

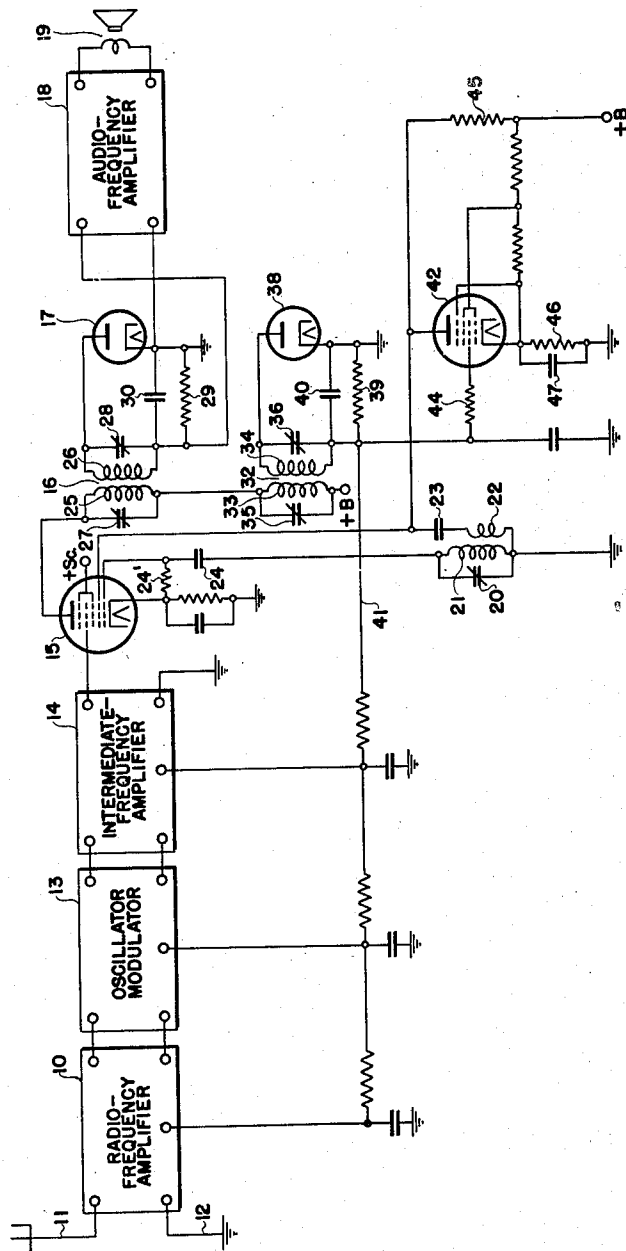
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SIGNAL TRANSLATING SYSTEM

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SIGNAL-TRANSLATING SYSTEM

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This invention relates to signal-translating systems and particularly to such systems having a regressive control of a given characteristic of the signal output of the signal-translating channel thereof, the control means being unaffected by variations in such signal-output characteristic. While the invention is generally useful in signal-translating systems, it is of particular utility as a noise suppressor network for silencing a modulated-carrier signal receiver during intervals when the amplitude of received signals is below a predetermined value.

It is desirable to incorporate in a modulated-carrier signal receiver an arrangement for silencing the receiver during intervals when the received signal is below a predetermined value necessary for satisfactory reproduction, generally near the noise level. It is also desirable to silence a receiver during the intervals when it is mistuned more than a predetermined amount from a strong desired signal in order to prevent the reproduction of signals distorted by such mistuning.

The silencing arrangements of receivers of the prior art have generally been of the progressive type; that is, a control signal to operate the silencing network is derived from a given point of the signal-translating channel of the receiver and utilized to block the signal-translating channel at a subsequent point in the channel. In certain receiver designs, it is more advantageous to utilize a regressively operating silencing network; that is, one in which the control effect is injected into the signal-translating channel at a point preceding the point from which the control signal is derived. However, in signaling systems of the prior art this was not possible because of the fact that blocking the signal channel at a point preceding the point, from which the control signal was derived, had the effect of removing the source of the blocking control signal. Transmission through the signal-translating channel of such a receiver would, therefore, again take place and this process would repeat itself indefinitely causing an objectionable flutter.

