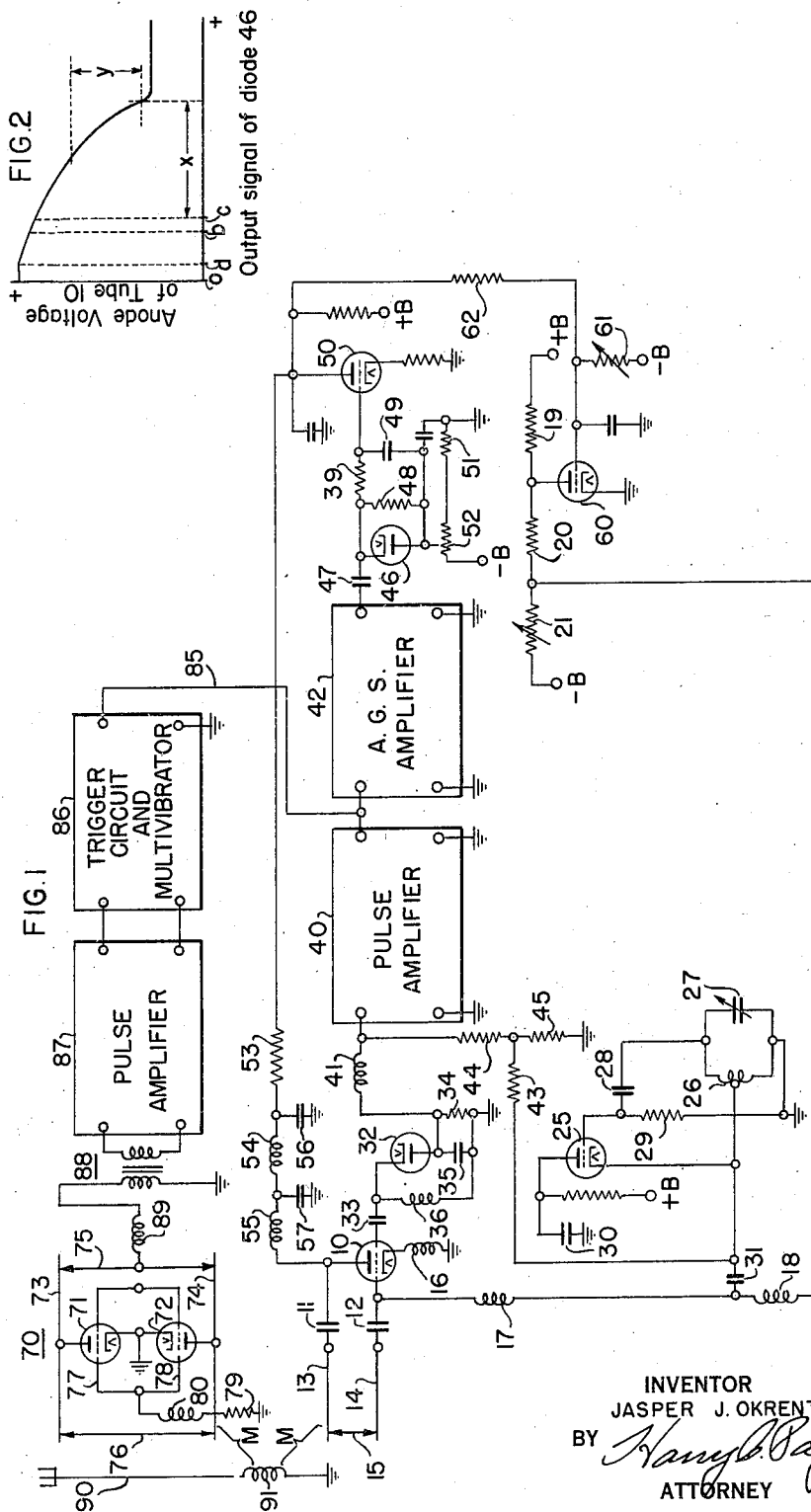


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WAVE-SIGNAL RECEIVER, INCLUDING
A DISABLING ARRANGEMENT
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WAVE-SIGNAL RECEIVER, INCLUDING A
DISABLING ARRANGEMENT

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7 Claims. (Cl. 250—20)

1

This invention is directed to a wave-signal receiver including an arrangement for disabling the receiver in response to an abnormal variation of a predetermined operating condition of the receiver. While being subject to a variety of applications, the invention is especially suited for inclusion in a wave-signal transponder system and will be particularly described in that connection.

