SEQUENTIAL NULL WAVE

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BACKGROUND OF THE INVENTION

[0010] Field of the invention

[0020] The area of this invention is in communication and wave transfer of energy

[0030] Description of the Prior Art

[0040] At the current time almost all Wave functions for the transfer of power or for the purpose of communication is in the form of waves or modulated sine waves.

[0050] Communication uses sine wave functions from a few hertz all the way into light waves and beyond. For the purpose of communication a sine wave function may be modulated. Current art produces frequencies with bandwidth in proportion to the frequency and amplitude of the modulation irregardless of the type of modulation used.

[0060] The current art of information transfer using wave functions is limited by the available bandwidth. With the current art, bandwidth of a signal is proportional to the rate of information being transferred. The current best ratio of the required bandwidth to frequency or data rate of modulation is one to one. An example of this is a minimum of one megahertz of bandwidth is generated when a carrier is modulated by modulation of one megahertz.

[0070] Because of the required bandwidth, a separation between transmission frequencies is required. The result is a limited number of signals in any geographical area or communication system. This bandwidth requirement also limits the amount of information per unit of time. The limitations of bandwidth apply to all current methods of modulation.

[0080] All methods of communications used today produce modulated carrier waves that are poor with respect to signal to noise and are prone to interference, natural or man made, intended or accidental.

[0090] Current methods of communications also lack security and are easily detected. The ability to detect a transmission compromises privacy, security, safety and the source of transmission. Once a transmission is detected, it is only a question of time before any transmission may be decoded, jammed or overridden.

[0100] The current limitation not only affects radio wave type carriers, but other types of wave functions such as sound and light.

SUMMARY OF THE INVENTION

[0110] This invention uses sideband reduction and carrier null to effectively create new radio spectrum that allows high information rates with narrow bandwidth. This method is also able to coexist without causing interference with or be affected by current radio spectrum use.

[0120] A pure carrier wave without modulation is a mathematical sine wave function. All the energy of a pure carrier wave is at one frequency without any sideband energy. As a carrier wave is modulated, the mathematical sine wave function is changed and no longer has energy at only one frequency. As the wave shape is changed by the modulation, energy is generated at frequencies other than the fundamental carrier frequency. This energy is considered sidebands and is dependent on the modulation amplitude and the frequency of the modulation.

[0130] In this invention sidebands of modulated carrier waves are reduced or eliminated by maintaining each cycle as a mathematical sine function. In order to maintain a mathematical sine function when modulating the carrier, any changes of the carrier should take place at or near zero crossing of the carrier cycle and maintain a sine wave function for the rest of the cycle. This applies to all types of modulation and includes amplitude, digital, video, frequency and phase modulation.

[0140] This invention also reduces or eliminates the carrier. The carrier is made invisible to current forms of communication by alternating the phase of a cycle or set of cycles such that the energy of a cycle or set of cycles is canceled by equal energy of following cycles or set of cycles that are out of phase. The alternating phase will produce a null in resonant circuits. In order to be transparent to current state of the art equipment that uses resonant circuits, the cancellation of in-phase and out-of-phase sets of cycles must alternate at a rate that allows cancellation of out-of-phase wave energy in resonant circuits of current state of the art equipment. If a set of cycles is too long before cancellation with an out-of-phase set of cycles, the voltage in a resonant circuit will rise to a value that is detectable in non-alternating phase equipment that uses current state of the art resonant circuits.

[0150] When sideband reduction and alternating phasing are used together the result is a signal that is transparent to current forms of communication. This method uses very narrow bandwidth and allows modulation frequencies that are only limited by the frequency of the carrier. A carrier of one megahertz using two cycle cancellation is able to change every two microseconds, or a maximum modulation frequency of five hundred kilohertz while requiring a bandwidth of only one cycle. In the same manner, a carrier of 20 MHz is able to be modulated with a modulation frequency of 10 MHz and still only use a bandwidth of one cycle.

[0160] It is seen that nature makes no distinction in propagation of a wave function with respect to the number of cycles used. All wave functions of any number of cycles or even one cycle propagate in the same manner and over the same distance.

[0170] The narrow spectrum and high information rate modulation in combination with multiple alternating phase patterns of this invention makes an almost unlimited number of communication channels possible.

[0180] In this invention the frequency and phasing must be known before a signal may be detected. The difficulty of detecting the presence of signals produced by this invention along with other secure methods, such as phase pattern shifting and frequency hopping, makes unintended detection and decoding almost impossible.

[0190] The alternating phase waves of this invention transfer power without reactive currents that are seen in inductive and capacitive elements in power distribution systems. An advantage is also seen in motors or other equipment if they are designed to use sequential alternating phase waves.

[0200] The methods of this invention have advantages even when partial components are implemented. Simple transmitters and receivers used for CW keying or digital modulation can be constructed using only the alternating phase method. Digital or CW keying communication only produce sideband energy at the time of switching. If switching takes place every tenth of a second and the frequency of the carrier is 10 MHz, sideband energy will be less than 10^-6 of the carrier energy. As long as the switching rate is not too great, digital or CW keyed signals using only sequential phase cancellation show little or no interference with current forms of communication.

[0210] It is also found that many applications do not require a mathematical sine function in order to be transparent to equipment that uses resonant circuits. The energy of a cycle or wave of any shape will be canceled by a cycle or wave of the same shape and opposite phase. This is most useful on low cost systems such as garage door openers or near field switching. The circuit for this type of device is not much more than a low cost microprocessor.

DESCRIPTION OF INVENTION

SIDEBAND REDUCTION

[0220] In order to optimize and improve on current wave energy transfer or communication, several methods described in this patent are used alone or in combination.

[0230] This invention considers wave and wave functions, cycle by cycle. Each complete cycle is considered an integral unit or quantized function. Any number of individual wave cycles may also be considered a quantized unit if all of the cycles as a unit maintain all the same parameters.

[0240] Integral cycles with mathematical sine functions only have energy at a single frequency. An unmodulated wave function of constant amplitude or “carrier wave”, as seen in FIG. 1-1, is an example of integral sine functions with energy at one frequency. FIG.1-1 shows cycles of mathematical sine functions that are used as a reference. In modulated systems, the carrier wave frequency is considered the fundamental frequency.

[0250] All current modulation methods change the mathematical sine function of each cycle of a carrier wave. FIG. 1-2 shows how each cycle is affected by a modulated carrier.

[0260] It can be seen in FIG. 1-2 that the wave no longer remains a mathematical sine function when the amplitude is changed. The slope, the zero crossing point, and wave shape have changed compared to FIG.1-1. When the amplitude is increased between Cycle 10 and Cycle 13 of FIG.1-2, the slope 11 at point 12 is greater than the slope at the same point in

FIG.1-1. In addition, zero crossing at point 12 leads the zero crossing point compared to zero crossing in FIG.1-1. When the amplitude is decreased between Cycle 14 and Cycle 17 the slope 15 at point 16 is less and the zero crossing at 16 will lag the zero crossing point of FIG. 1-1.

[0270] Any change of a mathematical sine function results in energy at frequencies other than the fundamental carrier frequency. Energy produced at other than the fundamental frequency is considered sideband energy. This invention reduces or eliminates sidebands by maintaining each cycle or group of cycles of a carrier as a mathematical sine functions even under modulation changes.

[0280] In this invention it is desirable to modulate the carrier by setting the parameters of the next cycle or group of cycles at or near zero crossing of the carrier. Zero crossing points are referenced as points 20 and 23 in FIG.1-3. The parameters of the cycle or group of cycles are then maintained as a mathematical sine function during the entire cycle or group of cycles. In FIG.1-3, the sine function is the same through cycles 18 and 19 and then again maintained throughout cycles 21 and 22, only changing parameters at point 20. The sine function is held until the end of the cycle or group of cycles. Cycle 24 is then held as a mathematical sine function after changing parameters at point 23. This method maintains each cycle or group of cycles as a mathematical sine function for all amplitudes of the modulated carrier.

[0290] Figures 2-1, 2-2 and 2-3 are used to show the extrapolation from an unmodulated carrier in FIG.2-1 and the modulating signal in FIG.2-2 to the modulated wave of integral cycles in FIG.2-3.

[0300] Using amplitude modulation as an example, the amplitude of the next wave cycle or group of cycles is determined from a sample of the amplitude of the modulating signal of FIG. 2-2 at points 25 through 36. They should be sampled at or before the zero crossing point of the carrier wave of FIG. 2-1. Each point of the amplitude of the modulating signal is sampled and held before the start of each cycle of the carrier and is used to set the amplitude of the next cycle or group of cycles in FIG.2-3. Once the amplitude parameters are set, the mathematical sine function at that amplitude is maintained until the end of the cycle or group of cycles. Before the end of the current sine cycle, the amplitude of the next cycle or group of cycles is determined from a sample of the amplitude of the modulating signal at that time, and the process is repeated. The modulated wave generated by this process is seen in FIG.2-3. By maintaining a mathematical sine function for each cycle or group of cycles there is no side band energy generated. The maximum of the amplitude of the modulating signal is the maximum of the modulated carrier in FIG. 2-3. The minimum of the modulating signal is set no lower than zero of the modulated carrier. The modulated carrier should never try to go lower than zero or splatter will occur. The same splatter occurs as in current state of the art equipment. Splatter, of course, results in energy over a wide bandwidth.

[0310] The modulation signal of FIG. 3-1, when applied to a carrier, results in a frequency modulated wave form of FIG. 3-2. In the same manner, the modulation points 37, 38, and all following points are sampled and held before the start of the next cycle or group of cycles of FIG. 3-2. The sampled modulation is then used to set the frequency or phase of the next cycle or group of cycles. The frequency or phase is set at or near the zero crossing of the carrier wave.

[0320] Figures 3-1 and 3-2 show the extrapolation from the modulating signal in FIG. 3-1 to the modulated wave of integral cycles in FIG. 3-2. The amplitude of the modulating signal is measured at the start of the carrier cycle 37 in FIG. 3-1. This amplitude is converted into the next frequency of the carrier. The cycle starts at 37 FIG. 3-2 and ends at 38.

[0330] This procedure of measuring the amplitude, converting to a frequency, and setting the frequency is repeated for all cycles of the wave. All changes to the cycle parameters are applied at a point where no sidebands are generated which is usually zero crossing of the carrier. The amplitude measurement of the modulation can occur at any point before the cycle parameters are set, but it is usually best to do it just before zero crossing of the frequency modulated wave of FIG.3-2. FIG. 3-2 shows the frequency change for each sample point of the modulating signal at zero crossing of the carrier.

[0340] Frequency modulation can require more than one cycle of bandwidth depending on the type of detection of the frequency modulation used. Phase modulation may be accomplished using less bandwidth then frequency modulation when using a phase detector.

[0350] A modulated carrier without sidebands can be modulated at a rate equal to the frequency of the carrier. A one megahertz carrier is able to change amplitude every microsecond. In theory this allows one megahertz modulation using only one cycle of bandwidth. In practice, the use of several cycles is more practical.

[0360] With the reduction or elimination of sidebands, thousands of transmissions are possible in the same bandwidth now occupied by one transmission. The elimination of sidebands allows the selection or differentiation of signals just a few cycles apart. Without the limitation of bandwidth caused by sideband energy, data rates are only limited by the carrier frequency.

[0370] For greatest reduction of sidebands, an undistorted sine wave of any number of cycles should start and end at zero crossing of the cycles. This is done in order to eliminate step functions with energy components at frequencies other than the main carrier.

[0380] Many of the mathematical functions of each cycle may be changed from cycle to cycle, such as amplitude, phase, or frequency, without creating sidebands. The changes from cycle to cycle or group of cycles may take place as long as each cycle maintains a mathematical sine function.

[0390] Digital modulation FIG.4-1 or interrupted carrier modulation using a constant mathematical sine function of each individual cycle or a number of cycles, when processed properly, can easily produce a narrow bandwidth signal with high data rates. For the greatest reduction of sidebands in digital modulation the changes of the carrier wave should take place at zero crossing points as seen in FIG.4-1 at 40 and between cycles 42 and 44 at 43 of the carrier wave. The carrier wave should also end at zero crossing point 45.

