Sept. 24, 1935. M. OSNOS 2,015,189

MODULATION CIRCUIT ARRANGEMENT

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Fig. 1

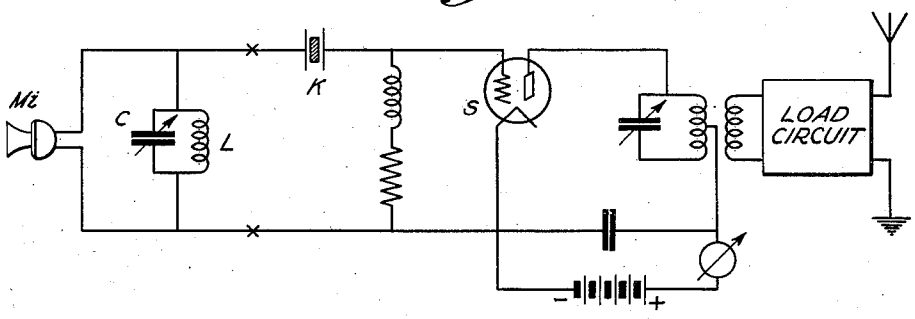


Fig. 1a

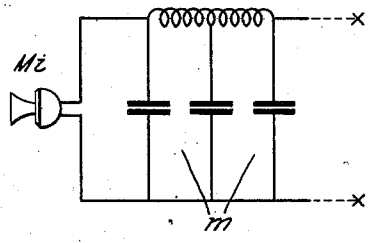


Fig. 2

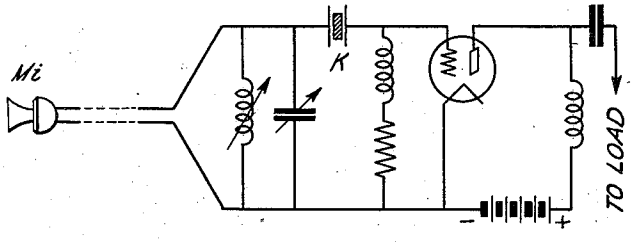
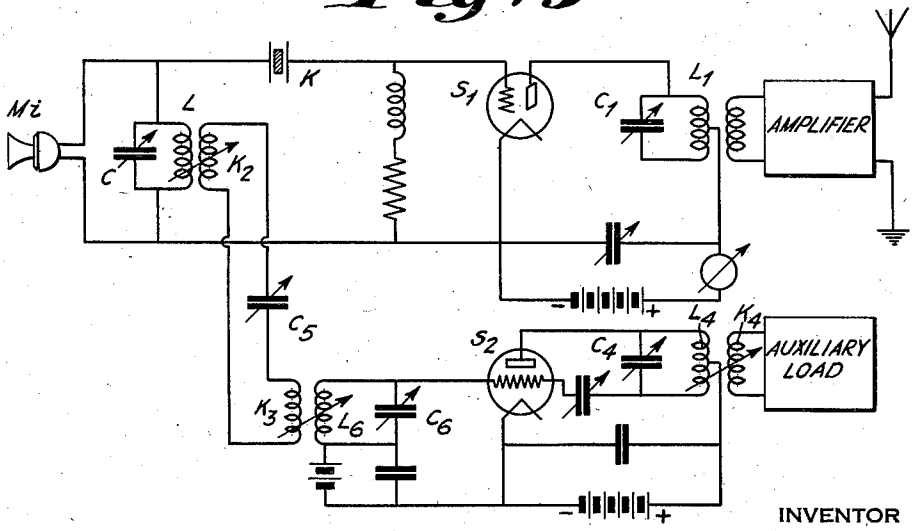


