contact prongs including a control grid and a plate prong sealed therein and extending from opposite fraces thereof, a radio tube mount supported from the upwardly projecting ends of said contact prongs, a metal box shield substantially entirely enclosing said mount, a metal member lying against the upper face of said base and surrounded by said prongs, another metal member lying against the lower face of said base and through which said prongs insulatingly pass, said box shield and metal members being electrically connected, and a central metal plug-in member carried by said other metal member and extending downwardly between the control grid and plate prongs for electrostatically shielding them from each other throughout substantially their entire external length.

7. A radio tube for high frequency use comprising a glass enclosing envelope formed of a bulb portion and a base portion, said base portion having a plurality of rigid metal contact prongs sealed directly therein and extending from opposite faces thereof, an electrode mount connected to the upwardly projecting ends of said prongs, a metal cup-like member within which the lower end of said envelope is seated, said cup-like member having a spider-like base with openings through which said contact prongs pass, and a metal disc lying against the inner face of said base and surrounded by said contact prongs.

8. The combination according to claim 7 in which said cup-like member is provided with a downwardly depending metal tubular key which supplements said cup-like member and said disc in shielding the prongs electrostatically from one another.

9. An electron discharge tube for high frequency use comprising a glass envelope formed of a bulb portion and a cup-like portion having a substantially flat base, a plurality of rigid metal contact prongs sealed directly into and through said base, and metal means lying against opposite faces of said base and having a central portion surrounded by said prongs to shield said prongs electrostatically, and a central metal plug-in member carried by the lower end of the tube and extending downwardly beyond the ends of said prongs to shield them electrostatically from each other throughout substantially their entire external length.

10. An electron discharge tube having an enclosing envelope comprising a bulb portion sealed at its lower end to a non-reentrant glass header, a plurality of lead-in members sealed through said header with portions extending inwardly of the envelope and portions extending outwardly of the envelope, said lead-in members terminating in external rigid contact prongs including a control grid and a plate prong, metal shielding means disposed interiorly of the envelope adjacent said header and located between certain of said lead-in members, and downwardly extending metal shielding means disposed exteriorly of the envelope and located between said control grid and plate prongs for shielding electrostatically substantially the entire external length portions of certain of said control grid and plate prongs from each other.

11. An electron tube for high frequency signalling systems comprising an electrode assembly, an enclosing envelope for said assembly consisting of a bulb portion sealed at its lower end in a vacuum-tight manner to a non-reentrant glass header flattened in a plane substantially transverse to the longitudinal axis of the tube and having an exhaust opening, an exhaust tubulation depending from said header in alignment with said opening, a plurality of lead-in members sealed through said header and disposed around said tubulation, an electrostatic shielding member electrically connected to one of said lead-in members and contacting the inner face of said header, said shielding member having an opening in registry with the exhaust opening in said header.

12. An electron tube for high frequency signalling systems comprising an electrode assembly, an enclosing envelope for said assembly consisting of a bulb sealed in a vacuum-tight manner at its lower end to a non-reentrant glass header, an exhaust tubulation downwardly depending from said header, a plurality of lead-in members sealed through said header around said tubulation, and electrostatic shielding means consisting of a metal member contacting with the inner face of said glass header and another metal member exteriorly surrounding said tubulation, both said metal members being electrically connected to one of said lead-in members.

13. An electron discharge device comprising an envelope, a plurality of electrodes in said envelope, and a plurality of contact pins connected to said electrodes and arranged in a circle at one end of said envelope, a perforated metal disc secured to and extending across said end of the envelope and electrically insulated from said pins by means of glass bosses fitted into said perforations and sealed to said pins, a metal plug-in member extending from the center of said metal disc for supporting said tube and electrostatically shielding said pins.

14. An electron discharge tube having an enclosing envelope comprising a glass bulb sealed at its lower end to a non-reentrant glass header, a plurality of rigid metal contact prongs including control grid and plate prongs sealed through said header, an electrode assembly within the bulb, an electrostatic shield member inside the bulb surrounding said assembly, an electrostatic shield member on the exterior of the bulb adjacent the lower end thereof and cooperating with the first-mentioned member to supplement the shielding of the tube, the said exterior shield member including a central metal plug-in member which extends downwardly between the control grid and plate prongs for shielding electrostatically substantially the entire external length of said plate and grid prongs from each other.

15. An electron discharge tube comprising an enclosing glass bulb having a non-reentrant glass header carrying contact prongs including grid and plate prongs sealed therethrough, an electrode assembly mounted within said bulb and connected to said prongs, a metal cup-shaped member within which the lower end of the bulb

is seated and having openings through which said prongs insulatingly pass, an electrostatic shield inside said bulb surrounding said assembly and cooperating with said cup-shaped member to shield electrostatically the electrode assembly and the inner ends of said prongs, and a central metal plug-in member which extends downwardly between the control grid and plate prongs for electrostatically shielding substantially the entire external length of the plate and grid prongs from each other.

16. A radio tube of the type having a cathode, an anode, a control grid, and at least one additional grid, a bulb enclosing said electrodes said bulb having attached to the lower end thereof a metal disc with a plurality of openings arranged in a closed path around the center thereof each opening having fitted therein a glass-beaded lead-in member terminating in a rigid contact prong, a central opening to receive a tipped-off exhaust tubulation, and a central metal plug-in member attached to said disc and extending downwardly between the plate and control grid prongs to shield the entire external length thereof.

17. An electron discharge device comprising an envelope, an electrode assembly within said envelope, a plurality of contact pins connected to said electrodes and arranged in a circle at one end of said envelope and including plate and control-grid pins, a metal disc secured to and extending across said end of the envelope and electrically insulated from said pins by means of glass bosses fitted into corresponding perforations in said disc and sealed to said pins, a metal plug-in stud located between the plate and grid pins and extending from the center of said metal disc for guiding said tube into a suitable socket and for electrostatically shielding said control-grid and plate pins.

18. A radio tube comprising an enclosing envelope closed off at its lower end by a substantially flattened header of insulating material, a base attached to the bottom of said tube comprising an outer cup-like metal member having a central opening to receive an exhaust tubulation depending from said header and a plurality of other openings surrounding said central opening to insulatingly receive rigid contact prongs, said prongs being directly and rigidly sealed in said header and insulatingly passing through said other openings in said cup-like metal member said prongs being insulated from the edges of the corresponding openings in said cup-like metal member by means of glass bosses fitted into said openings and sealed to said prongs, said metal member having electrically connected thereto and centrally thereof a downwardly depending metal plug-in member for electrostatically shielding certain of said prongs from each other.

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