As used throughout this specification, the term "wave-signal transponder system" is intended to designate a wave-signal translating system including a receiver and a transmitter arranged to transmit a reply signal in response to a received interrogating signal, each such signal preferably comprising a pulse-modulated radiant-energy signal.

In one prior transponder system, the receiver is of the superregenerative type and the transmitter is triggered, or set into operation, under the control of the receiver through an amplitude-selective circuit. Optimum sensitivity of such an arrangement is obtained by adjusting the receiver gain to a compromise value between that corresponding to maximum receiver sensitivity and that which is necessary to assure freedom from triggering the transmitter on the quiescent signal output of the receiver. This quiescent signal comprises the noise-signal output of the receiver which is obtained during intervals when no desired signal is being received. In general, the quiescent signal has a relatively low amplitude, as determined by the noise signals and other inherent disturbances of the receiver circuit, but its amplitude varies with variations of the operating potentials, tube characteristics and other factors. In order to maintain freedom from triggering the transmitter on the quiescent signal, it is customary to embody a gain-control arrangement in the receiver. The gain-control arrangements known in the art usually comprise a signal-translating channel for translating and rectifying at least a selected portion of the quiescent signal of the receiver to derive a gain-control voltage. The gain-control voltage varies with variations in the gain characteristic of the receiver and is utilized to stabilize the receiver gain so as to maintain the amplitude of the quiescent signal output at that value required for optimum sensitivity.

While receivers of the type under consideration, stabilized by the described gain-control arrangements, are generally satisfactory, they are subject to certain operating limitations which may be undesirable in particular installations. Specifically, in the event of a failure in the gain-

2

control arrangement, the gain-control voltage reaches an extreme value in the direction to increase the receiver sensitivity and gain. As a result, the amplitude of the quiescent signal output may increase sufficiently to trigger the associated transmitter. This phenomenon is termed "false firing" and may be most undesirable.

Shut-down circuits have been proposed for effectively interrupting the coupling between the receiver and transmitter in case of a failure in the gain-control system so as to preclude the false firing described above. One such arrangement is shown in copending application Serial No. 558,531, now abandoned, filed concurrently herewith, in the name of Jasper J. Okrent, and assigned to the same assignee as the present invention. Where the receiver is of the superregenerative type, it may frequently be more advantageous to disable the superregenerative detector itself. This not only obviates false firing of the transmitter but also eliminates radiation of the quiescent output signal of the receiver during operating intervals when the transponder system is defective which is a desirable feature especially for military installations. However, if a shut-down circuit of the type disclosed in the aforementioned application is utilized in the manner suggested, the receiver may under certain circumstances be disabled while the gain-control arrangement is, in fact, functioning normally. Suppose, for example, that the operation of the superregenerative detector is momentarily interrupted for some reason or other but that the control arrangement is in a completely operative state. By interrupting the detector operation, the signal input to the gain-control arrangement falls to zero and the shut-down circuit operates to disable the receiver just as though the gain-control arrangement had failed. This operation of the shut-down circuit may be undesirable in that it prevents the receiver from being restored to normal operating conditions when the momentary interruption of its detector circuit has terminated.

The invention proposes a new type of control arrangement which is peculiarly adapted to any wave-signal receiver having a signal generator included as a necessary component thereof, such as a superregenerative receiver including a quench-signal generator. The proposed arrangement takes advantage of the fact that a monitor signal may be derived from the signal generator of the receiver and may be utilized for monitoring purposes. As applied to receivers of the type discussed above, the monitor signal controls the

3

shut-down circuit to disable the receiver only in response to a true failure of the gain-control arrangement.

It is an object of the invention to provide an improved wave-signal receiver including an arrangement for disabling the receiver in response to an abnormal variation of an operating condition of the receiver and which avoids one or more of the above-mentioned limitations of the described arrangements.

It is another object of the invention to provide an improved wave-signal receiver including an arrangement for monitoring at least a portion of the receiver and for disabling the receiver in response to an abnormal variation of a predetermined operating condition of the monitored portion.

It is a specific object of the invention to provide an improved wave-signal receiver including a gain-stabilization arrangement and means for monitoring the gain-control arrangement to provide a control effect effectively to disable the receiver in response to an abnormal variation of a predetermined operating condition thereof.

