Dec. 5, 1950 D. L. HINGS 2,532,450

PULSE RECEPTION SYSTEM

Filed Aug. 6, 1945 3 Sheets-Sheet 1

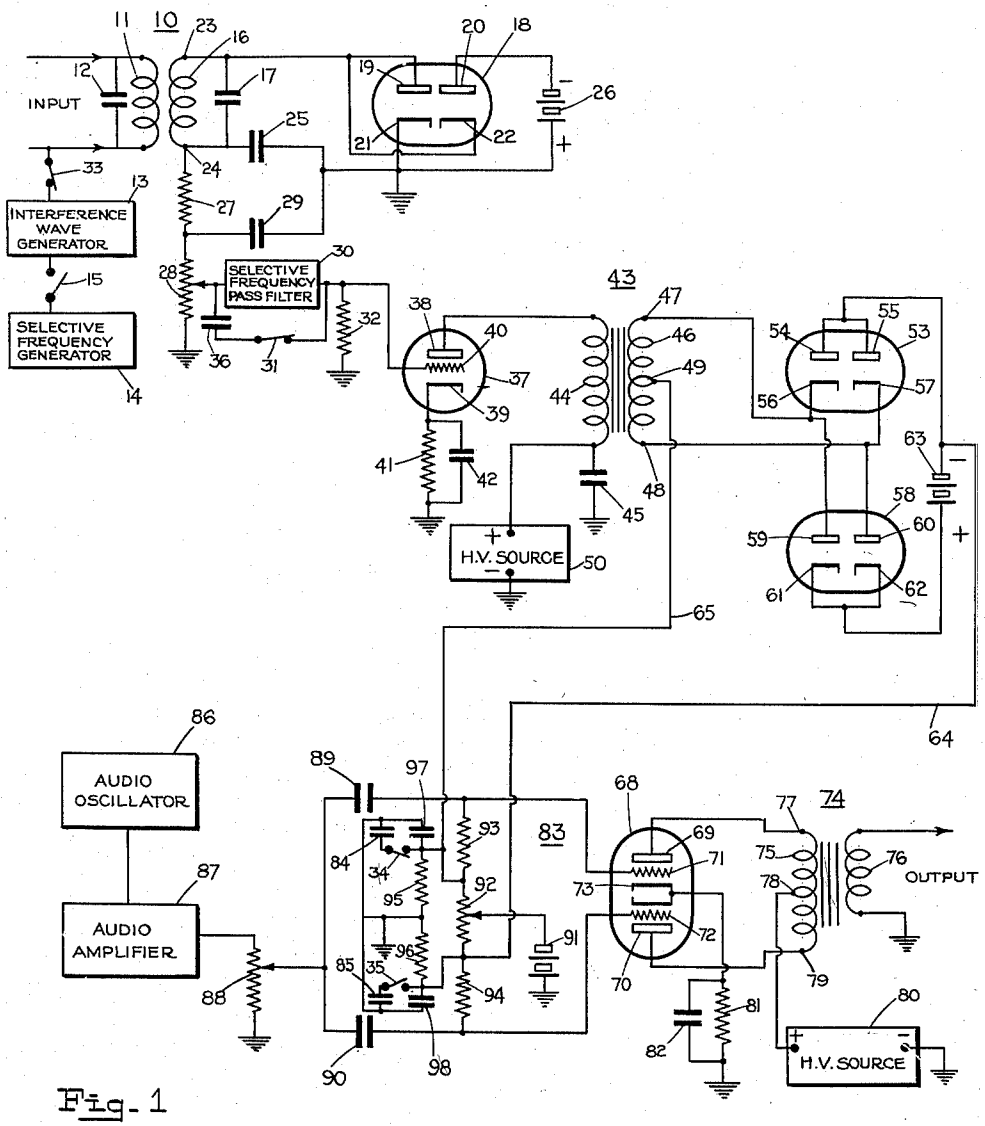


Fig. 1

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Fig. 2

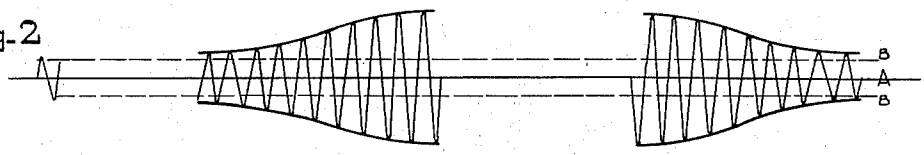


Fig. 3

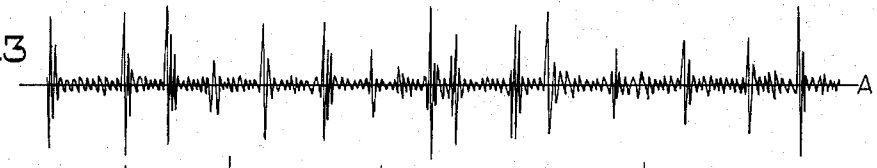


