Oct. 15, 1929. H. L. STRONGSON 1,731,797

SHIELDED TUBE

Filed Jan. 18, 1927

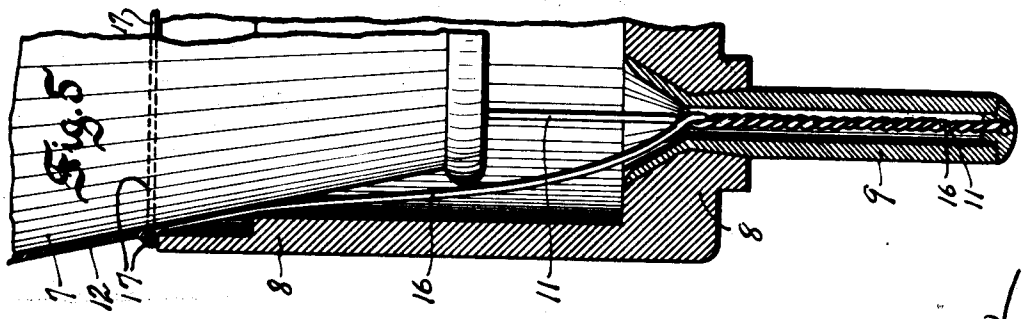


Fig. 5

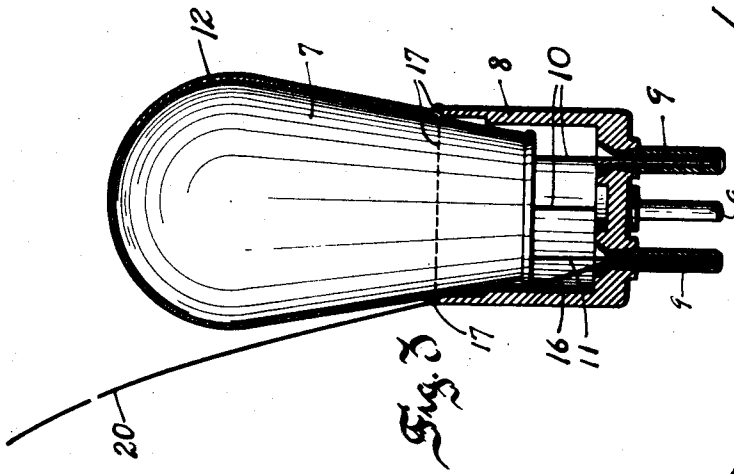


Fig. 3

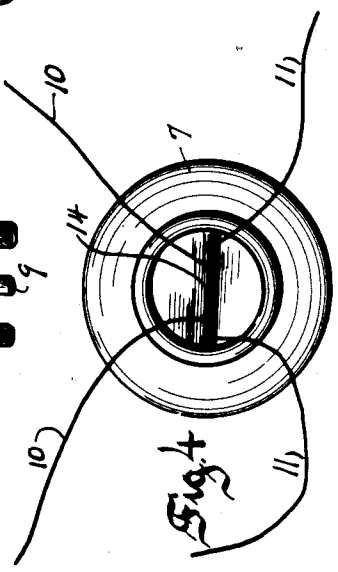


Fig. 4

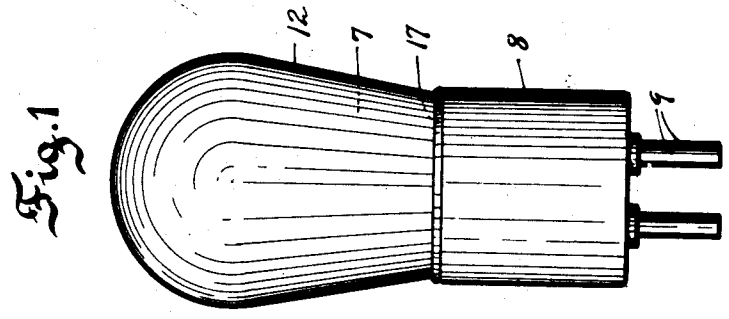


Fig. 1

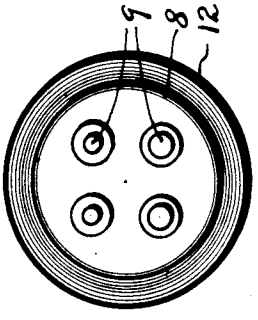


Fig. 2

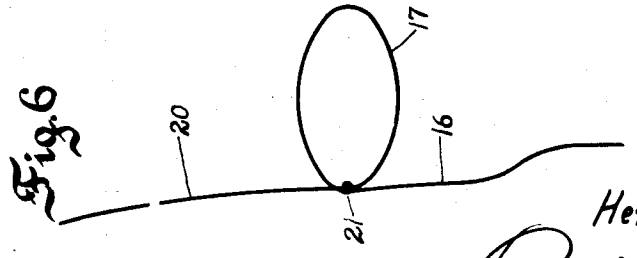


Fig. 6

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UNITED STATES PATENT OFFICE

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SHIELDED TUBE

Application filed January 18, 1927. Serial No. 161,744.

This invention relates to improvements in vacuum tubes and more particularly to a shielded vacuum tube for radio reception and other similar uses.

An object of the invention is to shield electric, radio, wireless and receiving apparatus and more particularly to shield vacuum tubes from stray radio electromagnetic currents, signals or interference and to improve the general operating characteristics of the tube by confining the operation of the tube to radio signals intended therefor; and this is accomplished by improved shielding means which envelops the vacuum tube or its elements together with a novel ground wire construction leading from the shielding means to carry away the stray radio signals through one or more of the tube contacts.

Electron discharge tubes improved as herein described are not affected by stray radio and audio impulses or high frequency currents which are not in resonance with the receiving or transmitting instrument because the shield prevents transmission of such currents through the wall of the tube by intercepting and transmitting them to the ground.

The accompanying drawing illustrates an example of the invention serving to disclose its principle, wherein:

Figure 1 shows a side elevation of one type of vacuum tube shielded in accordance with my invention; Figure 2 shows a bottom plan view thereof.

Figure 3 shows a vacuum tube, the base of which is in longitudinal section thereby disclosing the concealed novel ground wire construction, and the shield of which is also in section, while the bulb is in elevation, together with a terminal suspension wire attached to the ground wire by which the shield plating process is carried out.

