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D. D. GRIEG

2,416,308

RADIO RECEIVER

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2 Sheets-Sheet 2

Fig: 3.

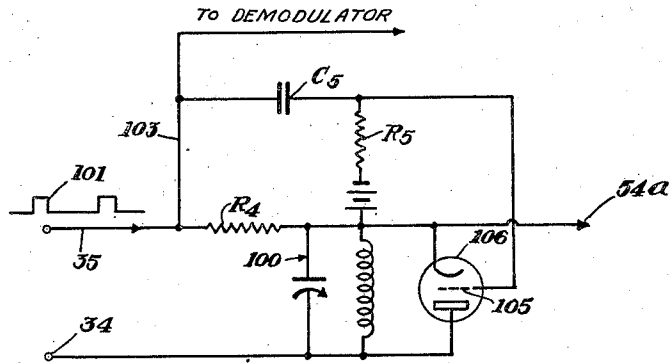


Fig: 4.

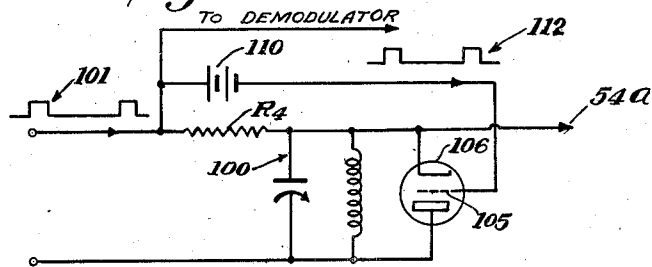
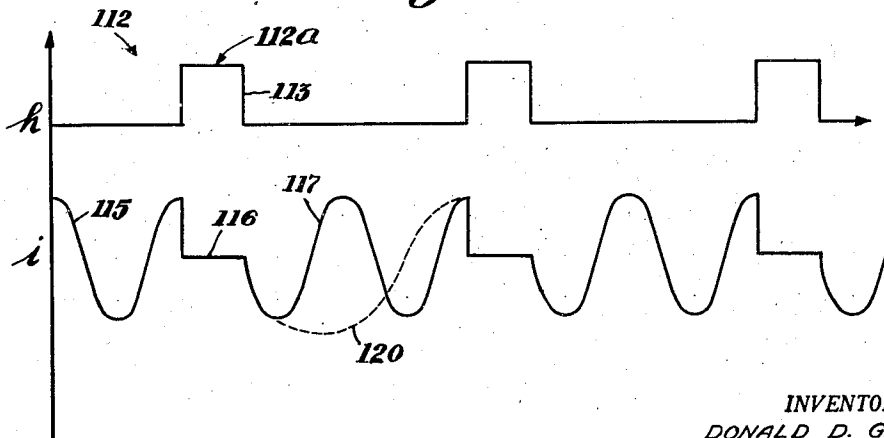


Fig:5.



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RADIO RECEIVER

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Application July 20, 1943, Serial No. 495,419

16 Claims. (Cl. 250—20)

1

This invention relates to radio receiving circuits and more particularly to electrical circuits for translation of pulse energy into impulses of greater intensity.

In the copending application of E. Labin and myself, Serial No. 488,181, filed May 24, 1943, are certain forms of triggerable oscillating circuits tunable for response to a given pulse source such as a carrier wave of time modulated pulses for translation of the carrier pulses into impulses of greater intensity. The oscillating circuits therein disclosed are adjusted for normal interval operation at a frequency slightly lower than the unmodulated pulse repetition rate of the pulse source. The pulses of the source can then control the oscillation intervals of the circuit when the circuit operation is brought into approximate synchronization with the pulse source. While this adjustment of the oscillating circuit may be made to eliminate most noise interference, other interference pulses such as produced for jamming purposes can trigger the circuit to operation and effect a translation of unwanted pulses and the consequent elimination of at least a percentage of the wanted signal pulses.

