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[54] SEGMENT LOCATING INTRUSION ALARM SYSTEM

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[52] U.S. Cl. ....**340/258 B**, 250/221, 340/258 R
[51] Int. Cl. **G08b 13/00**
[58] Field of Search..............340/258 B, 276, 258 R; 343/5 PD, 7.5; 250/221; 325/2, 29

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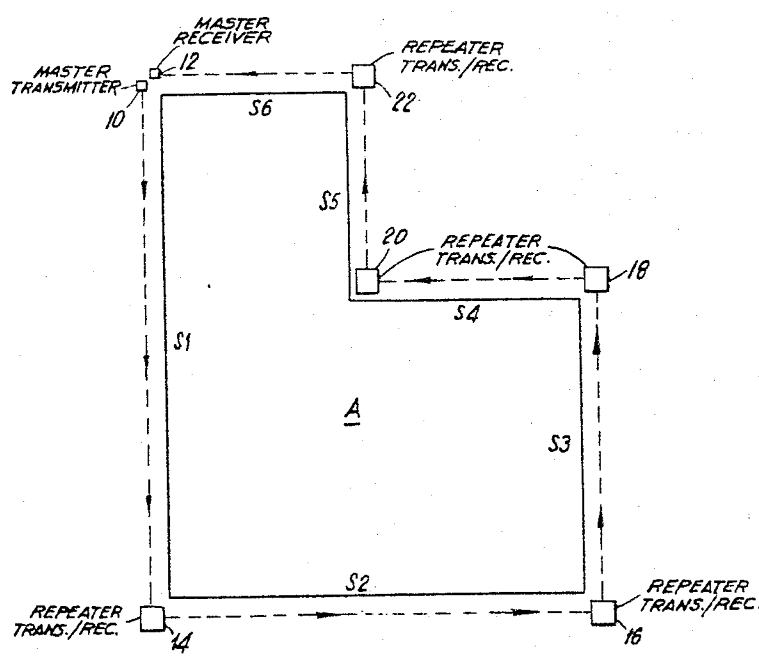
[57] ABSTRACT

An intrusion alarm protection system for use in an area enclosed by a multi-segmented perimeter. An intrusion into the area actuates an alarm and the segment in which the intrusion occurs is uniquely identified. In the embodiment of the invention herein disclosed, a beam is directed around the protected area by repeaters located at the termination of each perimeter segment. When any repeater does not receive an input pulse, due to the interruption in the beam to that repeater as a result of an intrusion, the latter produces a unique or characteristic signal. That signal is received to actuate the alarm, and decoded at a master receiver to provide the desired, unambiguous indication of the individual segment in which the intrusion occurred.