Fig. 4

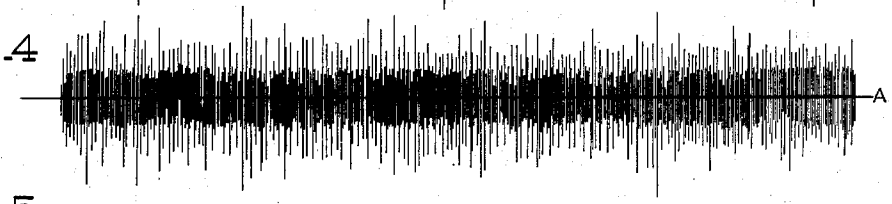


Fig. 5



Fig. 6

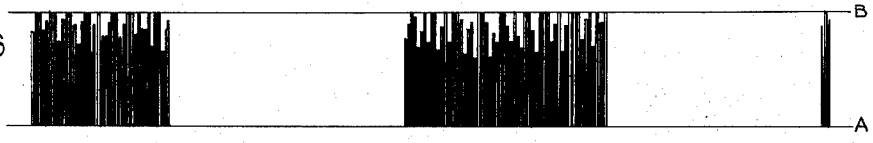


Fig. 7



Fig. 8

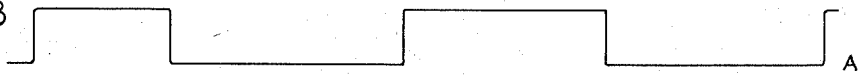


Fig. 9

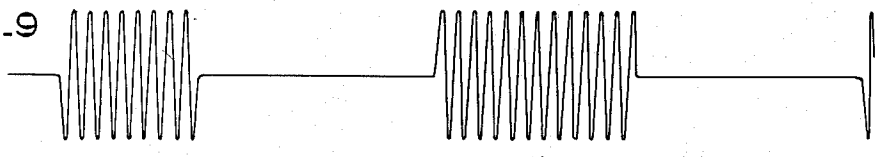
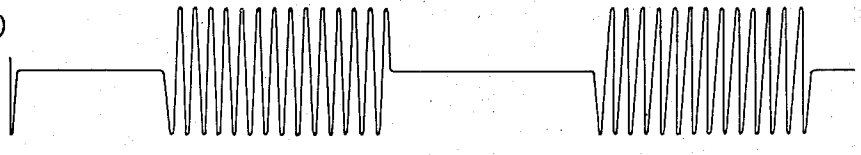


