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ELECTRON TUBE BASE AND SHIELD

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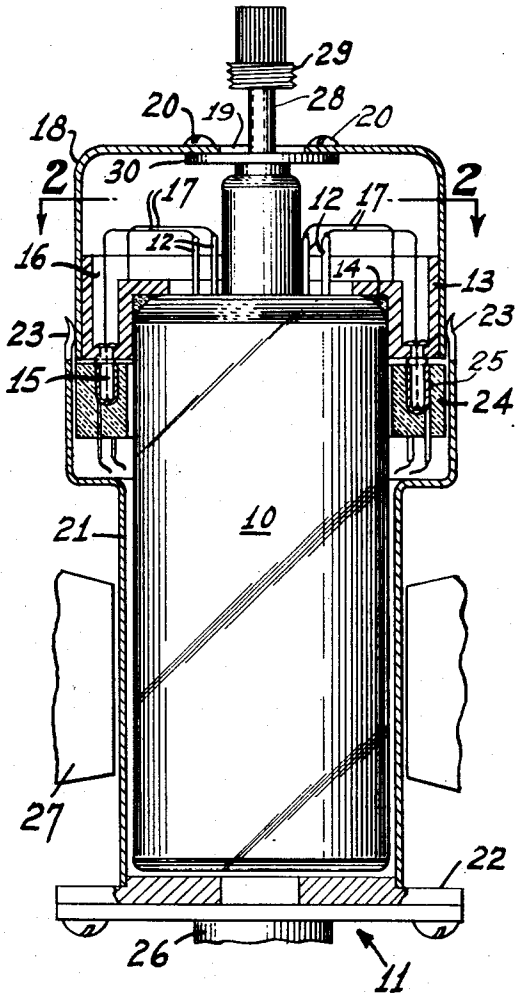


Fig-1

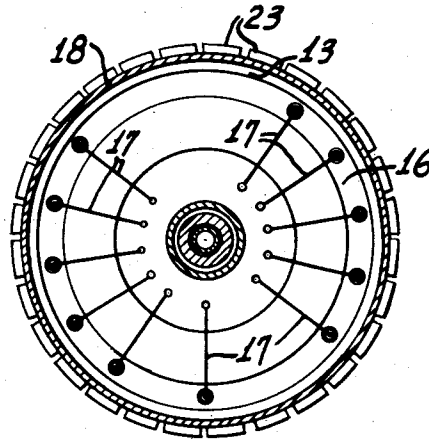


Fig-2

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2,802,190

ELECTRON TUBE BASE AND SHIELD

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8 Claims. (Cl. 339—145)

My present invention relates to a tube base and mounting, and more particularly to a base and tube mounting particularly useful for high frequency electron tubes.

A problem encountered with electron tubes is that of mounting the tube in operative relation with the equipment with which it is to operate. In the case of high frequency tubes the problem is complicated by the nature of the high frequency circuit elements as well as the physical characteristics thereof. The need for circuit separation so as to avoid undesired coupling, the prevention of stray high frequency radiations as well as other factors must be considered when mounting such devices for operation. At the same time it is necessary that as little as possible of the high frequency circuit be disturbed when mounting or dismounting the electron tube to minimize detuning of the circuit as well as the cost and time involved.

It is therefore a principal object of this invention to provide a base for a high frequency electron tube which facilitates mounting the tube for operation with a high frequency circuit.

Another object is the provision of a base and mounting for a high frequency electron tube by means of which the tube may be readily plugged into operating position in a high frequency circuit.

In accordance with my present invention I provide a base in which the pins are arranged in an annular array the diameter of which is somewhat larger than the outer diameter through the electron tube for which it is intended. The base pins extend from the base toward the opposite end of the electron tube than that to which the base is attached. The tube lead-in pins extend outwardly of the base end of the tube, as the end to which the base is attached may be termed, and each is connected to one of the base pins. The base pins are arranged around the tube intermediate the ends thereof, near the base end, and extend back along the tube toward the opposite end of the same. A socket to receive the base contact pins is mounted in the open end of a tubular housing or shield. When the tube is inserted into the tubular shield it is simultaneously plugged into the socket.

