Oct. 4, 1932. H. D. STALEY 1,881,032

RADIO RECEIVING SYSTEM

Filed May 11, 1926

Fig. 1

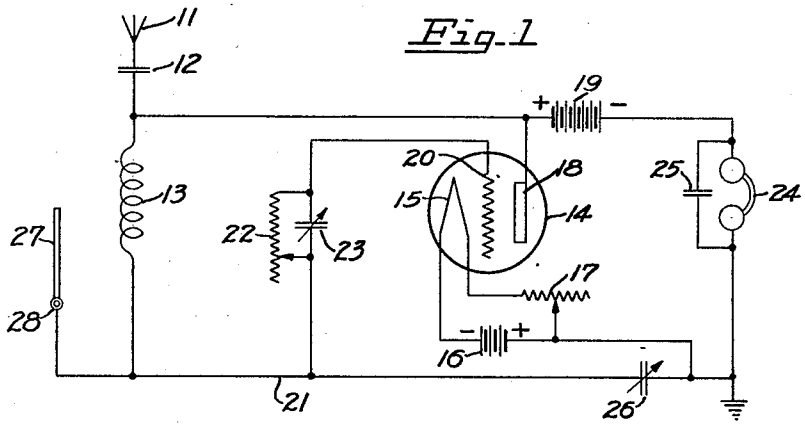
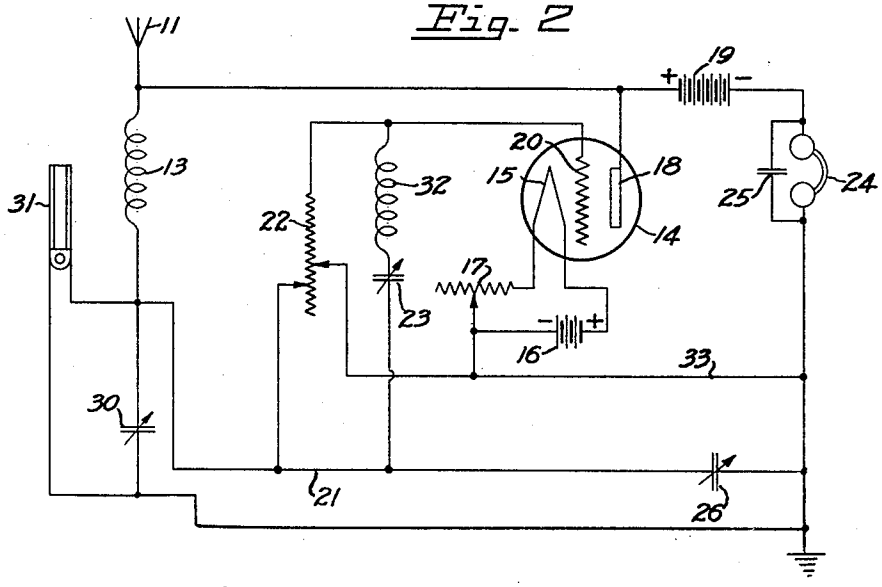


Fig. 2



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UNITED STATES PATENT OFFICE

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RADIO RECEIVING SYSTEM

Application filed May 11, 1926. Serial No. 108,210.

This invention relates to a system for receiving radio frequency signals, especially by the aid of electronic emission devices, such as audions.

This application is a continuation in part of a prior application filed March 4, 1926 in my name, having Serial Number 92,115 and entitled "Radio receiving system".

It is one of the objects of my invention to make it possible to receive radio signals with a simple and inexpensive apparatus.

I have developed a system by experimentation that utilizes but one detector tube, yet that can obtain audible signals from distant points; and it is therefore another object of my invention to provide a receiving set utilizing a single tube and having a large range. Of course, my invention can be utilized with a plurality of tubes also.

My invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description, where I shall outline in full those forms of my invention which I have selected for illustration in the drawing accompanying and forming part of the present specification. Although I have shown in the drawing but a few embodiments of my invention, I do not desire to be limited thereto, since the invention as defined in the claims may be embodied in other forms also.

Referring to the drawing:

Figure 1 is a schematic wiring diagram of one form of my invention; and

Figure 2 is a wiring diagram of a modified form.

In Fig. 1 I show a conventional form of absorbing circuit, such as the elevated conductors or antenna 11, condenser 12, leading inductance coil 13, and ground 34. Of course, other equivalent forms of absorbing circuit could be used. Operatively associated with the circuit, is a conventional type of electronic emission device, or audion 14. As is now well understood, such devices include a plurality of electrodes sealed in a vacuum.

One of the electrodes, such as 15, serves as the seat of electronic emission; and for this purpose it is in filamentary form, whereby current from a source such as battery 16 can be passed through it to heat it to a degree sufficient for the emission of electrons. The filament circuit usually includes a variable resistance or rheostat 17, whereby the activity of the filament 15 may be controlled. A plate electrode 18 serves to receive the electrons emitted from filament 15, and its ability to draw such electrons is increased by impressing a positive potential on the plate, as by the aid of battery 19. The resultant flow of electrons between the filament 15 and plate 18 is termed the space current. This can be controlled by a third electrode, such as a grid 20, usually interposed between the filament 15 and the plate 18, so as to control the potential of a point in the space between these electrodes. Comparatively minute variations in potential between the filament 15 and grid 20 cause correspondingly large variations in space current flow.

All this is well understood, and is outlined here merely to make it possible to coordinate the description of the new features rendered necessary with my invention, with what is known.