In a further copending application of E. Labin and myself, Serial No. 488,183, filed May 24, 1943, a radio receiving circuit is disclosed which includes an oscillating trigger circuit provided with a multivibrator for generating rectangular voltage pulses which are applied to the oscillating trigger circuit to increase the susceptibility of its operation to input pulses during the selected width of the multivibrator pulse. The multivibrator is adjusted for operation at a frequency corresponding to the unmodulated pulse repetition rate of the pulse source and the width of the rectangular pulse is selected so that each rectangular pulse will cover an interval equal to at least the maximum degree of modulation applied to the pulses at said source. The applied multivibrator pulse increases sharply the susceptibility of the circuit and maintains this increased susceptibility throughout the duration of the rectangular pulse so that regardless of the degree of modulation of the input pulses, the circuit will be susceptible thereto. The susceptibility of the circuit during the interval between successive multivibrator pulses is low in comparison and the circuit during such intervals normally will not respond to input pulses unless the latter are of exceptionally high intensity.

It is an object of my present invention to provide another improved radio receiving circuit for translation and demodulation of time modulated pulses wherein the translation involves the generation of a sinusoidal voltage which is uti-

2

lized to render the oscillating trigger circuit highly susceptible to pulses occurring only during an interval approximately equal to the maximum degree of modulation applied to the pulses of the source the reception of which is desired.

Another object of the invention is to provide a method and means for translation of desired pulse energy into impulses of much greater intensity while eliminating to a high degree noise and other unwanted pulses.

One feature of my present invention, for example, includes an oscillating trigger circuit in combination with a shock excitable resonant circuit which is provided with a damping tube which may be controlled in such a manner as to damp out the oscillations set up in the resonant circuit the instant a train of oscillations has served its purpose. In other words, the sinusoidal voltage established by operation of the resonant circuit is applied to the trigger oscillating circuit so as to control the susceptibility thereof in a manner to increase the susceptibility sharply for the interval the wanted signal pulses are expected. This control of the susceptibility of the oscillating trigger circuit takes place at a frequency which corresponds with the unmodulated pulse repetition rate of the desired pulse source. When a wanted pulse operates the oscillating trigger circuit, the damping feature of the resonant circuit responds to damp the existing oscillations of the resonant circuit and thereby condition the circuit for shock excitation by the termination of the operation of the oscillating trigger circuit. The termination of the oscillating trigger circuit shock excites the resonant circuit to oscillation which thereafter controls the susceptibility of the oscillating trigger circuit according to the tuning of the resonant circuit.

The above and other objects and features of my invention will become more apparent upon reference to the following detailed description when read in connection with the accompanying drawings, in which:

Fig. 1 is a schematic wiring diagram of a radio receiving circuit according to my invention;

Fig. 2 is a graphical illustration of the operating steps performed by the receiver of Fig. 1;

Figs. 3 and 4 are schematic wiring diagrams of two additional embodiments for performing the sinusoidal voltage generating and damping features of my invention; and

Fig. 5 is a graphical illustration showing curves to assist in the explanation of the embodiment shown in Fig. 4.

Referring to Fig. 1, a T. M. (time modulation) radio receiver is shown having the usual antenna

10, an oscillating trigger circuit 12, a local sinusoidal voltage generator 14 and a T. M. demodulator 18. The oscillating trigger circuit 12 is provided with a tunable inductance-capacitance circuit L_1C_1 for detection of R. F. energy of any particular carrier wave obtainable from an antenna coupling coil 19. The oscillating circuit 12 includes a vacuum tube 20 having an anode 21, a control grid 22, a cathode 23 and a screen grid 24. One side 25 of the circuit L_1C_1 is connected through a blocking condenser 26 to the grid 22. The opposite side 27 of the circuit L_1C_1 is grounded. For triggering action, the cathode 23 is connected to the coil L_1 . The screen grid 24 is connected to ground through a condenser 30 for by-passing the radio frequency energy. The screen grid is also connected through a resistor 32 to a source of positive energy from battery terminal 34.