[0400] The modulation shift of a digital data carrier may be between any two amplitude levels 39 to 41 and 42 to 44 and return from 44 to 46. With amplitude modulation the shift may be between any two voltages including zero. In the same manner digital frequency or phase modulation is between any two frequencies or phase angles.

[0410] Current methods of detection and reception that use LC resonance for frequency selection are not able to take advantage of a zero sideband transmission. When a zero sideband wave is applied to an LC resonant circuit FIG. 4-2. With the circuit either at the transmitter or the receiver, the unwanted sidebands are reproduced; thus defeating the purpose of the intent. FIG. 4-2 shows a step function applied to an LC resonant circuit. The step function takes place from 47 to 48 at 43. The amplitude is only able to increase in an LC circuit over a number of cycles dependent upon the impedance of the LC circuit, as seen between 43 and 48. With each cycle being different in amplitude, the mathematical sine function of each cycle is not maintained and sidebands are generated.

[0420] When a wave function is applied to a resonant circuit, the amplitude of the wave function is only allowed to increase as permitted by the Q, impedance, of the resonant circuit. The increase of the amplitude is that of a typical RC curve. As the amplitude of the wave function is changing, it no longer remains a mathematical sine function. As stated before, only a carrier that is a mathematical sine function is without sideband energy.

[0430] This invention uses non LC resonant methods to select a desired frequency. Once the initial frequency is selected by a digital or other non-resonant method, further processing may use resonant techniques to refine the frequency selection.

[0440] The sideband reduction or elimination in this invention solves the problem of eliminating the sidebands of a communication system that is designed with non LC resonant circuits, but does not reduce the sidebands for current communication systems that use LC tuned circuits for frequency selection. This method also does not eliminate the reception of the sidebands of signals that produce sidebands in equipment designed for reduced side band reception.

[0450] Even though many applications will find great advantages using just the sideband reduction method, for example cable systems, the total result is not the most practical method for general use.

SEQUENTIAL NULL

[0460] Another part of this invention, that solves the problem of compatibility with current art and adds to the function of communication methods, is the reduction or elimination of the carrier energy that may be detected by current reception methods. The reduction or elimination of a carrier combined with sideband reduction or elimination makes this method of communication invisible to current state of the art reception.

[0470] FIG.5-1 is a reference carrier wave to help visualize the phasing.

[0480] A sequential null wave [SNW] is defined as a wave cycle or group of wave cycles followed by another wave cycle or group of wave cycles that cancels the first wave cycle or groups of cycles. An example of a SNW is a sine wave followed by another sine wave that is out-of-phase with the first sine wave

FIG.5-2 and results in cancellation of wave functions in a resonant circuit.

[0490] Using reference cycles 49 and 50 of the reference wave in FIG.5-1 it may be seen that cycle 52 of FIG.5-2 is phase shifted 180 degrees with respect to cycle 51. The alternating phase shifting continues throughout FIG.5-2. The alternating phase cycles of the waves of FIG.5-2 are canceled when applied to a resonant circuit. The waveform of FIG.5-2 does however, produce a sub frequency of one half the carrier frequency that must be filtered or eliminated. High pass filters or a change of phase pattern may be used to accomplish this.

[0500] The sub frequency of FIG. 5-2 are eliminated in FIG. 5-3 by changing the phase pattern, as seen in cycles 53 and 54. In FIG. 5-3 every other cycle is moved 180 degrees from the last cycle. There are an infinite number of phase patterns that may be used to produce a sequential null wave [SNW]. Care should be taken to avoid patterns that may produce unintended resonance or sub harmonics.

[0510] FIG. 5-4 shows two pairs of in-phase cycles 55, 56 followed by two cycles 57, 58 that are 180 degrees out-of-phase with the first pair. FIG. 5-4 illustrate the use of multiple cycles.

[0520] FIG. 6-1 is a carrier wave used for reference.

[0530] The cycles or groups of cycles of a sequential null wave need not follow immediately sequentially. In FIG. 6-2 the first cycle 59 is followed by a second out-of-phase cycle 60 that is one and a half cycles after the first and is, of course, 180 degrees out-of-phase with the first cycle. The second sequential null wave [SNW] pair follow the first pair with a delay of one cycle. Cycle 61 is followed by a second cycle 62 that is 180 degrees out-of-phase with cycle 61. The third pair 63, 64 start one cycle after the second pair. Cycle 63 is immediately followed by cycle 64 that is 180 degrees out-of-phase with cycle 63. FIG. 6-4 is a group of waves that are out-of-phase with a second group of waves. All phasing shown in FIG. 6-1, 6-2, 6-3, and 6-4 will produce a sequential null wave [SNW].

[0540] The alternating cycles or groups of cycles of a sequential null wave may be distributed throughout the signal FIG.6-3. The number of cycles in a group or the placement in distribution should be set to minimize the ability to detect or interfere with current state of the art equipment. In FIG.6-3 the first null pair cycle 65 is followed by a second cycle 66. Null pair cycles 67 and 68 also follow each other. Cycle 69, however, is paired with cycle 71 as cycle 70 is paired with 72. FIG. 6-4 shows paired groups of cycles. Cycle group 73 is followed by cycle group 75 with cycle group 75 out-of-phase with cycle group 73. The gap 75 allows for the change of phase.

[0550] FIG.7-1 is a reference carrier wave.

[0560] In amplitude modulation of a sequential null wave, a sample of the applied modulation is taken before the start of the next null phase sine wave pair at 76 of FIG. 7-2. The sample amplitude is used to set and maintain the amplitude parameters of the next sine wave pair 77, 78. The amplitude parameters are then maintained as a mathematical sine wave function for the entire cycle pair 77, 78. This is repeated starting at 79 and the next sample is taken and applied to the next cycle pair 80 and 81. This basic method is used for all types of modulation. The number of cycles used in a group can affect the bandwidth and reduction of apparent carrier when using current state of the art methods of reception.

[0570] A sequential null wave [SNW] cycle pair or a group of sequential null wave [SNW] pairs may also be multiplexed with a number of different channels of information. Sequential null wave [SNW] cycle pairs of 82,83 and 86, 87 of FIG. 8-1 may be used as channel A and 84, 85 and 88, 89 used as the second sequential null wave [SNW] channel B. FIG.8-2 shows a 3 channel wave form. Channel C starts with SNW pair 90. Channel D starts with SNW pair 91 and channel E starts with pair 92. The 3 channels continue to repeat through the rest of FIG. 8-2. The effective modulation frequency able to be used any channel is determined by the number of sine cycles allocated to that channel and the frequency of the carrier. The number of cycles per second or frequency of the carrier limits the number of channels possible using reduced sideband sequential null.

[0580] FIG. 9-1 Is a switching signal 93 applied to modulate a sequential null wave [SNW] of multiple cycles as seen in FIG. 9-2, 9-3, and 9-4. FIG. 9-2 shows two sets of waves with one set of waves 94 having no offset from waves 95. FIG.9-3 shows an offset of one and a half cycles between 96 and 97. FIG. 9-4 shows an offset of one cycle between 98 and 99. In all of these methods, the second set of cycles cancels the first set of cycles.

[0590] All signals using this invention may be encoded by selecting the phase pattern, number of cycles used, spacing, timing between cycles, or any other changes of each cycle or group or cycles. For reasons of encodingf or other purposes; the methods given here may be ignored in whole or part to produce the desired results. An example of this is an insertion of a number of in-phase sine waves for frequency tracking.

[0600] Receivers for sequential null wave modulation must recognize and take advantage of the alternating phase of the wave function. The incoming signal is switched to match the phase changes of the transmitted signal. One method is to switch every other cycle or group of cycles through a phase inverter. The phase inverter then restores the out of phase cycles to a continuous in-phase waveform. The switching method, if used, also provides selection of the incoming frequency. The selection may be improved by adjustment of the width of the phase inverter. Signals that are not resonant with the switching rate will be out of phase and are canceled. In this manner, all incoming normal in-phase wave functions will be canceled. Nothing in nature is known to produce alternating phase wave functions. The methods of this invention results in a reduction of interference and noise from all sources, natural or man made. The visibility of the signal using reduced sideband

and sequential null is adjustable by selecting the number of cycles in a group.

[0610] This invention offers ideal privacy. No listening is possible if a signal is not known to exist. There is no method to detect transmission using this invention by any unintended party. Only by reorganizing null-phase waves back into normal non-alternating phase waves, can the signal level rise above the background noise. The encoding must be known and applied before reorganizing can take place.

[0620] Sequential null without sideband reduction will still produce sidebands when applied to a resonant circuit. Both sideband reduction and sequential null must be used for maximum results.

[0630] Phase tracking is required and may be achieved using stable frequency sources that are available using current state of the art devices. Phase tracking can also be achieved using a reference carrier from any non-switching phase carrier, such as normal broadcast transmitters. The methods of this invention are able to sync with a standard broadcast carrier and be transparent while operating at the same frequency. A non-switching phase carrier, such as a current broadcast station, may be transmitted concurrent with the switching phase signals of this invention. The signal and the modulation of each carrier will be invisible to each other. The bandwidth of the tracking carrier, if not modulated, is just one cycle wide. The modulation bandwidth of the switching phase signal of this invention remains also just one cycle wide. The frequency of the modulation, as stated before, is only limited by the frequency of the transmission carrier. The received signal from this invention may also be used to lock the frequency and phase of the phase switches.

DESCRIPTIONS OF THE CIRCUITS

[0640] The circuit in FIG. 10-1 is used to convert an unmodulated carrier wave into a sequential null wave [SNW] and make it transparent to communication equipment using the current state of the art resonant circuits. With digital or CW keying, the waveforms are able to maintain a mathematical sine function except when switching between 0 and 1. When switching between 0 and 1, the change should be at or near zero crossing of the carrier wave cycle.

[0650] The circuit in FIG. 10-1 is a simple phasing circuit used to illustrate the theory of the generation of a sequential null wave [SNW]. The transmitter 100 generates an unmodulated carrier wave. The output from the transmitter 100 is applied to a switch controller 101 that divides the transmitter frequency. The output of the switch controller operates the switch 103. Switch 103 is able to switch the transmitter output between the in-phase and out-of-phase windings of a transformer. The output of the switch produces a carrier wave that has every other cycle out of phase with the last cycle. This is a [SNW]. The [SNW] wave from switch 103 is connected to antenna 104. The switching circuit 101 divides the transmitter frequency. A division by two switches the phasing from in phase to out-of-phase on every other cycle. The result of a division by 2 is the signal seen in FIG. 5-2. Other divisions may be used to produce multiple in-phase cycles followed by multiple out-of-phase cycles.

[0660] The circuit to receive the sequential null wave [SNW] is shown in FIG. 10-2. The circuit receives the sequential null wave [SNW] signal from antenna 105.The switch controller 108 controls switch 106 and is used to convert the antenna input back into an in-phase signal by switching inputs from transformer 107. The switch 106 is controlled to match the phasing requirements of the incoming sequential null wave [SNW]. After conversion back into a normal in-phase signal it may be applied to a current state of the art receiver 109.

[0670] The switch and controller may be phase locked by using accurate frequency sources, or by using other carriers as a reference. [SNW] may also use the same frequency with state of the art non-alternating phase carriers. The alternating phase methods [SNW] of this patent and the non-alternating phase of the current state of the art equipment are undetectable to each other, even when using the same frequency. The shared carrier may also be used to lock the transmit and receive circuits. The transmit and receive circuits of this patent may also be locked using feedback from the receive circuit of this patent.

[0680] When a non-alternating phase carrier is applied to a resonant circuit, each cycle of the carrier is integrated with previous cycles of the carrier. Energy is stored in a resonant circuit with each cycle of a wave that is at the resonant frequency of the resonant circuit. When the energy supplied by a cycle of the wave is applied to a resonant circuit, the energy and the voltage in the resonant circuit increases. An alternating phase signal [SNW] prevents the energy and the voltage increase in a resonant circuit. When a cycle that is out of phase with the previous cycle is applied to the resonant circuit, the two cancel each other and the signal energy is canceled.

[0690] Likewise, when non-alternating phase carriers are applied to alternating phase [SNW] circuits, the energy is canceled.