16 Claims, 5 Drawing Figures



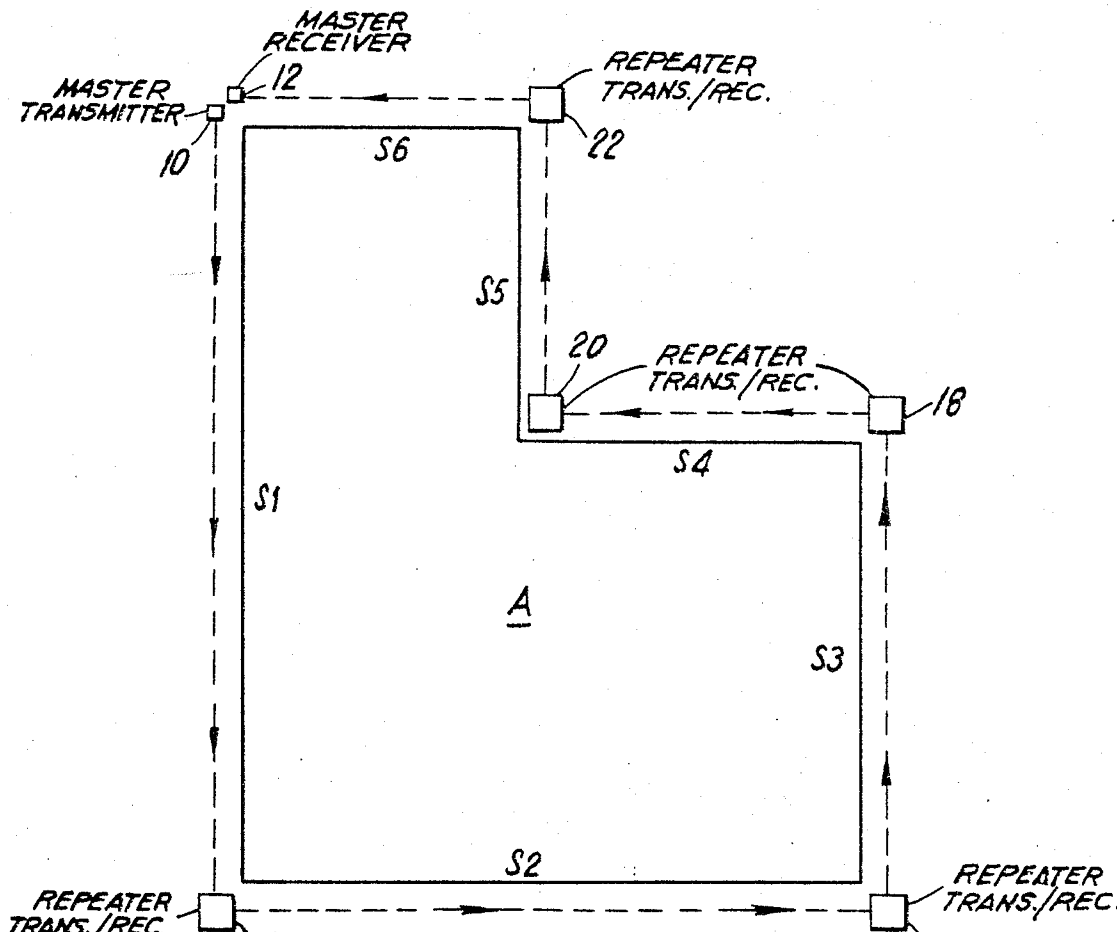


FIG. 1

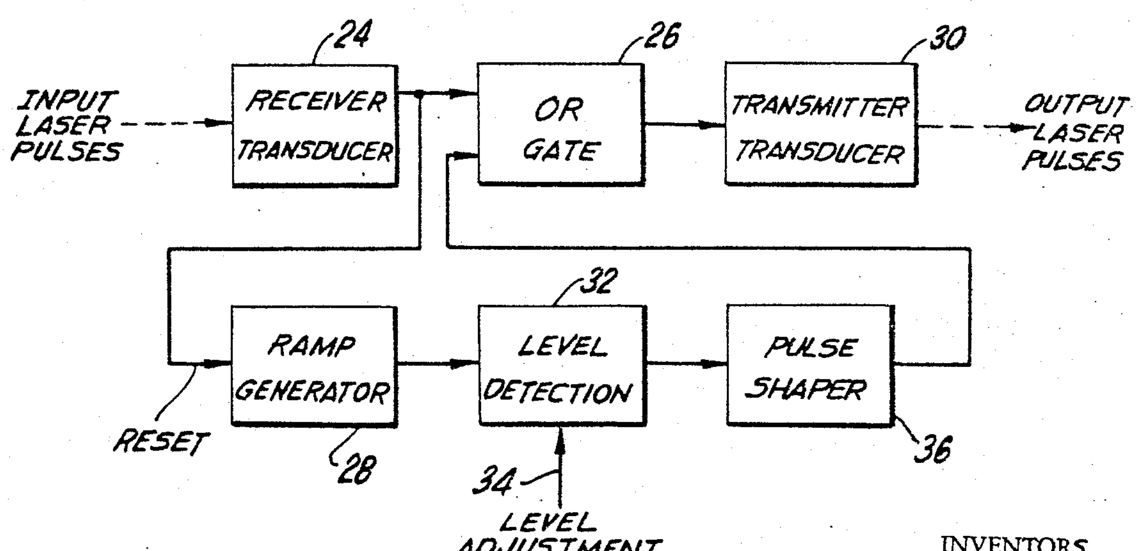


FIG. 2

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