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OSCILLATING RADIO RECEIVER

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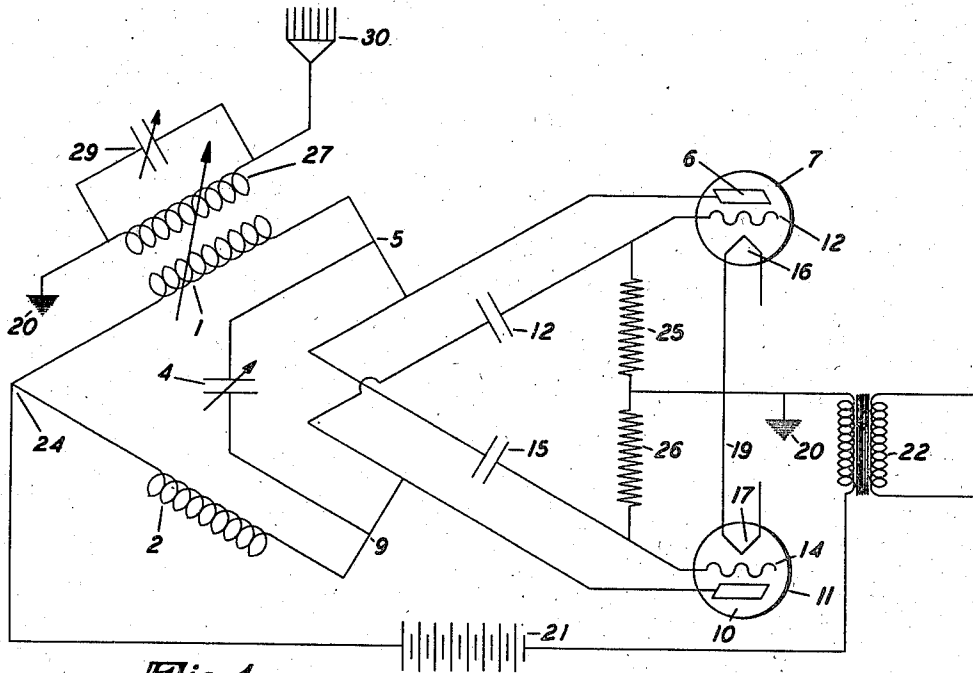


Fig. 1

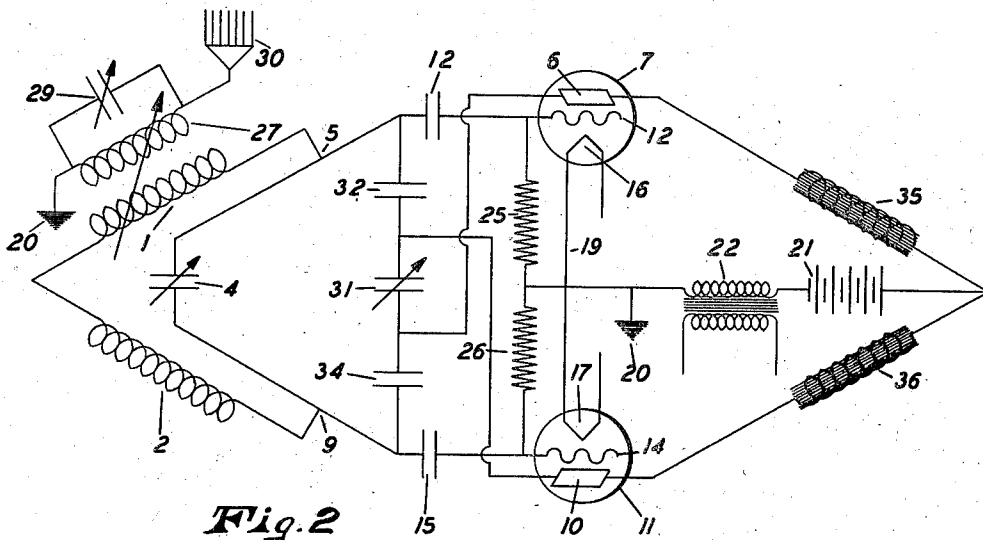


Fig. 2

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OSCILLATING RADIO RECEIVER

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4 Claims. (Cl. 250—36)