Fig. 10



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PULSE RECEPTION SYSTEM

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Fig. 11

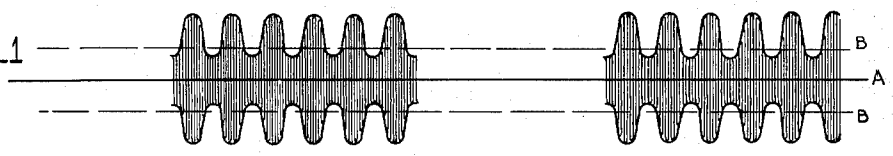


Fig. 12

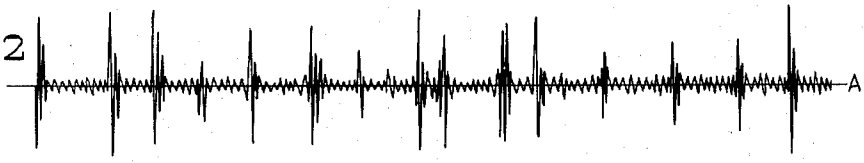


Fig. 13

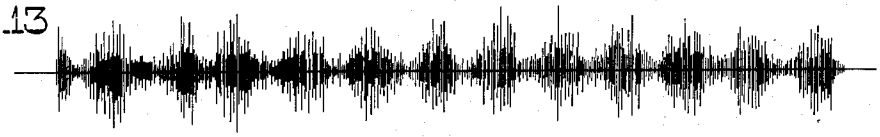


Fig. 14

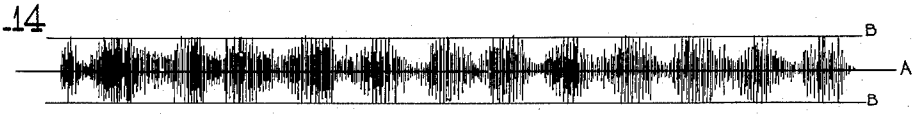


Fig. 15

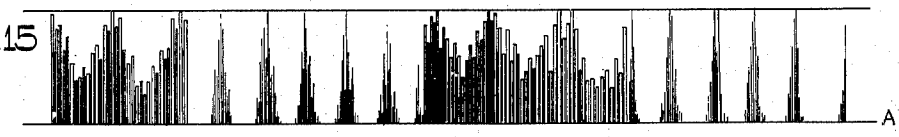


Fig. 16

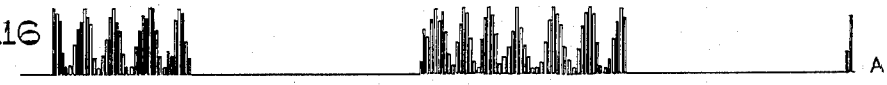


Fig. 17



Fig. 18

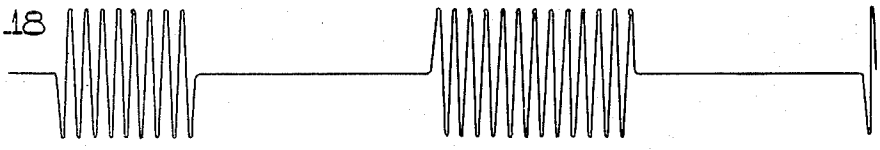
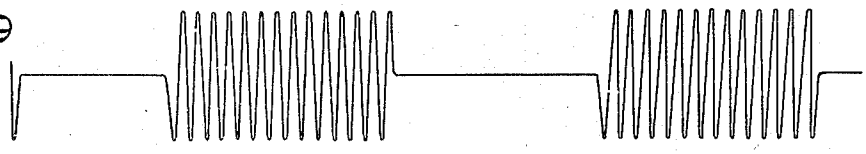


Fig. 19



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UNITED STATES PATENT OFFICE

2,532,450

PULSE RECEPTION SYSTEM

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Application August 6, 1945, Serial No. 609,260
In Canada July 20, 1945

8 Claims. (Cl. 250—20)

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My invention relates to a pulse reception system and more particularly to a pulse reception system having both pulsed continuous waves and interference waves between which discrimination is made for the purpose of establishing a control circuit to govern a current responsive device.

An object of my invention is the provision of a reception system having both pulsed continuous waves and interference waves, together with means during the spacer intervals for utilizing the energy from the interference waves and for neutralizing both the pulsed continuous waves and the interference waves during the marker intervals.

Another object of my invention is the provision in a pulse reception system of injecting generated interference waves over and above the inherent spurious interference waves, whereby an increased amount of energy is available during the spacer intervals for utilization as a means of control to govern a current responsive device which generates a secondary pulsed continuous wave which has substantially the same time constants as the primary pulsed continuous waves.

Another object of my invention is the provision, in a pulse reception system, of means for injecting energy into the system which is available for control purposes during the spacer intervals of the pulsed continuous wave.

Another object of my invention is the provision, in a pulse reception system, which neutralizes the pulsed continuous waves during the marker intervals and which provides a source of control energy during the spacer intervals.

Another object of my invention is the provision, in a pulse reception system, of providing full-wave rectification of the interference waves and thereafter peak limiting the rectified energy to give a control current of relatively constant amplitude throughout the period of the spacer intervals.

Another object of my invention is to inject, into a pulse reception system, interference energies having a larger magnitude than that of the spurious interference energies.

Another object of my invention is to provide for injecting modulated interference waves in a pulse reception system to make the system receptive to modulated pulsed carrier waves.

Another object of my invention is the provision, in a pulse reception system, of discriminating between modulated pulsed carrier waves and modulated interference waves.

Other objects and a fuller understanding of my invention may be had from the following description and claims, taken in conjunction with the accompanying drawings, in which:

Figure 1 represents a diagrammatic view of a

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pulse reception system embodying the features of my invention;

Figure 2 is a view of a pulsed continuous wave which is shown as being free of all interference waves and is shown as having a fading amplitude component.

Figure 3 is a view of a spurious interference wave which is present in normal atmospheric reception.

Figure 4 shows a view of a discharge interference wave, having a random peaked envelope, which may be injected into my pulse reception system.

Figure 5 shows a view of the combination energy waves comprising both the spurious interference energies and the injected interference energies, with the amplitude of the energies limited.

Figure 6 is a view of a radio frequency wave produced by detecting the energy wave of Figure 5.

Figure 7 is a view of the amplitude wave in Figure 6, after the frequency of the wave in Figure 6 has been doubled, the energy rectified and the amplitude of the energies limited to a pre-determined level.

