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RADIO RECEIVING SYSTEM

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Fig. 1

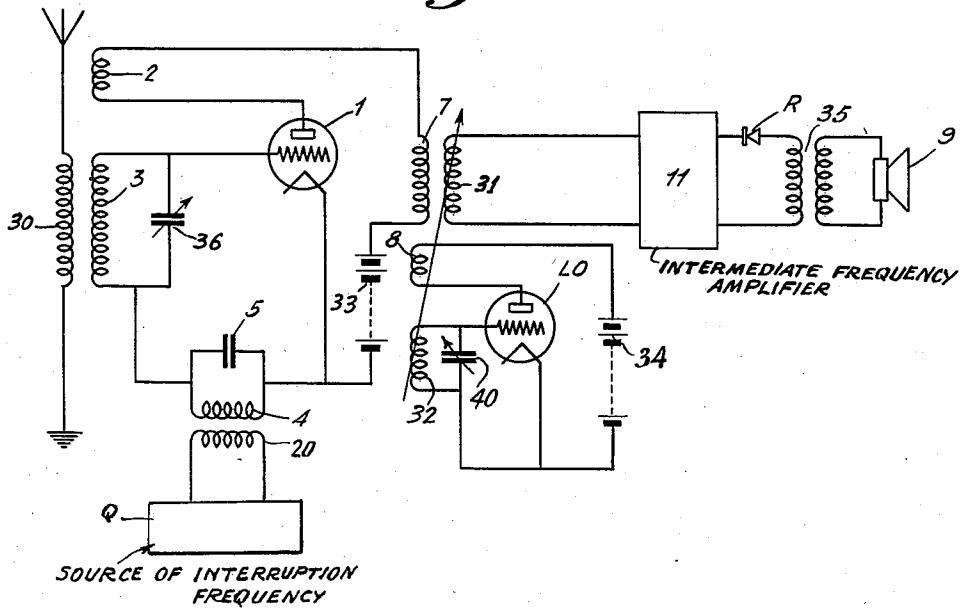
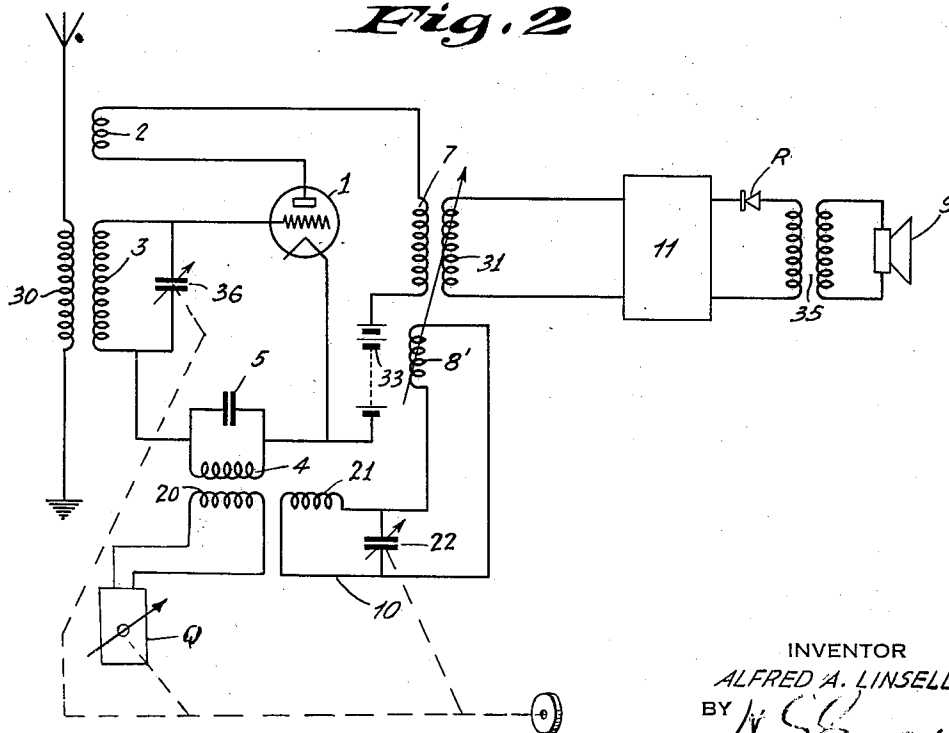


Fig. 2



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RADIO RECEIVING SYSTEM

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3 Claims. (Cl. 250—20)

This invention relates to radio and like receivers and more particularly to so-called super-regenerative receivers.

The invention has for its object to provide an improved receiver of the super-regenerative type having highly selective and good amplification qualities.

In super-regenerative receivers as at present known the common practice is to detect the received signals (that is, to demodulate them) after the super-regeneration process without further amplification, or at any rate, if any further such amplification is employed, only with low frequency amplification.

In its broadest aspect the present invention envisages subjecting the high frequency output from a super-regenerative circuit to a superheterodyne action thus taking advantage of the known properties of the superheterodyne principle to sharpen up the selectivity of the receiver as a whole.

According to this invention a radio or like receiver comprises a super-regenerative stage, means for heterodyning high frequency output from said stage to an intermediate frequency, means for amplifying said intermediate frequency and means for demodulating the output from the intermediate frequency amplifier.

Preferably a single local oscillator is employed to provide both the quenching frequency for the super-regenerative process and the local oscillation frequency for the superheterodyne process the second frequency being a harmonic of the first.

The invention is illustrated in the accompanying diagrammatic drawing in which Figure 1 illustrates one embodiment of the invention utilizing two sources of local oscillations, and, Figure 2 illustrates in diagrammatic form a preferred form of the invention utilizing a single source of local oscillations.