In accordance with the invention, a wave-signal receiver including an arrangement for disabling the receiver in response to an abnormal variation of a predetermined gain condition thereof comprises a signal-translating channel having a predetermined gain condition and means for applying to the channel for translation therethrough received signals and in the absence of received signals a quiescent signal representing inherent electrical disturbances. This means includes a signal generator associated with the signal-translating channel at least during receiving intervals for effecting the application of the signals to the channel. The receiver additionally is provided with means for deriving from the signal generator a monitor signal and for applying the monitor signal directly to the signal-translating channel independently of any received signal and any quiescent signal, and means responsive to at least one of these applied signals after translation through the channel for deriving an output signal having amplitude levels within a predetermined range of values for normal gain conditions of the channel and having abnormal amplitude levels outside the predetermined range in response to the substantial absence of all of the translated signals caused by an abnormal variation of the gain condition of the channel. The receiver also includes amplitude-selective means responsive primarily only to such abnormal amplitude levels of the output signal for deriving a control effect and means for utilizing this control effect effectively to disable the receiver.

For a better understanding of the present invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the drawing, Fig. 1 is a schematic circuit diagram of a wave-signal transponder system, embodying the present invention in a preferred form, and Fig. 2 is a graph utilized in explaining the operation of a portion of the Fig. 1 arrangement.

Referring now more particularly to Fig. 1, there is represented a wave-signal transponder system for translating pulse-modulated signals and including an arrangement, in accordance with the present invention, for providing a con-

4

trol effect in response to an abnormal variation of a predetermined operating condition of the receiver portion thereof. For convenience of explanation, the system is illustrated as a radio beacon adapted to transmit direction-finding information to inquiring aircraft.

The beacon includes a receiver of the super-regenerative type having a linear mode of operation. This receiver comprises an oscillator including a vacuum tube 10 having anode, cathode and control electrodes. A frequency-determining circuit is coupled to the anode and control electrodes of tube 10 through coupling condensers 11 and 12, respectively, this circuit being in the form of a transmission-line section of adjustable electrical length. The transmission-line section is provided by a pair of parallel conductors 13 and 14 of uniformly distributed inductance and capacitance and a short-circuiting element 15 adjustable therealong to determine the effective electrical length of the transmission-line section and the operating frequency of the oscillator in well-known manner. The cathode of tube 10 is grounded through a choke 16 and an operating bias potential is applied to the tube through additional chokes 17 and 18 from a bleeder network. The bleeder network consists of resistors 19 and 20 and a variable resistor 21, connected across terminals -B and +B of a potential source. A source of space current is applied to tube 10 in a manner to be pointed out hereinafter.

A quench-signal generator is associated with oscillator 10 for supplying a periodic quench signal thereto to provide superregeneration. This signal generator comprises a vacuum tube 25 arranged in an oscillatory circuit of the Hartley type. The oscillator has a frequency-determining circuit including an inductor 26 and an adjustable condenser 27, coupled to the control electrode of tube 25 through a condenser 28 and grid resistor 29. The anode of tube 25 is effectively connected with its frequency-determining circuit by means of a condenser 30 while the cathode thereof is directly coupled to a tap on inductor 26. A source of space current, indicated +B, is applied to the anode of the tube and a quench-signal output derived from the cathode circuit is delivered to oscillator 10 through a condenser 31 and choke 17. The quench signal supplied by oscillator 25 may have a sinusoidal or other suitable wave form but has a frequency which is low with reference to the operating frequency of oscillator 10. Also, the quench frequency is high in comparison with the pulse-repetition frequencies of interrogating signals to be received by the beacon, preferably, being so high that the quench period is equal to or less than the pulse duration of a received signal. Chokes 17 and 18 are selected to isolate the oscillations generated in the receiver circuit from the quench-signal generator and from the biasing circuit of resistors 19-21, inclusive. A diode detector 32 is coupled to the control electrode of tube 10 by way of a condenser 33. This diode provides means for deriving from the receiver an output signal having an amplitude characteristic determined by the receiver gain characteristic. A resistor 34, by-passed by a condenser 35, and a signal-frequency choke 36 constitute the load circuit of diode 32.

The receiver portion of the radio beacon also comprises a signal-translating channel, specifically, a gain-stabilization channel having a predetermined operating condition, such as a predetermined gain condition. This channel in-

cludes a pulse amplifier 40 of one or more stages associated with the described superregenerative detector and, therefore, associated with the signal generator 25 during intervals of wave-signal translation through a signal-frequency choke 41. Thus, choke 41 comprises means for applying the signal output of the detector 32 to the channel including pulse amplifier 40 for translation therethrough. The channel under consideration further includes an automatic-gain-stabilization or A. G. S. amplifier 42 of one or more stages coupled to the output circuit of pulse amplifier 40. The A. G. S. amplifier preferably includes selector circuits arranged to select the quench-frequency component of the detected signal output of the receiver for utilization in stabilizing the receiver gain.

