

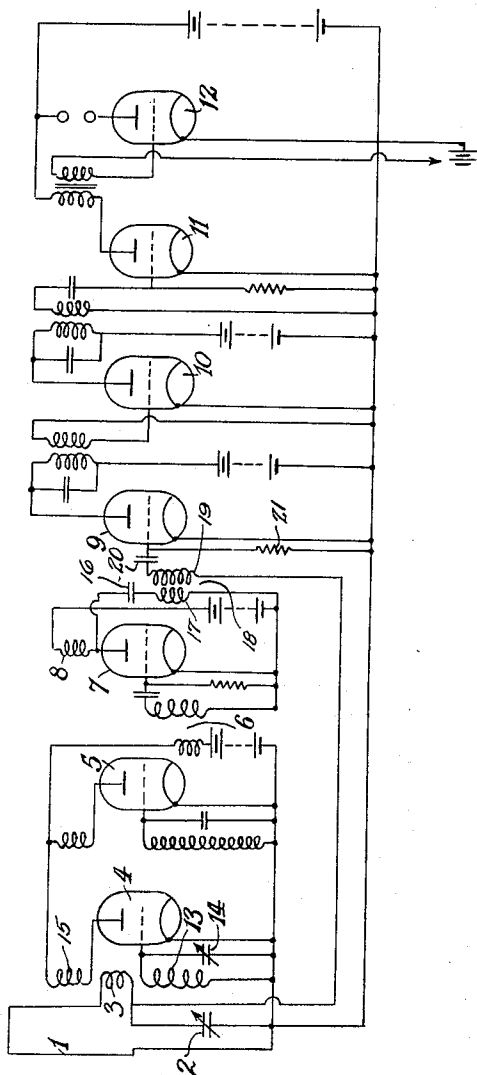
Dec. 26, 1933.

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1,941,070

HETERODYNE WIRELESS RECEIVER

Filed Jan. 6, 1930



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UNITED STATES PATENT OFFICE

1,941,070

HETERODYNE WIRELESS RECEIVER

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Application January 6, 1930, Serial No. 418,931,
and in Great Britain January 9, 1929

7 Claims. (Cl. 250—20)

The present invention relates to heterodyne wireless receivers and more particularly though not exclusively to receivers of the super-sonic heterodyne type.

In receivers of this type the received high frequency oscillations at a frequency f_1 are caused to beat with locally produced oscillations at a frequency f_2 and thereby to generate oscillations at a beat frequency f_3 , which is known as the intermediate frequency and is equal to the sum of or the difference between f_1 and f_2 .

According to the present invention locally generated oscillations in a heterodyne receiver are produced by beating together two oscillations, one having a frequency equal to the intermediate frequency. The other has preferably a frequency equal to that of the oscillations to be received.

One advantage of this arrangement is that by making the local oscillator, which produces oscillations at the frequency of the oscillations to be received, in the form of a loosely coupled circuit itself loosely coupled to the aerial tuned circuit, the oscillations produced by this oscillator are pulled into step with the incoming signals and beats are therefore produced at exactly the right frequency.

One form of apparatus in accordance with the present invention will be described, with reference to the accompanying drawing, using the same references to denote the various frequencies involved as were used earlier in the specification.

A frame aerial 1 is adapted to be tuned by means of a variable condenser 2 to a frequency f_1 . This tuned circuit 1, 2 which may, if desired, also embody amplifying means, will be referred to as the radio frequency tuning device. Loosely coupled to the frame aerial 1 by means of the coil 3 is an oscillator 4 which will be referred to as the radio frequency oscillator, adapted to generate local oscillations at a frequency f_1 . The oscillator 4 is tuned by means of the inductance 13 and the variable condenser 14. A second oscillator 5, which will be referred to as the intermediate frequency oscillator, adapted to generate local oscillations at a frequency f_3 , is provided and the oscillations produced by beating the oscillations from the intermediate frequency oscillator 5 with the radio frequency oscillator are passed through the transformer 6 to a detector device 7, known as the first detector. As the oscillations from this detector will be at frequencies of both $f_1 + f_3$ and $f_1 - f_3$ some reactive or impedance device, such as a radio frequency choke 8 of suitable value, is inserted in the out-

put circuit of the first detector in order to shift the phase of one of these oscillations or alter its amplitude or both to prevent annulment of the frequency f_3 . The output from the first detector 7 is then caused to beat with the output from the radio frequency tuning device 1, 2 and the resulting oscillations are fed to a second detector 9.