It is an object of the invention to provide a modulated-carrier signal-translating system having a regressive control of a given characteristic of the output signal of the signal-translating channel, the control means itself being substantially unaffected by variations in such characteristic due to the control means.

It is a further object of the invention to provide a regressively controlled silencing network

for a modulated-carrier signal receiver in which the control means is always effective.

In accordance with the invention, a modulated-carrier signal-translating system including a signal-translating channel comprises a signal-translating stage in the channel, the signal output of the stage having two characteristics. There is provided a regressive control means coupled to the channel and including means responsive only to one of the two characteristics for producing a control effect varying in accordance therewith, and means for utilizing the control effect for altering only the other of the two characteristics, whereby the control means is unresponsive to alterations in the other of the two characteristics.

In accordance with a preferred embodiment of the invention, control of the signal output of the signal-translating channel of a modulated-carrier signal-translating system is effected by controlling the beat frequency between locally-generated oscillations and a desired received signal, the output circuit of the signal-translating channel being responsive only to a signal of a predetermined beat frequency. The control of the signal output of the channel in accordance with a characteristic of the signal input to the system is effected by means of a regressively operating control channel which varies the frequency of the locally-generated oscillations and thus the frequency of the beat-frequency signal. The control system itself is responsive only to signals of the frequency of the input to the system and is thus substantially unaffected by variations in the frequency of the locally-generated oscillations.

In a preferred embodiment, the invention is utilized in a modulated-carrier signal receiver as a silencing network, the receiver being silenced when the locally-generated oscillations are stopped by the control means which, in turn, is responsive to the amplitude of the signal input to the system. The potential utilized to silence the receiver may also be utilized automatically to control the amplification thereof, the operation of the amplification control in this case also being substantially independent of the operation of the silencing network.

The novel features which are believed to be characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, together with other objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying

drawing, which is a circuit diagram, partly schematic, of a modulated-carrier receiver of the superheterodyne type embodying a silencing network designed in accordance with the invention.

Referring now more particularly to the drawing, the receiver illustrated comprises a radio-frequency amplifier 10 having an input circuit coupled between antenna 11 and ground 12 and an output circuit coupled to an oscillator-modulator or first frequency-changer 13. Connected in cascade with the output circuit of frequency changer 13 in the signal-translating channel of the receiver are an intermediate-frequency amplifier 14, a second frequency changer 15, a selector 16, a detector 17, an audio-frequency amplifier 18, and a sound reproducer 19. There is, in connection with frequency changer 15, a frequency-determining circuit including condenser 20 and inductance 21 for generating local oscillations of a predetermined frequency. A feed-back circuit for sustaining oscillations in frequency-determining circuit 20, 21 is coupled from the anode of the modulator section of tube 15 through a blocking condenser 23 and inductance 22 inductively coupled to inductance 21. Frequency-determining circuit 20, 21 is coupled to the oscillator grid of the oscillator section of vacuum tube 15 through a coupling condenser 24. A grid leak 24' is provided for the oscillator grid. The selector 16 comprises windings 25 and 26 tuned by condensers 27 and 28, respectively, to the normal second intermediate frequency.

Detector 17 is provided with a load circuit comprising a resistor 29 by-passed for intermediate-frequency currents by condenser 30.

Considering first the operation of the receiver as a whole, without regard to the details of the portion of the receiver constituting the present invention presently to be described, a desired received signal is selected and amplified in radio-frequency amplifier 10 and is converted to a first modulated intermediate-frequency carrier by the first frequency changer 13. The signal as thus converted is further amplified in intermediate-frequency amplifier 14, is converted in the second frequency changer 15 to a second modulated intermediate-frequency carrier. The second intermediate-frequency signal is translated through selector 16 to detector 17, wherein the audio frequencies of modulation are derived. The audio frequencies of modulation are, in turn, amplified in audio-frequency amplifier 18 and reproduced by sound reproducer 19.

