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RADIO RECEIVER

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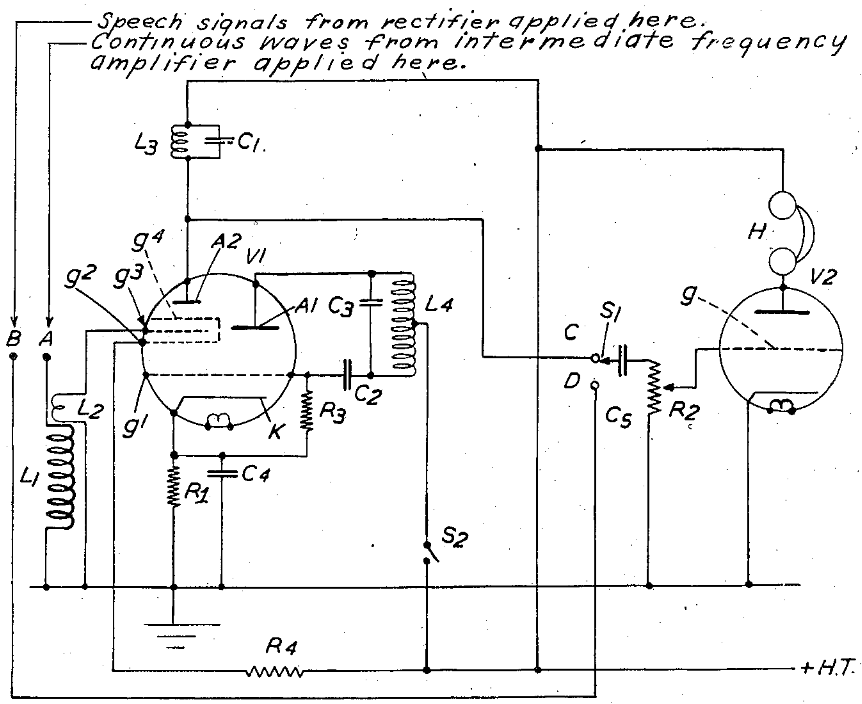

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RADIO RECEIVER

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2 Claims. (Cl. 250—20)

The present invention relates to circuit arrangements for the reception of continuous wave signals and more specifically to reception by means of a superheterodyne receiver employing automatic gain control.

For the detection of continuous wave signals the amplitude of the "beat note" or difference frequency is proportional to the product of the amplitude of the input signal and that of the local heterodyne oscillations.

In a superheterodyne receiver employing automatic gain control it is the conventional practice to inject the local heterodyne or C. W. oscillation at a point in the intermediate frequency amplifier, usually the last stage. This arrangement will cause the automatic gain control to come into operation and bias back the controlled valves. This desensitising of the receiver or amplifier can be partially avoided by the well known expedient of supplying a delay voltage so that the controlled valves are not affected by injection voltage due to the local C. W. oscillator. It will then be found, however, that the delay voltage will not be of the correct value for the reception of modulated signals with the local C. W. oscillator switched off. Alternatively, as a compromise, the strength of the local C. W. oscillator may be reduced, but it will then be found that it may be easily pulled into step or "zero beat" by a strong signal. Furthermore, the theoretically desirable condition that the local C. W. oscillator should be stronger than the signal will not always be met. Moreover, the strength of the local oscillator will also determine the strength of the harmonics it produces. These harmonics may occur at a frequency where signal frequency reception is desired.

It is the object of the present invention to overcome these difficulties and according thereto a circuit arrangement for the reception of C. W. signals by means of a superheterodyne receiver employing automatic gain control is characterised in that the local continuous oscillations beating with the intermediate frequency are not injected directly into the intermediate frequency amplifier provided with automatic gain control, but separate electric circuit paths are provided after the intermediate frequency amplifier having automatic gain control for reception of continuous wave signals and of modulated signals.

According to another aspect of the invention in circuit arrangements for the reception of continuous wave signals by means of a superheterodyne receiver employing automatic gain control, the continuous oscillations for beating with the intermediate frequency are combined with the intermediate frequency in a stage separate from the intermediate frequency amplifier having automatic gain control and having a minimum of coupling with the said intermediate frequency amplifying stage having the automatic gain control.

The invention will be better understood from the following description taken in conjunction with the accompanying drawing which shows by way of example, a circuit arrangement according to the invention incorporated in a system for receiving speech signals as well as continuous wave signals and in which a low frequency amplifying stage is common to the reception of both signals.

In the drawing there is shown a hexode-triode thermionic valve V1 having a cathode K (shown as indirectly heated) and a first grid g^1 common to the hexode and triode electrode combinations. The triode portion is completed by an anode A1 and the hexode portion is completed by grids g^2, g^3, g^4 and anode A2.