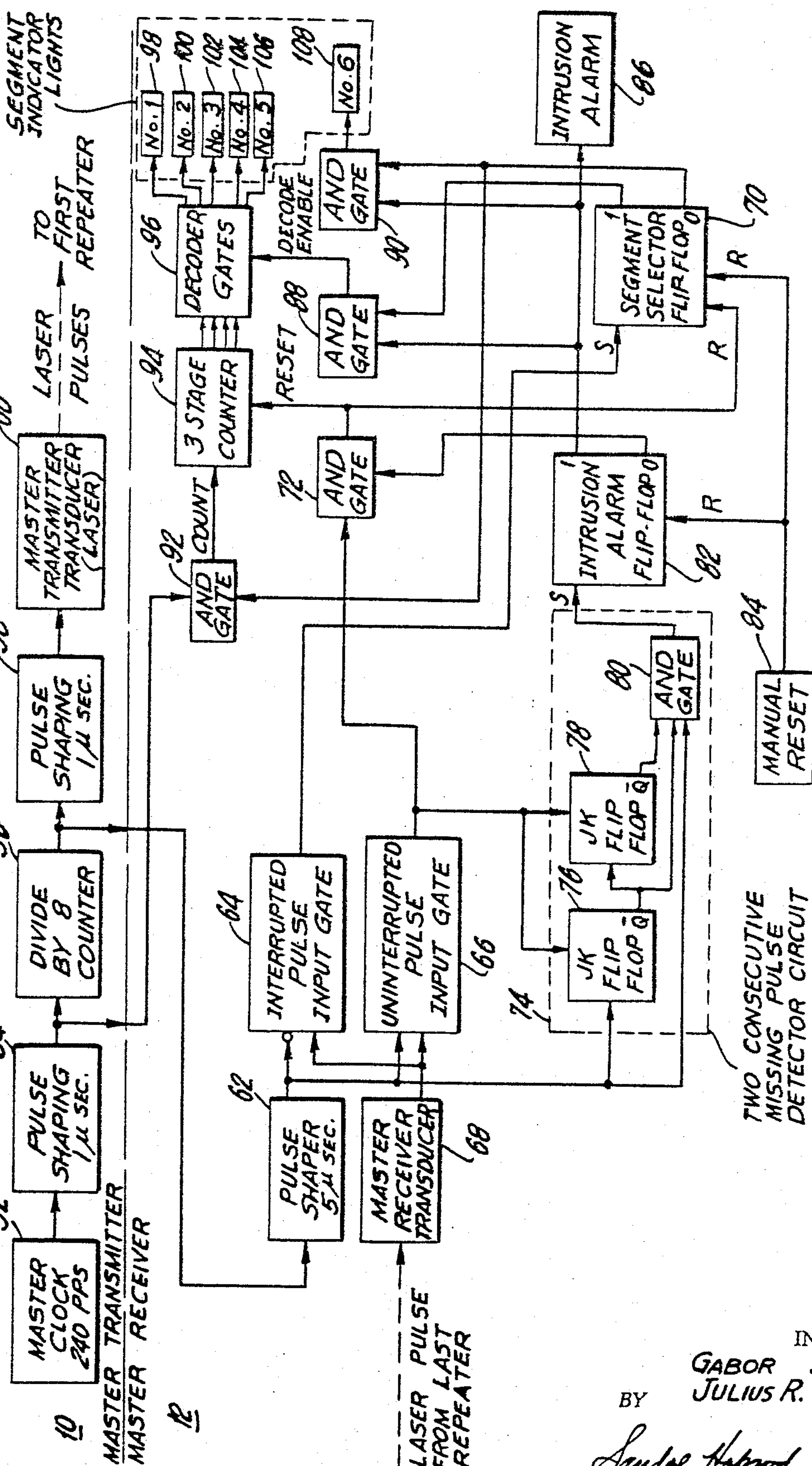

FIG. 3

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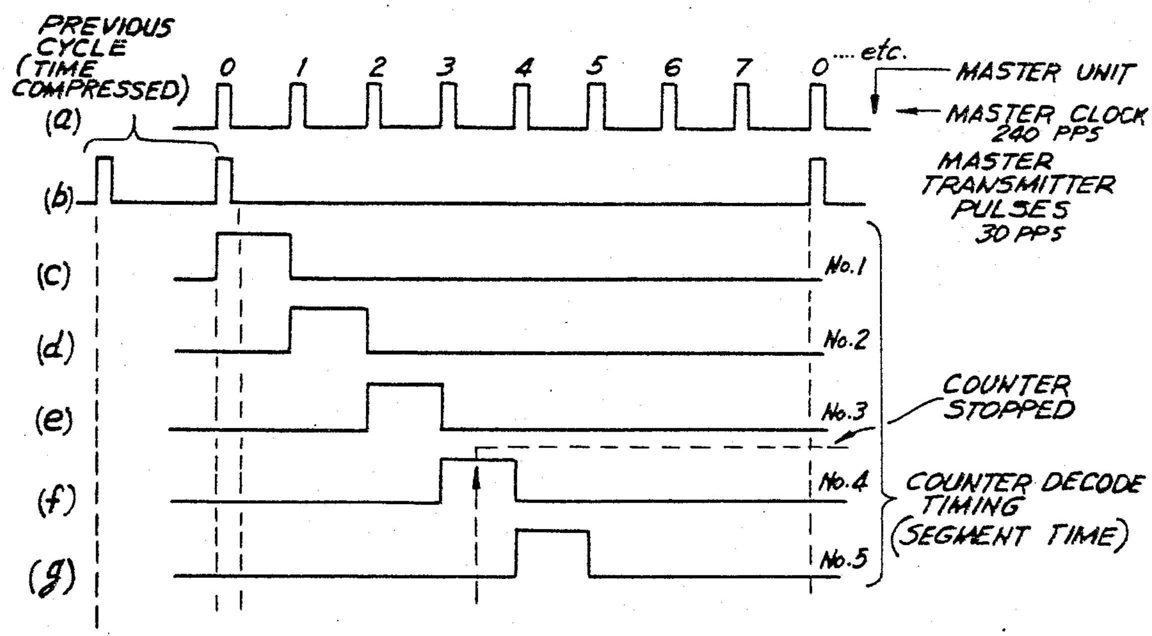