My invention relates to an oscillating radio receiver and more particularly to a variation of and improvement on the circuits shown and described in the patents to Frederick G. Simpson, Nos. 1,507,689, 1,625,504 and 1,775,327, dated September 9, 1924, April 19, 1927, and September 9, 1930 respectively, and which is adapted for the reception of continuous wave telegraph signals, although it is also applicable to the reception of modulated signals by the "zero beat" method.

Among the objects of my invention are: To provide a balanced oscillator capable of use in receiving circuits; to provide a means of controlling the degree of oscillation in a balanced oscillator; to provide an oscillation control for a balanced oscillator which will change the frequency of the oscillator a minimum amount during use; and to provide a simple and effective means of using the balanced oscillator described by Simpson, as mentioned above, in radio telegraph and telephone receivers.

Other objects of my invention will be apparent or will be specifically pointed out in the description forming a part of this specification, but I do not limit myself to the embodiment of my invention herein described, as various forms may be adopted within the scope of the claims.

Referring to the drawing:

Figure 1 is a schematic diagram reduced to lowest terms of the balanced oscillator as disclosed by Simpson.

Figure 2 is a schematic diagram also reduced to lowest terms of the circuit embodying my invention.

In the Simpson oscillator, as it will be hereafter called, shown in Figure 1, an oscillating circuit is formed from a pair of inductances 1 and 2, shunted by a tuning condenser 4. It is preferable that the inductances be alike, and uncoupled. One end 5 of the oscillating circuit is connected to the plate 6 of a tube 7, the opposite end 9 being connected to the plate 10 of a second tube 11. A grid 12 of the first tube 7 is connected through a grid condenser 12 to the opposite end 9 of the oscillating circuit, and a grid 14 of the second tube 11 is cross connected through a second grid condenser 15 to the first end 5 of the oscillating system.

Cathodes 16 and 17 in each of the tubes are connected by a common wire 19 which is grounded. Means for heating the cathode is not shown, as such means are no part of the present invention, and are well known in the art, their omission greatly simplifying the diagrams. It is

preferable that the cathodes be connected to a ground 20.

It is preferable to energize the plates from a source 21 having its negative pole connected through an output transformer 22 to the common cathode wire 19, the positive end connecting to a common connection 24 between the inductances 1 and 2, thence to the plates, through the inductances.

Grid leaks 25 and 26 are usually provided between each grid and ground.

A tuned input circuit, here represented by an antenna inductance 27 variably coupled to one of the inductances 1 and 2 shunted by a variable antenna capacity 29, the antenna inductance being in series with a receiving antenna 30 and the ground 20. It is obvious, however, that radio frequency may be supplied to the inductances 1 and 2 in other ways, and that the inductances 1 and 2 may be either inductively or direct coupled to the preceding source. For example, the output of a radio frequency amplifier instead of the antenna circuit as shown, may be coupled to inductance 1.

When the plates and cathodes of the tubes are energized the tubes will oscillate in opposite phase relationship, the frequency being controlled by the use of the variable capacity 4.

The circuit described, however, is not ideal for the reception of continuous waves by the heterodyne method, or for the reception of modulated signals by the zero beat method, as no means is provided for changing the coupling between the two tubes, and the methods first referred to require careful adjustment of the strength of the local oscillations as well as frequency. I have therefore provided the Simpson circuit as described with a capacity potentiometer for the control of voltage between the two tubes, as shown in Figure 2.

In Figure 2 all parts common to Figure 1 carry the same numerals.