[0700] In order to prevent unwanted cancellation of the [SNW] signal, amplifiers and antenna systems to be used with this patent should be designed to avoid resonance at the operating frequency. Impedance matching to the medium should be done by applying the correct voltage for a given area of antenna. The antenna and impedance matching devices should, as much as possible, also be without resonance to the applied signal. The voltage required for impedance matching to the spatial medium may be achieved by using non-resonant broadband transformers.

[0710] The circuits of FIG. 10-1 and FIG. 10-2 may also be used to switch the phase of any number of cycles. Wherever one cycle is shown, it may be replaced with any number of cycles. Phase cancellation does not need to be cycles that are continuous.

[0720] For example, there may be two phase A cycles, then three phase B cycles, followed by two out-of-phase A cycles and then three out-of-phase B cycles. The visibility to current state of the art detectors will increase with an increase in the number of continuous cycles. The number of cycles should be set to limit the signal level to the desired level of detection in the current state of the art resonant receivers.

[0730] The receive phase converter of FIG. 10-2 also acts to reject signals that are not synchronous with the switching phase of the converter. The converter provides complete rejection of normal in-phase waves used in the current state of the art resonant circuits. Continuous in-phase signals will be switched by the circuit in FIG. 10-2. If a switched signal is then applied to a resonant circuit, the cancellation will be the same as stated in FIG. 10-1. Since noise is almost always a non-alternating phase wave function, the converter circuit of FIG. 10-2 is able to reject noise, both natural and man made.

[0740] If a modulated wave is applied to the circuit in FIG. 10-1, the carrier will become invisible and the sidebands of the modulation will be left. This will appear similar to a double sideband signal. Single sideband and double sideband modulation remove all carrier energy. The method descried in this patent retains all the energy of the carrier but with the difference that it is invisible to current state of the art equipment.

[0750] The circuit in FIG. 11-1 shows a logic arrangement for digital switching. The oscillator 110 provides a sine wave carrier to phase transformer 111. The phase transformer outputs two out-of-phase signals, one in-phase output to switch 112 and the other out-of-phase output to switch 113. The oscillator output is also used for the switching logic. The output of the oscillator is applied to the clock input of the D-flip-flop 114 that is connected as a divider. On every other cycle of the oscillator, the gates of the NOR logic 117 and 118 are alternately switched. One output of Flip-Flop 114 is also connected to the clock input of Flip-Flop 115. This circuit is intended to switch the phasing switches 112 and 113 on and off at zero crossing of the start and finish of the [SNW] pair of cycles, consisting of one in-phase and one out-of-phase cycle. The [SNW] cycles will continue whenever the D input 116 of Flip-Flop 115 is high.

[0760] The circuit shown in FIG. 11-2 is the same as FIG. 11-1 with oscillator 120 connected to phase transformer 121. This provides in-phase and out-of-phase signals to switches 122 and 123. Except in FIG. 11-2, a computer chip switch controller 124 is used for switching the phasing of the output. The computer control enables generation of a variety of phasing logic, as seen in FIG. 5-1 through FIG. 8-2. The output to the antenna 126 is controlled by the input 125 of the computer controller chip.

[0770] Modulation of a carrier wave must be applied in a manner that maintains each cycle of the carrier as a mathematical sine function. This is accomplished using a sample and hold circuit as shown in FIG. 12-1. A sample of the modulation wave is taken from input 133 before each cycle or number or cycles of the carrier wave. The sample of the modulation wave is then used to set the amplitude of the next cycle, or number of cycles, of the carrier wave. The oscillator 127 is connected to the phase transformer 128 and phase switching logic 132. Phase switching logic outputs switch controls 136 and 137. The switch control logic may provided simple or complex phasing timing. The switching logic also provides an output 138 that is used to latch the modulation input of 133 into modulator 131. The modulator holds the amplitude of the [SNW] carrier through the entire in-phase and out-of-phase cycle or cycles.

[0780] After the modulation of the carrier wave, the modulated carrier wave must be amplified or applied to an antenna without going through resonant circuits. The antenna should be broadband and care should be taken to avoid resonance of the antenna itself. All amplifiers should be linear, broadband, and non-resonant. This will produce a sequential null modulated carrier wave without sidebands. Fractal antennas may be ideal for use with this application.

[0790] The modulator circuit 131 in FIG. 12-1 modulates the sequential null carrier from the output of the switches 129 and 130. The modulator should maintain the wave as a mathematical sine function. The circuit in FIG. 12-1 produces a sequential null wave signal without sidebands and no visible carrier to equipment using resonant circuits.

[0800] FIG. 12-2 is a basic converter. The signal enters from antenna 139 through amplifier 140, then through switches 141 and 142 that are switched in synchronization with the incoming sequential null wave [SNW]. This converts the alternating phase waves into a normal non-alternating phase wave at the input of the amplifier 145. The output of 145 is at 146. 147 is the common. Input 148 is from a reference signal. The reference signal may be from an oscillator, a reference carrier, or feedback from the output of the detector of the receiver. The switch controller 144 is designed or programed to match the requirements of the incoming signal from 139.

[0810] All the methods of modulation of this patent apply to all types of modulation.

DESCRIPTION OF THE FIGURES

FIG. 1-1 Shows a basic sine wave carrier used as a reference.

FIG. 1-2 Shows a modulated wave showing the change of sine function. The change of the zero crossing point is shown as an example of the loss of sine function. The change of sine function is the result of, not only voltage differences of one cycle to another, but also the change of modulation frequencies.

FIG. 1-3 Shows the same modulation as applied to FIG. 1-2 applied to a quantized sine wave that maintains a mathematical sine wave function of this invention. Each cycle starts at zero and maintains a mathematical sine wave function for the entire cycle. The amplitude of each sine cycle is determined from the modulating wave before the start of each carrier sine cycle and is held for the length of the cycle.

FIG. 2-1 Shows a basic sine wave used as a reference.

FIG.2-2 Shows modulation signal used to modulate FIG. 2-3

FIG. 2-3 Shows quantized mathematical sine wave functions for each sample point of FIG.2-2.

FIG. 3-1 Shows modulated signal applied to a frequency modulated carrier resulting in a wave seen in FIG. 3-2. a sample is taken of modulation at each zero crossing of the carrier frequency.

FIG. 3-2 Shows At zero crossing of the carrier in FIG. 3-2 a sample of modulation is taken from the modulating signal FIG. 3-1 and used to maintain the frequency of the next cycle in FIG. 3-2

FIG. 4-1 Show a digital modulation with a step function at 40 and another at 43 and 45.

FIG. 4-2 Shows the result of a step function applied to a resonant circuit. The rate of increase in amplitude with each cycle of the wave is dependent on the Q of the circuit and the impedance of the source. A resonant circuit in effect acts to integrate the wave form. When quantized mathematical sine wave function is applied to a resonant circuit all sidebands will reappear.

FIG. 5-1 Shows a reference wave.

FIG. 5-2 Shows a sequential null wave form with one cycle closely following the next.

FIG. 5-3 Shows a sequential null wave form set one half cycle apart

FIG. 5-4 Shows a sequential null wave form of a pair of cycles follow by a second pair that is out of phase with the first pair.

FIG. 6-1 Shows a reference wave form.

FIG. 6-2 Shows a different sequential null waveforms that may be used.

FIG. 6-3 Shows a sequential null waveform with different positions in the wave.

FIG. 6-4 Shows the use of multiple cycle waveforms used in sequential null waves.

FIG. 7-1 Shows a reference carrier wave.

FIG. 7-2 Shows a modulation used to produce reduced sideband and sequential null carrier waves of FIG. 7-3.

FIG. 7-3 Shows a reduced sideband and sequential null carrier wave.

FIG. 8-1 Shows how two channels are used in this invention.

FIG. 8-2 Shows how three channels may be used in this invention.

FIG. 9-1 Shows a step function change.

FIG. 9-2 Shows a multiple cycle reduced sideband and sequential null carrier waves with no separation between in phase and out-of-phase waves.

FIG. 9-3 Shows a multiple cycle reduced sideband and sequential null carrier waves with one and half cycle separation between in phase and out-of-phase waves.

FIG. 9-4 Shows a multiple cycle reduced sideband and sequential null carrier waves with one cycle separation between in phase and out-of-phase waves.

FIG. 10-1 Shows a simple sequential null converter transmitter.

FIG. 10-2 Shows a simple sequential null converter receiver.

FIG. 11-1 Shows a simple reduced sideband and sequential null transmitter.

FIG. 11-2 Shows a simple reduced sideband and sequential null transmitter using phasing logic.

FIG. 12-1 Shows a simple reduced sideband and sequential null transmitter.

FIG. 12-2 Shows a receiver converter for reduced sideband and sequential null signals.