My invention as well as further objects thereof will be best understood by reference to the following description taken in connection with the accompanying drawing in which:

Figure 1 is a view partially in section of one type of tube with the mounting including the base and socket constructed in accordance with my invention; and

Figure 2 is a sectional view thereof along the line 2—2 of Figure 1.

One type of electron tube and circuit with which my tube base and mounting is particularly advantageous is a magnetron tube indicated generally at 10 and constructed for waveguide type output; a portion of the output waveguide being indicated at 11. While my invention will now be described in detail in connection with such a magnetron 10, it is to be understood that its usefulness is not limited solely to such electron tubes. In the co-

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pending application of Brown, Kovach and Seachrist, Serial No. 339,316, now Patent No. 2,768,326 filed simultaneously herewith and assigned to the assignee of my application, one such magnetron tube is described in detail and only such portions thereof as are necessary to a proper understanding of my present invention will be described herein. As pointed out in said copending application, the envelope of electron tube 10 has a plurality of lead-in pins 12 extending through a stem structure forming one end wall of the envelope at the base end of the tube. Lead in pins 12 serve as the current lead-ins for all of the electrodes and circuit elements inside of tube 10.

Tube 10 is provided with a tube base comprising a base member 13, which may be a cylindrical shell as shown and is formed with a bore having an annular shoulder to receive the base end of tube 10 to which it is attached by the usual well known basing cement. For use with tube 10, the central bore in base member 13 extends axially therethrough to receive tube lead-in pins 12 and is provided with shoulder 14 provided to engage against the base end of tube 10. Base member 13 is preferably molded from any of the readily molded phenolic compounds which are insulators.

Surrounding the opening or bore in base member 13 which receives the base end of tube 10 is an array of spaced contact pins 15. Contact pins 15 are of the usual tubular form connected to and extending from one end of base member 13 and opening toward the opposite end thereof. As shown in Figure 1, contact pins 15 extend back along tube 10 away from the base end thereof and toward the opposite or output end of tube 10. A channel 16 formed in base member 13 communicates with each of the tubular contact pins 15 and provides access to each of the contact pins from the opposite end of the base for a plurality of lead wires 17.

Each of the lead wires 17 at one end thereof is connected to one of the lead-in pins 12 of tube 10 while the other end thereof extends into and is connected to one of the tubular contact pins 15. It is apparent that while lead-in pins 12 extend outwardly of tube 10 in one direction, tubular contact pins extend outwardly of base member 13 in the opposite direction.

The tube base further includes a base shield 18 which is a metallic cup-shaped member having a central aperture 19 formed through the base thereof. Bolts 20 serve as a convenient means for rigidly connecting base shield 18 to a flange or plate 30 on tube 10 with base shield 18 surrounding all but the contact pin end of base member 13.

The tube 10 is mounted within and supported by a tubular metallic shield 21 closed at one end by waveguide mounting flange 22 in the present instance. At its opposite end, shield 21 has a plurality of resilient fingers 23 adapted to engage base shield 18 thereby partially supporting tube 10. The end of shield 21 adapted to receive and support tube 10 is enlarged to engirdle base member 13 and shield 18. Thus, that end portion of shield 21 is sufficiently large to receive socket 24 which is secured thereto. As shown, the inner diameter of socket 24 is larger than the outer diameter of tube 10. Socket 24 has an array of openings or contact recesses, one to receive each of the tubular contact pins 15. Socket 24 is also provided with a plurality of socket contacts 25 one in each of the contact recesses. As is well known, socket 24 is fabricated of any one of the usual insulating materials. Contacts 25 are mounted on socket 24 in spaced insulated relation. Since the socket 24 is secured to shield 21, the tube 10 is partially supported in the shield by the socket 24.