FIG. 4b

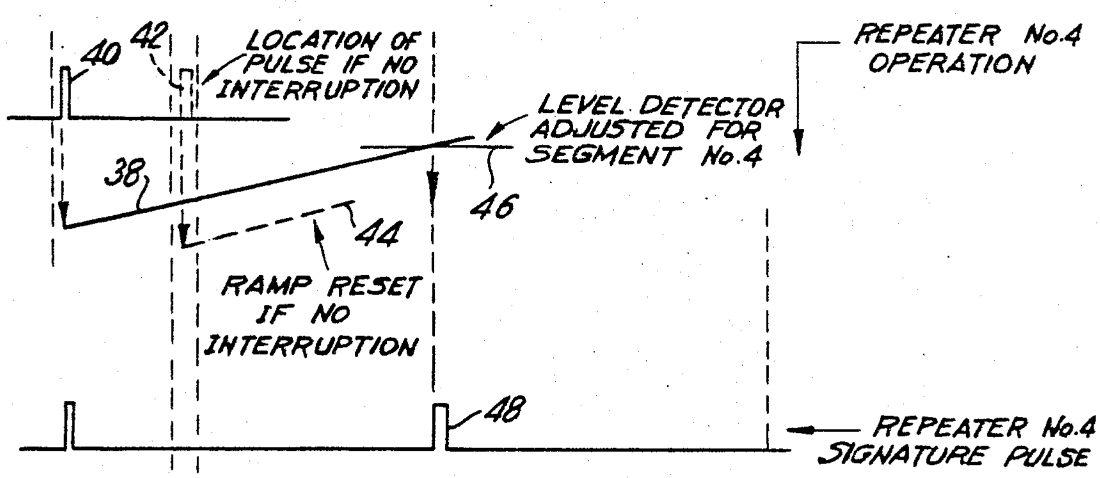

FIG. 4a

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SEGMENT LOCATING INTRUSION ALARM SYSTEM

The present invention relates generally to intrusion alarm systems, and more particularly to an intrusion alarm system for use in protecting an area having a multi-segmented perimeter.

The owner of property of a commercial as well as a residential nature has a natural desire to protect his home or factory from theft and vandalism. It is thus not uncommon for property owners to construct a protective fence surrounding their property to prevent the unwanted entry of intruders, such as would-be thieves or vandals, into the property and buildings located thereon. That fence may include, as is common, a physical entrance-preventing structure, or it may be simply in the form of a beam of light or infrared energy projected about the perimeter of the protected area. To greatly increase the amount of protection that such fences provide, many property owners have also installed alarm systems which are actuated whenever an undesired intruder gains access to the protected property, such as by breaking through or climbing over the protective fence, or by interrupting the protective light beam.

One major drawback in the conventionally employed intrusion alarm systems is that they are often insensitive to the location or direction of the intrusion. That is, the alarm, when actuated, is the same irrespective of the location at which the unwanted entrance into the protected property was made. This inability to detect, or to at least isolate, the location of the intrusion, significantly reduces the efficiency of the known intrusion alarms since it delays by a considerable time the location and thus the apprehension of the intruder. This is a particular problem in the protection of large areas such as industrial, military, and similar installations. A knowledge of the location of the initial intrusion into the property is also of use in tracking down the escaping intruder who in all likelihood would attempt to escape through the same segment through which the initial access into the property was made.