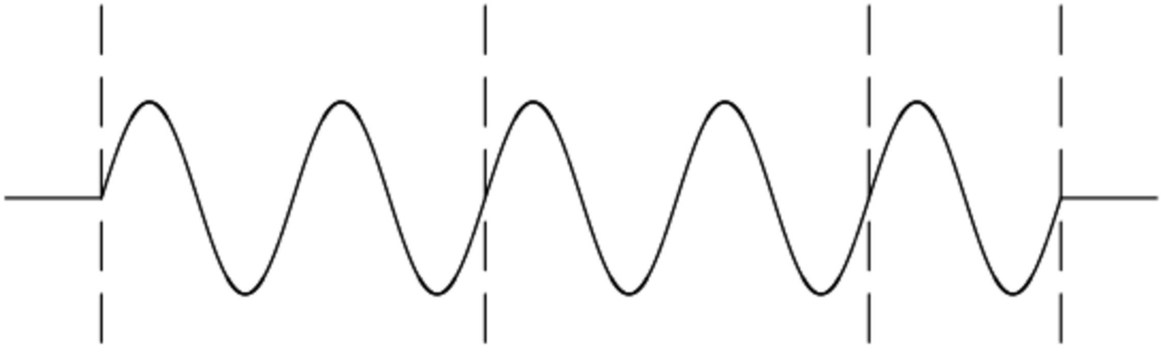

FIG. 1–1

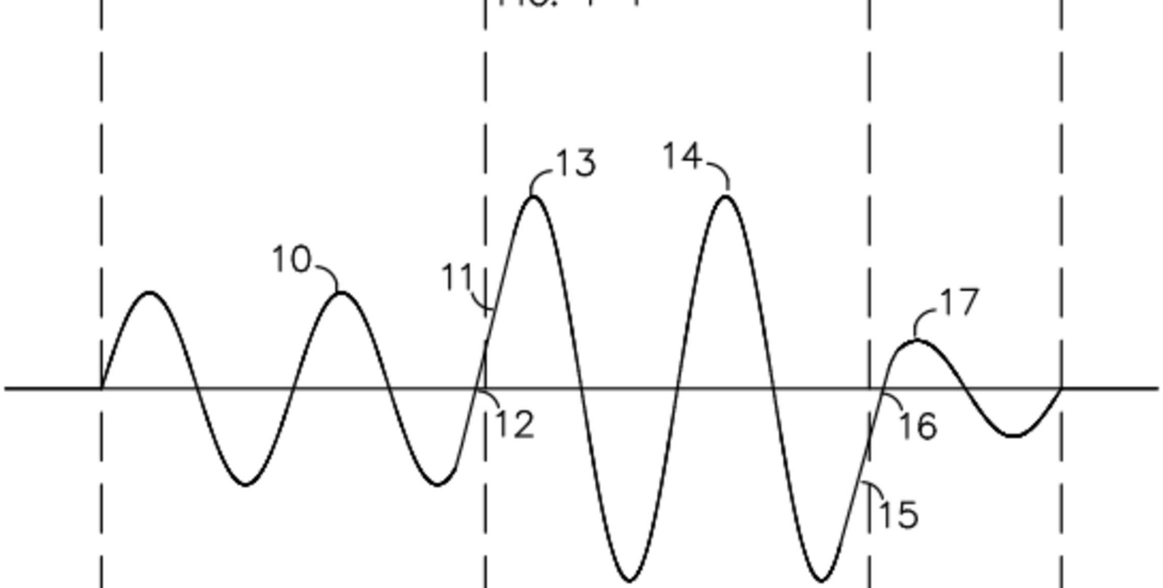

FIG. 1–2

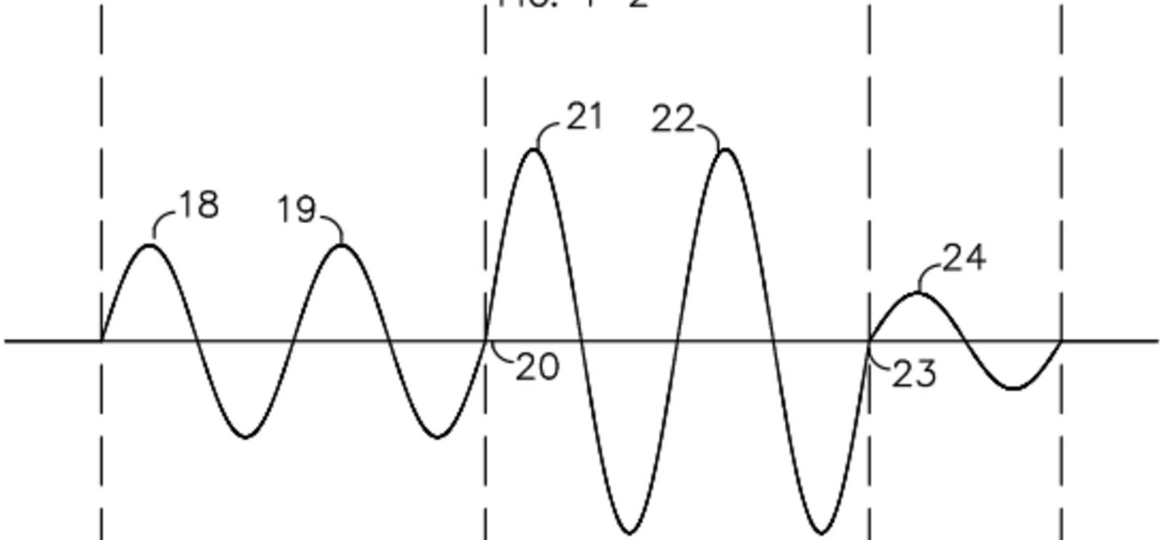

FIG. 1–3

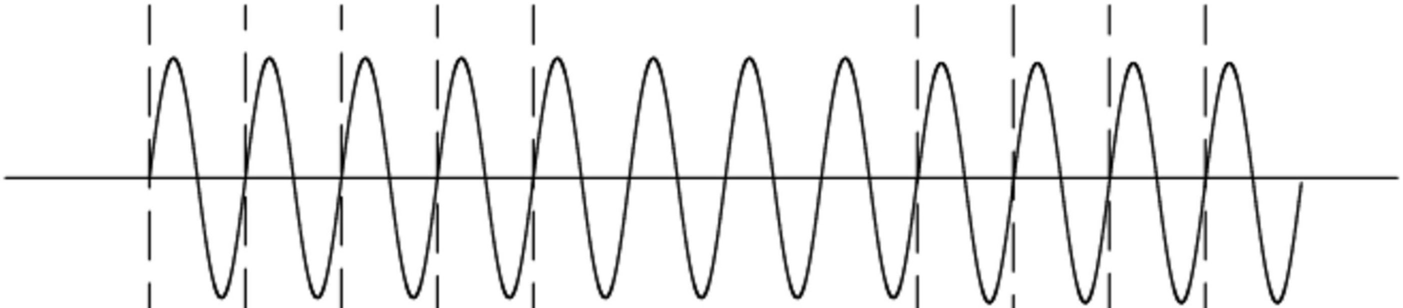

FIG. 2–1

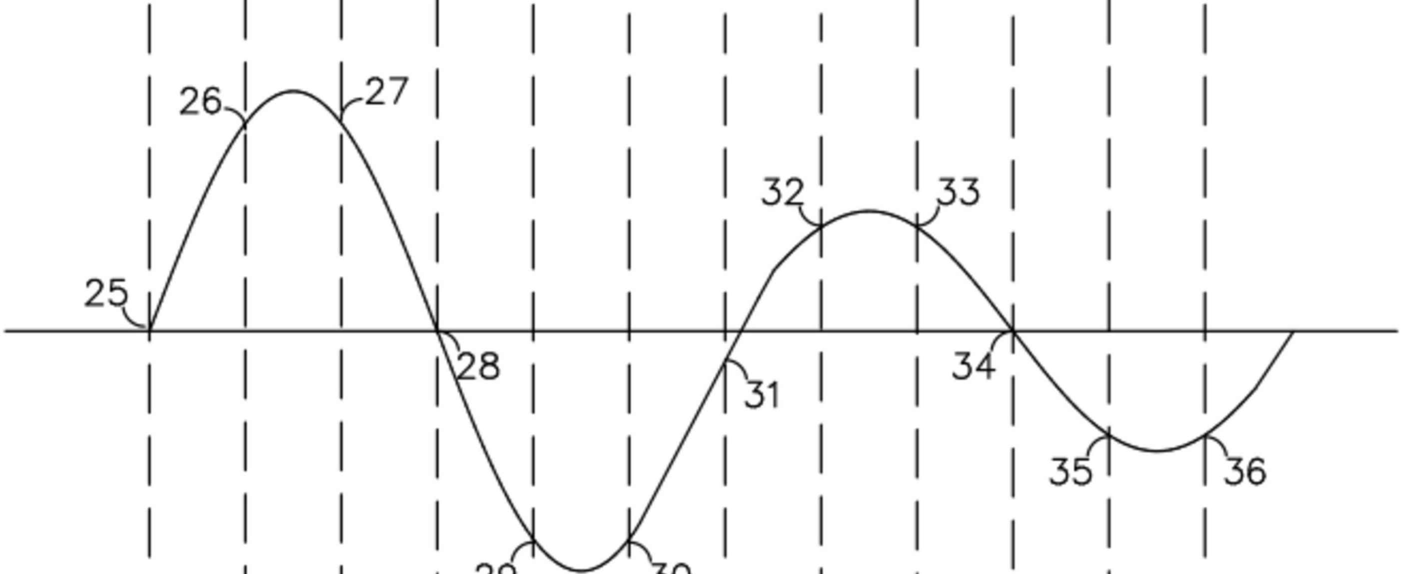

FIG. 2–2

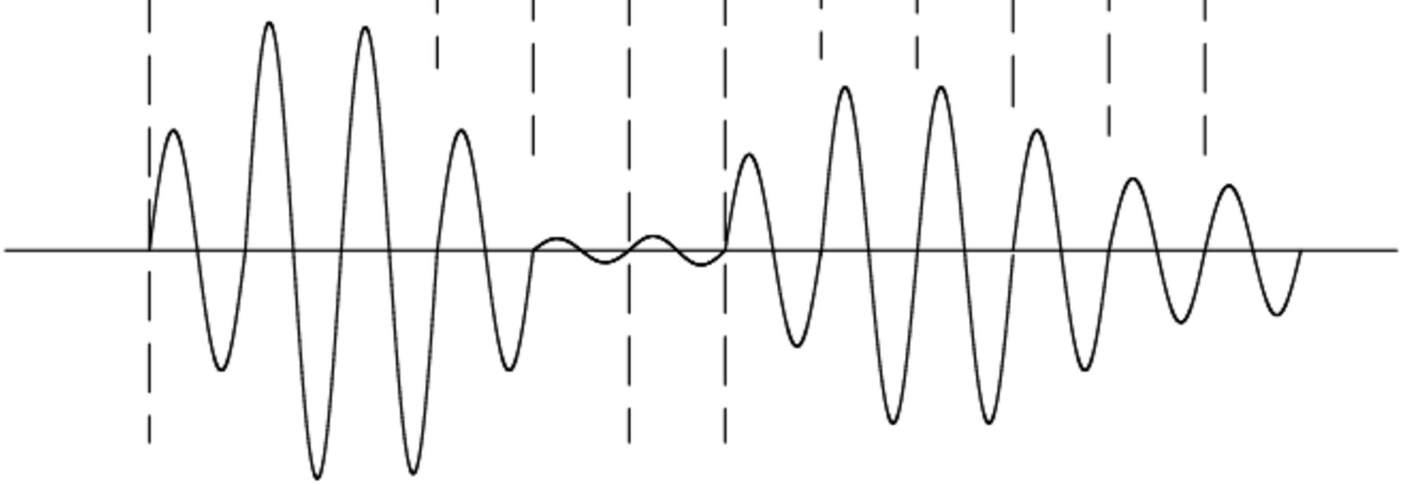

FIG. 2–3

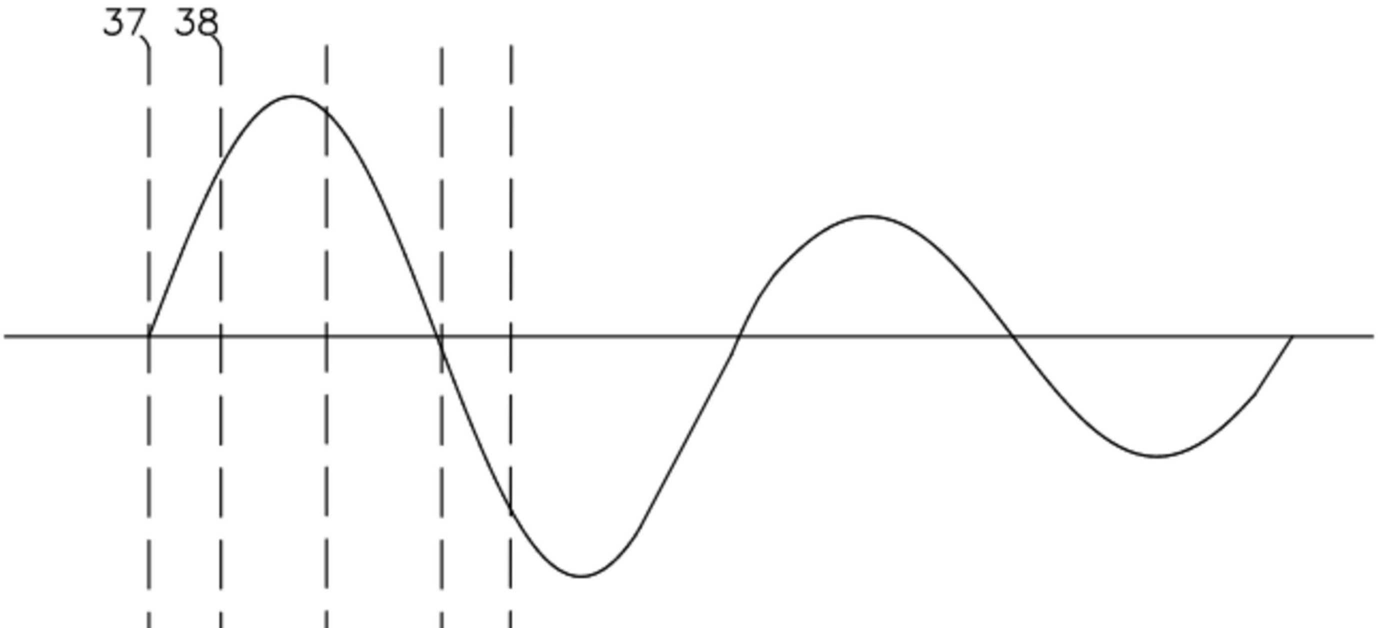

