June 2, 1931. C. E. HUFFMAN 1,807,844

ADAPTER

Filed June 25, 1927

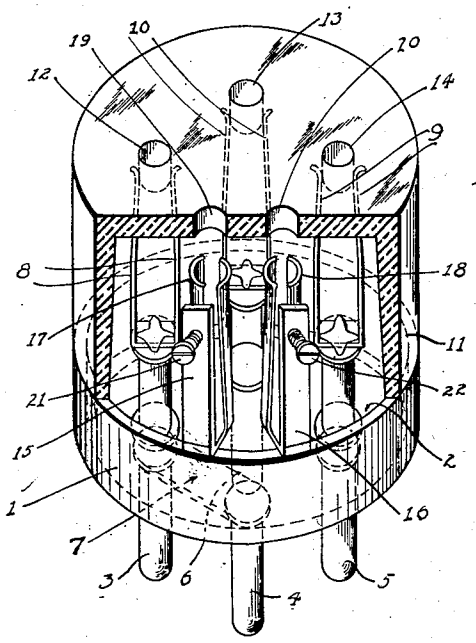


Fig. 1.

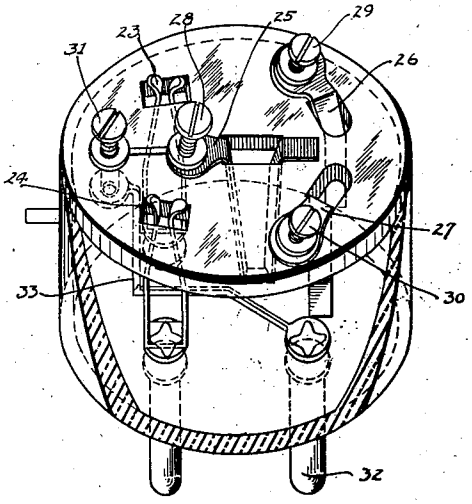


Fig. 2.

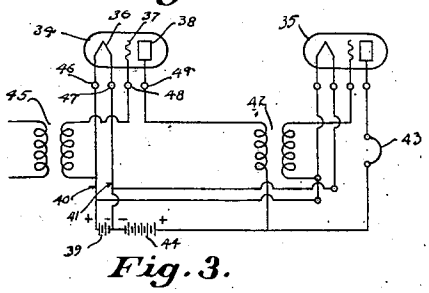


Fig. 3.

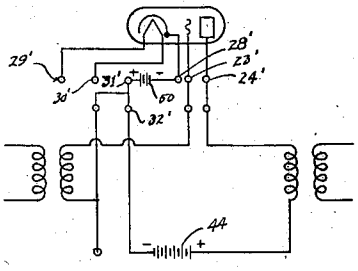


Fig. 5.

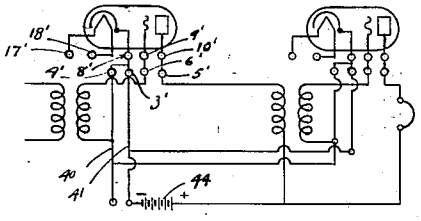


Fig. 4

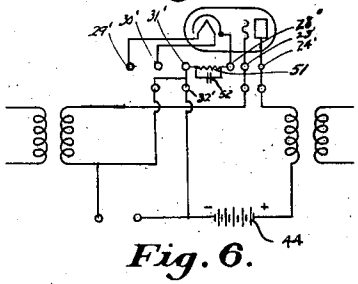


Fig. 6.

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UNITED STATES PATENT OFFICE

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ADAPTER

Application filed June 25, 1927. Serial No. 201,292.

This invention relates to an adapter for enabling radio tubes and similar electric devices having a specific arrangement of electric terminals to be employed in sockets or receptacles designed for the reception of electric devices having a different arrangement of electric terminals.

Heretofore in the construction of radio receiving apparatus, it has been the usual practice to employ for the detection and amplification of the radio signals, a three electrode electron discharge device having a filamentary cathode, grid and anode. In such apparatus, the cathode is heated to an electron emitting temperature by the passage of direct current therethrough by means of suitable batteries and the grid and anode returns are connected to one terminal of the filamentary cathode so that only four terminals are required for the tube and consequently, only four contacts are provided in the socket or receptacle in which such tubes are removably received.