In this circuit, the one end 5 of the oscillating circuit is connected to the grid 12 of the first tube 7 through the grid condenser 12, and the opposite end 9 of the oscillating circuit is connected to the grid 14 of the other tube through its grid condenser 15. The usual leaks 25 and 26 are connected to the common cathode wire and thence to ground.

Bridged across the oscillating circuit is a variable control capacity 31, and connected between this control capacity and the ends 5 and 9 of the oscillating circuit are fixed capacities 32 and 34. It is preferable that the values of these fixed ca-

capacities be identical. The plate 6 of the first tube 7 is then connected to the side of the variable capacity 31 which is connected to the opposite end 9 of the oscillating circuit through the fixed capacity 34, and the plate 10 of the second tube 11 is crossed and connected to the side of the variable condenser 31 which is connected to the other end 5 of the oscillating circuit through the fixed capacity 32.

The plates 6 and 10 of the two tubes may then be energized by the source 21, the positive connection of which is split and passed through two chokes 35 and 36 to the respective anodes. The negative end of the source is connected to ground and the cathodes through the customary output transformer 22. The input may be from an antenna system as shown, or from another source of radio frequency.

When the cathodes and plates of the two tubes are energized, the tubes will oscillate in opposite phase relation as in the original Simpson circuit 1, the frequency being controllable by the use of tuning condenser 4. In addition, however, the degree or strength of oscillation of the tubes can be regulated by the voltage divider or capacity potentiometer formed by the series connection of condensers 32, 31 and 34 with the respective plates and grids, variation of the capacity 31 regulating the amount of feed between the two tubes. As the condensers are all in series across the tuning condenser, the tuning is not greatly affected by such regulation, at least not sufficiently to cause loss of tuned-in stations in the higher frequency bands. The regulation obtained by the potentiometer makes it possible to adjust the strength of the local oscillations to that most efficient for the proper combination with and detection of the incoming signals by either the heterodyne or zero beat methods.

It will be obvious that my controlled oscillator here described for heterodyning and detecting incoming signals may be used also as a separate heterodyne oscillator, the output transformer 22 being changed accordingly, and the radio frequency amplification and detection being performed by other tubes than those shown.

It is also obvious that the connections to the grids and plates of the two tubes may be reversed to accommodate different amplification

factors of tubes, without essential interference with the efficient operation of the circuit.

I claim:

1. In combination, a pair of oscillator tubes each having a control electrode and an anode, an oscillating circuit connecting the control electrodes of said tubes, a capacity potentiometer bridged across said oscillating circuit, and a connection between the anodes of each of said tubes and a point on said potentiometer more closely adjacent the connection thereof to the control electrode of the other tube whereby the tubes may be set into varying degrees of oscillation in opposite phase relation.

2. In combination, a pair of oscillator tubes each having a control electrode and an anode, an oscillating circuit connecting the control electrodes of said tubes, a capacity potentiometer bridged across said oscillating circuit, comprising a variable capacity in series with a separate capacity on each side thereof, and a cross connection between the anodes of each of said tubes and the terminals of said variable capacity whereby the tubes may be set into oscillation in opposite phase relation under control of said variable capacity.

3. In combination, a pair of oscillator tubes each having a control electrode and an anode, an oscillating circuit connecting the control electrodes of said tubes, a capacity potentiometer connecting said control electrodes comprising a variable capacity, a fixed capacity connected between said variable capacity and each of said control electrodes, and a connection between the side of the variable capacity nearest one tube to the anode of the other tube.

4. In combination, a pair of similar oscillator tubes each having a pair of dissimilar electrodes therein, an oscillating circuit connecting similar electrodes of the two tubes, a variable capacity in series with a fixed capacity on each side thereof bridged across said oscillating circuit, and similar connections from each side of said variable condenser, said connections leading from the terminal of said condenser nearer one tube of the pair to the electrode of the other tube of said pair not connected directly to said oscillating circuit.

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