One type of intrusion alarm system that has been proposed consists of a transmitter which, in combination with suitably located repeaters or reflectors, causes a beam to travel about the various segments or paths of the perimeter of the protected facility. When an intrusion occurs anywhere in that perimeter, the beam is temporarily interrupted which in turn causes the alarm to be actuated. As noted above, in this conventional intrusion alarm system, it is, however, not possible to identify or locate the particular beam segment in which the beam interruption caused by the intrusion occurred.

It has been proposed to obtain intrusion location information of this nature by providing separate transmitter-receiver pairs at each perimeter segment, with separate cables being employed to couple the receiver at each segment to a central indicator station at which the intrusion alarm indication is given when an intrusion is sensed by any repeater. While a system of this type has the capability of providing the desired intrusion location information, its requirement of additional transmitters and cables makes this system impractical from an economic viewpoint and has accordingly greatly limited its acceptance even at facilities at which the location of the intrusion would be highly desirable.

It is thus an object of the invention to provide an improved intrusion alarm system in which the location of the intrusion can be accurately, unambiguously, and reliably determined.

It is a further object of the invention to provide an intrusion alarm and detection system requiring only a single transmitter, and which requires no costly independent cabling for each segment of the perimeter of the protected area.

It is another object of the invention to provide an intrusion alarm system which is insensitive to insignificant intrusions into the protected area, but which is highly sensitive to meaningful intrusions therein.

The intrusion alarm system of the invention comprises a master transmitter and a master receiver located at a selected location at the multiple-segment perimeter of the area under surveillance and protection. The signal from the transmitter is directed around each segment of the guarded perimeter by means of reflectors or repeaters located near the end of each perimeter segment. When an intrusion occurs, such as a result of an unwarranted entry into the protected area by a would-be vandal, the transmitted beam is temporarily interrupted and an alarm controlled by the master receiver is actuated to give a readily sensed indication of the intrusion.

In accordance with the invention, the segment in which the intrusion occurred can be positively and reliably identified. That is, the alarm indication given by the system of the invention not only indicates the occurrence of an unwarranted intrusion into the protected area, but also locates the perimeter segment in which that intrusion occurred.

The various repeaters of the system have the capability of producing a first signal upon the receipt of the beam from the transmitter, and a second, distinctive signal whenever it does not receive a signal from the transmitter, or from the immediately preceding repeater, such as when the beam is interrupted by an unwarranted intrusion. That is, when the beam is interrupted, the repeater located at the end of the segment in which the intrusion occurred, transmits only an interrupted signal which is unique for each repeater. The characteristic signal is received and redirected to the master receiver by subsequent repeaters located about the perimeter. The latter in turn recognizes the repeater characteristic signal as an indication of an intrusion, and decodes that signal to produce a signal unambiguously identifying the path segment in which the intrusion occurred.

As herein described the repeater comprises a ramp generator which is reset upon the receipt of a pulse signal from the master transmitter or the immediately preceding repeater. That uninterrupted pulse signal is also passed to the repeater transmitter which in response produces and transmits a pulse signal to the next repeater in the system or to the master receiver.

When no pulse signal is received by the repeater, its transmitter is not immediately actuated. Instead, the repeater ramp generator is not reset and the ramp voltage produced thereby is thus allowed to rise to a detection level at which time an interrupted pulse is generated. That pulse is thereafter applied to the repeater transmitter to energize the latter causing an interrupted pulse to be directed along the perimeter to the succeeding repeaters and master receiver as described above.

The detection voltages at each repeater are preset at different levels such that the time delays respectively introduced to the transmitted interrupted pulse with respect to the originally transmitted pulse for each repeater upon an interruption in the segment immediately preceding that repeater, are successively greater.

Thus, as long as the transmitter pulse is uninterrupted in its travel about the protected perimeter between the master transmitter and master receiver, the ramp generators in each of the repeaters are periodically reset, thereby preventing the ramp generators in each of the repeaters from reaching their respective detection levels. This, in turn, prevents the generation of a unique delayed pulse signal by any repeater. If, however, an intrusion occurs that interrupts the transmitted signal in any segment, the ramp generator of the repeater located at the end of that segment generates the delayed signal that uniquely identifies the interrupted segment to the decoding section of the master receiver.

To the accomplishment of the above and to such further objects as may hereinafter appear, the present invention relates to a segment locating intrusion alarm system substantially as defined in the appended claims, and as described in the following specification taken together with the accompanying drawings in which:

FIG. 1 is a schematic diagram of the intrusion alarm system of the invention as employed to protect a typical facility;

FIG. 2 is a schematic block diagram of a repeater that may be used in the system of FIG. 1;

FIG. 3 is a schematic block diagram of the master transmitter and receiver that may be used in the system of FIG. 1; and

FIGS. 4*a* and 4*b* are signal timing diagrams respectively illustrating the operation of the repeater and the master receiver of the intrusion alarm system of FIG. 1.