FIG. 3–1

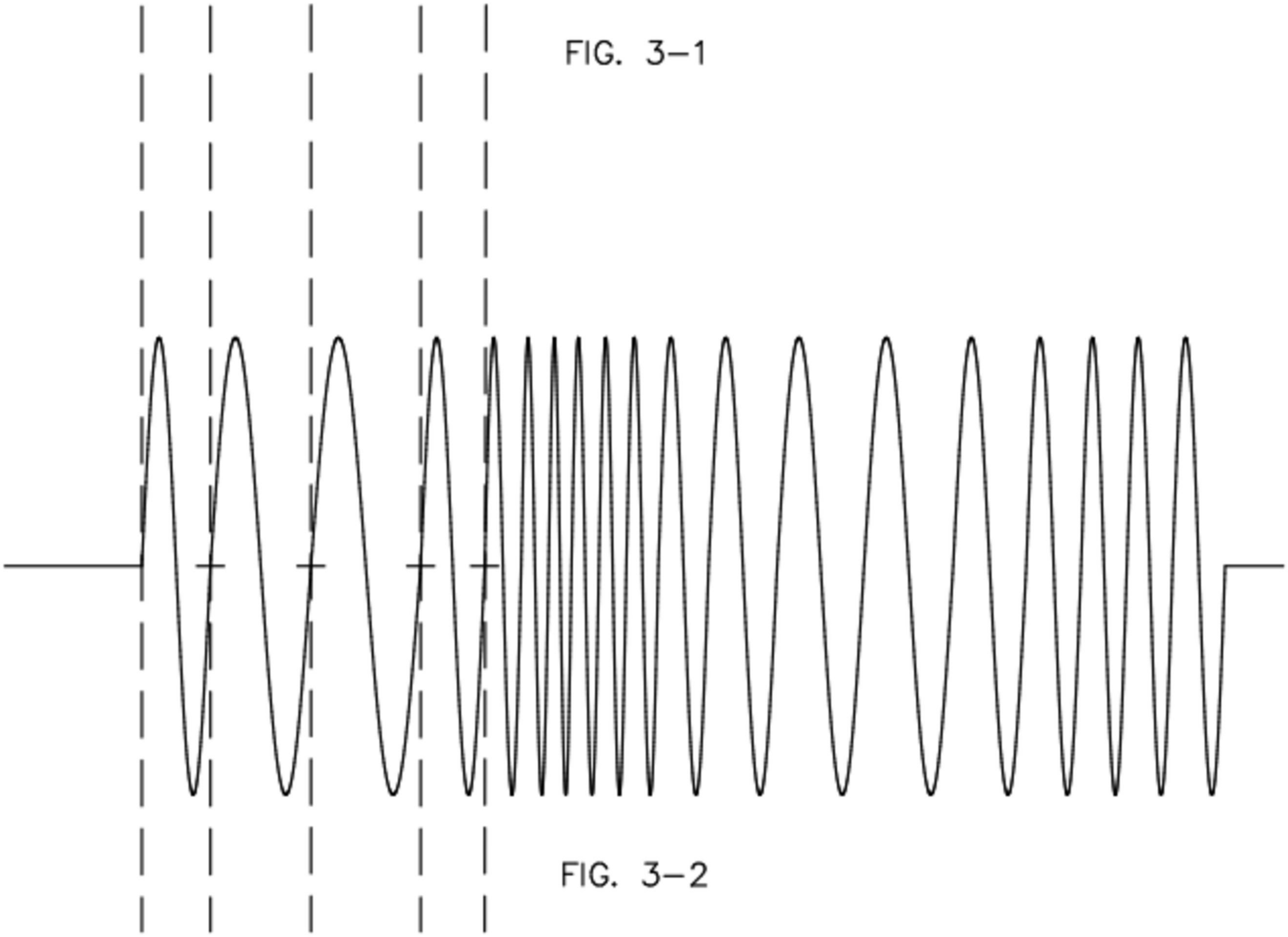

FIG. 3–2

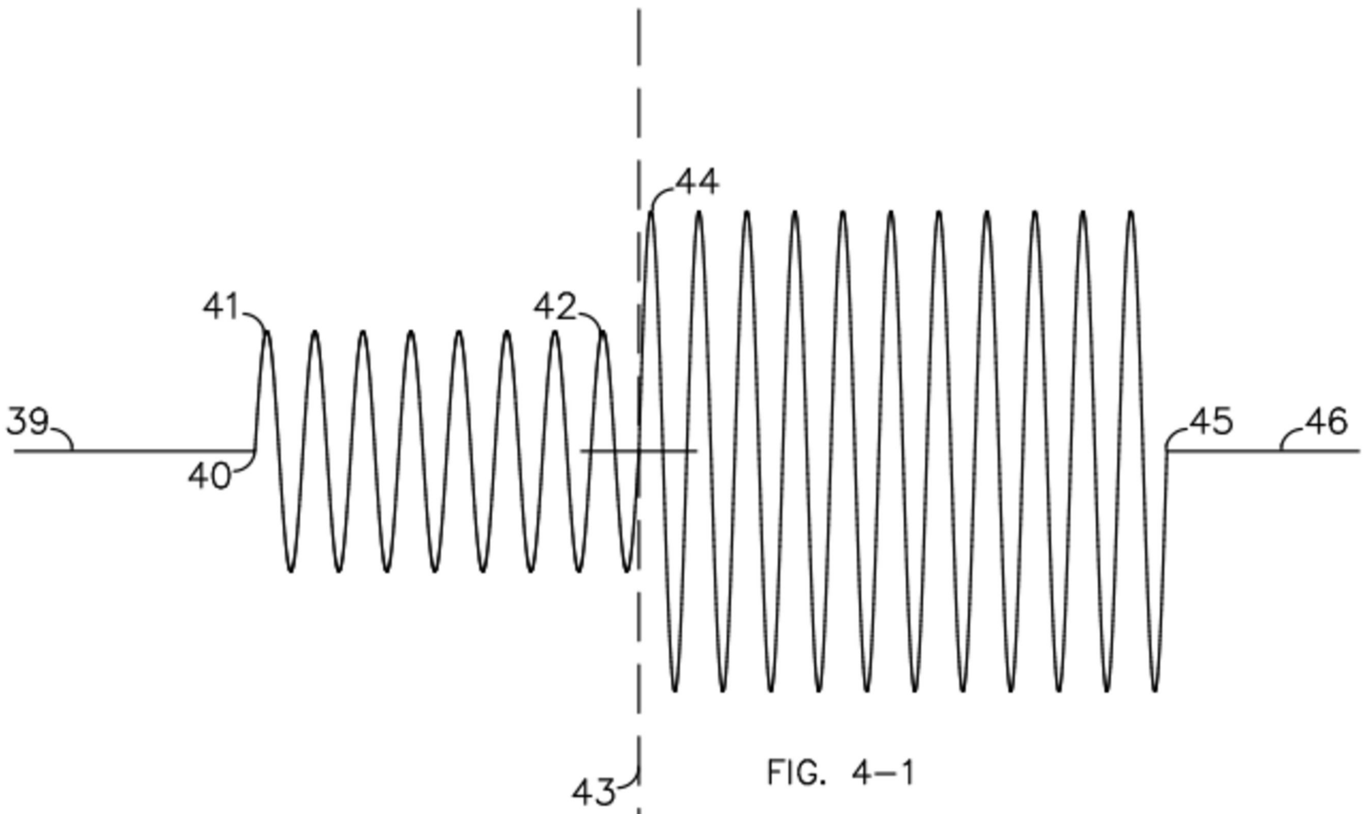

FIG. 4–1

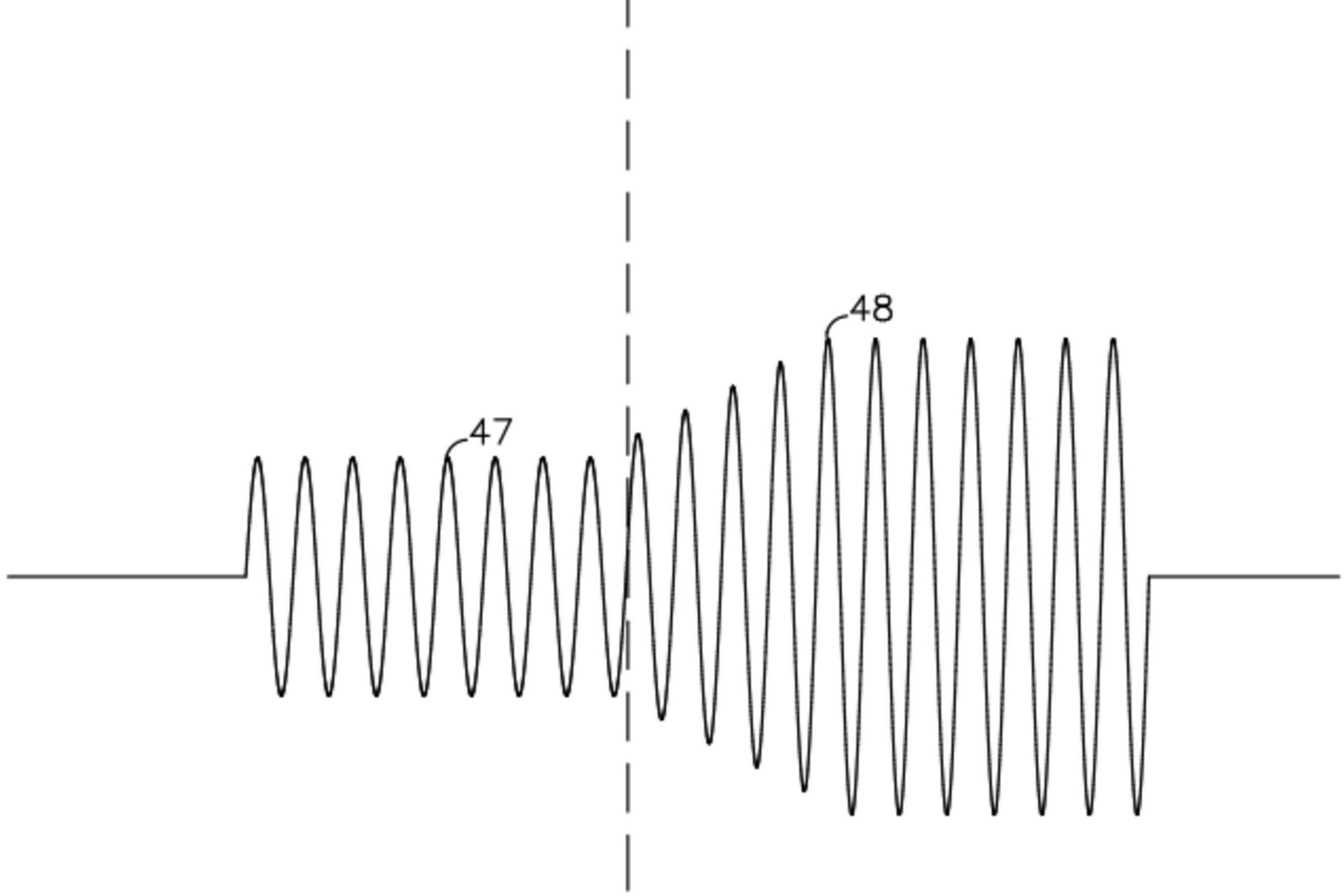

FIG. 4–2

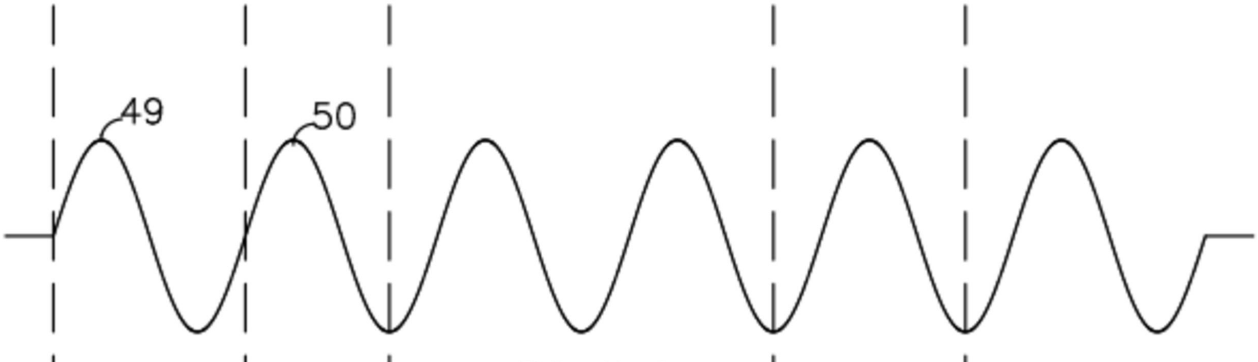

FIG. 5-1

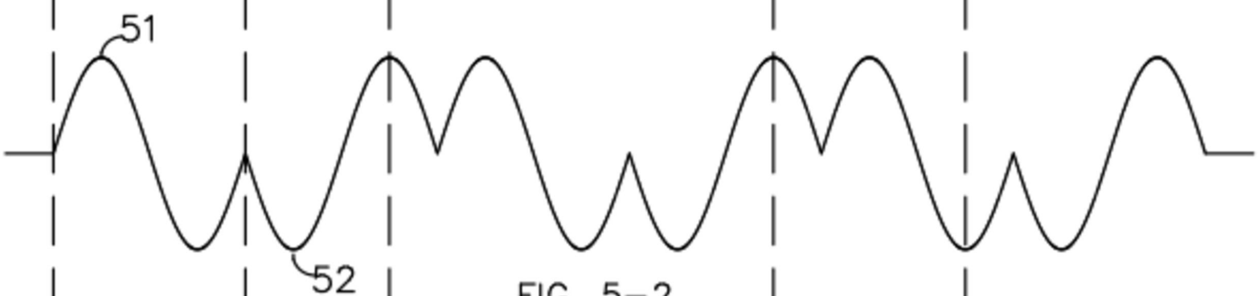

FIG. 5-2

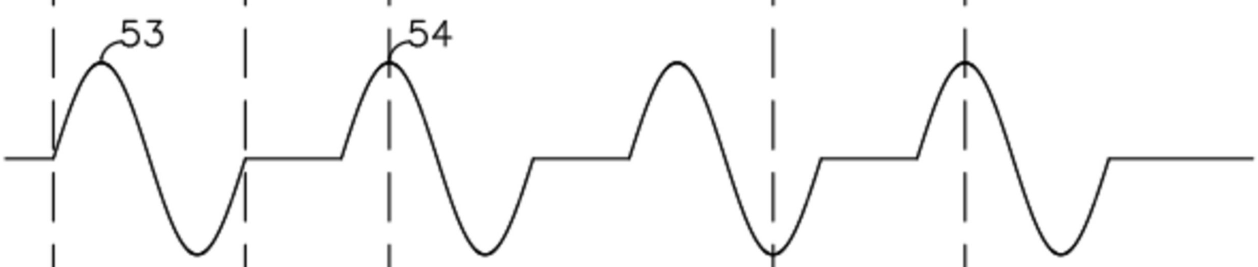

FIG. 5-3