To facilitate monitoring the described signal-translating channel in order to ascertain its operating state or condition, the receiver has means for deriving from the quench-signal generator a monitor signal and for applying the monitor signal to the channel for translation therethrough at least in the absence of received wave signals. To this end, the signal-translating channel is directly coupled to the output circuit of quench-oscillator 25 through a T-network of impedance 43, 44 and 45. This network is selected to supply to the gain-stabilization channel a monitor signal of low intensity as compared to the receiver detected signal output, but preferably with substantially the same phase as the quench-frequency component of that detected wave-signal output. In the illustrated arrangement the desired phase relation of the signals applied to the channel is accomplished by using resistors in the T-network. However, T-network 43-45 may, if desired, be augmented with a suitable phase-shifting circuit for securing any particular phase relation.

There is coupled to the output circuit of A. G. S. amplifier 42 means dependent upon the translation of signals through the described signal-translating channel for deriving therefrom an output signal having amplitude levels determined by the gain characteristic of the receiver and within a predetermined range of values for normal operating conditions of the receiver but having abnormal amplitude levels outside this range of values in response to an abnormal variation of the operating conditions of the receiver or of the gain condition of the gain-stabilization channel. This means comprises an A. G. S. rectifier, including a diode rectifier 46, coupled to the output circuit of A. G. S. amplifier 42 by a coupling condenser 47. The load circuit of diode 46 is provided by a resistor 48, a filter resistor 39 and a by-pass condenser 49. The rectifier circuit has a fast-charging time constant and a slow-discharge time constant so as to peak-rectify the applied signal output of amplifier 42.

The signal output of the rectifier, as obtained across its load resistor 48, is applied with positive polarity to the input circuit of an amplifier including a vacuum tube 50. A bias potential, derived from a bleeder network provided by a resistor 51 and a voltage divider 52 connected in circuit with a suitable potential source, indicated -B, is likewise applied to the input circuit of tube 50 through resistor 48 and an adjustable tap on the voltage divider. The magnitude of this bias potential is selected of such value that, in the absence of a control signal from A. G. S. rectifier 46, tube 50 is biased substantially to anode-current cutoff. A source of space cur-

rent +B is coupled to the anode of tube 50. A unidirectional potential, having a magnitude determined by the conductive state of tube 50, is derived from the anode-cathode circuit thereof and is utilized as a source of space current for receiver tube 10. To this end, the anodes of tubes 50 and 10 are coupled through a resistor 53 and a filter provided by series inductors 54 and 55 and shunt condensers 56 and 57. Tube 50 constitutes means for utilizing the output signal of the gain-stabilization channel to control the gain characteristic of the receiver through an adjustment of the anode-cathode excitation potential of tube 10.

The receiver is also provided with an amplitude-selective means responsive to abnormal amplitude levels of the output signal of the A. G. S. rectifier 46 for deriving a control effect. This last-named means comprises an electron-discharge device, specifically a triode amplifier including a vacuum tube 60 having its anode-cathode circuit connected in shunt relation to resistor 19 of the biasing circuit of receiver tube 10. Tube 60 is normally biased to anode-current cutoff by a suitable bias potential -B coupled to the input circuit thereof through a variable resistor 61. A resistor 62 couples the input circuit of tube 60 to the output circuit of amplifier 50 in order that tube 60 may be rendered conductive in response to abnormal amplitude levels of the output signal of the A. G. S. rectifier 46 for deriving a control effect. This control effect is produced in the biasing circuit of elements 19-21 and is utilized so to adjust the operating bias of oscillator 10 as effectively to disable the receiver portion of the beacon.

The transmitter portion of the radio beacon comprises a balanced ultra-high-frequency oscillation generator 70, forming the subject matter of copending application Serial No. 527,753, filed March 23, 1944, now Patent No. 2,431,762 issued December 2, 1947, in the name of Leonard R. Malling and assigned to the same assignee as the present invention. This generator operates at substantially the same frequency as the receiver and includes a pair of vacuum tubes 71 and 72. A first balanced transmission line of the feed-through type, comprising a pair of open conductors 73 and 74 is directly coupled to the anode electrodes of tubes 71 and 72. Adjustable tuning elements 75 and 76 are included in the line and constitute therewith a frequency-adjusting circuit for tuning the generator. A second balanced transmission line of the feed-through type, provided by a pair of conductors 77 and 78, is coupled to the control electrodes of tubes 71 and 72 and extends therefrom in the same direction as the first-described line. A grid resistor 79 is coupled to the control electrodes of the tubes through a signal-frequency choke 80 and transmission line 77, 78. A detailed description of this generator is included in the above-mentioned copending application.