Referring now to the parts of the system constituting the present invention, there is connected in the anode circuit of frequency changer 15, in series with selector 16, a second selector 32 comprising inductively coupled windings 33, 34 sharply tuned to the frequency of the first intermediate-frequency signal by means of condensers 35 and 36, respectively. Coupled to the selector 32 there is provided an auxiliary diode rectifier 38 having a load circuit comprising a resistor 39 by-passed for intermediate-frequency currents by condenser 40. In order to provide an automatic amplification control for the receiver, the negative-bias voltage developed across resistor 39 is applied through conductor 41 to the control grids of one or more of the tubes of radio-frequency amplifier 10, first frequency-changer 13, and intermediate-frequency amplifier 14. The bias voltage developed across resistor 39 is also applied through resistor 44 to the control grid of a vacuum tube 42, the anode circuit of which is connected in shunt to the feed-back circuit

22, 23 of the oscillator section of frequency changer 15 to control the generation of local oscillations. Operating potentials are supplied from the source +B through resistor 45 to the oscillator anode of frequency changer 15 and the anode of vacuum tube 42 and through the windings 25, 33 to the output anode of tube 15. A cathode-biasing circuit comprising resistor 46 by-passed by condenser 47 is provided for vacuum tube 42.

In considering the operation of the circuit just described, it will be seen that, under normal conditions of operation, the locally-generated oscillations of the oscillator section of frequency changer 15 are heterodyned with the first intermediate-frequency signals derived from amplifier 14 to produce a beat frequency or second intermediate-frequency signal, which may be considered as one output characteristic of tube 15. This second intermediate-frequency signal is translated by the selector 16 to detector 17, wherein audio-frequency potentials are derived in a conventional manner. Also during normal operation, there is present in the output circuit of frequency changer 15 a component varying in amplitude in accordance with, and having the frequency of, the first intermediate-frequency signal, which may be considered as a second output characteristic of tube 15. This signal component is translated to rectifier 38 through selector 32, and thus there is developed across resistor 39 a bias voltage or control effect which varies directly in accordance with the amplitude of received signals. This bias voltage is applied negatively over conductor 41 to the grids of one or more of the tubes of radio-frequency amplifier 10, first frequency-changer 13, and intermediate-frequency amplifier 14, thereby to maintain the signal input to detector 17 within a relatively narrow range for a wide range of received signal amplitudes. The bias voltage developed across resistor 39 is also applied negatively to the control grid of vacuum tube 42 through resistor 44 to control its anode conductance. The cathode of amplifier 42 is initially biased slightly positively by means of resistor 46. Amplifier 42 is biased beyond cutoff when the negative voltage supplied to its control grid from resistor 39 is increased to a predetermined value corresponding to a signal input of sufficient amplitude to ensure satisfactory reproduction. The circuit constants are such that the unidirectional potential of the oscillator anode of frequency changer 15 is normal when vacuum tube 42 is biased beyond cutoff, but is reduced below an operating value when tube 42 has a substantial anode conductance. Thus, when vacuum tube 42 is conductive, during the reception of weak signals, it has the effect of reducing to zero the amplitude of the oscillations generated in the oscillator section of frequency changer 15, effectively suppressing second intermediate-frequency signals without affecting the first intermediate-frequency output of tube 15 to which control tube 42 is solely responsive, and thus effectively preventing audio-frequency signals from being translated to sound reproducer 19. When the received signal amplitude rises above a predetermined limiting value, tube 42 is cut off and the receiver operates in a normal manner. It will be seen that the automatic amplification control circuit and the silencing control circuit of the network just described are at all times operative, since the voltage developed across resistor 39 is not substantially affected by changes in the signal output of the signal-translating channel of the receiver.