The anode circuit of the tube 20 includes the local sinusoidal voltage generator 14. The generator 14 includes a resonant circuit comprising inductance coil L_2 and condenser C_2 together with a damping tube 40 the anode 41 and cathode 42 of which are connected across the resonant circuit. The input 35 of the resonant circuit L_2C_2 is connected to the anode 21 of tube 20. The opposite side 45 of the resonant circuit is connected through resistors R_1 and R_2 to a source of positive energy at terminal 34. A differentiator circuit comprising a condenser C_3 and a resistor R_3 is connected by line 48 to a point between resistors R_1 and R_2 . A battery 50 is interposed between the resistor R_3 and the side 45 of the resonant circuit. The output connection 52 from the differentiator is applied to the control grid 43 of the damping tube 40. The sinusoidal voltage established in the resonant circuit L_2C_2 is applied to the grid 22 of tube 20 through coupling connection 54 and voltage dividers R_4 and R_5 . The impulse output of the oscillating trigger circuit is taken off from the line 48 thereby providing output voltage pulses from across the resistor R_2 which are applied through connection 56 to the T. M. demodulator 18.

In Fig. 2, curve *a* shows a train of three signal pulses having an unmodulated pulse repetition rate represented by the period T_s . The pulses are shown to be "double modulated." In "double pulse modulation" the duration of every pulse is usually constant and small compared with the time interval between adjacent pulses and the pulses occur in pairs with the time interval therebetween being proportional to the amplitude of the modulating signal. Pulses 61 and 62 comprise a pair of pulses which are modulated to one extreme degree of displacement, the opposite degree of displacement being indicated by the broken lines 63 and 64. Pulse 65 is the first pulse of the next succeeding pair of pulses and is shown modulated in the extreme position similar to that of pulse 61.

Curve *b* of Fig. 2 represents, generally, the grid voltage of the grid 22 during the reception of the signal pulses of curve *a*. Curve *c* represents the effective voltage impulse acting across the anode circuit of tube 20 during the oscillating operation of the circuit 12. Curve *d* represents the output voltage impulses across resistor R_1 with respect to point 45 in response to the impulses of curve *c*. The impulses of curve *d* are applied to the differentiator C_3, R_3 and to the T. M. demodulator 18. Curve *e* represents the output of the differentiator circuit C_3, R_3 together with an indication of the polarity relationship of the pulses with regard to

the bias condition of the damping tube 40. Curve *f* represents the sinusoidal voltage output of the voltage generator 14 which is applied to the grid 22 of the oscillating trigger circuit 12.

Assuming that no sinusoidal voltage is applied to the grid 22 of the circuit 12, the negative grid voltage may be represented as decreasing (becoming less negative) gradually as indicated by the portion 70 of curve *b*. The normal period of operation of the circuit 12 in the absence of signal reception is determined according to selected time constants of the grid circuit (condenser 26 and resistors R_4, R_5) and the biasing potential applied to the screen grid 24. This normal period is represented approximately as the period T_0 . The reception of pulse 61 triggers the oscillating circuit 12 into operation thereby producing a current flow through the anode circuit of the tube 20 which gives rise to the voltage indicated by impulse 71 of curve *c*. The effective negative current impulse resulting flows through the resonant circuit L_2, C_2 and due to the polarity connections of resistor R_4 is translated into a voltage impulse across R_1 which is positive as indicated by impulse 72 of curve *d*. This voltage impulse 72 is differentiated by the condenser-resistor arrangement C_3, R_3 to produce positive pulse 73 and negative pulse 74, curve *e*, the pulse 73 corresponding to the leading edge of the pulse 72 and the pulse 74 corresponding to the trailing edge thereof. The positive pulse 73 is of an amplitude sufficient to overcome the negative grid bias applied by battery 50 on the grid 43 of the tube 40. This pulse energy renders the tube conductive thereby reducing momentarily the "Q" of the resonant circuit L_2C_2 to such a value as to absorb any oscillatory energy present in the circuit. This absorption of the oscillatory energy is such as to substantially completely damp out all oscillations occurring in the circuit including the shock excitation energy applied thereto by the leading edge of the impulse 71, thereby resulting in a zero potential in the coupling connection 54. The importance of this damping feature will become more apparent as the description proceeds.