Figure 8 is a view representing an energy wave produced by filtering the wave of Figure 7.

Figure 9 is a pulsed continuous wave generated by a secondary source and governed in response to the energies obtained during the spacer intervals from the interference waves.

Figure 10 shows a modified pulsed continuous wave, generated from the secondary source and having an inverse time constant with respect to Figure 9, but of the same time constant as of Figure 2 which shows the primary pulsed continuous wave.

Figure 11 is a view of a modulated pulsed carrier wave.

Figure 12 is a view similar to Figure 3.

Figure 13 is a view similar to Figure 4 with modulation on the interference waves.

Figure 14 is a view similar to Figure 5, but produced from the modulated discharge wave envelope shown in Figure 13 and controlled by the wave of Figure 11.

Figure 15 is a view similar to Figure 6, but produced from the energy wave shown in Figure 14.

Figure 16 is a view similar to Figure 7, but produced from the wave shown in Figure 15.

Figure 17 is a view similar to Figure 8, but produced from the wave shown in Figure 16.

Figure 18 is a view similar to Figure 9.

Figure 19 is a view similar to Figure 10.

With reference to Figure 1 of the drawing, the reference character 10 represents a transformer having a primary winding 11 adapted to receive pulsed continuous waves having on and off periods to produce alternate spacer and marker intervals

which may come from pulsed transmissions of intelligence such, for example, as a pulsed continuous wave employed in the operation of a teleprinter or other device. A condenser 12 is connected across the primary winding 11 and the two constitute a tuned circuit which may be tuned substantially to resonance at a frequency equal to the frequency of the incoming carrier waves.

My invention preferably provides for injecting interference waves into the transformer circuit, whereby the transformer delivers both pulsed continuous waves and injected interference waves. The injection of the interference waves into the pulsed continuous waves may be done by employing an interference wave generator 13, which may be connected to the transformer circuit by a switch 33. For certain conditions, the interference waves may be modulated by waves from a selective or low frequency generator 14. A switch 15 connects the selective frequency generator 14 to the interference wave generator 13. When the switch 15 is closed, the interference waves injected into the pulsed reception system are modulated as shown in Figure 11. When the switch 15 is open, the interference waves injected into the pulsed continuous wave system have a random discharge wave envelope, as shown in Figure 4. The construction and arrangement of the interference wave generator 13 and the low-frequency generator 14 may be substantially the same as those shown in my pending application, executed concurrently herewith, entitled Discharge Wave Generator, Serial Number 609,259, filed August 6, 1945, now Patent No. 2,468,754 granted May 3, 1949.

Figure 2 may represent a pure pulsed continuous wave which is excited in the transformer 10, without the presence of the spurious interference waves which exist in reception under normal atmospheric conditions. Figure 3 shows a representation of a spurious interference wave as may be found in reception. In actual operation, the incoming energy received from the pulsed continuous wave transmitter would be a combination of Figures 2 and 3. Figure 4 shows a representation of an interference wave as delivered by the interference wave generator 13 without the low-frequency wave generator 14 being connected into the circuit.

In actual operation, the wave energies excited in the secondary winding 16 of the transformer would be a combination of the waves shown in Figures 2, 3 and 4. In my invention, the injected interference energies preferably have a larger magnitude than that of the spurious interference energies. A condenser 17 is connected across the secondary winding 16 and provides in combination therewith a tuned circuit which may be tuned substantially to resonance at a frequency substantially equal to the frequency of the incoming pulsed continuous waves. The energy delivered by the secondary winding 16 and the condenser 17 is detected and limited by a duo-diode rectifier 18 comprising two plates 19 and 20 and two cathodes 21 and 22. The plate 19 and the cathode 22 are connected to the upper terminal 23 of the secondary winding 16. The cathode 21 is connected to ground and to the lower terminal 24 of the secondary winding 16 through a high-frequency by-pass condenser 25.

A battery 26 is connected between the plate 20 and the cathode 21. The plate 19 and the cathode 21 constitute a part of the detector circuit which comprises the resonant circuit 16 and 17 and the fixed resistor 27 and the adjustable

resistor 28. The fixed resistor 27 in combination with condensers 25 and 29 constitutes a high-frequency filter and the adjustable resistor 28 constitutes a detector load resistance.