For the purpose of illustrating my invention, electron

tube 10 is shown as a magnetron operable at a high frequency. The envelope of tube 10 is permeable to radiant energy of the frequency at which tube 10 is operated; the output from tube 10 being supplied through the permeable envelope of tube 10 through the window formed in waveguide flange 22 into waveguide 11. When mounted for operation, tubular metallic shield 21 is disposed between the poles of magnet 27. Slidably mounted tuning plunger 28, which projects outside of tube 10 and through base member 13, extends outwardly of base shield 18 through aperture 19. The outer end of tuning plunger 28 is conveniently provided with a threaded bushing 29. A yoke (not shown) may be conveniently attached to either magnet 27 or tubular metallic shield 21. Such a yoke is provided with a threaded finger piece for engaging threaded bushing 29 and adjusting tuning plunger 28 axially.

As was described hereinabove, base shield 18 is bolted to tube 10. It should be further noted that shield 18 is preferably of good heat conducting and radiating material. Shield 18 is in good heat exchange contact with plate 30 which is in turn thermally connected to the various electrodes within tube 10. As pointed out hereinabove the internal structure of tube 10 is described in detail in the referred to copending application. It is believed to be sufficient to point out here that the various electrodes and parts which require cooling are connected to plate 30 by good thermal conductors. Thus shield 18 serves the additional function of a heat radiator.

It is apparent from the foregoing that electron tube 10 may be inserted into tubular metallic shield 21 through the end portion thereof in which socket 24 is secured. When thus inserted the electron tube 10 is simultaneously plugged into socket 24, thereby completing all of the direct current connections to the lead-in pins 12, and into the high frequency output socket formed by the shield 21 and the waveguide flange 22. Together base shield 18, tubular shield 21 and waveguide flange 22 serve to completely shield electron tube 10 and prevent the emanation of stray radiations therefrom. Lead wires connected to contacts 25 are conveniently brought out through one or more holes (not shown) formed in shield 21. As a further precaution against unwanted radiation the lead wires connected to contacts 25 may be decoupled. For this purpose, high frequency chokes, lossy dielectric material or the like may be used as is well known. Furthermore, it is believed apparent that electron tube 10 may be readily replaced in a rapid and efficient manner without requiring dismantling of any part of the output circuit.

While I have shown one form which my invention may take and described the same in detail in connection therewith, it is believed apparent that changes or modifications may be made therein without departing from the spirit of my present invention. It is, therefore, desired that all modifications within the scope of the appended claims be included within my invention.

What I claim is:

1. An electric device comprising an electron tube for operation at a given frequency and having an envelope with lead-ins extending through one end and outwardly therefrom, an insulating tubular member engirdling said end of said tube and attached thereto, a plurality of contacts mounted in said tubular member and arranged in spaced insulated relation about said envelope, said contacts extending outwardly of said tubular member in a direction toward the opposite end of said envelope, a plurality of conductive leads one connecting each of said lead-ins to one of said contacts, a shield impermeable to radiant energy of said frequency surrounding said tubular member and enclosing said leads and said lead-ins, a tubular shield impermeable to radiant energy of said frequency surrounding said envelope and at one end engaging said first mentioned shield, a socket disposed in said one end of said tubular shield and attached thereto,

and a plurality of contacts in said socket in spaced insulated relation one in good electrical contact with each of the contacts on said tubular member, whereby when said electron tube is inserted in said tubular shield it is simultaneously plugged into said socket and is supported thereby.

