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2,203,277

THERMIONIC TUBE CIRCUIT

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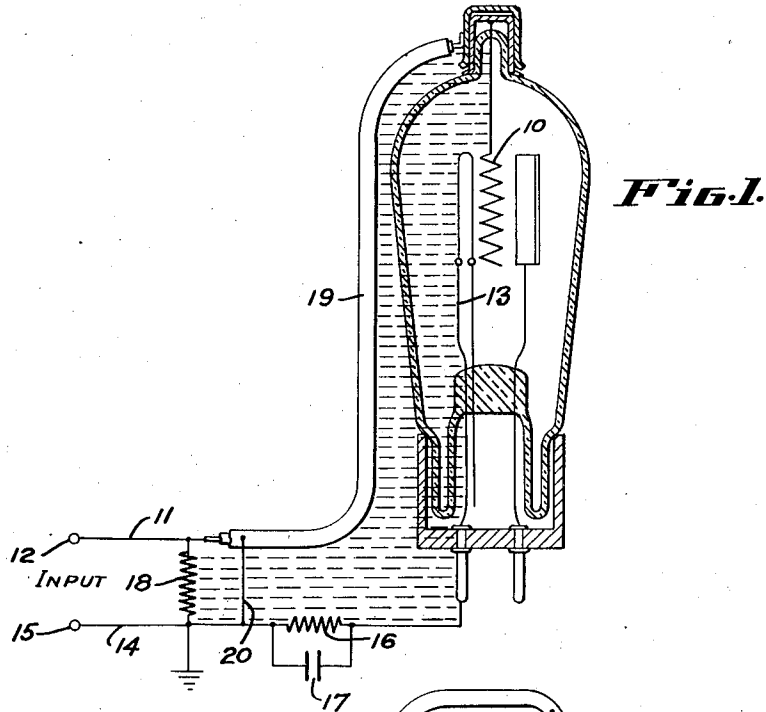


Fig. 1.

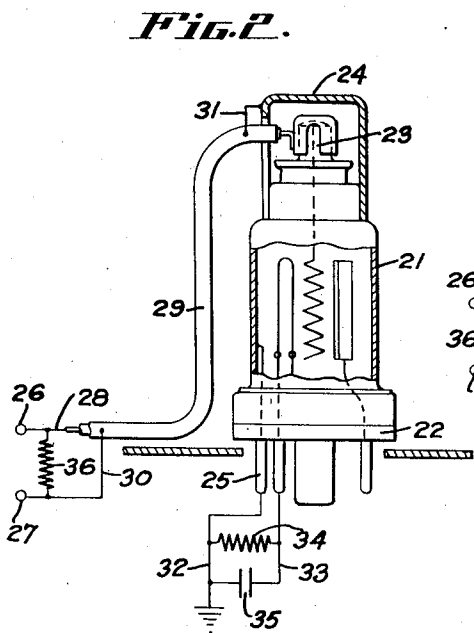


Fig. 2.

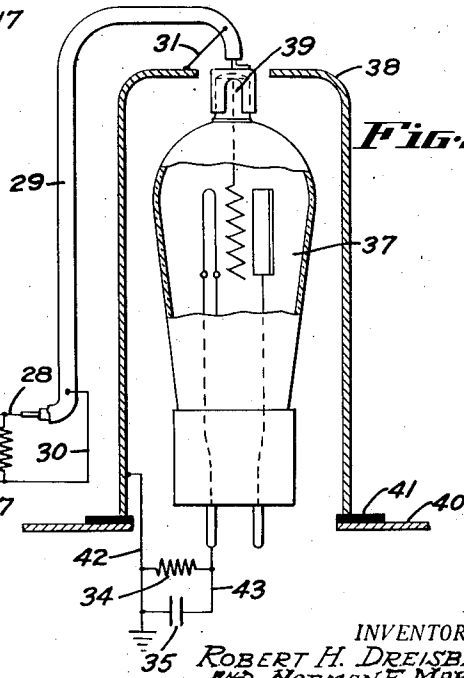


Fig. 3.

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THERMIONIC TUBE CIRCUIT

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2 Claims. (Cl. 250-27)

The present invention relates to an improved input circuit for thermionic tubes, such as are used in radio circuits and amplifiers, and is particularly applicable to amplifiers of the so-called high gain type.

An object of the invention is to provide a practical, efficient and inexpensive shielding means for the input circuit of a thermionic tube amplifier.