This invention is directed towards an improved intrusion alarm system for use in a multi-segment perimeter enclosed area in which an indication of the individual segment in which the intrusion occurs as well as the intrusion itself is positively located and identified.

The principles of operation of the system are illustrated in FIG. 1 which illustrates, for purposes of example, the application of the system in protecting an area enclosed by a six-segment perimeter, it being understood that the system of the invention may be used to equal advantage in the protection of enclosed areas having a greater or smaller number of perimeter segments.

Thus, as shown in FIG. 1, the enclosed area A has a surrounding perimeter consisting of six interconnected path segments S1-S6. Located at the corner defined by the intersection of segments S1 and S6 is a master transmitter **10** and a master receiver **12**, both of which are described in greater detail below with reference to FIG. 3. Located at each other corner of area A are repeaters **14**, **16**, **18**, **20**, and **22** located respectively at the ends of segments S1–S5, each of which includes a receiver and a transmitter as described in greater detail below with reference to FIG. 2.

Transmitter **10** directs a beam of energy, such as a laser beam, along segment S1 toward repeater **14**. Assuming that no intrusion occurs in any of the segments of the enclosing perimeter, that beam is received and redirected in sequence by repeaters **14–22** and eventually to master receiver **12**. As described below, when the transmitted beam is uninterrupted along its travel about the enclosing perimeter, receiver **12** produces no alarm indication.

However, when an interruption or discontinuity occurs in the beam along any path segment, such as a result of an unwarranted intrusion into the area through that segment, the repeater located at the end of the segment at which the intrusion occurs does not receive a signal from the master transmitter or from the immediately preceding repeater. The repeater located at the end of the affected segment will in turn initiate a separate beam which is then directed by the succeeding repeaters along the perimeter to the master receiver. In the intrusion alarm system of the invention, each repeater upon the failure to receive an input signal initiates a signature signal that is unique to it. That signature signal is received by the immediately succeeding repeater and redirected to the master receiver which contains decoding circuitry for decoding the received repeater signature signal, to thereby operate an intrusion alarm and actuate a segment intrusion indicator uniquely associated with the signature signal from the repeater affected by the intrusion, and thus with the path segment in which the intrusion occurred.

As illustrated in FIG. 2, each repeater includes a receiver transducer **24** which normally, to wit, when there is no beam interruption, receives a beam signal from either master transmitter **10** or from the immediately preceding repeater. The output of transducer **24** is coupled to one input of an OR gate **26** as well as to the reset terminal of a ramp generator **28**. The output of gate **26** is coupled to a transmitter transducer **30**, which advantageously includes a low-cost gallium-arsenide laser, which upon receipt of a pulse from gate **26** transmits a pulse of laser energy.

The output of ramp generator **28** is coupled to a level detection circuit or level comparator **32** at which the output of generator **30** is compared to d.c. voltage the amplitude of which is preset by a level adjustment indicated at **34**. When the level of the ramp signal produced by generator **28** equals that d.c. voltage level detection circuit **32** produces an output pulse which is coupled to a pulse shaper **36**, the output of which is in turn coupled to the other input of OR gate **26**.

In operation, when a signal is received by transducer **24**, it supplies a pulse through gate **26** to laser transducer **30**, the latter in turn producing a laser pulse at a minimum delay with respect to the received input signal. This is the normal function of the repeater, which occurs periodically each time the repeater receives an uninterrupted pulse at its input transducer.

The repeater shown in FIG. 2, and as employed in the intrusion alarm system of FIG. 1, has the additional capability of producing an output, signature pulse when no input signal is received at the input transducer of the the repeater. To this end, ramp generator **28** is normally reset by the reset pulse obtained from transducer **24** when the latter receives an uninterrupted input pulse so that the maximum level of the ramp signal is in this condition less than that of the detection level. However, when no input signal is received by the repeater input transducer, no reset signal is supplied therefrom to ramp generator **28** so that the ramp voltage produced by generator **28** continues to rise until it reaches the level of the detection voltage. At this time, detection circuit **32** produces an output pulse signal which is shaped in shaper **36**, and passed through gate **26** to laser transducer **30**, to cause the latter to transmit the signature pulse uniquely associated with that repeater.