Fig. 3



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Fig. 4

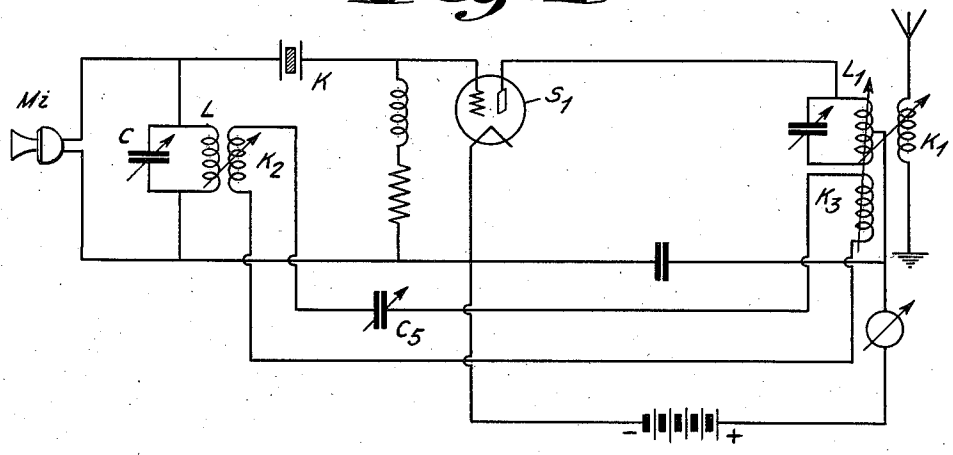
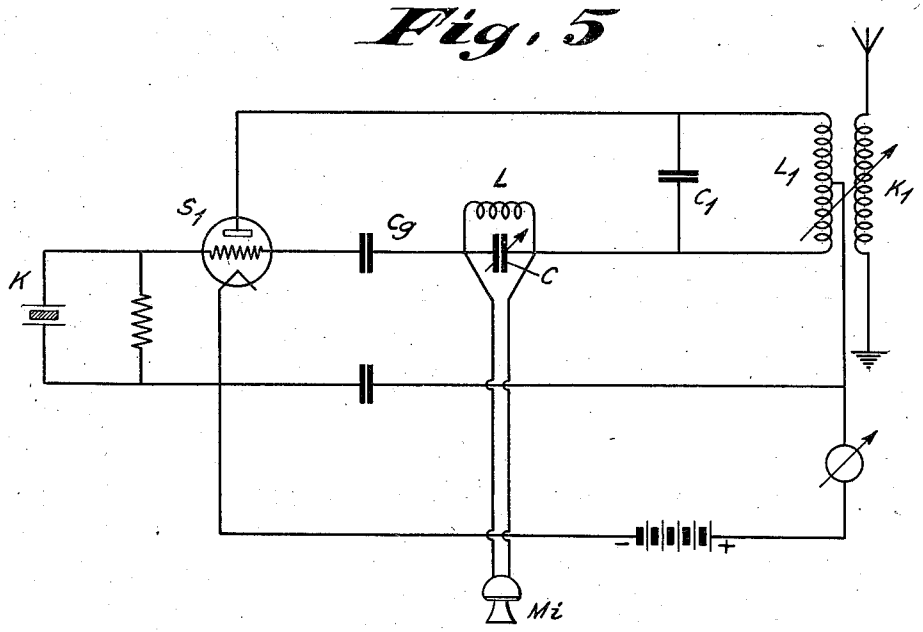


Fig. 5



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MODULATION CIRCUIT ARRANGEMENT

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Application July 13, 1933, Serial No. 680,206
In Germany July 1, 1932

3 Claims. (Cl. 179—171)

The present application discloses a telephony circuit for radio frequency transmitters comprising piezo-electric monitors or stabilizers in which a microphone, preferably of the carbon dust type, influenced by acoustic vibrations, voice, music, etc., alters the non-reactive resistance of the crystal circuit of a radio frequency vacuum tube generator directly or by way of a suitable coupling. The microphone, which in this case need not be energized by a direct current biasing battery, is suitably shunted by an impedance which, if desired, may be of the variable or adjustable kind.

Additional research has shown that it is particularly advantageous in practice to make the impedance shunting the microphone of a combination of parallel, and if desirable adjustable inductance and capacity. By such an arrangement, as will be seen, both the modulator power as well as the acoustic quality of the reproduction are considerably raised. Under certain circumstances it may be of advantage to dispose in parallel relation to the microphone a network system comprising a plurality of meshes or units containing capacity and inductance rather than a loop comprising inductance and capacity.

The invention will be better understood by reading the description thereof which follows and by reference to the drawings attached hereto. In the several views of the drawings like reference characters indicate like parts as far as possible. In Figure 1 I have shown a modulation circuit including the novel features of the present invention; while, in Figures 1*a*, 2, 3, 4 and 5 I have shown modifications of the arrangement of Figure 1.