Generator 70 is controlled by the receiver portion of the beacon through a connection 85, extending between the output circuit of pulse amplifier 40 and the input circuit of a unit 86. Unit 86 may be of conventional design and construction and includes a multivibrator adapted to be keyed into operation by an amplitude-selective trigger circuit to generate a single pulse of unidirectional potential, preferably, having a rectangular wave form and a controllable pulse duration. The output circuit of unit 86 is coupled through a pulse amplifier 87, a pulse transformer

88 and a signal-frequency choke 89 to the anode-cathode circuit of generator 70.

A single antenna-ground system 90, utilized for both receiving and transmitting, is magnetically coupled to the frequency-determining circuits of oscillators 10 and 70 of the receiver and transmitter portions, respectively, by means of an inductor 91. Inductor 91 is so positioned with respect to the frequency-determining circuits of oscillators 10 and 70 as to have a substantial magnetic coupling therewith, indicated by brackets M and M, for any adjustments of short-circuiting elements 15 and 75, 76.

Neglecting for a moment the direct coupling between quench-signal generator 25 and pulse amplifier 40 and the function of the control circuit including vacuum tube 60, the described arrangement constitutes a conventional radio beacon the operation of which is well understood by those skilled in the art so that a detailed description thereof is unnecessary herein. Briefly, during quiescent operating conditions when no signal is intercepted by antenna system 90, oscillations are periodically produced by oscillator 10 of the receiver circuit under the control of the quench voltage supplied by oscillator 25. These oscillations are initiated by the low-amplitude noise signals and similar disturbances inherent in the receiver circuit and have a correspondingly small amplitude value. The generated oscillations are detected by detector 32, producing across resistor 34 the low-amplitude quiescent signal output discussed above. This quiescent signal output is applied to pulse amplifier 40 for translation through the described gain-stabilization channel of the receiver. Thus, this channel is effective in the absence of received wave signals to translate a quiescent signal representing inherent disturbances within the receiver. After amplification in pulse amplifier 40, the quench-frequency component of the quiescent signal is selected and further amplified in A. G. S. amplifier 42 and applied to rectifier 46 for rectification. The resulting output signal of the rectifier, obtained across its load resistor 48, comprises a substantially unidirectional potential.

The output signal of the A. G. S. rectifier is applied with positive polarity to the input circuit of vacuum tube 50 and in conjunction with the biasing arrangements thereof determines the conductivity of tube 50 and, consequently, the magnitude of the unidirectional potential obtained therefrom and applied to the anode-cathode circuit of oscillator 10. The circuit parameters and operating potentials of the gain-control arrangement and amplifier 50 are so selected that under normal conditions of operation the excitation potential thus applied to oscillator 10 has that value which is required to establish optimum sensitivity of the receiver circuit. Any variation in the gain of the receiver manifests itself in an amplitude variation of its quiescent signal output which, in turn, produces like variations in the magnitude of the output signal of A. G. S. rectifier 46. Should the magnitude of this signal output increase, the conductivity of tube 50 is increased thereby reducing the anode-cathode excitation potential of tube 10 to restore the desired gain condition of the receiver. On the other hand, a decrease in the output signal of rectifier 46, indicating a loss of gain in the receiver, increases the anode-cathode potential of receiver 10 as required to stabilize the receiver gain and sensitivity.

The quiescent signal output of the receiver is

also applied from pulse amplifier 40 to unit 86. However, during normal operating conditions of the receiver the controlled amplitude of its quiescent signal output is insufficient to excite the trigger circuit of unit 86 and trigger transmitter 70.

Let it be assumed, now, that an aircraft desiring direction-finding information from the beacon transmits thereto a pulse-modulated interrogating signal. In general, this signal has a high intensity with reference to the noise signal of the receiver circuit so that oscillations generated in the receiver in any quench cycle occurring within the duration of a received pulse have a relatively high amplitude. During intervals which intervene between pulses of the received signal, the output signal of detector 32 comprises the low-amplitude quiescent signal mentioned above. The resulting output signal of the receiver, including both the high-amplitude and low-amplitude signal components, is supplied to pulse amplifier 40 for translation through the gain-stabilization channel to maintain the desired gain of the receiver in the manner indicated above. In the usual installation, the pulse-repetition frequencies of received interrogating signals are sufficiently low that the high-amplitude components of the receiver output signal, representing the pulse modulation of a received signal, have no appreciable adverse effect on the described operation of the gain-control arrangement.