As illustrative of a specific embodiment of the invention, the following circuit constants are given for a receiver having a first intermediate-frequency channel of 460 kilocycles, locally-generated oscillations of 360 kilocycles, and a second intermediate-frequency of 100 kilocycles:

Tube 15.....	Type 6A8
Tubes 17 and 38.....	Type 6H6
Tube 42.....	Type 6J7
Resistor 29.....	ohms... 500,000
Resistor 39.....	do... 500,000
Resistor 46.....	do... 500
Resistor 45.....	do... 100,000

While there has been described what is at present considered to be the preferred embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A modulated-carrier signal-translating system including a signal-translating channel, a signal-translating stage in said channel, the signal output of said stage having two characteristics, and a regressive control means coupled to said channel including means responsive only to one of said two characteristics for producing a control effect varying in accordance therewith and means for utilizing said control effect for altering only the other of said two characteristics, whereby said control means is unresponsive to alterations in said other of said two characteristics.

2. A modulated-carrier signal-translating system including a signal-translating channel, a signal-translating stage in said channel having signal output comprising two signal components, and a regressive control means coupled to said channel including means responsive only to one of said two components for producing a control effect varying in accordance therewith and means for utilizing said control effect for altering only a characteristic of the other of said two components, whereby said control means is unresponsive to variations in said characteristic of said other of said two components.

3. A modulated-carrier signal-translating system including a signal-translating channel having an input and an output circuit, a frequency changer therein, said frequency changer normally developing a beat-frequency signal output of a predetermined frequency, a regressive control means coupled to said channel including means responsive only to a predetermined characteristic of the signal input to said input circuit for producing a control effect varying in accordance therewith and means for utilizing said control effect for altering only the frequency of said beat-frequency output from said predetermined frequency, whereby said control means is unresponsive to substantial changes in the frequency of said beat-frequency output, and means responsive to said predetermined frequency of said beat-frequency output for determining an operative condition of said output circuit.

4. A modulated-carrier signal-translating system including a signal-translating channel having an input and an output circuit, a frequency changer therein, means for generating oscillations of a fixed frequency coupled to said frequency changer, said frequency changer nor-

mally developing a beat-frequency signal between said oscillations and a received signal, a regressive control means coupled to said channel and responsive to a predetermined characteristic of the signal input to said input circuit for stopping said oscillations, said control means being independent of substantial changes in the frequency of said beat-frequency output, and means responsive to said beat-frequency output for determining an operative condition of said output circuit.

5. A modulated-carrier signal-translating system including a signal-translating channel having an input and an output circuit, a frequency changer therein, said frequency changer normally developing a beat-frequency signal output of a predetermined frequency, a regressive control means coupled to said channel including means responsive only to the amplitude of the signal input to said input circuit for producing a control effect varying in accordance therewith and means for utilizing said control effect for altering only the frequency of said beat-frequency output from said predetermined frequency, whereby said control means is unresponsive to substantial changes in the frequency of said beat-frequency output, and means responsive to said predetermined frequency of said beat-frequency output for determining an operative condition of said output circuit.

6. A modulated-carrier signal-translating system including a signal-translating channel having an input and an output circuit, a frequency changer therein, said frequency changer normally developing a beat-frequency output of a predetermined frequency, a regressive control means coupled to said channel including means responsive only to the amplitude of the signal input to said input circuit for producing a control effect varying in accordance therewith and means for utilizing said control effect for altering only the frequency of said beat-frequency output from said predetermined frequency, whereby said control means is unresponsive to substantial changes in the frequency of said beat-frequency output, and means responsive only to signals of said predetermined frequency coupled between said frequency changer and said output circuit.