Another object of the invention is to provide a new and improved arrangement for the input circuit of a thermionic tube of the type having a control grid in which the circuits are so arranged that they are non-inductive with respect to extraneous magnetic fields which may exist thereabout.

Another object of the invention is to provide a new and novel form of non-inductive input circuit for a thermionic tube of the metal incased type, in which the grid terminal is located at the upper end thereof.

A further object of the invention is to provide a new and novel method and arrangement for connecting the input terminals of a thermionic tube circuit with the input terminals of the tube to eliminate the possibility of an inductive loop in this part of the circuit.

A serious limitation found in amplifiers of the thermionic tube type, and particularly in those of the so-called high gain type, is the hum appearing in the output of the amplifier when it is operated from an alternating current power supply, or operated in an alternating or pulsating magnetic field. This hum is generally due to the fact that the connections of the grid to cathode circuit of the input tube of the amplifier form an inductive loop which picks up induced extraneous currents that progress through the amplifier and are superimposed upon the output thereof. It is therefore a particular object of the present invention to provide an improved circuit which will effectively shield the input circuit of a thermionic amplifier in such a manner that these extraneous currents will not be picked up thereby and be superimposed upon the amplified output of the amplifier.

For a better understanding of the invention reference should be had to the accompanying drawing, wherein there is illustrated a thermionic tube circuit constructed in accordance with the present prior art practice, and wherein there is also shown by way of illustration and not of limitation, several improved arrangements constructed in accordance with the object and spirit of the present invention.

In the drawing;

Figure 1 is a diagrammatic view partially in section showing the input circuit of a thermionic tube connected and arranged in accordance with the present prior art practice,

Figure 2 is a diagrammatic view partly in section showing the invention applied to a thermionic tube of the metal incased type, and

Figure 3 is a diagrammatic view partly in section illustrating a form and arrangement of the invention applied to a thermionic tube of the non-metallic type having its grid terminal at the top thereof.

In Figure 1 of the drawing there is shown, for the purpose of facilitating an understanding of the present invention, the input circuit of a thermionic tube of the three electrode type, arranged and shielded in accordance with the present day accepted practice. In this arrangement the grid 10 of the thermionic tube is connected through a conductor 11 with an input terminal 12, and the circuit of the cathode 13 of the thermionic tube is connected through a conductor 14 to a cathode and ground input terminal 15. In the conductor 14 of the cathode circuit there is the usual cathode resistor 16 and cathode bypass condenser 17. Connected between the input terminals 12 and 15 there is also a grid return resistor 18, in accordance with the standard practice. At the present time, in a circuit of this character, it is customary to provide a grounded electrostatic shield 19 about the grid circuit conductor 11. As shown, this shield 19 is grounded through a connection 20 to the ground input terminal 15. In such a circuit, even with the shielding 19, it will be readily seen that with the ionized path between the grid 10 and the cathode 13 of the tube, these connections complete an electrical loop or circuit which will include the zone indicated by the horizontally shaded area shown in this figure of the drawing, and consequently, if this loop or circuit is disposed in an alternating magnetic field, it will have induced therein extraneous currents depending upon the frequency and character of said magnetic field. This condition is particularly objectionable in high gain amplifiers operated from an alternating current power supply when used in sound reproduction service, as the inductive loop in the input circuit of the amplifier will pick up extraneous currents and produce a characteristic hum in the output of the amplifier.

In the remaining figures of the drawing there is shown, for the purpose of illustration, a number of arrangements that have been devised in

accordance with the present invention to eliminate the above referred to condition in the input circuit of a thermionic tube.

In Figure 2 of the drawing the invention is illustrated as applied to a thermionic tube of the so-called metallic type, in which the electrodes of the tube are incased in a metallic envelop, designated by the numeral 21. The metallic envelop 21 has an insulating base 22 at its lower end, and at its upper end it carries an insulated grid support and terminal 23 over which a cap 24 is usually disposed. Extending through the base 22 of the tube there is also provided a grounding terminal 25 for grounding the metallic envelop 21. In addition to the thermionic tube, as above described, this figure of the drawing also shows input terminals 26 and 27, to which the input of the tube 21 is adapted to be connected. The grid input terminal 26 is connected to the grid contact 23 by means of a conductor 28 around which there is disposed a shielding means 29, as is customary in present day practice. At this point the present invention departs from standard practice in a novel manner, in that the shielding means 29 and the metallic envelop 21 of the thermionic tube are utilized as a conductor concentric with the grid to cathode circuit of the tube. As shown, this result is obtained by providing a connection 30 between the input terminal 27 and the adjacent end of the shielding means 29 and a further connection 31 between the shielding means 29 and the cap 24 or the upper end of the metallic envelop 21 from which the ground connection for the terminal 27 is completed through the grounding contact 25 of the tube and the connection 32.