The trailing edge 81 of the current impulse 71 operates to shock excite the resonant circuit L_2C_2 into renewed oscillation (portion 82 of curve *f*) the frequency of which is determined by the tuning adjustment of the condenser C_2 . This sinusoidal voltage 82 is applied over connection 54 as hereinbefore described to the grid 22 of tube 20 to control the susceptibility of the oscillating circuit 12. This superposition of the sinusoidal voltage on the grid potential is indicated by portion 83 of curve *b*. The frequency of the sinusoidal wave is so selected as to cause the peak portion 84 of an undulation of the sinusoidal voltage to occur in coincidence substantially with the interval 85 which corresponds to the maximum degree of modulation of the signal pulses. The signal pulse 62 occurring during interval 85 adds to the peak part 84 of the grid potential thereby causing it to pass through critical level 86 and initiate a period of oscillations in the circuit 12. As hereinbefore described, this oscillating operation produces an effective current impulse 91, curve *c*, and by differentiating the corresponding voltage impulse 92 two pulses 93 and 94 are produced corresponding respectively to the leading and trailing edges of the current impulse 91. The positive pulse 93 produces conduction in the tube 40 thereby damping the sinusoidal voltage 82 to zero potential as indicated at 95. The trailing edge of the current pulse 91 shock

5

excites the resonant circuit L_2C_2 into another operation producing the sinusoidal voltage 96, curve *f*. This operation continues for successive signal pulses.

From the foregoing description it will be clear that the damping feature operates to discontinue the sinusoidal voltage as soon as it has served its purpose. That is to say, the sinusoidal voltage is removed from the grid 22 as soon as the tubes 20 and 40 are rendered conductive so that no sinusoidal voltage will continue to exist following the sensitizing function for which it is supplied. Should the sinusoidal voltage be permitted to continue as indicated by the broken line 97 of curve *f*, it would adversely affect both the amplitude and timing of the next succeeding excitation of the circuit L_2C_2 . Each sinusoidal wave 82, 96, etc. is independent of the others so that substantially no variation of amplitude or timing of the grid peak voltage occurring at the signal reception intervals such as interval 85 is permitted.

With the oscillation circuit 12 adjusted at the operating frequency T_0 and in the absence of the sinusoidal voltage, approximately only alternate signal pulses will initiate oscillation in circuit 12. This is clear from an inspection of curve *b* as outlined by the portions 70 and 70a. By properly tuning the resonant circuit L_2C_2 , the peak portion of a selected undulation of the sinusoidal voltage may be caused to cover a signal reception interval such as the interval 85 which correspond to the maximum degree of modulation of the signal pulses so that regardless of the degree of modulation of any particular signal pulse the circuit 12 will be rendered highly susceptible thereto. It is therefore clear that by applying the sinusoidal voltage to the control or other grid of tube 20, the oscillating circuit 12 is rendered highly susceptible during the intervals when signal pulses from a given source are received and maintained less susceptible to input pulses for substantially all of the time occurring between the reception intervals of successive signal pulses.

The voltage output impulses across resistor R_1 are applied to the T. M. demodulator 18 for demodulation in the usual manner. If desired, the pulse energy may be differentiated to sharpen the pulse shape thereof before it is applied to the demodulator. The demodulator 18 may be of any known construction and preferably is of the character disclosed in my copending application Serial No. 459,959, filed September 28, 1942. The demodulation of the pulses according to the invention of the aforesaid application translates the intelligence represented by the time displacements of pairs of pulses into corresponding amplitude variation which may then be audibly detected in known manner.

In Fig. 3, I show a variation of the local sinusoidal voltage generator wherein the current input impulses 101 applied to the resonant circuit 100 are of positive polarity. This impulse energy may be taken from the cathode 23 of the oscillating circuit 12. The current impulses 101 are applied through the resistor R_4 to the resonant circuit 100. Output voltage impulses are taken from across the resistor R_4 by connection 103 for application to the demodulator and also to the differentiator combination C_5R_5 . The first pulse of the differentiating operation is applied to the control grid 105 of the damping tube 106. The cathode and anode terminals of the tube 106 are connected across the resonant circuit 100 so that

6

when conduction is produced therein by the differentiator, any oscillating energy present in the circuit 100 is damped out. The resulting sinusoidal energy of the circuit 100, which is similar to that of curve *i*, Fig. 5, is applied over connection 54a to the grid 22 of the oscillating circuit 12, Fig. 1, similarly as hereinbefore described to obtain a desired control of the susceptibility of the oscillating circuit.