Referring to Figure 1 which shows one way of carrying out this invention there is employed a triode valve 1 which is connected for super-regeneration as well known per se. The grid of this valve is connected through a parallel tuned circuit, including a coil 3 shunted by a tuning condenser 36 and thence through a coupling inductance 4 shunted by a radio frequency by-pass condenser 5 to the cathode and received signal potentials are set up across the tuned circuit 3 as in the usual way, that is, through coupling of coil 3 with the antenna coil 30. The coupling inductance 4 is coupled to a coil 20 which is in the output of a local oscillation generator device Q

which may consist of a thermionic oscillator valve arrangement of any type well known per se, said oscillator providing the necessary quenching frequency for super-regeneration. The coil 3 is coupled as shown to a coil 2 in the anode circuit of valve 1 this latter coil being in series with an output coil 7 and a source of anode potential 33 between the anode and cathode of the valve in question. The output coil 7 is coupled to a further coil 31 connected across the input terminals of a fixed tuned thermionic valve intermediate frequency amplifier 11 of conventional design which is followed as in the usual way by a demodulating rectifier of any known type (exemplified in Figure 1 by a crystal R) whose rectified output is passed through transformer 35 to a loudspeaker or other utilization device 9 if desired after audio frequency amplification. Also coupled (preferably variably coupled) to the input circuit of the intermediate frequency amplifier 11 is a coil 8 in the output circuit of a second local oscillator valve LO which is adjustable in frequency this local oscillator being also of any known convenient type and providing the local oscillations for heterodyning. For example, this heterodyne local oscillator may be a back coupled valve as shown.

In the drawing, the tube LO is provided with an output circuit including in a connection between the anode and cathode thereof the coil 8 and a source of anode potential 34. The input circuit of the tube LO comprises a connection between the grid and cathode which connection includes the coil 32 shunted by a variable condenser 40.

In a preferred modification shown in Figure 2 the arrangement of Figure 1 is simplified somewhat by dispensing with a separate second oscillator LO for the superheterodyne action. In this preferred modification the same valve generator arrangement Q is employed both to provide the quenching or interruption frequency and to provide the local oscillation frequency for superheterodyning, the latter frequency being a harmonic of the former. The common oscillator arrangement Q is shown generally in the drawing, it being understood that it may comprise a thermionic valve generator of well known type, such as, a regeneratively coupled thermionic tube. An output coil 20 of the generator Q is coupled to the coupling coil 4 in the grid circuit of the super-regenerative valve 1 and is also coupled to a further coupling coil 21 in a link circuit 10 which is tuned as shown by an adjustable condenser 22 to a harmonic of the quenching frequency. The super-regenerative tube 1 is provided with an

output circuit connected between the anode and cathode thereof and including the feedback coil 2, the output coil 7 and the source of anode potential 33. The input of the tube 1 is connected between the grid electrode and the cathode thereof and comprises the input coil 3 shunted by the variable tuning condenser 36 and the coil 4 shunted by condenser 5. Coil 3 is in coupling relationship with the antenna coil 30. The link circuit contains also a further coupling coil 8' variably coupled to the input circuit of the intermediate frequency amplifier 11 through the coil 31, the two coils and the condenser in the link circuit being in parallel with one another. In this embodiment the source Q of quenching frequency should be made variable as shown by the arrow through Q. The condenser 22 provided for tuning purposes in the link circuit 10 and the adjustment means for controlling the quenching frequency and the said condenser may be mechanically connected to one another for gang control and also, if desired, with the condenser for tuning the grid circuit 3 of the super-regenerative valve 1. Where full gang control is employed, i. e. where as shown, one single tuning knob is employed means should of course be provided for ensuring that the difference between the natural frequency of the grid circuit of the super-regenerative valve and the superheterodyne local frequency is constant and equal to the intermediate frequency throughout the range of adjustment, and any suitable means known per se may be employed for this purpose.

I claim:

1. An electric amplification system comprising a regenerative circuit embodying an electron discharge device, having coupled input and output circuits, said regenerative circuit being adjusted near the point of oscillation, a source of oscillations, means coupling the source of oscillations and said regenerative circuit for periodically varying the conductance of the electron discharge device and thereby periodically start and stop the oscillations in the regenerative circuit, whereby

super-regenerative action is obtained, means comprising a source of oscillations coupled to the regenerative circuit for producing a beat frequency which is a product of the output of the regenerative circuit and the oscillations from said means, a beat frequency utilizing circuit and means for coupling the output circuit of said electron discharge device to said utilizing circuit.

2. An electric amplification system comprising a regenerative circuit provided with an electron discharge device having coupled input and output circuits, said input circuit being provided with a variable tuning means for tuning the input circuit to any one of a band of signal frequencies, said regenerative circuit being adjusted near the point of oscillation, a local source of oscillations, means coupling said local source of oscillations to the regenerative circuit for periodically starting and stopping the oscillations in the regenerative circuit, whereby super-regenerative action is obtained, said source of oscillations being provided with means for varying the frequency of the oscillations, an additional coupling between the source of oscillations and the regenerative circuit, said additional coupling comprising a tunable circuit including a variable tuning instrumentality for tuning the tunable circuit to a harmonic of the frequency generated by the source of oscillations, whereby there is produced in the regenerative circuit a beat frequency which is a product of said harmonic frequency and the frequency of the received incoming signal oscillations, and a beat frequency utilizing circuit coupled to the output circuit of said electronic discharge device.

3. The circuit arrangement described in the next preceding claim characterized by that means are provided for uni-controlling the input circuit tuning means, the means for controlling the frequency of the oscillations generated by the local oscillator and the means for controlling the frequency of the harmonic circuit.

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