With this improved arrangement it will be seen that the input circuit of the thermionic tube will be in the form of concentrically arranged conductors from the input terminals 26 and 27 to the ground connection, and as a result, the input circuit of the tube will be effectively shielded and non-inductive. In the event that the metallic envelop 21 is not provided with a grid terminal cap 24, as shown, the connection 31 will be made directly to the upper end of the metallic envelop 21 of the thermionic tube. To complete the above described input circuit, the cathode of the thermionic tube is connected to ground by means of a circuit 33, which is shown as including a self-biasing cathode resistor 34 and a cathode by-pass condenser 35. Disposed and connected between the input terminals 26 and 27, there is also shown a grid return resistor 36.

In Figure 3 of the drawing, the present invention is shown as applied to a thermionic tube of the non-metallic type, in which the grid terminal of the tube is located at the upper end thereof. In this arrangement the thermionic tube, designated by the numeral 37, is provided with a concentrically disposed metallic shield 38 that extends from a grid terminal 39 concentrically downward about the tube 37 to the chassis or other support 40, from which it is insulated by insulation 41. With this arrangement the lower end of the metallic shield 38 is connected through a conductor 42 to ground, and the cathode circuit of the tube is completed through a circuit 43 which includes the cathode resistor 34 and the cathode condenser 35. As in the previously described arrangement, the input

terminal 26 is connected through a conductor 28 with the grid terminal 39 of the tube, and the circuit of the input terminal 27 is completed through the shielding means 29 to the metallic shield 38 by means of the connections 30 and 31. With this arrangement it will be seen that the connection between the input terminal 27 and ground will be completed through a conducting path which is concentric to the grid circuit throughout its entire length, and as a result, the input circuit of the tube 37, when so arranged, will be effectively shielded and non-inductive.

With each of the above disclosed arrangements it will be seen that because of the concentric arrangement of the terminal conductors the input circuit of the thermionic tube will be non-inductive, and consequently, the objectionable hum, due to stray magnetic fields, will be entirely eliminated.

While we have, for the sake of clearness and in order to disclose the invention so that the same can be readily understood, described and illustrated specific devices and arrangements, we desire to have it understood that this invention is not limited to the specific means disclosed, but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that this invention is new and it is desired to claim it so that all such changes as come within the scope of the appended claims are to be considered as part of this invention.

Having thus described our invention, what we claim and desire to secure by Letters Patent is—

1. In an improved input circuit for thermionic tube amplifiers employing metal tubes, the combination of grid and ground input terminals, a thermionic tube of the metal incased type having a grid terminal at the upper end thereof and a ground connection at the base thereof, a connection between the grid input terminal and the grid of said tube, a concentrically arranged metallic shield substantially covering said connection for its entire length, and a circuit-forming connection between the ground input terminal of the circuit extending through the concentrically arranged shield about the grid input connection and the walls of the thermionic tube to the grounding connection at the base of said tube.

2. In an improved input connection for thermionic tube circuits employing metal tubes, the combination of grid and ground input terminals, a thermionic tube of the metal incased type having a grid terminal at the upper end thereof and a grounding connection at the base thereof, a connection between the grid input terminal and the grid terminal of said tube, a concentrically arranged metallic shield substantially covering said connection for its entire length and directly connected electrically to the wall of said tube, and a circuit-forming connection between the ground input terminal and the adjacent end of said concentric shield, whereby the grounding connection of the ground input terminal will be completed through said concentrically arranged shield and the walls of the thermionic tube to the ground at the base of said tube.

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CERTIFICATE OF CORRECTION.

Patent No. 2,203,277.

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It is hereby certified that the above numbered patent was erroneously issued to "The Magnavox Company Incorporated, of Fort Wayne, Indiana, a corporation of Illinois" whereas said patent should have been issued to --The Magnavox Company, Incorporated, of Fort Wayne, Indiana, a corporation of Indiana, as assignee by mesne assignments--; as shown by the record of assignments in this office, and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of July, A. D. 1940.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)