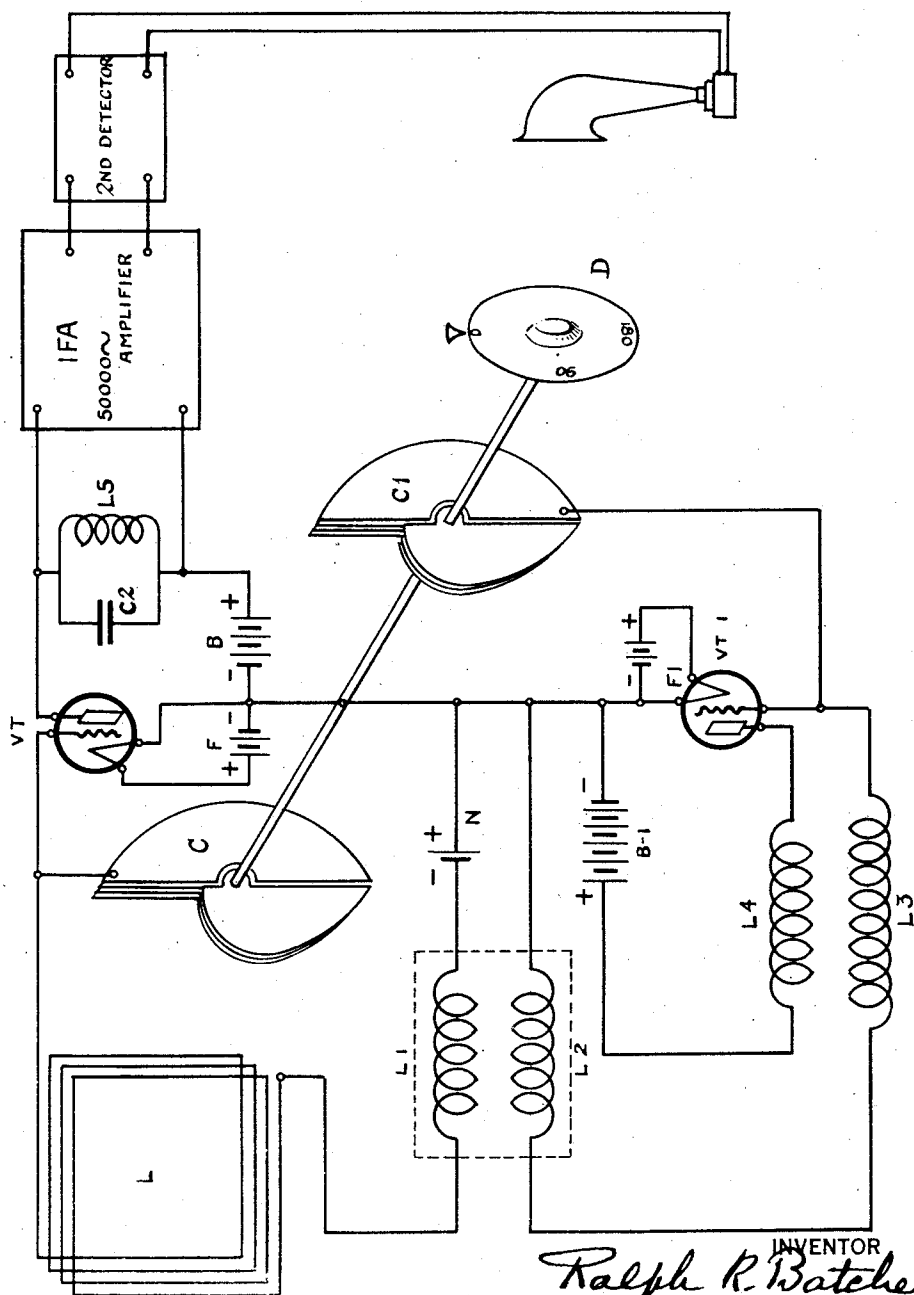


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RADIO RECEIVING APPARATUS
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RADIO RECEIVING APPARATUS.

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The present invention is particularly adapted for use in connection with the so-called super-heterodyne receiving system, in which an intermediate frequency amplifier is fed from the beats produced when the oscillations of a local oscillator are imposed upon the oscillations set up in the receiving system by the received signal; the local oscillator being adjusted to a frequency differing from the frequency of the received signal, the difference being equivalent to the resonant frequency of the intermediate amplifier. Two controls are necessary for the operation of the super-heterodyne receivers now in general use. It is my purpose to show how these two adjustments can be made with one dial or control handle.

The difficulty encountered when attempting to mechanically interlock these two controls is that the proper frequency relation cannot be maintained for more than one station, because the frequency increment is greater per division on one dial control than on the other.

Simply stated, the present invention consists of so designing the circuits, more particularly the variable condensers in the circuits, that a constant frequency increment is produced for a corresponding movement of the control dial, thus permitting the variable control members to be interlocked and enabling a constant frequency relation to be maintained between the variable circuits.