The triode portion of valve V1 functions as the local heterodyne oscillator and for this purpose is provided in the usual manner with a regenerative feedback circuit comprising inductance L4 and capacity C3 tuned to the desired frequency. Resistances R3 and capacity C2, as well as resistance R1 and capacity C4 are provided in well known manner.

On the hexode side of valve V1, the intermediate frequency continuous wave signals are applied between the terminal A and earth. The lead from terminal A to earth includes an inductance L1 which is coupled to another inductance L2 connected between grid g^3 which functions as a control grid, and the cathode K via resistance R1. L2 is a low impedance coupling coil, and L1 may be part of a tuned circuit at intermediate frequency. The anode A2 receives its high tension voltage via terminal H.T.+ via antiresonant circuit L3, C1 tuned to the difference frequency obtained between the intermediate frequency signal and the local beat oscillator, and the grids g^2, g^4 receive a positive voltage from H.T.+ via resistance R^4. The anode A1 of the local heterodyne oscillator receives its high tension voltage also from H.T.+ via an adjustable tap on the inductance L4. This lead includes a switch S2 so that when reception of modulated signals is desired, the local oscillator can be put out of action. The output from the valve V1 is applied via a switch S1 and resistance-capacity coupling C5, R2 to a low frequency amplifier V2 shown as a triode thermionic valve, the grid g of V2 being connected to an adjustable tap on R2 which thus acts as a volume control. The switch S1 is a change-over switch, one terminal C of which is connected to the output circuit of valve V1 as already stated and the other terminal D is connected at B to the output from the rectifier stage (not shown) of a receiver for speech reception. A pair of headphones H or other signal indicating device is connected in the output circuit of the low frequency amplifier V2.

For continuous wave signal reception, the oscillator is tuned to a frequency which differs from the intermediate frequency received by some 1000 cycles. Hence when the switch S1 is closed on terminal C as shown and switch S2 is closed the oscillations from the grid g^3 and the oscillations produced by the local oscillator (A1, g^1, K) will produce a difference frequency of 1000 cycles per second in the anode circuit L3, C1 of valve V1, which is placed across the volume control R2 and is amplified in valve V2 and then fed to the headphones H.

When the switch S1 is switched over to terminal D speech signals from B may be applied to V2 and amplified thereby. Preferably it is arranged that when switch S1 is switched over to D, switch S2 is opened.

By means of the circuit arrangement described the coupling between the intermediate frequency amplifier system and the local C. W. oscillator is negligible as only a small portion of the total intermediate frequency voltage is applied between g^3 and ground, and the circuits of the C. W. oscillator comprising L4C3 and the triode portion of V1 outside the valve are separated from the circuits of the hexode portion outside the valve. Hence the local heterodyne oscillator can be set for optimum conversion gain in the valve V1 without affecting the delay voltage that is associated with the rectification diodes (not shown) that are part of the intermediate frequency amplifier and pulling into step of the local oscillator by an incoming signal is remote due to the screening within the valve and also by using electronic coupling between the C. W. oscillator and the circuit of the signal at intermediate frequency.

Although the oscillator is only some 1000 cycles per second different from the intermediate frequency of the signals, coil L2 is effectively untuned and hence no positive feedback can result between L2 and L4.

By critical dimensioning of C1 and L3 a good note filter effect can be obtained, the damping of the filter being small due to the input impedance, namely, that of the hexode portion of V1, and the output impedance C5, R2 being of high value. If a note filtering effect is not required, C1, L3 may be replaced by a resistance of suitable value.

Another advantage of the circuit arrangement described is that by providing a two channel path, namely, one for continuous wave signals and one for speech signals, the circuit design for both is simplified.

Whilst in the example given, a hexode-triode valve has been described, any multigrid valve which functions by virtue of electronic mixing may be employed.

What is claimed is:

1. In a superheterodyne receiver of the type having an intermediate frequency wave circuit including an intermediate frequency amplifier adapted for the reception of continuous or speech modulated waves having automatic volume control means connected therewith, and a local oscillator for supplying a continuous wave to beat with the amplified continuous wave from said intermediate frequency amplifier, the combination including electronic means for producing a beat wave in response to waves from said intermediate frequency amplifier and said oscillator, said oscillator being electronically coupled with said beat producing means.

2. The combination according to claim 1, in which said beat producing means and said oscillator each include cathode, anode, and grid electrodes, said grid and anode of said beat producing means being separate from said oscillator grid and anode, said oscillator cathode and grid being common to said beat producing means.

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