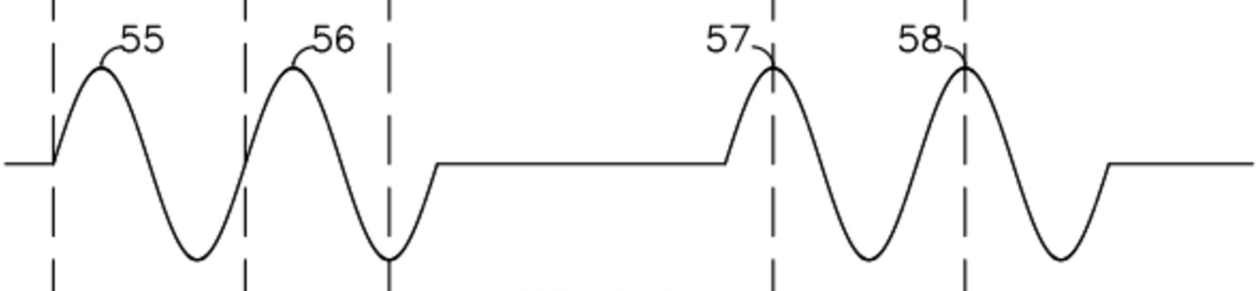

FIG. 5-4

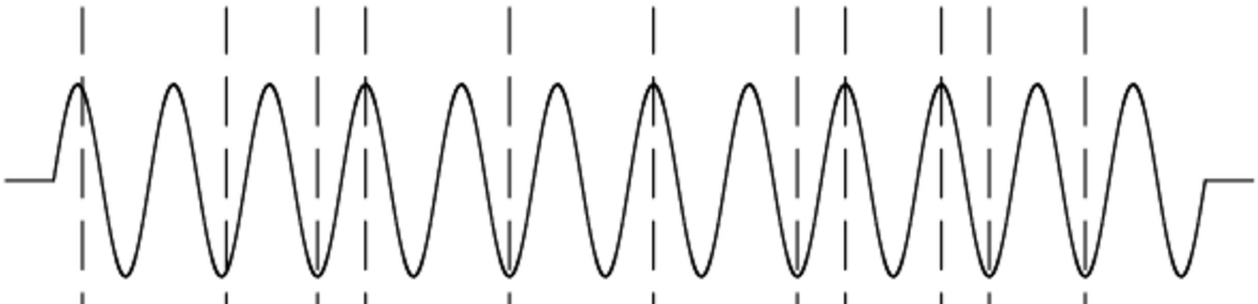

FIG. 6-1

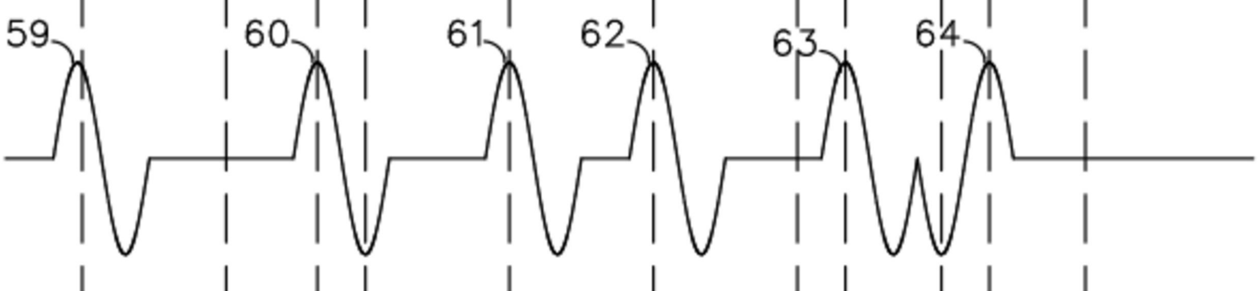

FIG. 6-2

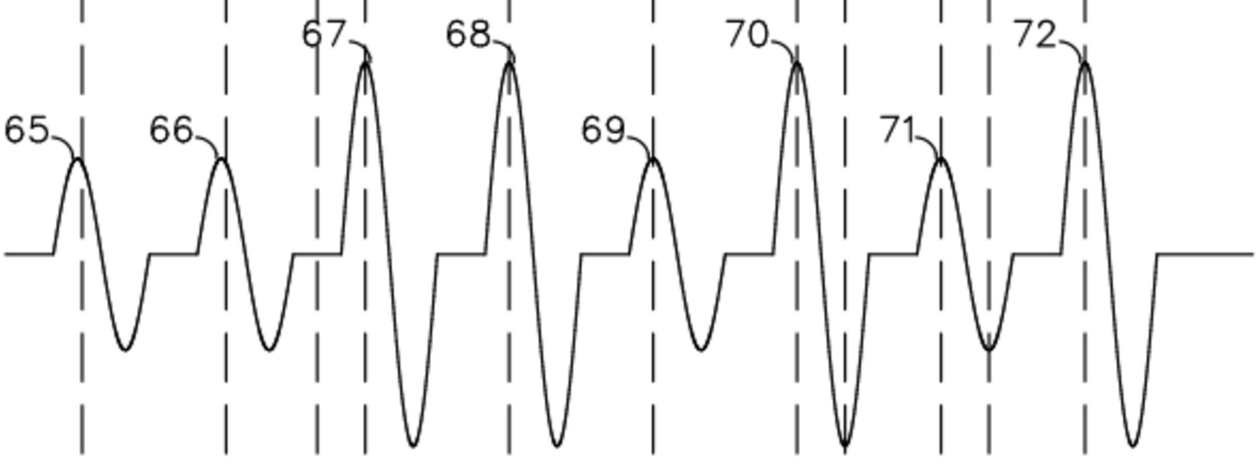

FIG. 6-3

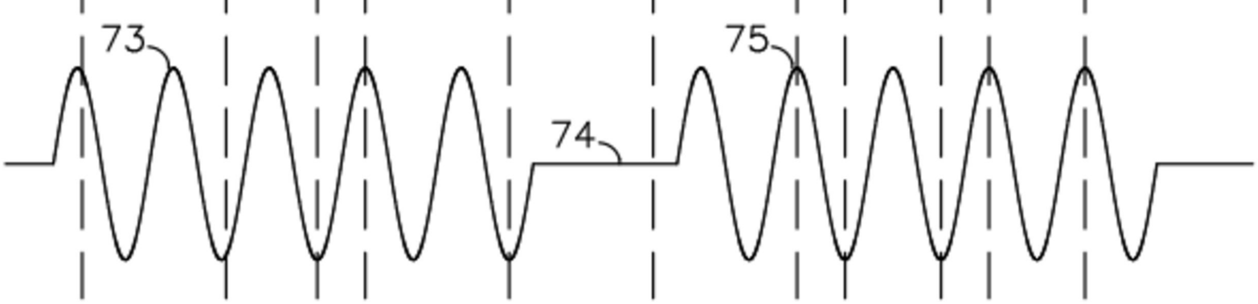

FIG. 6-4

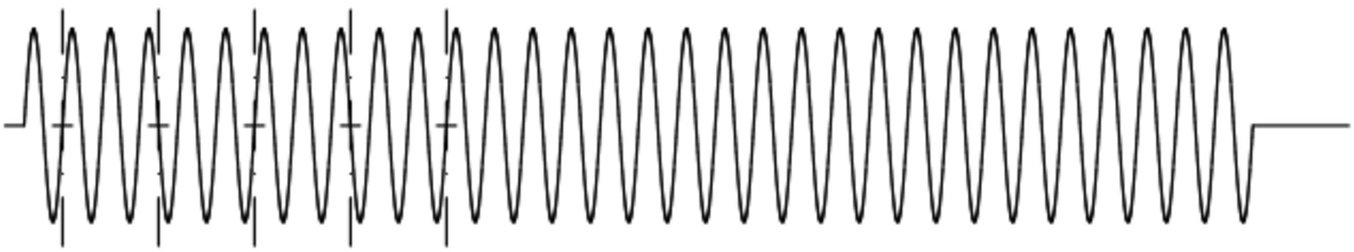

FIG. 7–1