With the two control method, a given station may be found on two or more different points on the local oscillator dial because the required intermediate frequency is produced by having the oscillator adjusted to a frequency either higher or lower than the frequency of the desired signal. With the improved system described here, not only the advantage of single control is obtained, but in addition the confusion to the operator, resulting when the same station is found at several settings, is avoided by using the constant frequency system, which requires only one control knob.

It should be understood that the use of straight line frequency condensers has been mentioned in the foregoing only because of the fact that the resultant equal spacing of stations along the dial scale of this type of condenser is a decided advantage in considering the plan now in force in connection with broadcast transmitting stations, which

provides for a separation of stations in terms of frequency rather than wave-length; furthermore with the straight line frequency condenser the same ease of tuning stations is afforded on the lower dial scale as on the upper dial scale. The invention is based upon the proposition of maintaining a constant frequency relation between circuits.

The figure is a circuit diagram in which the rotors of the tuning condenser C and C¹ are mechanically and incidentally electrically connected, the shaft serving as the common mechanical connection, terminating in a control knob dial D. The circuit consisting of a loop L, the primary of a coupling transformer L¹, the grid biasing battery N and the variable tuning condenser C is connected to the grid and filament of the vacuum tube VT. The variable condenser C is so designed that the circuit will respond to a frequency of from 1500 to 500 kilocycles when the control knob is moved through its complete range of 180 degrees. The plate circuit of the vacuum tube VT includes an inductance L² and a capacity C², the values of which are such as to respond to a frequency of 50 kilocycles. The oscillator circuit consists of the inductance L³ and one side L² of the coupling transformer K shunted by the variable condenser C¹.

It should be understood that these designated frequencies have been chosen merely for the purpose of explanation and that a receiving set of the super-heterodyne type may be made to function with quite a number of other frequency differences, provided particularly that the frequency of the intermediate amplifier does not come within the limits of audibility. Thus, 100 kilocycles difference might just as well be used provided the intermediate amplifier has been adjusted to operate on this same frequency.

The grid and filament of the vacuum tube VT¹ are included in this circuit and in addition an inductance L⁴ is included in the plate circuit of the vacuum tube and is placed in inductive relation with the inductance I¹ for the purpose of sustaining oscillations. The variable condenser C¹ is so designed as to cause a circuit which includes the coupling inductance L² to vary the frequency of the oscillations from 1550 to 550 when the control dial D is rotated through its 180 degree range. The constant frequency increment characteristic of both variable con-

denser C and C¹ cause the frequency differences of 50 kilocycles, which is provided for at both maximum and minimum settings of the dial, to be maintained at all other points of the dial, thereby keeping the circuits in the constant frequency relation required for the operation of the receiving system. Merely for the purpose of completing the receiving system diagram, the batteries F and F¹ for heating the filament of the vacuum tubes VT and VT¹ respectively are shown, also the plate batteries B and B¹. The intermediate frequency amplifier (50 kilocycles, amplifier IFA) is shown connected to the tuned plate circuit L⁵ and C² of the vacuum tube VT the output of the intermediate amplifier IFA is shown connected to the detector and audio amplifier DA, the output of the latter being connected to a loud speaker.

While the advantages of equal spacing of stations over the dial range may not be obtained with condensers of different characteristics, the constant frequency relation system may be operated where the condenser C is an ordinary semi-circular plate variable condenser, provided the variable condenser C¹ is designed in such a manner as to provide for a constant frequency when both C and C¹ are mechanically locked to the same shaft and rotated together for the purpose of tuning, furthermore, two more semi-circular plate variable condensers which are not mechanically locked together may be operated from a single dial, provided a cam or other mechanical system for imparting mechanical motion with varying increment is used.

Having thus described my invention, what I claim is:

1. A signal receiving system comprising

an input circuit and an oscillator circuit, each of said circuits being provided with requisite tuning means including variable elements adapted to give a straight line frequency variation, and said circuits being tuned to different predetermined frequencies, and means for simultaneously varying the said tuning means so as to maintain constant said frequency difference.

2. A signal receiving system comprising an input circuit and an oscillator circuit, each of said circuits being provided with variable tuning condensers adapted to give a straight line frequency variation, said tuning condensers being relatively so adjusted as to give said circuits a predetermined frequency difference, and means to maintain constant throughout the operating range said frequency difference.

3. A signal receiving system comprising an input circuit and an oscillator circuit, each of said circuits being provided with variable tuning means adapted to give a straight line frequency variation, the said tuning means being mechanically connected in fixed relation and relatively adjusted to maintain a predetermined frequency difference between said circuits, and a tuning control common to the said tuning means.

4. A signal receiving system comprising an input circuit and an oscillator circuit, each of said circuits being provided with variable tuning means adapted to give a straight line frequency variation, the variable elements of the said tuning means being mounted upon a common shaft and fixed thereon in such angular relation as to maintain a predetermined frequency difference between said circuits.

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