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(54)	RADIO RECEPTION AND AMPLIFICATION	(57)	Abstract:				
(54)	RECEPTION ET AMPLIFICATION DE RADIO						

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My invention relates to radio reception and amplification systems and pertains particularly to those systems which utilize thermionic tubes in which the cathode is heated by an alternating current and which are commonly called alternating current tubes.

The principal objects of my invention consist in producing a radio receiver and amplifier in which alternating current tubes may be used efficiently, in which the possibility of interference with reception due to the use of such tubes is reduced to a minimum, and a system of extreme simplicity with respect to the control requirements.

Thermionic tubes of the type in which an alternating current of commercial light and power frequency is used to heat a member which in turn heats the cathode member to cause an electronic emission therefrom are beginning to be placed on the market, but so far their use in a radio receiver and amplifier has not met with success. This is due to the fact that it has been difficult to minimize and almost impossible to eliminate an audible, disagreeable interfering hum or disturbance caused by the introduction of the alternating current into the system. Many different methods have been tried to overcome this defect, including a system of electromagnetically and electrostatically shielding the alternating current leads from the balance of the circuit and apparatus. All of the methods so far tried have met with no great measure of success.

I attain complete elimination of the disturbance with my invention by electromagnetically and electrostatically shielding the audio transformers from the tubes and from the leads supplying the alternating current to the filaments of the tubes and further so shielding

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all of those portions of the circuit carrying audio currents and which are at a higher potential than the filaments of the tubes. An exhaustive series of experiments has proven that by this novel method all trace of hum or disturbance at the frequency of the alternating current used is entirely eliminated and further that the system is not at all critical with respect to tubes of variant electrical characteristics.

In the drawings which accompany and form a part of this specification and in which like reference numerals designate corresponding parts throughout:

Fig. 1 illustrates diagrammatically the circuits and apparatus of a three tube regenerative radio receiver and amplifier employing my invention.

Fig. 2 is a plan view of a radio receiver constructed in accordance with my invention and showing the disposition and relation of the essential parts.

Fig. 3 is a side elevation of the same with the end of the cabinet removed.

Referring now especially to Fig. 1 in which I have chosen to illustrate a common form of regenerative receiver with two stages of audio amplification as a means of disclosing a practical application of my invention, the variometer 1 is connected to ground 2 and by means of switch 3 may be connected to antenna 4 through either condenser 5 or 30. These condensers have different magnitudes to allow the antenna system to be brought into resonance with any wave length of the entire broadcasting band. This is a common form of tuning and needs no further explanation. The tubes 6, 7 and 8 are alternating current tubes and the filaments 9, 10 and 11 respectively are heated from any commercial

source of alternating current through the medium of the transformer 40, which is usually adapted to step the voltage down to approximately 6 volts. The cathodes 12, 13 and 14 respectively are usually cylindrical in form and are heated to electron emissivity either by induction, radiation or conduction. As they are metallic and entirely surround the heating filament they act as electromagnetic and electrostatic shields between the filaments carrying alternating current and the balance of the elements of the tubes as will be hereinafter discussed. The tubes are supplied with grids 15, 16 and 17 respectively and with anodes 18, 19 and 20 respectively. Variometer 21 is connected in the anode circuit of the detector tube 6 and is used in the well known manner to tune the anode circuit to resonance with the desired carrier wave. Tube 7 is the first audio amplifier and the input circuit thereof is connected as usual through an audio transformer 22 with the output circuit of the detector tube 6. Tube 8 is the second audio amplifier tube and the input circuit of this tube is coupled to the output circuit of tube 7 through audio transformer 23. A rheostat 24 is provided to control the voltage supplied to the filament of the detector tube 6 and thus to control the temperature of the cathode and therefore the internal impedance of this tube, as is usually required in detector tubes. A grid condenser 25 and grid leak resistance 26 is provided in the usual way in the grid connection with the antenna tuning variometer. The anode of the detector tube 6 is provided with a battery 27 while a battery 28 furnishes the anode potential for both amplifier tubes 7 and 8. A potentiometer 33 is connected across the secondary of the transformer 40 and serves as a means for grounding the zero

potential point of the alternating current supply and further to connect the cathodes to such point to eliminate any chance of unbalance of alternating current potentials within the tube. A head phone 34 or other signal receiving means is connected in the anode circuit of the tube 8. As the cathodes of alternating current tubes are from their nature and construction unipotential surfaces there is required for proper operation a grid potential on the amplifier tubes 7 and 8 and this is supplied by the battery 32.