The arrangement is such that local oscillations are generated at frequencies f_1 and f_3 in connection with devices 4 and 5 respectively, device 4 being under control of the signal oscillation frequency received in circuit 1—2—3. The combined frequencies f_1 and f_3 are passed through the first detector 7 and are applied to the second detector 9 simultaneously with signals at the frequency f_1 derived from the circuit 1—2—3. The resulting interaction or beating of the signal frequency with the locally generated combined frequency is such that the signal frequency cancels out, leaving the intermediate frequency f_3 to be transmitted through the amplifier including the tube or device 10, and to be applied to the third detector 11.

It will thus be seen that the system above described includes means for deriving in the tube 9, which is the second detector, the local heterodyne or intermediate frequency from the demodulation or detection of two locally generated oscillation frequencies, one of which is the frequency to which the intermediate amplifier is tuned and the other of which is the signal frequency.

The oscillations from this detector 9 (at a frequency f_3) are fed to the intermediate frequency amplifier 10 and thence through a third detector 11 to an audio frequency amplifier 12.

One advantage of the arrangement according to the present invention is that, since the circuits 1, 2 and 13, 14 have to be tuned to the same frequency, differences between the tuning inductances may be allowed for by using tuning condensers obeying a logarithmic law and the condensers 2 and 13 can without difficulty be mechanically coupled. The final pulling into step will be done by the carrier wave itself. The aerial tuner may thus be made more selective than usual.

In the present example the oscillator 4 is provided with a plate coil 15 inductively coupled to the inductance 13 in the tuned circuit 13—14. The input circuit, comprising the aerial or collector 1, and input tuning condenser 2 are also coupled with the tuned circuit 13—14 by induc-

tive coupling between the coil 3 and the inductance 13.

The first detector 7 is coupled to the second detector 9 by a shunt feed circuit including the 5 choke coil 8 from the plate end of which signal currents are taken through a coupling condenser 16 to the primary winding 17 of a coupling transformer 18, the secondary winding 19 of which is, in turn, coupled to the tube 9 through a grid 10 condenser 20 and a grid leak 21.

I claim:

1. In a heterodyne wireless receiver having a predetermined intermediate frequency, means for receiving modulated signal oscillations, means for 15 generating and beating together two oscillations of different frequency, one of said oscillations having a frequency equal to the intermediate frequency, and detector means for heterodyning said modulated signal oscillations with the resulting 20 beat frequency to produce intermediate frequency signals.

2. A heterodyne wireless receiver according to claim 1 wherein the second of said oscillations has a frequency equal to the frequency to be received.

25 3. The method of radio signal reception, which comprises receiving modulated signal oscillations at a frequency f_1 , generating local oscillations at frequencies f_1 and f_3 , causing said local oscillations to interact to produce oscillations at a 30 frequency f_2 , causing said last named oscillations to beat with said signals to produce signal modulated oscillations at the frequency f_3 and thereafter amplifying and detecting said last named oscillations.

4. The method as set forth in claim 3 further characterized in that the incoming signals are utilized to control the generation of the local oscillations at the signal-frequency f_1 .

5. In a signal receiving system, a receiving network, an oscillation generator, means for simultaneously tuning said network and generator to the same frequency, a second oscillation generator, means for deriving a beat frequency from the oscillations generated by said oscillators and 85 means for impressing said beat frequency on said network.

6. The combination as set forth in claim 5 characterized in that the first mentioned oscillator is so coupled with the receiving network that an incoming signal is enabled to exert a measure of control over the frequency of the oscillations generated thereby. 90

7. A heterodyne wireless receiver comprising three oscillatory circuits, one of said circuits including an oscillation generator and being tunable to the intermediate frequency, the other two of said circuits including means whereby said circuits may be tuned to the same signal frequency, one of the two last named circuits being coupled 95 with an oscillation generator, means for deriving a beat frequency from said oscillation generator circuits, means for combining said beat frequency with the signal frequency to provide oscillations at said intermediate frequency, and means for 105 detecting signals at said intermediate frequency.

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