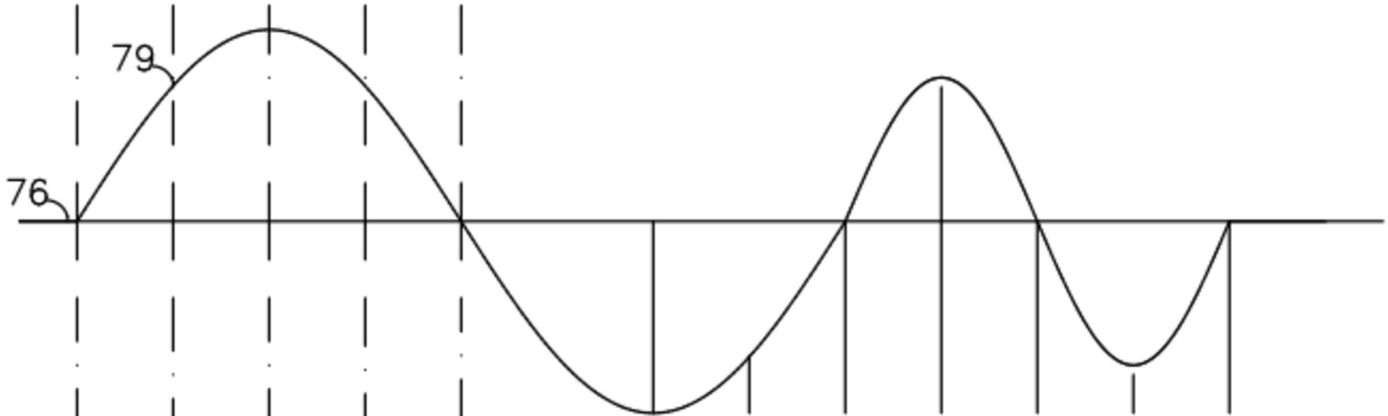

FIG. 7–2

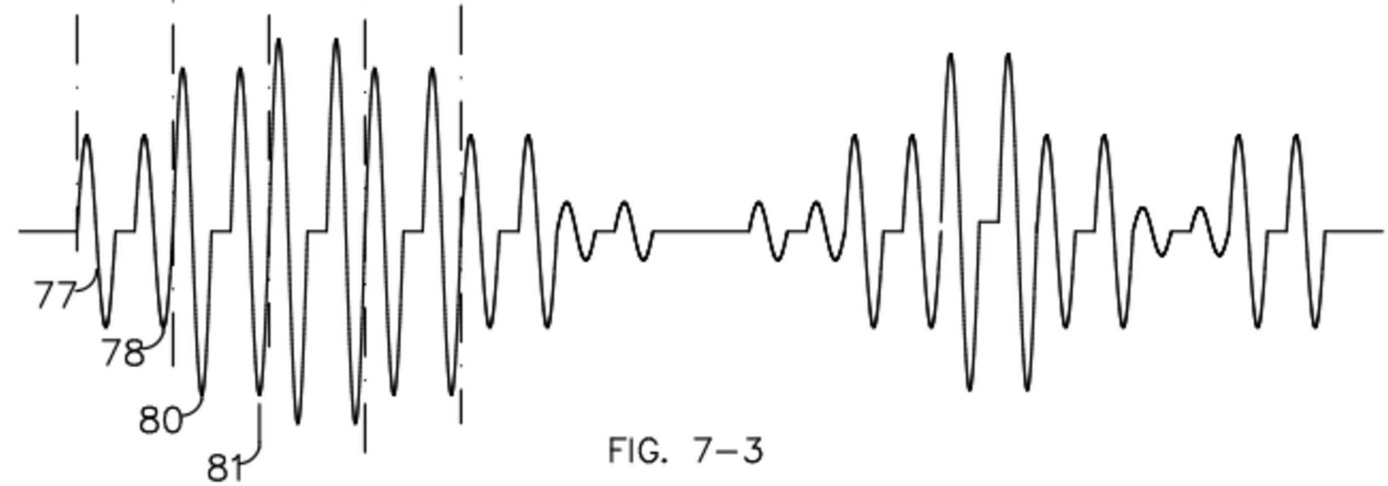

FIG. 7–3

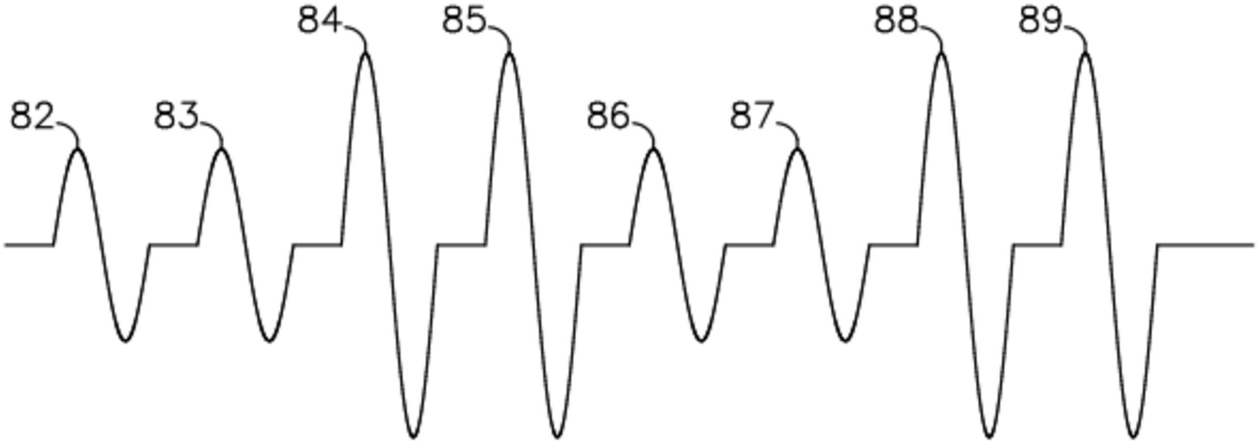

FIG. 8–1

FIG. 8–2

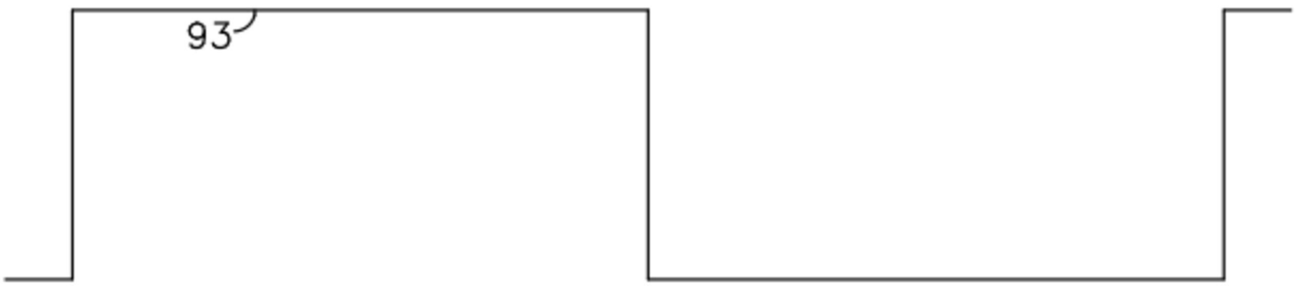

FIG. 9-1

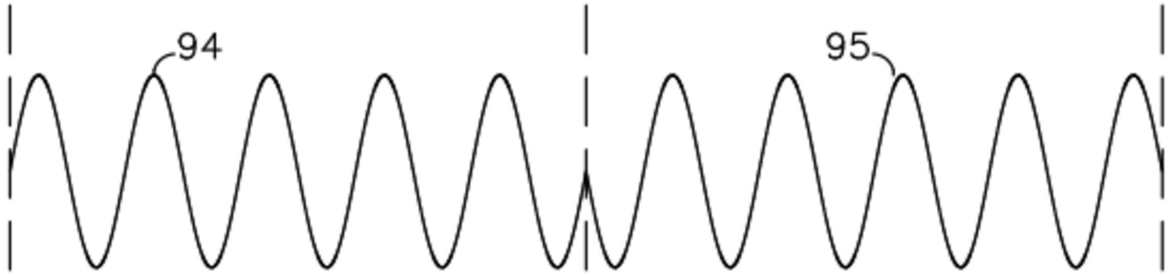

FIG. 9-2

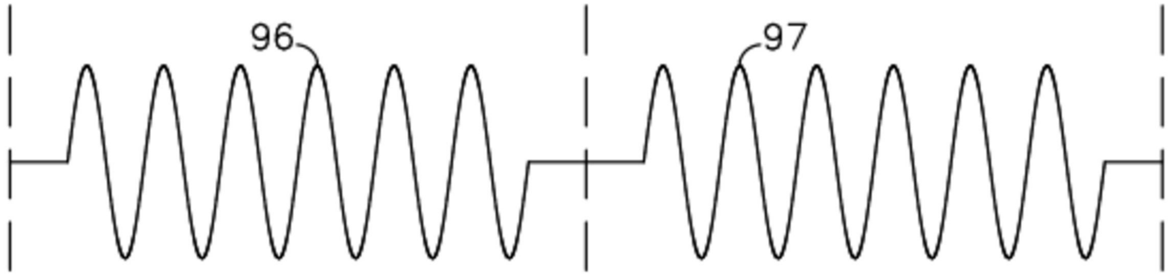

FIG. 9-3

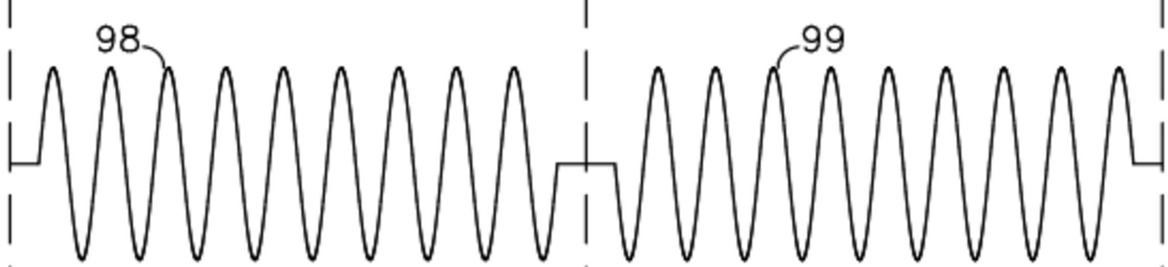