7. A modulated-carrier signal receiver including a signal-translating channel having an input and an output circuit, a frequency changer in said channel, said frequency changer normally developing a beat frequency of a predetermined frequency, a regressive control means coupled to said channel including means responsive only to the amplitude of the signal input to said input circuit for producing a control effect varying in accordance therewith and means for utilizing said control effect for altering only the frequency of said beat-frequency output from said predetermined frequency, whereby said control means is unresponsive to substantial changes in the frequency of said beat-frequency output, and means responsive only to signals of said predetermined frequency coupled between said frequency changer and said output circuit for silencing said receiver when the frequency of said beat-frequency output is substantially altered.

8. A modulated-carrier signal receiver including a signal-translating channel having an input and an output circuit, a frequency changer in said channel, means for generating oscillations of a fixed frequency coupled to said frequency changer, means comprising said frequency changer for developing a beat frequency

between said oscillations and a received signal, a regressive control means coupled to said channel and responsive to the amplitude of the signal input to said input circuit for stopping said oscillations, said control means being independent of substantial changes in the frequency of said beat-frequency output, and means responsive only to said beat frequency coupled between said frequency changer and said output circuit for silencing said receiver when said oscillations are stopped.

9. A modulated-carrier signal-translating system including a signal-translating channel having input and output circuits, a frequency changer therein, means for generating oscillations of a fixed frequency, means comprising said frequency changer for developing a beat frequency between said oscillations and a received signal, a regressive control means coupled to said channel and responsive to a predetermined characteristic of the signal input to said input circuit for suppressing said oscillations from said frequency changer, said control means being substantially independent of said oscillations, and means responsive to said beat-frequency output for determining an operative condition of said output circuit.

10. A modulated-carrier signal-translating system comprising a signal-translating channel having an input and an output circuit, a frequency changer in said channel having an input circuit and an output circuit, said frequency changer normally developing a beat-frequency output of a predetermined frequency, a selector circuit responsive to the frequency of the signal input to said system coupled to the output circuit of said frequency changer, a regressive control means coupled to said selector circuit including means responsive to the amplitude of the signal input to said input circuit for producing a control effect varying in accordance therewith and means for utilizing said control effect for substantially altering the frequency of said beat-frequency output, and means responsive only to signals of said predetermined frequency coupled between said output circuit of said frequency changer and said output circuit of said system.

11. A modulated-carrier signal-translating system comprising a signal-translating channel having an input and an output circuit, a frequency changer in said channel having an input and an output circuit, means for generating oscilla-

tions of a fixed frequency coupled to said frequency changer, means comprising said frequency changer for developing a beat-frequency output of a predetermined frequency from said oscillations and a received signal, a selector circuit responsive to the frequency of the signal input to said system coupled to the output circuit of said frequency changer, a regressive control means coupled to said selector circuit and responsive to the amplitude of the signal input to said input circuit for stopping said oscillations, and means responsive only to signals of said predetermined frequency coupled between said output circuit of said frequency changer and said output circuit of said system.

12. A modulated-carrier signal-translating system comprising a signal-translating channel having input and output circuits, a frequency changer in said channel for developing a beat-frequency output of a predetermined frequency, a regressive control means responsive to the amplitude of received signals coupled to said channel for controlling the amplification and including means for substantially altering only said beat frequency from said predetermined frequency, whereby said control means is unresponsive to substantial changes in the frequency of said beat-frequency output, and means responsive only to said predetermined frequency for determining an operative condition of said output circuit.

13. A modulated-carrier signal receiver comprising a signal-translating channel having input and output circuits, a frequency changer in said channel for developing a beat-frequency output of a predetermined frequency, an audio-frequency detector coupled to the output circuit of said frequency changer, a regressive control means responsive to the amplitude of received signals coupled to said channel for maintaining the amplitude of the signal input to said detector within a relatively narrow range for a wide range of received signal amplitudes and including means for substantially altering only said beat frequency from said predetermined frequency, whereby said control means is unresponsive to substantial changes in the frequency of said beat-frequency output, and means responsive only to said predetermined frequency for silencing the receiver when the frequency of said beat frequency is substantially altered.

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