Figure 4 is a bottom plan view of the vacuum tube with the tube base removed showing the usual element wires leading from the stalk or sealed end of the bulb as in the usual vacuum tube construction.

Figure 5 shows a fragmentary enlarged view, the tube bulb being in elevation, the tube shield in section, and the tube base in longitudinal section to disclose the general construction.

Figure 6 is a view of the ground wire including bulb loop and suspension terminal all in one piece of wire as it would appear if removed from the tube.

The tube comprises the usual evacuated glass bulb 7 mounted in a tube base 8 of any of the well known forms and carrying contact prongs 9 in the usual way or other suitable contacts. Element wires 10 are led from the glass bulb 7 through the sealing stalk or end 14 thereof and these wires are connected to the contacts 9 in any suitable manner. The element wires 10 for example run from the grid and plate of the tube while the wires 11 may be the filament terminals.

According to this invention, I improve a tube of the kind referred to or similar tubes by applying a metallic shield coating 12 of the kind shown or other shielding means to the glass bulb to intercept and collect stray radio signals or interfering current and transmit the same away from the delicate tube and its sensitive elements inside the bulb.

A ground wire 16 has its upper end electrically connected to the metallic shield 12. This connection may to advantage be effected by coiling at 17 the upper end of the ground wire 16 around the glass bulb 7 to form a positive and durable loop connection around the glass bulb between the thin coating 12 and concealed ground wire 16. The loop or coil 17 is secured around the glass bulb 7 and thereafter the bulb is plated as for example by an electroplating process to deposit the metallic coating or shield 12 on the glass bulb 7 by causing the plating material 12 to unite and build up from the ground wire coil 17 around the glass bulb.

The ground wire loop or coil 17 is placed adjacent the upper edge of the tube base 8 so as to cause the copper or other plating metal 12 to deposit itself around the loop 17 in the corner defined by the surface of the bulb 7 and upper rim of the tube base 8, and this arrangement causes the loop 17 to be embedded and united with the shield 12.