This output signal of the receiver derived in response to a received interrogating signal is likewise applied through pulse amplifier 40 to unit 86. The first high-amplitude signal component derived from each received pulse of the interrogating signal causes the trigger circuit of unit 86 to excite its associated multivibrator and generate a pulse of unidirectional potential for application through units 87 and 88 to oscillation generator 70. Oscillations are continuously generated in unit 70 for the duration of each applied pulse of unidirectional potential and are transmitted by antenna system 90. Therefore, in response to a received interrogating signal, the beacon transmits a pulse-modulated reply signal having the same pulse-repetition frequency as the received signal and having a pulse duration determined by the adjustments of the multivibrator included in unit 86. The inquiring aircraft is thus able to obtain the desired bearing indication or other direction-finding information from such transmitted reply signals.

In considering the effect of the monitor signal applied from quench-signal generator 25 to the gain-stabilization arrangement and the operation of the control circuit including vacuum tube 60, reference is made to the curve of Fig. 2. This curve illustrates the variations in the anode-cathode potential of tube 10 in response to amplitude variations of the signal output of A. G. S. diode 46. During intervals of normal operation when the entire receiver arrangement is functioning properly, the signal input to diode 46 from A. G. S. amplifier 42 has two components: (1) the quench-frequency component of the detected signal output of the detector 32 and (2) the monitor signal obtained from quench-signal generator 25 through resistors 43, 44 and 45. For such conditions, the output signal of A. G. S. detector 45 has an amplitude level within a given range of values represented by dimension line x in Fig. 2. In response to this output signal the anode-cathode potential of receiver tube 10 is

controlled by amplifier 50, in the manner indicated above, to have amplitude levels within a normal range of values, designated by dimension line *y* in Fig. 2. Ranges *x* and *y* are not coextensive for a reason to be pointed out presently. The blocking bias applied to the input circuit of tube 60 is selected of such value that the anode-cathode voltage of receiver tube 10 must reach a value indicated by ordinate line *b* to overcome this bias and render tube 60 conductive. Therefore, during normal operating conditions, tube 60 remains blocked and the receiver is conditioned for operation.

Assume, now, that the circuit of receiver tube 10 is interrupted momentarily but that the operation of the gain-stabilization arrangement is unimpaired. Such conditions are frequently realized in transponder arrangements where it is necessary to suppress the transponder operation for brief intervals as, for example, when other equipment in a nearby installation having closely associated operating frequencies is to be utilized. Such momentary interruptions may be accomplished through suitable switching circuits which have been omitted from the drawing for the purpose of simplicity. While receiver tube 10 may be disabled during these intervals, quench-signal generator 25 continues to supply a monitor signal directly to pulse amplifier 40 through resistor network 43, 44, 45. Since the gain-control arrangement has been assumed to be functioning properly, an output signal of reduced amplitude, indicated by abscissa dimension *o-c* and corresponding to a limiting value of the range of values *x* is obtained from the circuit of rectifier 46, establishing the anode-cathode potential of tube 10 at a value indicated by ordinate line *c*. This voltage level is still below that required to energize control tube 60 and consequently at the termination of the receiver suppression interval, normal operating conditions are re-established throughout.

However, in the event of a failure of the gain-control arrangement, whether receiver tube 10 is disabled or not, the output signal of rectifier 46 has an abnormal amplitude level outside of the range designated *x*. Specifically, the amplitude level of this signal output is reduced to zero. Tube 50 is then driven substantially to anode-current cutoff by its biasing circuit including voltage divider 52 and the anode-cathode potential of receiver tube 10 rises to its maximum value, indicated by ordinate line *d*. With this abnormally high anode-cathode voltage applied to tube 10, the amplitude of its quiescent signal output may reach a sufficient level to energize the trigger circuit of unit 86 and initiate false firing of transmitter 70. This undesired result, however, is precluded by the operation of vacuum tube 60 which is rendered conductive in response to the rise of anode potential of tube 50 following such an abnormal amplitude level of the output signal of the gain-control arrangement. When tube 60 is conductive, the bias potential applied from bleeder network 19-21 to the control electrode of tube 10 has sufficient magnitude to hold the receiver blocked. In this manner the amplitude of the quiescent signal output is reduced substantially to zero value, thereby obviating false firing of the transmitter which may otherwise occur.