The present tendencies in the design of radio receiving apparatus are to eliminate the use of batteries for supplying the operating current and in place thereof, to employ the usual house lighting current. It is desirable, therefore, in many instances, to heat the cathode by means of low voltage alternating current stepped down from the house supply by suitable transformers and radio receiving tubes have been designed to be so employed.

Briefly, such tubes consist of an indirectly heated cathode, that is, a cathode heated by radiation or conduction from a hot filament electrically insulated therefrom and supplied with alternating heating current. The cathode requires a separate terminal and consequently such a tube employs five external contacts as distinguished from the four heretofore employed.

One of the objects of the present invention is to enable a device of this nature, having more than four external terminals, to be employed in a receiving apparatus designed for the use of radio tubes having the usual four terminals without requiring the re-wiring of such sets or replacement of the sockets.

Another object is to provide an adapter which will enable a tube having the cathode heated by alternating current to be substituted in radio receiving apparatus designed for the use of tubes, the cathodes of which are heated by direct current.

Another object is to provide an adapter of the above nature which is simple in construction and economical to manufacture.

A further object is to provide an adapter which will enable a biasing potential to be applied to the grid of the tube with which it is associated.

In accordance with my invention, I provide an adapter constructed so as to be received in the ordinary four contact socket and having means for the reception of a five prong base in such manner that the grid, plate and cathode terminals of the five prong tube are connected directly through the adapter to the corresponding pins of the adapter and thence to their respective contacts in the socket. Since the filament in the usual three electrode tube having a directly heated cathode serves as the cathode, it is one or both of the filament contacts of the socket to which the grid and plate returns are connected. The adapter is so constructed, therefore, that the particular contact pin of the five prong tube to which the indirectly heated cathode is connected, is joined to one or both of the filament contacts of the socket, thus providing a return to the cathode of both the grid and plate currents. Separate terminals are provided on the adapter for the contacts engaged by the pins of the tube to which the heater element for the indirectly heated cathode is connected.

In employing a tube having an indirectly heated cathode, it is only necessary to insert the adapter in the usual socket and connect the alternating heating source to the appropriate terminals on the adapter. The five prong tube may then be directly inserted in the adapter and the set operated in the same manner as when employing the directly heated cathode type of tube.

In order that the invention may be more fully understood, reference will be had to the accompanying drawings in which:

Fig. 1 is a perspective view, partly in section, of an adapter constructed in accordance with my invention;

Fig. 2 is a perspective view of a modified form of adapter;

Fig. 3 is a circuit diagram showing a manner in which the ordinary direct heated cathode tube is employed;

Fig. 4 is a similar circuit showing the manner of employing an indirectly heated cathode type of tube by means of the adapter shown in Fig. 1;

Fig. 5 is a circuit diagram showing a manner of employing an indirectly heated cathode type of tube with the adapter shown in Fig. 2; and,

Fig. 6 is a circuit diagram similar to Fig. 5, but employing a modified form of grid biasing.

The adapter shown in Fig. 1 comprises an insulating base member 1 of cylindrical form, having a closed insulating bottom portion 2 in which the four contact pins 3, 4, 5 and 6 are secured. The terminal pins 3 and 4 are joined together electrically by a metal link 7 and are adapted to contact with the cathode terminals of the usual form of radio tube socket (not shown). The terminal pins 5 and 6 are arranged so as to contact with the anode terminal and grid terminal respectively of the socket. Spring contact members 8, 9 and 10 are secured to and project vertically above the pins 3, 5 and 6 of the adapter and are designed for the reception of the terminal pins of the five prong tube, namely the cathode, plate and grid terminal respectively. A cap 11 of insulating material encloses the contacts and is apertured as at 12, 13 and 14 to permit insertion of the terminals of the base in their respective adapter contacts.

The cap 11 is shown in section at the forward portion to more clearly show the interior construction. Moulded in or otherwise secured to that portion of the cap and flush with the exterior cylindrical surface thereof, which is cut away in the view, are two terminals 15 and 16 provided respectively with spring contact members 17 and 18 adapted for the reception of the terminal pins of the base which supply current for the heater element of the cathode of the device. The cap is apertured at 19 and 20 to provide access to these contacts. Screws 21 and 22 are provided in the terminal strips 15 and 16 to facilitate securing current conductors thereto.

