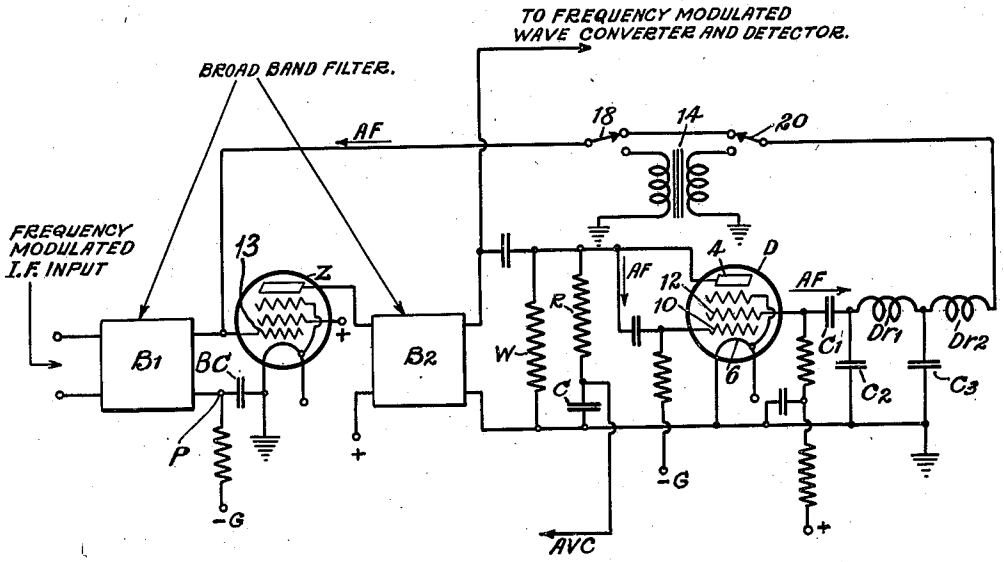
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RECEIVER FOR FREQUENCY OR PHASE MODULATED OSCILLATIONS

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Inventor
WILHELM SCHÖNFELD

By H. S. Grover

Attorney

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RECEIVER FOR FREQUENCY OR PHASE MODULATED OSCILLATIONS

Wilhelm Schönfeld, Berlin, Germany, assignor to Telefunken Gesellschaft für Drahtlose Telegraphie m. b. H., Berlin, Germany, a corporation of Germany

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5 Claims. (Cl. 250—20)

When impressing frequency modulation upon a wave transmitted from sending station, it is generally quite difficult to prevent simultaneous amplitude modulation. The latter in the receiving set occasions distortions even if the amplitude modulation arises only in the receiver itself. It would be possible to provide amplitude limiting means in the receiver, for instance, a biased rectifier though this involves the shortcoming that the incoming signal amplitude should not and cannot fall below a certain level. Another fact is that amplitude limiting is accompanied by harmonics which are conducive to whistling or squealing.

According to the invention, with a view to compensating and neutralizing amplitude modulation in frequency-or phase-modulated oscillations, the amplitude modulation frequencies are obtained by rectification of the incoming signal waves, followed by filtering and separation from the radio frequency by using a filter comprising series inductances and shunt capacities without ohmic resistances, and feeding the potentials of modulation frequency to the grid of a radio-frequency or intermediate-frequency tube, preferably directly, in a sense insuring inverse regulation.

An exemplified embodiment of the invention is shown in the single figure of the appended drawing. The intermediate-frequency energy subject to frequency modulation and, incidentally, also to amplitude modulation, is fed by way of a broad-band filter B1 to the control grid of the intermediate-frequency amplifier electron discharge tube Z and thence to broad-band filter B2. The intermediate-frequency energy, on the one hand, is fed from here to a stage, not shown, where conversion into amplitude-modulated oscillations is insured with a view to subsequent demodulation and, on the other hand, to electron discharge tube D in which the path between plate 4 and filament 6 serves for diode detection. The direct-current potential which arises across the load resistance W of this diode is fed by way of a filter mesh RC to a preceding stage (not shown) to serve as volume control potentials for intermediate-frequency or radio-frequency tubes (not shown).