When signaling impulses are received, there exists a corresponding E. M. F. across the terminals of an element in the absorbing circuit, such as of coil 13, which can be appropriately connected so as to affect the device 14. In the present instance, this is accomplished through a capacity. The lower end of coil 13 is connected to filament 15, by way of connection 21 and variable condenser 26, the farther side of which may be grounded at 34. The condenser 26 has about .001 microfarad capacity. A unique feature of my invention is that the control electrode 20, instead of being externally connected to the other terminal of coil 13, is instead in electrical connection externally of tube 14, with the same terminal as filament 15. This connection is accomplished by way of a high resistance 22, of the order of from 1 to 30 megohms, branching a variable condenser 23 of the order of from .0005 to .001 microfarads. The upper terminal of coil 13 is connected to the plate 18. The translating device, such

as phones 24, is in a circuit extending from the plate 18 to filament 15, which can be traced as follows: from plate 18, battery 19, phones 24 (shunted by the usual phone condenser 25), back to filament 15.

I have found by experiment that remarkably good results can be obtained by the receiving system above described. This is also improved by the aid of a conductor 27 in the form of a flat disc or rectangle, adjustable as by pivot 28, and connected to ground. This conductor is placed adjacent the coil 13 and lies within its magnetic field so that it provides a means of adjusting the damping of the circuit. With this equipment, I have been able to pick up signals several thousand miles distant, with good audibility and comparative freedom from disturbing noises.

For distant reception, resistance 22 must be high; from about 8 to 10 megohms; for local reception, from one quarter megohm up may be used. This resistance is preferably variable for that reason.

The tuning of the system is accomplished by condenser 26; and the volume or intensity of the signals by varying the grid resistance 22.

In Fig. 2, I have shown a slight modification. The absorbing circuit in this case includes a variable condenser 30, connected to the ground 29. Furthermore, the metallic member 27 is replaced by a double disc 31 comprising two plates insulated from each other, one connected to ground, and the other between condenser 30 and coil 13; in other words, condenser 30 has each of its terminals respectively connected to the plates. Another variation is the provision of an air cored choke coil 32 in series with condenser 23, of about 400 turns; and lastly, a connection 33 extends from a terminal of phones 24 to a variable point on resistance 22. These variations are not absolutely essential; but they may be useful under certain conditions.

In both modifications, I found that reception can be obtained even when the filament 15 is dark. I do not fully understand the manner in which the circuit of my invention operates; for the actions taking place are quite complex and incapable at the present time of adequate analysis.

I claim:

1. In a radio receiving system, an absorbing circuit including an impedance, an electronic emission device having an electron emitting electrode, a control electrode and a plate electrode, said plate electrode being coupled to one terminal of the impedance, and the electron emitting electrode to the other, a connection between the control electrode and that terminal of the impedance which is connected to the electron emitting electrode, said connection including a condenser and a high resistance in parallel, a circuit including a source of electrical energy and a translating device connecting the plate electrode and the electron emitting electrode, and a metallic damping member lying within the magnetic field of the impedance and connected to one of its terminals.

2. In a radio receiving system, an absorbing circuit including in series, an inductance coil, a condenser, and a ground connection, a detecting device associated with the system, and a pair of spaced, insulated metallic plates adjacent the coil and connected respectively to opposite sides of the condenser.

3. In a radio receiving system, an absorbing circuit including an inductance coil, an electronic emission device having an electron emitting electrode, a control electrode and a plate electrode, said plate electrode being coupled to one terminal of the coil, and the electron emitting electrode to the other, a circuit extending between the plate and the electron emitting electrode including a source of direct current and a translating device, a high resistance connecting the control electrode and the electron emitting electrode, an inductance and a condenser shunting said resistance, said control electrode being externally in connection only by said resistance and shunt path, and a connection extending from that terminal of the translating device which is farthest from the source, to an intermediate point of said high resistance.

4. In a radio receiving system, an absorbing circuit including a coil and a condenser; an electronic emission device having an electron emitting electrode; a control electrode and an output electrode; the output electrode being directly connected to the first terminal of the coil; the electron emitting electrode being connected to the second terminal of the coil through the condenser, a connection between the control electrode and the second terminal of the coil consisting essentially of a condenser and a resistance in parallel; and a circuit including a source of electric energy and a translating device for connecting the output electrode to the electron emitting electrode.

5. In a radio receiving system, an absorbing circuit including a coil and a condenser; an electronic emission device having an electron emitting electrode, a control electrode and an output electrode; the output electrode being directly connected to the first terminal of the coil; the electron emitting electrode being connected to the second terminal of the coil through the condenser; a connection between the control electrode and the second terminal of the coil consisting essentially of an impedance which includes one continuous resistance path; and a circuit including a source of electric energy and a translating device for connecting the output electrode to the electron emitting electrode.

6. In a radio receiving system, an absorbing circuit including a coil and a condenser; an electronic emission device having an electron emitting electrode, a control electrode and an output electrode; the output electrode being directly connected to the first terminal of the coil; the electron emitting electrode being connected to the second terminal of the coil through the condenser; a connection between the control electrode and the second terminal of the coil consisting of a condenser and a coil in series, and a resistance in parallel therewith; a direct connection between the resistance and the electron emitting electrode; and a circuit including a source of electric energy and a translating device connecting the plate electrode and the electron emitting electrode.

In testimony whereof, I have hereunto set my hand.

HENRY D. STALEY.