In Fig. 4, I show a further sinusoidal wave generator in which the damping period is prolonged for substantially the duration of the impulse applied thereto from the oscillating circuit 12. As in Fig. 3 the connections are so selected as to apply positive current impulses 101 through resistor R_4 to the resonant circuit 100. The differentiator combination, however, is omitted in this embodiment. A battery 110 is provided to normally furnish a negative bias on the grid 105 of the damping tube 106. The current impulses 101 produce corresponding positive voltage impulses 112 across the resistor R_4 for application to the grid 105 to overcome the negative bias provided by battery 110 and thereby render the tube conductive for the duration of each of the impulses 112.

In Fig. 5, the voltage impulses 112 of curve *h* are shown in their relation with the resulting sinusoidal voltage of curve *i* in accordance with operation of the generator of Fig. 4. Assuming that the sinusoidal voltage 115 exists upon the reception of an actuating pulse, the passage of current through the tube 20 of the oscillating circuit 12, Fig. 1, will produce, when applied to the circuit of Fig. 4, a voltage impulse 112a. Since this impulse overcomes the bias on the tube 106, the tube 106 conducts thereby damping out the oscillations in circuit 100. The damping period continues for the duration of the impulse 112a throughout the zero potential portion 116. The trailing edge 113 of the corresponding current impulse, however, operates to shock excite the circuit 100 substantially simultaneously with the termination of the conduction through tube 106. This simultaneous timing of the shock excitation of circuit 100 and the termination of tube conduction causes some dissipation of the shock exciting energy, but not so much as to prevent renewed excitation of the circuit 100. This renewed sinusoidal voltage 117 is applied in the manner hereinbefore described to the grid 22 of tube 20 of Fig. 1. The advantage of this embodiment over the preceding embodiments is its simplicity and also the fact that the damping conduction of tube 106 is prolonged.

It will be noted that the sinusoidal wave portions of curve *i* are initiated in a direction opposite to the sinusoidal portions of curve *f* of Fig. 2. The number of undulations for each wave portion depends, of course, upon the tuning of the resonant circuit 100 and if desired the wave portion may take the form indicated at 120. While this latter form 120 lowers the susceptibility of the circuit 12 between signal reception intervals it is less sharp in its control from the low susceptibility level to the high susceptibility level.

While I have shown the principles of my invention in connection with specific apparatus, I recognize that many additional variations and embodiments may be devised without departing from the invention. It is to be understood, therefore, that the embodiments herein shown and described are given by way of example only and not as limiting the scope of the invention as set forth in the objects and the appended claims.

I claim:

1. In a radio receiver for time modulated pulse reception, an oscillating trigger circuit operating at a lower pulse frequency than the unmodulated pulse repetition rate of a given time modulated pulse source for production of an impulse for each operating interval thereof, means to generate a sinusoidal voltage having a selectable frequency relationship with the unmodulated repetition rate of said pulses, means to apply the sinusoidal voltage to said trigger circuit to control the susceptibility thereof to actuation by input pulses, said frequency relationship being selected to time an undulation of said sinusoidal voltage so that the peak portion thereof covers an interval at least as great as the maximum degree of modulation of the pulses from said source, means for causing the initiation of the generation of said sinusoidal voltage upon termination of a cycle of trigger circuit operation, means to suppress the sinusoidal voltage prior to the initiation of circuit operation.

2. The radio receiver defined in claim 1 wherein the sinusoidal voltage generating means includes a resonant circuit shock excitable in response to operation of said trigger circuit.

3. The radio receiver defined in claim 1 wherein the sinusoidal voltage generating means includes a resonant circuit shock excitable upon termination of a trigger circuit operation, and the means for suppressing the sinusoidal voltage includes means responsive to current flow in said trigger circuit during operation thereof to decrease the "Q" of the resonant circuit.

4. The radio receiver defined in claim 1 wherein the sinusoidal voltage generating means includes a resonant circuit and means for differentiating the impulse output of said trigger circuit to produce two pulses, the first of said pulses corresponding to the leading edge of said impulse and the second of said pulses corresponding to the trailing edge of said impulse, the means for suppressing the sinusoidal voltage being responsive to said first pulse to damp out any oscillations present in said resonant circuit, and said resonant circuit being responsive to said second pulse to renew oscillations therein.