In the system of FIG. **1**, the level detection voltages applied to the level detection circuits **32** is increasing higher for each repeater further along the perimeter from master transmitter **10**. That is, for example, the level detection voltage at repeater **16** is higher than that for repeater **14** but lower than that for repeater **18**. As a result, the signature pulse produced upon the failure of a repeater to receive an input pulse due to an intrusion in the immediately preceding segment, is increasingly displaced in time from the missing transmitted pulse for each repeater progressively further removed from the master transmitter. As a result, each repeater when it does not receive an input pulse, produces a unique signature pulse which, as noted above, is received and decoded at the master receiver to provide the desired segment intrusion identification.

The operation of the repeaters of the system of FIG. **1** is illustrated in FIG. 4*a* which illustrates the relevant signals produced in the operation of repeater **20** located at the end of segment S4, it being understood that each repeater in the intrusion alarm system of FIG. **1** operates in substantially the same manner.

As shown in FIG. 4*a*, the ramp voltage is reset to zero by the last received master receiver pulse **40** and then begins to rise. If a subsequent master pulse (indicated in the broken-line pulse **42**) has been received, that is, if there were no intrusion in segment S4, the ramp voltage would have once again been reset and would have the waveform indicated by the broken-line ramp signal **44**.

Assuming, however, that an intrusion has occurred in segment S4, repeater **20** receives no master transmitter pulse so that its ramp generator is not reset and the ramp voltage **38** rises until it reaches a level equal to the level detection voltage **46** that was previously preset to a unique level for that particular repeater. A comparison of the ramp and detection voltages in detection circuit **32** produces a signal which when shaped in pulse shaper **36** produces the signature pulse **48** for that repeater.

That signature pulse as noted above is redirected to the master receiver **12** which, along with master transmitter **10**, is illustrated schematically in FIG. **3**. Master transmitter **10** includes a master clock generator **52** which is herein shown producing pulses at a 240 pps rate. Those pulses are shaped to 1 μsec pulses in a pulse shaper **54**, which supplies the shaped pulses to an 8:1 counter **56** which lowers the pulse rate to 30 pps. The output of counter **56** is coupled to an additional 1 μs pulse shaper **58**, which in turn provides a 1 μs pulse at a 30 pps rate to a laser transducer **60**. The latter in response transmits a laser pulse along segment S1 to the first repeater **14**.

The output of counter **56** is also applied to a 5 μs pulse shaper **62** in the master receiver **12**, the output of which is coupled to an inverting input of an interrupted pulse input gate **64** as well as to one input of an uninterrupted pulse input gate **66**. Receiver **12** receives a laser pulse from the last repeater in the repeater chain, that is repeater **22**, at a transducer **68**, except when there is an interruption of the laser signal as a result of an intrusion in the final segment S6.

In response to the received laser signal, transducer **68** produces an electrical pulse signal which is applied to the other inputs of gates **64** and **66**. The output of gate **64** is applied to the set terminal of a segment selector flip-flop **70**, and the output of gate **66** is applied to one input of an AND gate **72** and to one input of a two consecutive missing pulse detector circuit **74**. Circuit **74** includes a pair of cascaded J-K flip-flops **76** and **78** and an AND gate **80** having its inputs connected to the outputs of flip-flops **76** and **78** and pulse shaper **62** as shown.

The output of circuit **74** is coupled to the set input terminal of an intrusion alarm flip-flop **82**. The reset terminals of flip-flops **70** and **82** are coupled to a manual reset switch **84**. The "1" output terminal of flip-flop **82** is coupled to an intrusion alarm **86** and to one input of AND gates **88** and **90**. The "0" output terminal of flip-flop **82** is coupled to the other input of AND gate **72**. The "0" output terminal of flip-flop **82** is coupled to the other input of AND gate **72** and the output of gate **72** is in turn coupled to the reset terminal of flip-flop **70**. The "1" output of flip-flop **70** is coupled to the other input of AND gate **88** and its "0" output terminal is coupled to the other input of AND gate **90**.

The "0" output terminal of flip-flop **70** is also coupled to one input of AND gate **92** which receives at its other input the 240 pps shaped pulses from the master transmitter at the output of pulse shaper **54**. The output of gate **92** is applied to the count input of a three-stage counter **94**, the latter having a reset line coupled to the output of gate **72**. The outputs of counter **94** are applied to a series of counter decoder gates **96**, the outputs of which are respectively coupled to a plurality of segment indicator lights **98–106**, one such light being provided for each of the first five segments S1–S5 of the protected perimeter, although the three-stage counter decoder of the receiver of FIG. 3 has the capacity to selectively operate up to eight lamps if required for a nine-segment perimeter. In the system herein disclosed, for use in a six-segment perimeter, only five indicator lamps need be provided in association with the counter and decoder. The output of gate **90** is coupled to a last segment indicator light **108**.