Figure 1 shows by way of example an arrangement in which in parallel to a carbon particle microphone M*i*, which influences the grid circuit of a tube S excited from a crystal K to produce amplitude modulation of the carrier wave generated in S at a frequency determined in part by the crystal K, there is disposed a loop circuit containing an inductance L and a capacity C.

It is preferable to make the natural period of the said loop circuit approximately equal to the transmitter wave, and furthermore to make the attenuation thereof as small as possible.

The amplitude modulated oscillations produced in S may be amplified, and transferred from the anode circuit to any load circuit which may comprise amplifiers, etc. For example, the modulated oscillations may be transferred from the tuned inductance in the anode circuit to an inductance coupled thereto and fed from said inductance to the load circuit directly or by way of amplifiers.

Figure 1*a* shows a modified scheme in which the loop circuit LC, Figure 1, is replaced by a two-mesh network *m*.

The network *m* and microphone M*i* of Figure 1*a* may replace the elements to the left of the crosses of Figure 1.

Under certain circumstances the network *m* or a part thereof may be replaced by a correspondingly long line possessing sufficient self-induction, self-capacitance and capacity to ground. This plan will be found advantageous whenever the tube is to be acted upon from a microphone located at a distance so that a more or less long line is required anyway. This arrangement is shown in Figure 2.

Another improvement flows from the circumstance that the loop circuit LC involves considerable oscillatory energy so that it is capable of yielding for additional purposes a considerable modulation power. This fact may be utilized in practice in this manner that this oscillation circuit is coupled either with the grid circuit of a second radio frequency tube or is in feed-back relation with the plate circuit of the same tube. In this way a considerable increase in modulation power and a far better modulation of the tube itself are attained. Embodiments of this kind are shown in Figures 3, 4 and 5.

In the scheme shown in Figure 3 the oscillation circuit LC of the crystal-stabilized generator tube S_1 in parallel relation to the microphone M*i* is united by means of couplings K_2, K_3, with the grid of a second radio frequency amplifier tube S_2 and in this manner the amplitude of the modulated energy of LC is raised by tube S_2. The energy output of S_2 may then be transferred to the next stage, e. g. by the aid of coupling L_4, K_4, as shown, as well known in the art.

In the circuit scheme shown in Figure 4 the modulated energy of the oscillation circuit LC is fed forward by means of couplings K_2, K_3 to the plate circuit of S_1, and in this way the modulation of the wave produced in S_1 is considerably raised.

The energy of S_1 may be fed either to antenna A or to an additional transmitter stage.

In a circuit arrangement as in Figure 5 the microphone M*i* and the oscillation circuit LC connected in parallel to it is in series with the grid condenser C*g* and the plate tuning circuit L_1, C_1 of tube S_1. This scheme assures a particularly satisfactory modulation of the tube S_1. The loop LC is excited at the rhythm of variations of the microphone resistance by the crystal

circuit or the transmitter, and in each instance it has a tendency to experience radio frequency oscillations under more or less free conditions. The higher the amplitude of the freely oscillating current, the higher will be the modulation percentage of the transmitter. Hence, in a circuit arrangement as here disclosed it is especially important that the damping of the loop LC should be minimized.

Having thus described my invention and the operation thereof, what I claim is:

1. Means for producing high frequency oscillations comprising a thermionic tube having its anode connected to its cathode by way of a resonant circuit including, a parallel inductance and capacity, and its control grid connected to its cathode by way of an impedance, said electrodes being energized to produce sustained oscillations in said tube and circuits due in part to the capacity within the tube between the control grid and anode electrodes, means for determining the frequency of the oscillations developed and for modulating the same comprising a piezo-electric crystal and a microphone in series between the control grid and cathode of said tube, and a resonant circuit connected in parallel with said microphone.

2. Means for producing high frequency oscillations comprising, a thermionic tube having its anode connected to its cathode by way of a resonant circuit including a parallel inductance and capacity, and its control grid connected to its cathode by way of an impedance, means for determining the frequency of the oscillations developed and for modulating the same comprising, a piezo-electric crystal and a microphone in series between the control grid and cathode of said tube, a resonant circuit connected in parallel with said microphone, and a circuit coupling said last named resonant circuit with the resonant circuit connected between said anode and cathode.

3. A device as recited in claim 2, in which said resonant circuit in parallel with said microphone comprises inductance and capacity, and in which said inductance is coupled to the resonant circuit connected between said anode and cathode by way of a variable coupling means.

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