In carrying out my invention I prefer to group the audio transformers and completely incase them in a metallic case 29 preferably constructed of magnetic material. This case is connected to ground through conductor 31 as shown and is located with respect to the tubes and tuning element as shown in Figs. 2 and 3. Obviously each transformer may be provided with a shield and the several shields connected together and to ground to effect the same result. Conductors 35, 36, 37, 38, 39, 41, 42, 43 and 44, which carry audio currents and are at higher potential than the filaments of the tubes, are provided with metallic coverings which are grounded by contact with the shielding case 29. The covering of conductor 35 is electrically connected to the covering of conductor 43 by means of the strap 50 indicated by the dotted lines. As hitherto mentioned, the cathode being metallic and cylindrical and entirely enclosing the filament carrying alternating current functions as an electromagnetic and electrostatic shield between the filament and the other elements of the tube, the filament lead in conductors of the tube however act as a source of stray alternating current induction and

constitute the reason for shielding all of the portions of the circuit and transformers which are at higher potential than the filament from the tubes. The leads carrying the alternating current to the filaments are also sources of stray induction and for this reason the above mentioned portions of the circuit and apparatus are likewise shielded from these leads.

Figs. 2 and 3 show the relation of all of the parts essential to the proper carrying out of my invention and show their disposition in a cabinet 100 provided with an insulating panel 101. I prefer to place the potentiometer 33 at the back of the cabinet where it will be least accessible to prevent undue adjustment thereof.

From the above it will be observed that I have produced a simple and effective system for efficiently using alternating current tubes in reception and amplification.

While I have illustrated but one embodiment of my device I wish it to be clearly understood that I may vary the details thereof without departing from the spirit or narrowing the scope of the invention.

Having thus disclosed my invention what I claim as new and desire to secure by Canadian Letters Patent is as follows:-

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1. In a radio reception system, a thermionic tube the cathode of which is adapted to be heated by an alternating current, input and output circuits for said tube, means for supplying alternating current to said tube and means for electromagnetically and electrostatically shielding portions of said input and output circuits from said tube and said alternating current supplying means.

2. In a radio reception system, a plurality of thermionic tubes the cathodes of which are adapted to be heated by alternating current, input and output circuits for said tubes, the output circuit of one tube being electrically associated with the input circuit of a succeeding tube to effect a successive amplification of the received signal, means for supplying alternating current to all of said tubes and means for electromagnetically and electrostatically shielding portions of said input and output circuits both from said tubes and said alternating current supplying means.

3. In a radio reception and amplification system, an alternating current detector tube, an alternating current amplifier tube, input and output circuits for each of said tubes, means for electrically coupling the output circuit of said detector tube with the input circuit of said amplifier tube, means for supplying alternating current to said tubes, and means for electromagnetically and electrostatically shielding portions of the input and output circuits of said tubes and said coupling means from said tubes and said alternating current supplying means.

4. In a radio reception and amplification system, a plurality of thermionic tubes the cathodes of which are adapted to be heated by alternating current, input and output circuits for each of said tubes, means for electrically associating the output circuit of a preceding tube with the input circuit of a following tube, means for supplying alternating current to said tubes, and means for electro-

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magnetically and electrostatically shielding portions of said input and output circuits and said electrically associating means from said tubes and said alternating current supplying means.

5. In a radio system, a plurality of alternating current tubes, input and output circuits for said tubes, means for electrically associating the circuits of a preceding tube with those of a following tube, means for supplying alternating current to each of said tubes, and means for electrically shielding portions of said input and output circuits and said electrically associating means from said alternating current supplying means.

6. In a radio reception and amplification system, an alternating current detector tube, a plurality of alternating current amplifier tubes, a transformer electrically associating the output circuit of said detector tube with the input circuit of one of said amplifier tubes, a transformer electrically associating the output circuit of one of said amplifier tubes with the input circuit of the other of said amplifier tubes, means for supplying alternating current to said tubes, and means for electromagnetically and electrostatically shielding portions of said input and output circuits and said transformers from said tubes and also from said alternating current supplying means.