From the foregoing description it will be clear that the range *x* represents the range of values of the signal output of rectifier 46 for all operating conditions in which the gain-stabilization arrangement exhibits its normal operating char-

acteristics. Inasmuch as the gain-stabilization arrangement may function properly even though receiver tube 10 is temporarily disabled, this range of values *x* is greater than the range *y*, the allowable range of anode potential applied to tube 10 during intervals in which both the receiver tube 10 and the gain-stabilization arrangement are operating normally. It also will be apparent from the above description that the monitor signal prevents permanent blocking of the receiver by the control circuit of tube 60 as a result of conditions arising during the warm-up period after the receiver is first turned on. If the monitor signal were not used, tube 60 might warm up faster than all of tubes 25, 46, 50 and all of the tubes of units 40 and 42 and would then operate permanently to bias off the superregenerator 10. With the monitor signal, however, normal operating conditions are established as soon as the oscillator 25 causes a monitor signal to be effective at the amplifier 50 and this is true even in the event that the superregenerator 10 may have been temporarily biased off by the tube 60 due to some warm-up condition.

While the control circuit including tube 60 may be used to interrupt the coupling between the receiver and transmitter portions of the beacon, as by biasing one of units 86 or 87 to cutoff, it is preferred that the control effect be applied to receiver tube 10 as described. This utilization of the control effect is particularly advantageous in that it prevents radiation of the quiescent signal output of the receiver during intervals of abnormal operating conditions. Although the same result may be obtained by interposing a suitable stage of radio-frequency amplification between the superregenerative detector and the antenna system, it is more desirable to omit such stages of amplification in order to obtain a maximum signal-to-noise ratio.

It will be understood that other methods of applying the quench-signal voltage to the superregenerative detector may be employed. For example, the quench voltage may be applied to the anode-cathode circuit of tube 10. Likewise, in establishing a gain control of the receiver, the gain-stabilization channel may be used to vary the amplitude of the applied quench signal.

It will be further understood that the described invention is not limited in application to a receiver of the superregenerative type. Also, the invention is not restricted to the monitoring of a gain-control arrangement of a wave-signal receiver. If desired, the principal signal-translating channel of the receiver or particular components thereof may be monitored in the manner described to derive a control effect in response to an abnormal variation of a predetermined operating condition.

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 to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A wave-signal receiver including an arrangement for disabling said receiver in response to an abnormal variation of a predetermined gain condition thereof, comprising: a signal-translating channel having a predetermined gain condition; means for applying to said channel for translation therethrough received signals and in the

absence of received signals a quiescent signal representing inherent electrical disturbances, said means including a signal generator associated with said channel at least during receiving intervals for effecting said application of said signals to said channel; means for deriving from said signal generator a monitor signal and for applying said monitor signal directly to said channel independently of any received signal and any quiescent signal; means responsive to at least one of said applied signals after translation through said channel for deriving an output signal having amplitude levels within a predetermined range of values for normal gain conditions of said channel and having abnormal amplitude levels outside of said range in response to the substantial absence of all of said translated signals caused by an abnormal variation of the gain condition of said channel; amplitude-selective means responsive primarily only to said abnormal amplitude levels of said output signal for deriving a control effect; and means for utilizing said control effect effectively to disable said receiver.

2. A wave-signal receiver of the superregenerative type including an arrangement for disabling said receiver in response to an abnormal variation of a predetermined gain condition thereof, comprising: a signal-translating channel having a predetermined gain condition; means for applying to said channel for translation therethrough received signals and in the absence of received signals a quiescent signal representing inherent electrical disturbances, said means including a quench-signal generator associated with said channel at least during receiving intervals for effecting said application of said signals to said channel; means for deriving from said quench-signal generator a monitor signal and for applying said monitor signal directly to said channel independently of any received signal and any quiescent signal; means responsive to at least one of said applied signals after translation through said channel for deriving an output signal having amplitude levels within a predetermined range of values for normal gain conditions of said channel and having abnormal amplitude levels outside said range in response to the substantial absence of all of said translated signals caused by an abnormal variation of the gain condition of said channel; amplitude-selective means responsive primarily only to said abnormal amplitude levels of said output signal for deriving a control effect; and means for utilizing said control effect effectively to disable said receiver.

3. A wave-signal receiver including an arrangement for disabling said receiver in response to an abnormal variation of a predetermined gain condition thereof, comprising: a signal-translating channel having a predetermined gain condition; a detector for detecting received wave signals and for applying to said channel for translation therethrough the detected signals and in the absence of received signals a quiescent signal representing inherent electrical disturbances, said detector having a signal generator associated therewith for effecting said application to said channel of said signals; means for deriving from said signal generator a monitor signal and for applying said monitor signal directly to said channel independently of any received signal and any quiescent signal; means responsive to at least one of said applied signals after translation through said channel for deriving an output signal having amplitude levels within a predetermined

range of values for normal gain conditions of said channel and having abnormal amplitude levels outside said range in response to the substantial absence of all of said translated signals caused by an abnormal variation of the gain condition of said channel; amplitude-selective means responsive primarily only to said abnormal amplitude levels of said output signal for deriving a control effect; and means for utilizing said control effect effectively to disable said receiver.