In actual operation, the plate 19 and the cathode 21 pass current from the secondary winding 16 until the voltage of the detector circuit reaches a value equal to the voltage of the battery 26, at which point the energy from the secondary winding 16 is conducted to ground through a circuit including the cathode 22, the plate 20 and the battery 26. In my invention, the potential of the battery 26 and the design of the detector circuit is such that the voltage generated in the detector circuit resulting from a detection of the pulsed continuous wave is always greater than the voltage of the battery 26, whereby during the marker intervals the energy of the secondary winding 16 of the transformer below the effective battery bias is conducted to the load resistor 28 and the energy which is above the effective battery bias is neutralized. Thus, under the above condition, the pulsed continuous waves during the marker intervals, as well as the spurious interference waves and the injected interference waves, are suppressed and prevented from flowing in the detector circuit. This condition is shown enlarged in Figure 6. However, the design of the detector circuit and the voltage of the battery 26 is such that a major portion of the energies from the spurious interference waves and the injected interference waves is permitted to flow in the detector circuit, such as shown in Figure 6, the high peaked random amplitudes being cut off. In other words, the detector circuit is such as to limit the amplitude of the detection of the spurious interference waves and the injected interference waves. The random peaked amplitudes of the spurious peaks in my invention may be many times greater than the amplitude of the pulsed continuous waves, but they are limited by the action of the duo-diode rectifier 18. The same is true with respect to the amplitudes of the injected interference waves. This limiting action is shown in Figure 5, which shows the voltage across the tuned circuit 16—17 with no signal applied. Even though the amplitudes of the spurious interference waves and the injected interference waves are limited to a predetermined value, yet there are a multitude of tiny spaces there between, which envelope may be detected below the level of the pre-determined value to which they are limited. To further explain the operation of this part of my circuit, I offer the following theory, but do not intend to be bound by the consequences of any theory: During the spacer intervals, since the envelope of the interference wave will periodically, at an audio frequency rate, drop to zero or to a magnitude less than that of the predetermined level of the battery bias, neutralization will not occur at these periods, and therefore an audio frequency voltage will appear across the load resistor 28, to be passed to the next stage. Now during the marker intervals, the voltage of the incoming signal, that is, the pulsed continuous wave, being a continuous wave that has an envelope always greater in magnitude than the effective battery bias, dominates the tuned circuit 16—17 to cause the positive half cycles passed by the diode elements 19 and 21 to fully occupy the diode rectifying cycle. Therefore, the filtering action of the high frequency filter 25, 29 and 27 smooths out the high frequency half cycles to effectively produce a direct current

component across the load resistor 28 as governed by the effective battery bias. The rectification of the negative half cycles in excess of the battery bias neutralizes that portion of the positive half cycles in excess of the battery potential in the filter 25—27—29, thereby leaving only the direct current voltage from the diode 19—21 at a potential substantially proportional to the effective battery bias across the load resistor 28. This neutralization of the high frequency cycles means that all alternating potentials are neutralized and therefore no envelope exists. Thus the neutralization of the high frequency cycles may also be considered as neutralization of the envelope, which means that no signal is passed to the next stage during the marker interval.

The next process in my pulse reception system is to amplify the detected energy waves, and, as illustrated, I provide an amplifier 37 for this purpose. The amplifier 37 may comprise a plate 38, a cathode 39 and a grid 40. With the switch 15 open, which is the condition when no modulation is applied to the injected interference waves, the detected energy from the resistor 28 of the detector circuit is coupled directly to the grid 40 of the amplifier tube 37 by a condenser 36 through a switch 31. In other words, when the switch 15 is open, the switch 31, which is connected across the low-frequency pass filter, is closed. The resistor 32 is the grid resistor for the grid 40 and the resistor 41 is the cathode biasing resistor for the cathode 39. The condenser 42 is a by-pass for the cathode 39 to ground. The wave which appears in the cathode plate circuit of the amplifier 37 may be represented as similar to Figure 6, which is a high audio frequency wave, although in actual practice the amplitude may be relatively greater than that shown in Figure 6, and it will be symmetrical on both sides of the base line A. The plate-to-cathode circuit of the amplifier 37 includes a primary winding 44 of a coupling transformer 43 having a secondary winding 46. The plate 38 of the amplifier tube 37 is connected to a high voltage source 50 through the primary winding 44. The condenser 45 is the by-pass for the waves flowing through the primary winding 44.