5. A radio receiver for time modulated pulse reception comprising an oscillating trigger circuit operating at a lower pulse frequency than the unmodulated pulse repetition rate of a given time modulated pulse source for production of an impulse for each operating interval thereof, means to produce upon termination of said circuit operation a sinusoidal voltage having a selectable frequency relationship with the unmodulated repetition rate of said pulses, means to apply the sinusoidal voltage to said circuit to control the susceptibility thereof to actuation by input pulses, said frequency relationship being selected to time an undulation of said sinusoidal voltage so that the peak portion thereof covers an interval at least as great as the maximum degree of modulation of the pulses from said source, means responsive to the initiation of circuit operation to damp out any existing sinusoidal voltage so that any sinusoidal voltage applied to the circuit prior to circuit operation will be eliminated before a new sinusoidal voltage is produced in response to the termination of a succeeding circuit operation, and means to demodulate the impulses produced by the circuit.

6. An electric pulse translator for translating the time modulated pulses of a given source into an equivalent train of time modulated impulses

comprising an oscillating trigger circuit operating at a lower pulse frequency than the unmodulated pulse repetition rate of said given source for production of an impulse for each operating interval thereof, means to generate a sinusoidal voltage having a selectable frequency relationship with the unmodulated repetition rate of said pulses, means to apply the sinusoidal voltage to said trigger circuit to control the susceptibility thereof to actuation by input pulses, said frequency relationship being selected to time an undulation of said sinusoidal voltage so that the peak portion thereof covers an interval corresponding in time to the maximum degree of modulation of the pulses from said source, means for causing the initiation of the generation of said sinusoidal voltage upon termination of a cycle of trigger circuit operation and means to suppress the sinusoidal voltage following the initiation of a circuit operation.

7. The pulse translator defined in claim 6 wherein the sinusoidal voltage generating means includes a resonant circuit shock excitable in response to operation of said trigger circuit.

8. The pulse translator defined in claim 6 wherein the sinusoidal voltage generating means includes a resonant circuit and means for differentiating the impulse output of said trigger circuit to produce two pulses, the first of said pulses corresponding to the leading edge of said impulse and the second of said pulses corresponding to the trailing edge of said impulse, the means for suppressing the sinusoidal voltage being responsive to said first pulse to damp out any oscillations present in said resonant circuit, and said resonant circuit being responsive to said second pulse to renew oscillations therein.

9. An electric pulse translator for translating the time modulated pulses of a given source into an equivalent train of time modulated impulses comprising an oscillating trigger circuit operating at a lower pulse frequency than the unmodulated pulse repetition rate of said given source for production of an impulse for each operating interval thereof, means responsive to the operation of said circuit to generate a sinusoidal voltage having a selectable frequency relationship with the unmodulated repetition rate of said pulses, means to apply the sinusoidal voltage to said circuit to increase the susceptibility thereof to actuation by input pulses, said frequency relationship being selected to time an undulation of said sinusoidal voltage so that the peak portion thereof covers an interval timed to substantially coincide with the maximum degree of modulation of the pulses from said source, and means responsive to the initiation of circuit operation to damp out said sinusoidal voltage so that the applied sinusoidal voltage will be eliminated prior to the production of a new sinusoidal voltage in response to the next succeeding circuit operation.

10. An electric pulse translator for translating the time modulated pulses of a given source into an equivalent train of time modulated impulses comprising an oscillating trigger circuit including a vacuum tube having plate, grid and cathode electrodes, means for applying pulses from said source to at least one of said electrodes, a grid-cathode circuit, an impulse output circuit connected to at least one of said electrodes to produce output impulses in response to oscillations established in said grid-cathode circuit, means responsive to current flow through said output circuit to generate a sinusoidal voltage having a selectable frequency relationship with the repeti-

tion rate of said pulses, means to apply the sinusoidal voltage to the grid electrode to control the susceptibility of the trigger circuit to actuation by input pulses, said frequency relationship being selected to time an undulation of said sinusoidal voltage so that the peak portion thereof covers an interval timed to the repetition occurrence, and at least as large as the maximum degree of modulation, of the pulses from said source, means for causing the initiation of the generation of said sinusoidal voltage upon termination of each cycle of trigger circuit operation, and means to suppress the sinusoidal voltage upon initiation of each circuit operation.