Fig. 2 shows a modified form of adapter designed particularly for a five prong tube, having one of the prongs or terminal pins arranged centrally thereof. In this form of adapter the grid and plate pins of the tube are recived by the spring contacts 23 and 24, joined to two of the pins of the adapter. The cathode pin of the tube is received by the contact 25 and the two heater pins are received by the contacts 26 and 27, each of these contacts being provided with terminal screws 28, 29 and 30 respectively. A fourth terminal screw 31 is joined to the cathode pin 32 of the adapter through a link 33.

The manner of employing the adapters shown in Figures 1 and 2 is described with reference to the circuit diagrams shown in Figures 3 to 6. Fig. 3 shows a typical circuit arrangement for radio receiving apparatus employing the usual directly heated cathode tube and comprises two tubes 34 and 35 each having a directly heated cathode 36, grid 37 and anode 38. The cathode of each tube is heated by battery 39 through current conductors 40 and 41 and the plate circuit is completed through the primary of transformer 42 or the telephone receiver 43, usual B-battery 44 and one of the filament heating conductors 41. The grid circuit is completed through the secondary of the transformers 45 and 42, and the filament heating conductor 40 to the cathode 36. The terminal pins of the tubes 34 and 35 are represented by the small circles 46, 47, 48 and 49.

In Fig. 4 the same circuit is shown with the substitution therein of an indirectly heated cathode tube. In this figure the filament heating battery 39 is omitted, the heater element of the tube being supplied with alternating current as from the usual house lighting circuit. In this view the four prongs of the adapter are designated as 3′, 4′, 5′ and 6′ to correspond with the reference numerals of Fig. 1, and are received in the usual socket in the same manner as the prongs 46 to 49 of the directly heated cathode tube. The five terminals of the indirectly heated cathode tube are designated by reference numerals 17′, 18′, 8′, 9′ and 10′. The terminals 17′ and 18′ are joined to any convenient source of alternating heating current of suitable potential. The cathode terminal 8′ is joined by link 7 (Fig. 1) to both of the conducting leads 40 and 41 thus completing the grid and plate returns and the grid and plate terminals 9′ and 10′ are directly connected to the respective contacts in the socket through the prongs 5′ and 6′ of the adapter.

It will be noted that by means of the adapter, that it is possible to employ in existing radio receiving sets, a tube capable of having the cathode heated by alternating current, as a substitute for the usual direct current heated cathode tube without any change in wiring except to join the alternating current leads to the appropriate contacts in the adapter.

In Figs. 5 and 6 there is shown an arrangement employing the adapter shown in Fig. 2. This diagram is restricted to a single stage but is otherwise similar to Fig. 4. It has provision, however, for the insertion of grid biasing means. This is shown as a C-battery 50 in Fig. 5 and as a resistance 51 in Fig. 6. A condenser 52 of proper capacity is pro-

vided to by-pass the alternating radio or audio frequency current around the resistance and prevent oscillations from being set up. Referring to Fig. 2, the grid biasing means may be inserted between the terminal screws 31 and 28.

While I have described but two specific forms in which the adapter may be made, it is to be understood of course, that many modifications may be made therein and I do not desire to be limited to the exact details shown and described.

What is claimed is:

An adapter for enabling a radio tube having an anode, a grid and a cathode designed to be heated by alternating current to be employed in radio receiving apparatus designed for the use of a tube having the cathode heated by direct current, comprising a body composed at least in part of insulating material, terminal prongs on said body, contact members in said body secured to two of said terminal prongs for engagement with the anode and grid prongs of the tube, two other contact members in said body having terminal connections independent of said prongs of the adapter for supplying heating current to said cathode and a fifth contact member for engagement with the cathode prong of the tube adapted to be joined to other of the terminal prongs of the adapter through an external circuit.

In testimony whereof, I have hereunto subscribed my name this 23rd day of June, 1927.

CHARLES E. HUFFMAN.