The next operation in my invention is to full-wave rectify the energy received from the secondary winding 46 of the coupling transformer 43 and thereafter limit the amplitude of the full-wave rectification energy. The full-wave rectification may be done by a duo-diode rectifier 53 and the limiting may be done by a duo-diode rectifier 58. The rectifier 53 comprises two plates 54 and 55 and two cathodes 56 and 57. The rectifier 58 comprises two plates 59 and 60 and two cathodes 61 and 62. The cathode 56 of the rectifier 53 and the plate 59 of the rectifier 58 are connected to the upper terminal 47 of the secondary winding 46. The cathode 57 of the rectifier 53 and the plate 60 of the rectifier 58 are connected to the lower terminal 48 of the secondary winding 46. The plates 54 and 55 of the rectifier 53 are connected to the negative terminal of a battery 63 and the cathodes 61 and 62 of the rectifier 58 are connected to the positive terminal of the battery 63. The output voltage representing the full-wave rectified and limited energy from the tubes 53 and 58 appears across the conductors 64 and 65, the conductor 64 being connected to the plates 54 and 55 and the conductor 65 to the center tap 49 on the secondary 46. The rectifier 53 provides for giving full-wave

rectification to the wave energy supplied thereto until the voltage appearing between the conductors 64 and 65 equals the voltage of the battery 63. The full-wave rectified and limited energy as appearing in the conductors 64 and 65 is represented by the waves in Figure 7. One object in providing full-wave rectification is that I am able to reduce the gap between the amplitude of the waves and thereby substantially double the frequency. The double frequency makes for a steady wave which may be more easily filtered than what it would be if the frequency were not doubled by the full-wave rectifier action.

The next operation in my invention is to utilize the interference wave energies which appear in the conductors 64 and 65 as a means for producing pulsed continuous waves from a secondary source, having spacer and marker intervals which have a time constant which may be either in opposite or in phase relation with the primary pulsed continuous waves appearing in the transformer 18. As illustrated in Figure 1, the voltage across the conductors 64 and 65 controls a current responsive device which provides for giving a pulsed continuous wave such as that shown in either Figure 9 or in Figure 10, depending upon the conditions of the current responsive device. The current responsive device may comprise a twin-triode amplifier 68, an audio oscillator 85, an audio amplifier 87 and a grid balancing circuit 83. The twin-triode amplifier comprises two plates 69 and 70, two grids 71 and 72 and a centrally disposed cathode 73. The two plates 69 and 70 are connected respectively to the ends 77 and 79 of the primary winding 75 of an output transformer 74 having a secondary winding 76 which supplies pulsed continuous waves. The cathode 73 is connected to ground through a cathode biasing resistor 81. A condenser 82 is connected across the resistor 81 for by-passing the cathode 73 to ground. The primary winding 75 is provided with a center tap 78 which is connected to a high-voltage source 80. The two grids 71 and 72 are connected in circuit relation with the grid balancing circuit 83, which circuit in turn is coupled to the audio amplifier 87 through an adjustable coupling resistor 86. A condenser 89 couples the grid 71 to the coupling resistor 88 and a condenser 90 couples the grid 72 to the coupling resistor 88. The conductors 64 and 65 are respectively connected to the ends of a balancing resistor 92 having an adjustable pointer which is connected to a biasing battery 91. The resistors 93 and 94 are grid resistors respectively for the grids 71 and 72. The resistors 95 and 96 are connected across the balancing resistor 92 and have their intermediate point connected to ground. The condenser 97 is a filter condenser and connects the conductor 65 to ground. Similarly, the condenser 98 is a filter condenser and connects the conductor 64 to ground. The condensers 97 and 98, in combination with the resistors 95 and 96 and 92, provide for filtering the voltage across the conductors 64 and 65, such as shown in Figure 8 of the drawing.

For teleprinter use, when no voltage appears across the conductors 64 and 65, such as would be the case when the pulsed continuous wave is at the marker interval, then the two grids 71 and 72 have the same bias thereon, which renders the twin-triode amplifier 68 inoperative. Thus, the output from the secondary winding 76 of the transformer is zero during the marker intervals

of the incoming pulsed continuous waves to the transformer 10. This condition is shown in Figure 9. During the spacer intervals, voltage appears across the conductors 64 and 65, and thus current flows through the balancing resistor 92 to offset the bias between the grids 71 and 72, so that the twin-triode amplifier 68 becomes operative to produce an output during the spacer intervals, such as shown in Figure 9, for teleprinter work. The alternating current delivered by the secondary winding 76 may be rectified for producing direct current for direct operation of the teleprinter. The wave in Figure 10 is the inverse of the wave in Figure 9, and this inverse wave may be obtained by re-balancing the balancing resistor 92 such that no current flows during the spacer intervals and such that current flows during the marker intervals, producing waves for oral or automatic reception of the primary pulses directly in proportion to their intelligence of transmission.