11. The translator defined in claim 10 wherein the sinusoidal voltage generating means includes a resonant circuit connected in said output circuit and means for differentiating the impulse output of said trigger circuit to produce two pulses, the first pulse corresponding to the leading edge of said impulse and the second pulse corresponding to the trailing edge of said impulse, and the means for suppressing the sinusoidal voltage being responsive to the first pulse to damp out any oscillations present in said resonant circuit, and said resonant circuit being responsive to said second pulse to renew oscillations therein.

12. The translator defined in claim 10 wherein the sinusoidal voltage generating means includes a resonant circuit connected in circuit with the cathode electrode and means for differentiating the impulse output of said trigger circuit to produce two pulses the first pulse corresponding to the leading edge of said impulse and the second pulse corresponding to the trailing edge of said impulse, and the means for suppressing the sinusoidal voltage being responsive to said first pulse to damp out any oscillations present in said resonant circuit and said resonant circuit being responsive to said second pulse to renew oscillations therein.

13. The circuit defined in claim 10 wherein the sinusoidal voltage generating means includes a resonant circuit connected in circuit with the cathode electrode of the trigger circuit tube so that current of said output impulses flows through said resonant circuit, and the means for suppressing the sinusoidal voltage includes a vacuum tube having the cathode and anode electrodes thereof connected across the resonant circuit, said vacuum tube having a control grid, and a battery connected between said control grid and the cathode electrode of said trigger circuit tube whereby said vacuum tube is normally biased to cut-off by said battery and rendered conductive by said output impulses.

14. In an electric pulse translator having an oscillating trigger circuit normally operating at a considerably lower pulse frequency than the unmodulated pulse repetition rate of a given pulse source so that the circuit is normally susceptible to operation by wanted and unwanted pulses only during the last portion of its normal operating period, the circuit when triggered operating to produce an impulse; means to generate a sinusoidal voltage having a selectable frequency relationship with the unmodulated repetition rate of said pulses, means to initiate the generation of said sinusoidal voltage upon termination of a circuit operation and means to suppress the sinusoidal voltage following initiation of circuit operation, and means for utilizing the sinusoidal voltage to increase the susceptibility of the circuit for the peak portion of a selected undulation of said sinusoidal voltage so that the circuit is highly

susceptible during signalling intervals when desired signal pulses occur and much less susceptible during the time between said signalling intervals.

15. In an electric pulse translator having an oscillating trigger circuit operating at a lower pulse frequency than the pulse repetition rate of a given pulse source for production of an impulse for each operating interval of the circuit, said trigger circuit being actuatable by the pulses of said source and also by undesired pulses; the method of decreasing the possibility of operation in response to said undesired pulses and of increasing susceptibility of the circuit to operation in response to the pulses of said source comprising producing upon termination of each operating interval of said trigger circuit a sinusoidal voltage having a selectable frequency relationship with the repetition rate of said pulses, applying the sinusoidal voltage to said trigger circuit to control the susceptibility thereof to actuation of input pulses, and selecting a frequency relationship for the sinusoidal voltage such that a selected undulation of said sinusoidal voltage is caused to occur so that the peak portion thereof coincides substantially with a pulse from said source, and suppressing the sinusoidal voltage upon the initiation of each operating interval.

16. In an electric pulse translator having an oscillating trigger circuit operating at a lower pulse frequency than the unmodulated pulse repetition rate of a given time modulation pulse source for production of an impulse for each operating interval thereof, said circuit being actuatable by pulses of said source and by undesired pulses when such pulses produce in said circuit a voltage exceeding a predetermined potential level; the method of decreasing the possibility of operation in response to said undesired pulses and of increasing susceptibility of said circuit to operation in response to the pulses of said source comprising producing upon termination of each operating interval of said trigger circuit a sinusoidal voltage of a frequency relationship with the unmodulated repetition rate of said pulses so that the peak portion of an undulation thereof is of sufficient width to cover a pulse reception interval for at least the maximum degree of modulation of the pulses of said source, applying the sinusoidal voltage to said oscillating circuit in a manner to increase the susceptibility of the circuit during the desired pulse reception intervals and to maintain a much lower susceptibility to input pulses during the time between the desired pulse reception intervals, and suppressing the sinusoidal voltage upon the initiation of each operating interval to prevent energy carry over from one sinusoidal voltage to the next.

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