FIG. 9-4

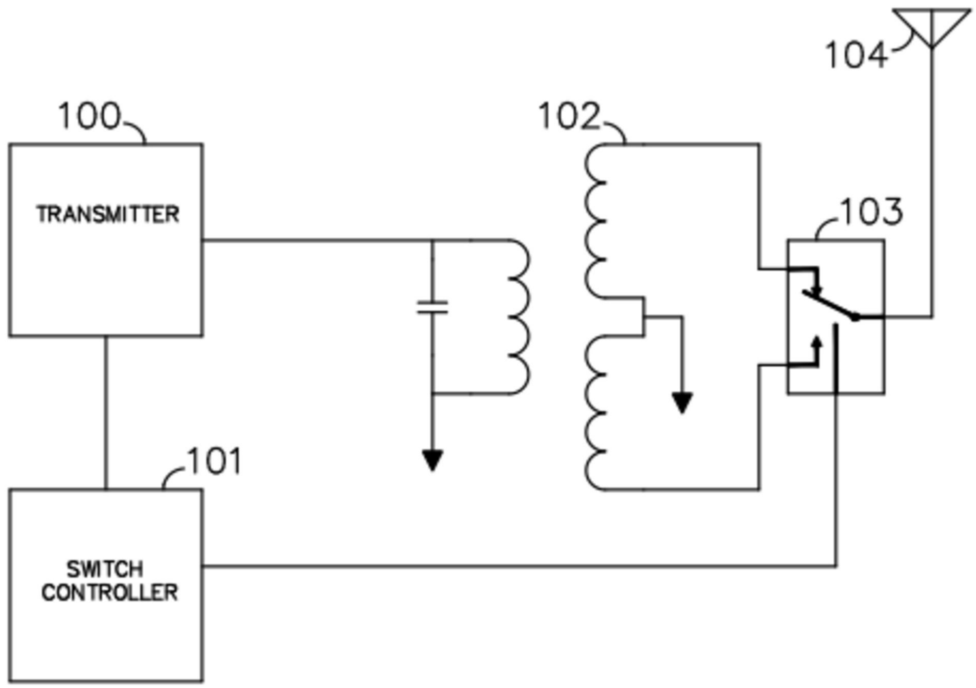

FIG. 10–1

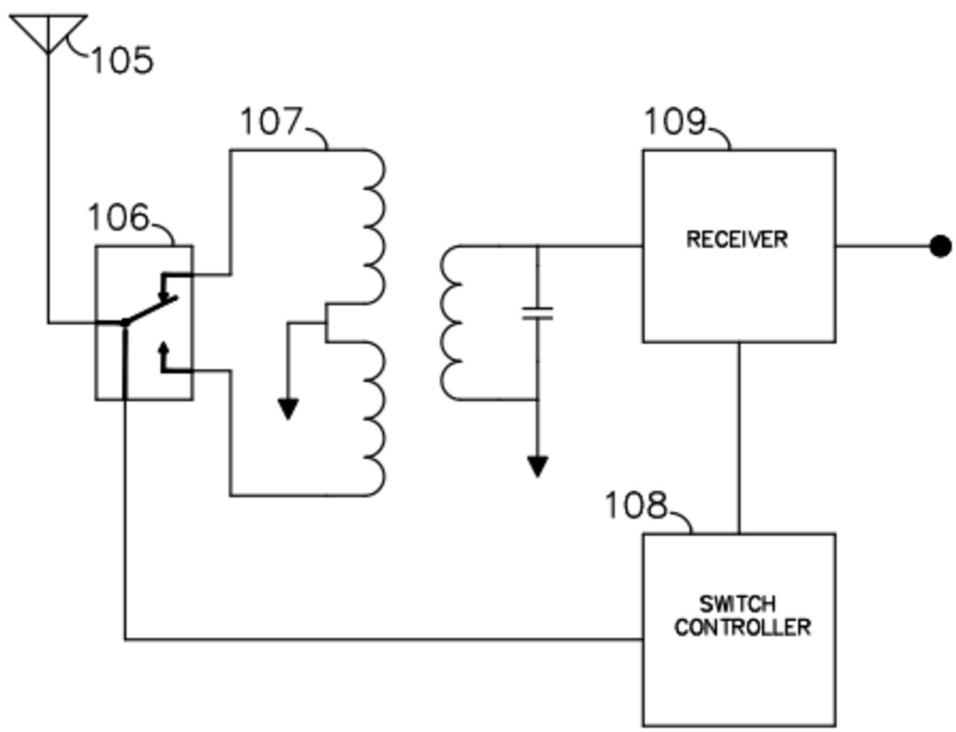

FIG. 10–2

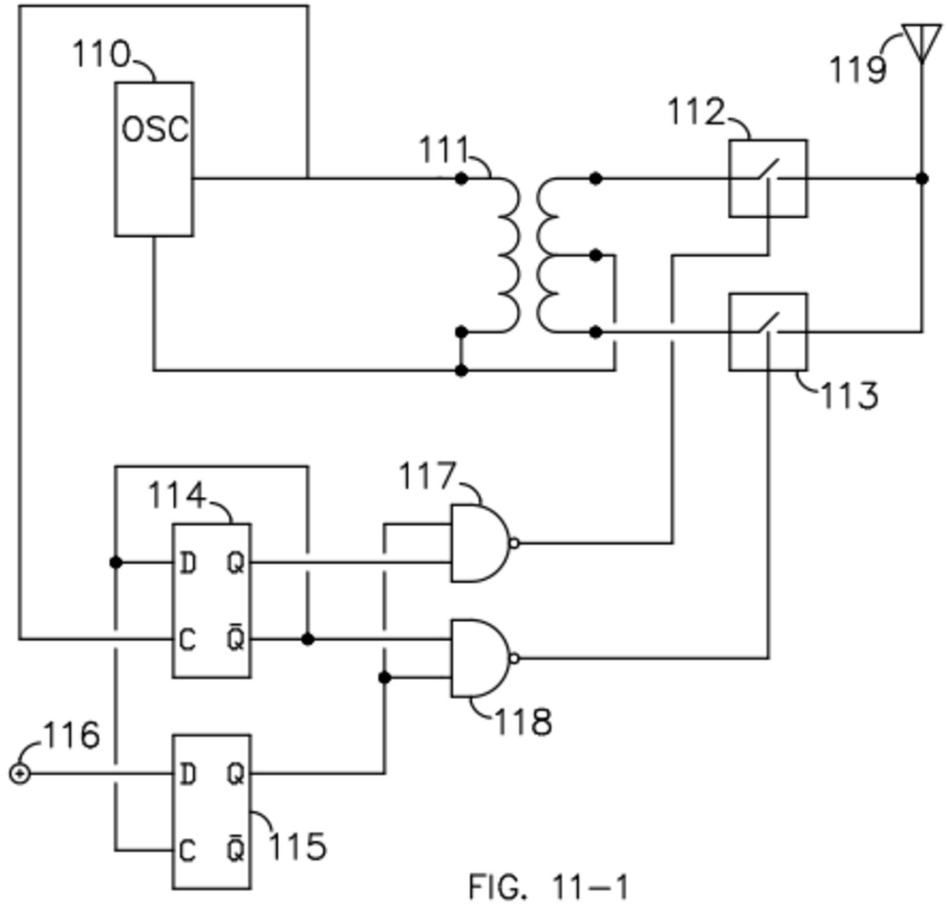

FIG. 11—1

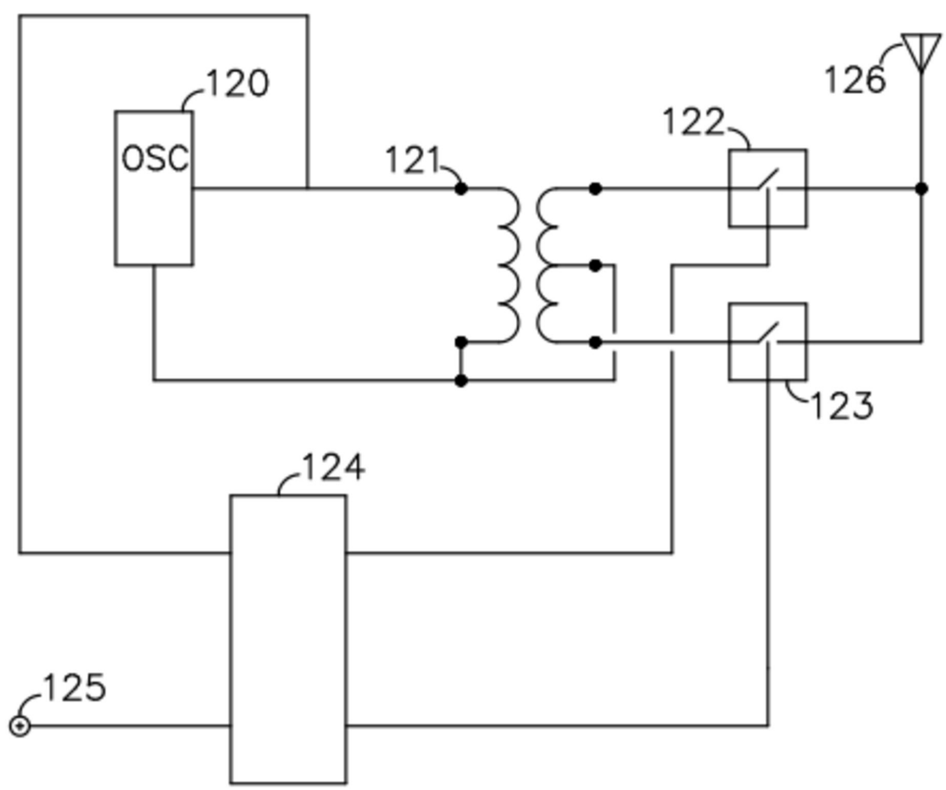

FIG. 11—2

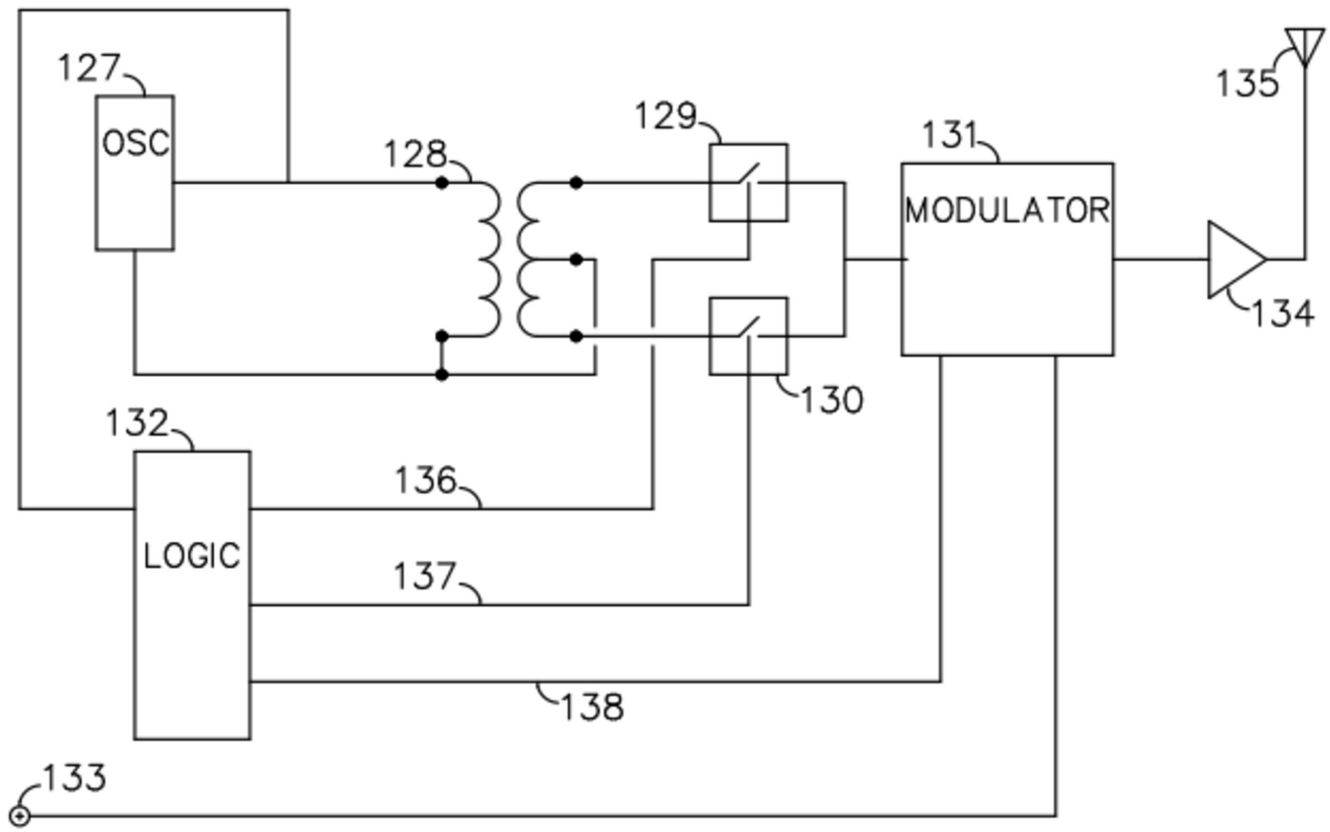

FIG. 12–1

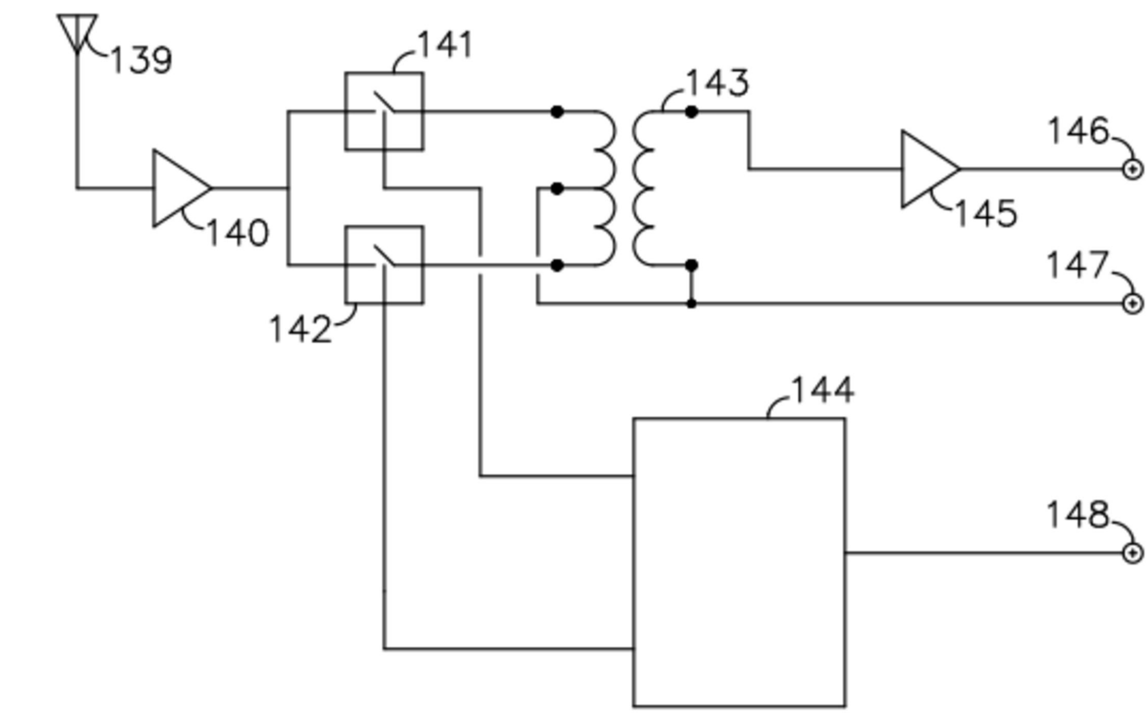

FIG. 12–2