4. A wave-signal receiver of the superregenerative type including an arrangement for disabling said receiver in response to an abnormal variation of a predetermined gain condition thereof, comprising: a signal-translating channel having a predetermined gain condition; a superregenerative detector for detecting received wave signals and for applying to said channel for translation therethrough the detected signals and in the absence of received signals a quiescent signal representing inherent electrical disturbances, said superregenerative detector having a quench-signal generator associated therewith for effecting said application to said channel of said signals; means for deriving from said quench-signal generator a monitor signal and for continuously applying said monitor signal directly to said channel with substantially the same phase as the quench-frequency component of said detected wave signals but independently of any received signal and any quiescent signal; means responsive to at least one of said applied signals after translation through said channel for deriving an output signal having amplitude levels within a predetermined range of values for normal gain conditions of said channel and having abnormal amplitude levels outside said range in response to the substantial absence of all of said translated signals caused by an abnormal variation of the gain condition of said channel; amplitude-selective means responsive primarily only to said abnormal amplitude levels of said output signal for deriving a control effect; and means for utilizing said control effect effectively to disable said receiver.

5. A wave-signal receiver of the superregenerative type including an arrangement for disabling said receiver in response to an abnormal variation of a predetermined gain condition thereof, comprising: a signal-translating channel having a predetermined gain condition; a superregenerative detector for detecting received wave signals and for applying to said channel for translation therethrough the detected signals and in the absence of received signals a quiescent signal representing inherent electrical disturbances, said superregenerative detector having a quench-signal generator associated therewith for effecting said application to said channel of said signals; means for deriving from said quench-signal generator a monitor signal having a low intensity as compared with said detected wave signals and for continuously applying said monitor signal directly to said channel with substantially the same phase as the quench-frequency component of said detected wave signals but independently of any received signal and any quiescent signals; means responsive to at least one of said applied signals after translation through said channel for deriving an output signal having amplitude levels within a predetermined range of values for normal gain conditions of said channel and having abnormal amplitude levels outside said range in response to the substantial absence of all of said translated signals caused by an abnormal variation of the gain

condition of said channel; amplitude-selective means responsive primarily only to said abnormal amplitude levels of said output signal for deriving a control effect; and means for utilizing said control effect effectively to disable said receiver.

6. A wave-signal receiver including an arrangement for disabling said receiver in response to an abnormal variation of a predetermined gain condition thereof, comprising: a signal-translating channel having a predetermined gain condition; means for applying to said channel for translation therethrough received signals and in the absence of received signals a quiescent signal representing inherent electrical disturbances, said means including a signal generator associated with said channel at least during receiving intervals for effecting said application of said signals to said channel; means for deriving from said signal generator a monitor signal and for applying said monitor signal directly to said channel independently of any received signal and any quiescent signal; means responsive to at least one of said applied signals after translation through said channel for deriving an output signal having amplitude levels within a predetermined range of values for normal gain conditions of said channel and having abnormal amplitude levels outside said range in response to the substantial absence of all of said translated signals caused by an abnormal variation of the gain condition of said channel; an electron-discharge device biased substantially to anode-current cut-off for normal gain conditions of said channel but responsive to said abnormal amplitude levels of said output signal for deriving a control effect; and means for utilizing said control effect effectively to disable said receiver.

7. A wave-signal receiver including an arrangement for disabling said receiver in response to an abnormal variation of a predetermined gain condition thereof, comprising: a gain stabilization channel for said receiver having a predetermined gain condition; means for applying to said channel for translation therethrough received signals and in the absence of received sig-

nals a quiescent signal representing inherent electrical disturbances, said means including a signal generator associated with said channel at least during receiving intervals for effecting said application of said signals to said channel; means for deriving from said signal generator a monitor signal and for applying said monitor signal directly to said channel independently of any received signal and any quiescent signal; means responsive to at least one of said applied signals after translation through said channel for deriving an output signal having amplitude levels determined by the gain characteristic of said receiver and within a predetermined range of values for normal gain conditions but having abnormal amplitude levels outside said range in response to the substantial absence of all of said translated signals caused by an abnormal variation of the gain condition of said channel; means for utilizing said output signal to stabilize said gain characteristic of said receiver; amplitude-selective means responsive primarily only to said abnormal amplitude levels of said output signal for deriving a control effect; and means for utilizing said control effect effectively to disable said receiver.

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