Figures 11 to 19 correspond respectively to Figures 2 to 10, but with the switch 15 closed, whereby the interference waves are modulated. In other words, with the switch 15 closed, the interference waves which are injected into the transformer circuit 19 may be characterized as having a modulated discharge wave envelope, such as shown in Figure 13. Where there is pure pulsed continuous wave reception, there is no need for modulating the interference waves. But, where the pulsed carrier wave is modulated, as shown in Figure 11, I preferably modulate the injected interference waves. Modulation of the interference waves is desirable, because the modulation occurring on the continuous wave signal causes the voltage thereof to periodically become less than the voltage of the battery 26. This permits interference wave energy to appear in the load resistor 23 during the marker intervals. It is then necessary to discriminate against the audio component of tone by passing the tone through a filter 39, the filter 39 being selective to pass the frequency of the selective frequency generator and not the frequency of the modulation of the carrier. The filtering, therefore, eliminates the pulses of interference wave energy during the marker intervals, as shown in the transition from Fig. 15 to Fig. 16. To facilitate discrimination between the modulation frequency of the carrier and modulation frequency of the selective frequency generator 14, the modulation of the generator 14 is purposely made of different frequency. Thus, I provide for closing the switch 15 under this condition. When the switch 15 is closed, the switch 31 is open for passing the detected energy through the selective frequency pass filter 39. In this event, the wave which is amplified by the amplifier 37 may be represented by the wave shown in Figure 15. The waves shown in Figures 15, 16, 17, 18 and 19 may be produced by the circuit of Figure 1 in the same manner as the waves in Figures 6, 7, 8, 9 and 10 were produced, except that the condensers 84 and 85 are connected respectively in parallel with the condensers 97 and 98 by closing the switches 34 and 35. The condensers 84 and 85 are added to increase the filtering capacities for the lower frequencies of the modulated injected interference waves. When using the selective frequency generator 14 for modulating the interference waves, I preferably fix the frequency of the generator 14 and the selective frequency pass filter 39 at a frequency substantially different from the frequency of the modulation on the pulse carrier wave. In this manner, the low-frequency pass filter selects only the frequency produced by the generator 14 and it excludes the modulating frequency of the carrier wave. In my invention, I preferably make the magnitude of the injected interference energy greater than the magnitude of the spurious interference energy, so that the interference energy is maintained substantially at a constant value, even though the energy of the spurious waves may fluctuate.

In those conditions where the intelligence signal is weak and the receiver is adjusted to give maximum sensitivity, the spurious waves, even though originally small, become relatively large by the time they reach the detector. Thus, the ratio between the signal energy and the spurious energy is small. Under this condition, the switch 33 may be opened and the circuit operated without the injection of separate interference energy. Should the signal suddenly become strong, my circuit still is operative, because the alternating current component of the signal is neutralized during the marker interval. Signal intelligence is conveyed by the periodicity of the marker intervals, and also by the ratio of the duration of the marker intervals to the spacer intervals.

Although I have shown and described my invention with a certain degree of particularity, it is understood that changes may be made therein without departing from the spirit of the invention which are included within the scope of the claims hereinafter set forth.

I claim as my invention:

1. A radio reception system for obtaining signal intelligence from an electromagnetic carrier wave having recurring first periods with a potential less than a determinable voltage and having recurring second periods with a potential greater than said determinable voltage, said carrier wave having present therein an interference wave having an envelope of a frequency lower than said carrier wave and with said envelope having at least periodically a magnitude less than said determinable voltage, said system comprising circuit means, means for applying said carrier wave to said circuit means, a single stage detector connected to said circuit means and including first and second rectifiers connected in opposition, differential means for establishing an influencing voltage at substantially the magnitude of said determinable voltage for influencing said second rectifier to reduce the voltage output of said second rectifier, said rectifiers producing a differential output alternating voltage during said first period from energy from said interference wave and producing a differential output voltage during said second period from energy from said carrier and interference waves with said output voltage having a characteristic patterned in accordance with said influencing voltage.

2. The method of obtaining signal intelligence from an electromagnetic carrier wave having recurring first and second periods of lesser and greater magnitudes, respectively, than a determinable voltage, said carrier wave having present therein an interference wave having an envelope of a frequency lower than said carrier wave and with said envelope having at least periodically a magnitude less than said determinable voltage, said method comprising, establishing an influencing voltage at the magnitude of said determinable voltage, detecting the first half wave pulses of said carrier wave, detecting the opposite half wave pulses of said carrier wave above

said determinable voltage, and combining said detected energies in a common load to produce thereacross an alternating voltage from said interference wave during said first period with said alternating voltage having a characteristic patterned in accordance with the envelope of said interference wave which is periodically below said determinable voltage, and to substantially eliminate across said load any said alternating voltage during said second period.