Radio Reception and Amplification System. 269205

13x

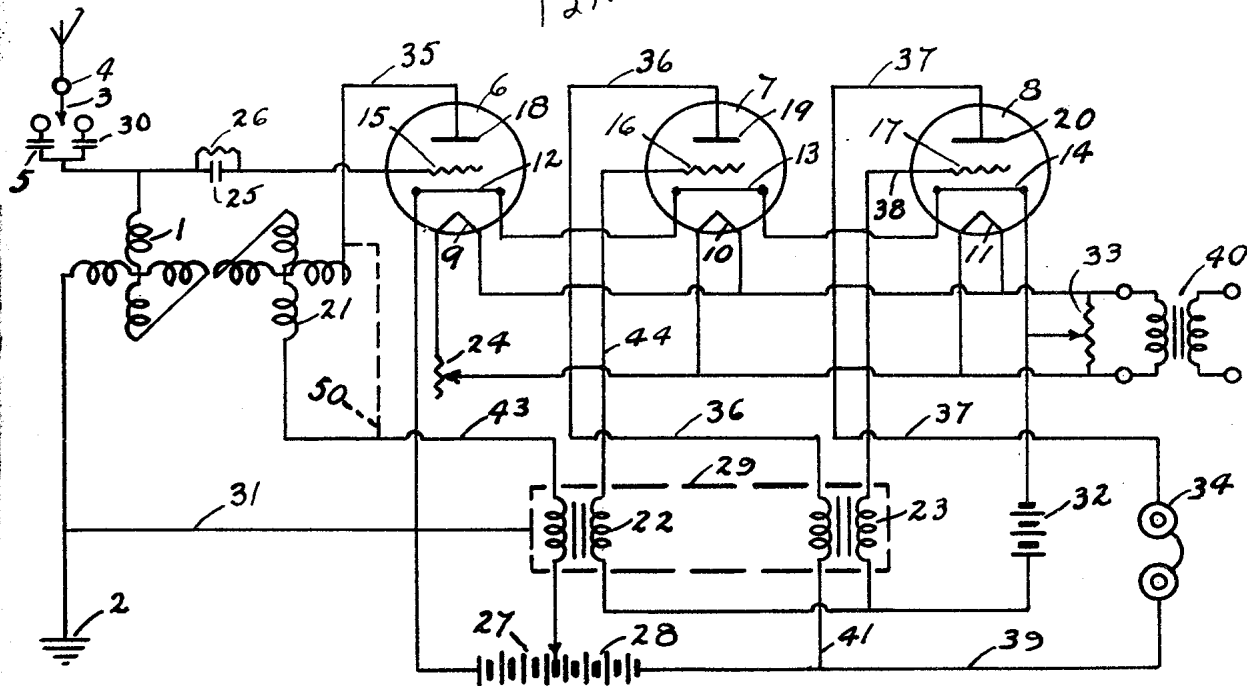


FIG. 1

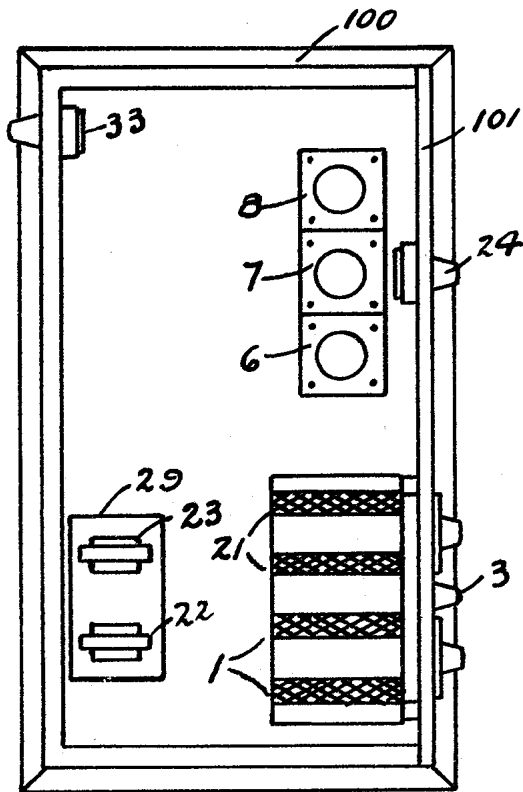


FIG. 2

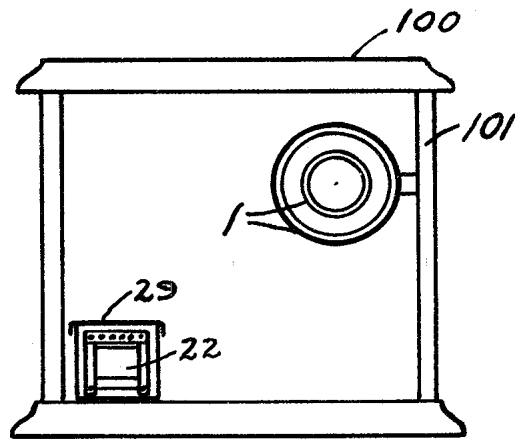


FIG. 3

CERTIFIED TO BE THE DRAWINGS REFERRED TO
IN THE SPECIFICATIONS HEREUNTO ANNEXED.
TORONTO ONT. Mar. 31, 1925.

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