2. An electric device comprising an electron tube for operation at given frequencies and having a tubular envelope with lead-ins extending outwardly of one end of said envelope, an insulating tubular member engirdling a portion of said end of said envelope and attached thereto, a plurality of contact pins mounted in one end of said insulating tubular member in insulated spaced relation and extending about said envelope in a direction toward the opposite end of said envelope, a plurality of conductive leads extending into the opposite end of said insulating tubular member one being connected to one of said contact pins and to one of said lead-ins, a metallic cup-shaped shield surrounding said tubular insulating member and said conductive leads with the base thereof disposed adjacent said opposite end of said tubular insulating member and connected to said electron tube, a tubular metallic shield surrounding that portion of said envelope extending from said one end of said insulating tubular member, said tubular metallic shield adjacent one end thereof engaging the outer surface of said cup-shaped shield, a socket disposed in said one end of said tubular metallic shield and attached thereto and engirdling said envelope, said socket having a plurality of openings formed therein one for receiving each of said contact pins, and a plurality of contacts one at each of said openings and in good electrical contact with each of said contact pins, whereby said tube when inserted into said tubular metallic shield through said one end thereof is simultaneously plugged into said socket and is supported thereby.

3. An electric device as defined in claim 2 wherein said tubular metallic shield has a plurality of resilient fingers formed at said one end portion thereof, and said fingers resiliently engage said cup-shaped shield.

4. An electron tube including: an envelope having an array of lead-ins extending outwardly from one end wall thereof; and a base attached to said envelope; said base comprising an apertured member of insulating material having one side disposed adjacent to said end wall with said lead-ins extending through an aperture in said member, a plurality of contact pins mounted in said member in spaced relation and insulated one from the other, said contact pins extending outwardly from said member in a direction toward the opposite end of said envelope, conductive means connecting each of said contact pins to one of said lead-ins, and a conductive shield attached to said member and enclosing said lead-ins and said conductive means.

5. An electron tube for operation at a given frequency and including a tubular envelope with lead-ins extending axially outwardly through one end thereof; and a base attached to said envelope; said base comprising a member of insulating material having a cup-shaped recess formed in one side thereof to receive said end of said envelope, said recess having a central aperture of reduced diameter open to the opposite side of said member, said end of said envelope being seated in said recess with said lead-ins extending through said aperture, a plurality of contact pins mounted in said member and extending through said member and outwardly therefrom in a direction toward the opposite end of said envelope, conductive leads connecting each of said lead-ins to one of said contact pins, and a shield impermeable to radiations of said frequency surrounding and attached to said base member and enclosing said leads and said lead-ins.

6. A base for an electron tube having an envelope with lead-ins extending through one end and outwardly thereof, comprising an insulating member having cup-shaped recess formed in one side thereof adapted to receive said end of

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the envelope of said tube and a central aperture there-through to receive said lead-ins, a plurality of contacts mounted in said member about said recess in spaced insulated relation and adapted to be connected within said base to said lead-ins, said contacts extending through said member and outwardly away from and perpendicular to the surface of said one side of said member, and a conductive shield surrounding and attached to said member, enclosing said opposite side and adapted to enclose said lead-ins of said electron tube.

7. An electric device comprising: an electron tube having an envelope containing a plurality of electrodes, and a separate base attached to said envelope adjacent to one end thereof and including a non-conducting member, a plurality of contact pins mounted in said member and connected through said envelope to said electrodes, said contact pins extending from said base along said envelope and toward the opposite end thereof, and a cup-shaped conductive shield attached to and surrounding said member; in combination with a second conductive shield surrounding said tube envelope, and a socket disposed entirely within said shield and attached thereto, a plurality of contacts in said socket, one in good electrical contact with each of said contacts in said base, whereby said elec-

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tron tube is adapted to be simultaneously inserted in said second shield and socket and supported thereby, said two shields being joined together for completely shielding said tube and base.

8. An electric device as defined in claim 7, wherein the opposite end of said envelope is permeable to radiant energy of the frequency at which said tube is adapted to operate, and said second shield is cup-shaped with the base thereof disposed adjacent to said opposite end of said envelope and formed with a window for transmitting said radiant energy therethrough.

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