3. The method of obtaining signal intelligence from an electromagnetic carrier wave having recurring first and second periods with a potential less than and greater than a determinable voltage, respectively, said carrier wave having present therein an interference wave having an envelope of a frequency lower than said carrier wave with said envelope having at least periodically a magnitude less than said determinable voltage, said method comprising, separately detecting the positive and negative half wave pulses of said carrier wave, establishing an influencing voltage at the magnitude of said determinable voltage, influencing the threshold of detection of one of said half wave pulses by said influencing voltage, and combining the detected energies to produce a differential output alternating voltage during said first period from energy from those interference waves having magnitudes less than said determinable voltage.

4. A radio reception system for obtaining signal intelligence from an electromagnetic carrier wave having recurring first periods with a potential, of at least a given polarity, less than a determinable voltage and having recurring second periods with a potential, of at least said given polarity, greater than said determinable voltage, said carrier wave having present therein an interference wave and at least the combination of said waves having an envelope of a frequency lower than said carrier wave and with said envelope having at least periodically a magnitude less than said determinable voltage, said system comprising circuit means, means for applying said carrier wave to said circuit means, a single stage detector connected to said circuit means and including first and second rectifiers connected in opposition, differential means for establishing an influencing voltage at substantially the magnitude of said determinable voltage for influencing said second rectifier to reduce the voltage output of said second rectifier, said rectifiers producing a differential output alternating voltage during said first period from energy from said interference wave and producing a differential output voltage during said second period from energy from said carrier and interference waves with said output voltage having a characteristic patterned in accordance with said influencing voltage.

5. The method of obtaining signal intelligence from an electromagnetic carrier wave having recurring first and second periods, respectively, of lesser and greater magnitudes of at least a given polarity than a determinable voltage, said carrier wave having present therein an interference wave and at least the combination of said waves having an envelope of a freqency lower than said carrier wave and with said envelope having at least periodically a magnitude less than said determinable voltage, said method comprising, establishing an influencing voltage at the magnitude of said determinable voltage, detecting the first half wave pulses of said carrier wave, detecting the opposite half wave pulses of said carrier wave above said determinable voltage, and combining said detected energies in a common load to produce thereacross an alternating voltage from said interference wave during said first period with said alternating voltage having a characteristic patterned in accordance with the envelope of said interference wave which is periodically below said determinable voltage, and to substantially eliminate across said load any said alternating voltage during said second period.

6. The method of obtaining signal intelligence from an electromagnetic carrier wave having recurring first and second periods with a potential of at least a given polarity less than and greater than a determinable voltage, respectively, said carrier wave having present therein an interference wave and at least the combination of said waves having an envelope of a frequency lower than said carrier wave with said envelope having at least periodically a magnitude less than said determinable voltage, said method comprising, separately detecting the positive and negative half wave pulses of said carrier wave, establishing an influencing voltage at the magnitude of said determinable voltage, influencing the threshold of detection of one of said half wave pulses by said influencing voltage, and combining the detected energies to produce a differential output alternating voltage bearing a relationship with said signal intelligence during said first period from energy from those interference waves having magnitudes less than said determinable voltage.

7. A radio reception system for obtaining signal intelligence from an electromagnetic carrier wave having recurring first and second periods, respectively, of lesser and greater magnitudes of at least a given polarity than a determinable voltage, said carrier wave having present therein an interference wave and at least the combination of said waves having an envelope of a frequency lower than said carrier wave and with said envelope having at least periodically a magnitude less than said determinable voltage, said system comprising, means for establishing an influencing voltage at the magnitude of said determinable voltage, a single stage detector operable from said combined waves and having first and second detector means, means for applying said influencing voltage to said single stage detector, said first detector means detecting the first half wave pulses of said carrier wave, said second detector means detecting the opposite half wave pulses of said carrier wave above said determinable voltage, and a common load for said detector means to produce thereacross an alternating voltage from said interference wave during said first period with said alternating voltage having a characteristic patterned in accordance with the envelope of said interference wave which is periodically below said determinable voltage, and to substantially eliminate across said load any said alternating voltage during said second period.

8. A radio reception system for obtaining signal intelligence from an electromagnetic carrier wave having recurring first and second periods, respectively, with a potential of at least a given polarity less than and greater than a determinable voltage, said carrier wave having present therein an interference wave and at least the combination of said waves having an envelope of a frequency lower than said carrier wave with said envelope having at least periodically a mag-

nitude less than said determinable voltage, said system comprising, first and second detectors separately detecting the positive and negative half wave pulses of said carrier wave, means for establishing an influencing voltage at the magnitude of said determinable voltage, means for influencing the threshold of detection of one of said detectors by said influencing voltage, and means for combining the detected energies to produce a differential output alternating voltage in accordance with said signal intelligence during said first period from energy from those interference waves having magnitudes less than said determinable voltage.

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