The tube D serves two functions the first of which is to rectify the intermediate frequency voltages as described above and then to amplify the resulting modulation potentials. The first three electrodes of tube D, namely, filament 6, control grid 10 and screen grid 12 in this exemplified embodiment are used to amplify the amplitude modulation frequencies AF arising across load resistance W. These frequencies by way of condenser C1 are fed to the intermediate-frequency filter C2, Dr1, C3, Dr2, and thence impressed upon the control grid 13 of tube Z. What is important is that the said filter should contain no ohmic resistances for this would make the time constant too high and would involve the risk of the filters retaining not only the intermediate frequency but also the amplitude modulation frequencies. The filter coupling the output electrodes of tube D and the input electrodes of tube Z is free of any electron discharge device. Hence, it may be termed a non-electronic reactive circuit having substantially no resistive component. In fact, this danger is particularly eminent where the amplitude-modulation frequencies do not consist of audio-frequency only, but also, or exclusively, of carrier frequencies, say, between 30 and 60 kilocycles; a case to be considered especially in short-wave work or work with still shorter waves. Amplitude modulation with carrier frequencies is due to the fact that frequency modulation with these carrier frequencies is effected in the transmitter and that, incidentally, undesirable amplitude modulation happens. The higher the amplitude modulation frequencies, the lower the time constant should be. For this reason, the control potential AF varying at the rate of these frequencies is impressed directly upon the control grid 13 of the tube Z rather than across a grid leak resistance or are applied to point P of band-pass filter B1. In this latter case, it will be noted, the blocking condenser BC will have to be made so small that the apparatus would exhibit the tendency to oscillate to an undesirable degree as the lead brought from the grid biasing potential source of supply —G carries intermediate frequency which might by way of the plate potential source get into the other stages. Inasmuch as the time constant must be chosen very low, there will, as a general rule, be hardly any chance to regulate several tubes, for in that case, also, there might be an undue tendency to oscillate because of insufficient de-coupling.

What may finally be mentioned is that the control potential AF, prior to its being fed to the grid, may be stepped up by means of a transformer 14 that may be connected in the circuit by switches 18 and 20.

What is claimed is:

1. In a system for relaying frequency-modulated wave energy which may also carry undesired amplitude modulations, electron discharge

device means provided with input and output electrodes for amplifying said wave energy, means for deriving amplified wave energy from said device for signal demodulation purposes, a combined rectifier and amplifier tube, means for impressing said amplified wave energy on the rectifier electrodes of said tube and deriving therefrom modulation potentials for controlling the amplitude of the wave energy, means for deriving potentials characteristic of the undesired amplitude modulations from said rectifier electrodes and impressing the same on the amplifier electrodes of said tube, and non-electronic reactive means coupled with said amplifier electrodes for impressing amplified amplitude modulations on the input electrodes of said device in reversed phase relative to the phase of the undesired amplitude modulations on the wave energy being amplified by said device.

2. In a wave length modulated wave receiver, a wave amplifier of controllable gain having an input and an output, means for impressing wave length modulated wave energy on the input of said amplifier, means for deriving amplified wave length modulated wave energy from the output of said amplifier, and means for neutralizing undesired amplitude modulations on said wave energy comprising, a rectifier having an output and having an input excited by said wave energy, and a non-electronic reactive circuit having substantially no resistive component coupling said rectifier output to the input of said amplifier of controllable gain to control the gain of said amplifier degeneratively with respect to the said undesired amplitude modulations on said wave energy.

3. In a wave length modulated wave receiver, a wave amplifier of controllable gain having an input and an output, means for impressing wave length modulated wave energy on the input of said amplifier, means for deriving amplified wave length modulated wave energy from the output of said amplifier, and means for neutralizing undesired amplitude modulations on said wave energy comprising, a rectifier having an output and having an input excited by said wave energy, modulation potential amplifying means having an input coupled to said rectifier output, said modulation potential amplifying means having an output, and a non-electronic reactive circuit having substantially no resistive component coupling said modulation potential amplifier output to the input of said amplifier of controllable gain to control the gain thereof degeneratively with respect to the said undesired amplitude modulations on said wave energy.

4. In a wave length modulated wave receiver, a wave amplifier of controllable gain having an input and an output, means for impressing wave length modulated wave energy on the input of said amplifier, means for deriving amplified wave length modulated wave energy from the output of said amplifier, and means for neutralizing undesired amplitude modulations on said wave energy comprising, a rectifier having an input and having an output excited by said wave energy, and a filter comprising series inductances and parallel capacities coupling the output of said rectifier directly to the input of said amplifier of controllable gain to control the gain thereof degeneratively with respect to the said undesired amplitude modulations on said wave energy.

5. A receiver as recited in claim 2 including a potential step-up transformer in said coupling including said reactive circuit between said rectifier output and the input of said amplifier of controllable gain.

WILHELM SCHÖNFELD.