The lower end of the ground wire 16 is suitably attached either to one of the wires

leading from the tube base or to a contact 9. For example the ground wire 16 may be soldered or connected to the filament wire 11. Thus the shield 12 is electrically connected to one of the element wires 10 or 11 leading from the tube base and more particularly connected with one of the tube contacts. In the example of the invention shown, the ground wire 16 leads down through the tube base and is twisted onto the lower end of the filament wire 11 and is led through the hollow contact pin 9 and soldered at the lower end thereof in the usual way. Thus the shield 12 is grounded to one of the contacts carried in the base of the radio or vacuum tube.

One of the advantages of the invention is to lead the ground wire 16 through the tubular base 8 thus protecting the delicate ground wire as well as its point of connection to the outside loop 17 united with the shield 12 and protecting the lower end thereof where it connects with one of the tube contacts 9. When the glass bulb 7 is cemented or anchored into the tube base 8, there is left sufficient inside room between the bulb and tube base in which to lead the ground wire 16 from the shielded glass bulb down to one of the contacts 9.

In the process of manufacturing the tubes, I may prefer to leave a long wire end 20 attached to the ground wire 16 or coil 17 so as to suspend the vacuum tube in the electroplating bath by which the plating process is carried out. The long wire end 20 is connected with one of the terminals of a source of electric current and thereby conveys current into the electroplating bath to carry out the plating process. In this way the metallic coating is caused to grow upon the bulb 7 starting from the wire loop 17, and extending over the bulb in a uniform manner thereby covering the glass bulb with a metal envelope or shield of uniform thickness. Furthermore, the plating is rapidly carried out because of the fact that it starts simultaneously all around the base and grows upwardly over the bulb.

Figure 6 is merely a diagram of the novel ground wire construction as it would appear if bodily removed from the tube. The bulb loop 17, the terminal 20, and ground wire end 16 are all in one piece for the sake of simplicity in construction. The wire may be twisted at 21 to better form the loop and hold its shape until the plating 12 develops and embeds the wire whereupon the end 20 is cut off near or at 21 thus leaving the loop 17 and ground wire end 16 intact.

After the plating process is completed and the ground wire coil 17 is fully covered and embedded in the copper deposit 12, the terminal suspension wire 20 is then cut off close to the bulb adjacent the upper rim of the tube base 8 and thus the tube is completed as shown in Figures 1 and 2. The delicate tubes are handled by the terminal suspension wire 20 in the process of plating the tubes and the work is thereby expedited and it is not necessary to touch the bulbs with the hand.

This invention fills a need felt for a positive shielding vacuum tube for radio receiving sets and other like uses and its shielding means is simple and does not add materially to the weight or bulk of the tube and improves the characteristics of the tube. It is rugged in construction since the ground wire is totally concealed and is itself shielded in the tube construction and is protected from breakage. The shield enveloping the glass bulb also adds strength to the tube construction.

What I claim is:

1. A vacuum tube including a bulb, a base and contacts therefor, a ground wire loop around the bulb and leading down through the base and connected with a contact, and a metallic coating over the loop and bulb.

2. A vacuum tube including a bulb, a cylindrical base carrying the bulb, and contacts in the bulb, a wire loop disposed around the bulb proximate the base, and a wire leading from the loop through the base to a contact, and a metallic coating extending from the base and loop over the bulb.

3. A vacuum tube including a bulb, a base and contacts therefor, a ground wire loop around the bulb and leading down through the base and connected with a contact, a suspension and terminal wire connected with the loop by which the tube is handled, and a metallic coating over the loop and bulb.

4. That improvement in a method of manufacturing and plating a tube which consists in suspending it in a plating bath by a terminal suspension wire which is looped around the bulb, and causing the plating material to build up on the bulb from the wire, cutting the terminal suspension wire off at the bulb after the loop is embedded in the plating material, and extending a part of the loop through the base of the tube to one of its contacts.

5. A vacuum tube comprising, a bulb including element wires leading therefrom, a base in which the bulb is mounted, contacts in the base to which the element wires are connected, a ground wire loop around the bulb and connected with an element wire through the base and a metallic coating over the loop and bulb.

In testimony whereof I affix my signature.

HERMAN L. STRONGSON.