In the explanation of the operation of the master receiver of FIG. 3, it is initially assumed that no intrusion has occurred in any segment of the protected perimeter so that there is no interruption of the laser beam produced by transmitter **10** and redirected around the perimeter by repeaters **14–22** to master receiver **12**. In this condition of the system, the returned laser pulse arrives at receiver **12** within 5 μs following the initial transmission of the pulse from the transmitter. During this 5 μs period, gate **66** is enabled and gate **64** is disabled by the 5 μs enabling signal produced by pulse shaper **62** and applied to respective inputs of these gates. At all other times, until the transmission of the following pulse from transmitter **10**, the condition of gates **64** and **66** is reversed, that is, gate **64** is enabled and gate **66** is disabled.

Thus, when a pulse is produced by transducer **68** in response to a received laser pulse within this 5 μs period, gate 66 produces an output signal. Since flip-flop 82 and 70 are initially reset by manual reset 84 to the "0" state, gates 72 and 92 are thus enabled at this time — the latter by the output of gate 66 — so that the 240 pps master clock signals are applied to counter 94 through gate 92. Counter 94 thus receives a reset pulse from gate 72 each time an uninterrupted pulse signal is received at transducer 68.

Gates 88 and 90 are, however, at this time in the disabled condition since flip-flops 70 and 82 are both still in the "0" state, so that decoder gates 96 remain disabled. Indicator lights 98–106 thus remain in an unactuated state irrespective of the state of counter 94. Moreover, since flip-flop 82 is in the "0" state at this time, alarm 86 also remains unactuated.

However, when the laser pulse is interrupted in any of segments S1–S5 (the situation in which the intrusion occurs in the last segment S6 is described in a later part of the application), the pulse received by transducer 68 is delayed from the master transmitter pulse signal by an amount greater than 5 μs and by a delay that is characteristic of the repeater located at the end of the segment in which the intrusion took place for reasons set forth above. Under this condition gate 64 becomes enabled (gate 66 is now disabled) and provides a set signal to flip-flop 70 causing the latter to shift to the "1" condition. Detector circuit 74, upon not receiving two consecutive pulses from disabled gate 66, produces a signal at the output of gate 80 which in turn sets flip-flop 82 to the "1" condition, and thereby actuates alarm 86 to indicate that an intrusion into the protected area has occurred.

As a result of the shift in the states of flip-flops 70 and 82 caused by the sensing of an interrupted pulse in any of segments S1–S5, gates 72 and 92 are disabled and previously disabled gate 88 becomes enabled and thus enables decoder gates 96. Counter 94 counts clock signals until AND gate 92 becomes disabled at which time the count in counter 94 is stopped. That count, which is directly proportional to the relative time position of the interrupted input laser pulse received at transducer 68, is decoded by decoder gates 96 to produce an actuating signal for one of the segment indicator lights 98–106 corresponding to the state of counter 94, such that the indication provided by one of lights 98–106 positively identifies the segment in which the intrusion indicated by alarm 86 occurred.

The operation of the master receiver when an intrusion occurs in the protected perimeter may be better understood by the waveform diagrams of FIG. 4*b* which assumes that an intrusion has occurred in segment S4. Lines (*a*) and (*b*) of FIG. 4*b* respectively illustrate the 240 pps master clock pulses and the 30 pps master transmitter pulses, and lines (*c*) – (*g*) of FIG. 4*b* respectively illustrate the signature pulses received at receiver 12 resulting from an intrusion in segments S1–S5. As seen in line (*f*) of FIG. 4*b*, the segment S4 signature pulse which inhibits the application of additional count pulses to counter 94 as described above, occurs after the counter has already received four clock pulses through gate 92. That four pulse count is decoded to produce a signal that actuates the No. 4 segment indicator light 104, as desired. It will be understood that this description applies equally for an intrusion in any of the other segments except for the last segment S6.

When an intrusion occurs in segment S6, transducer 68 receives no input pulses at all for at least two transmitter pulse periods. Under this condition gates 64 and 66 are both disabled. When flop-flop 76 of missing pulse detector circuit 74 receives two successive signals from pulse shaper 62, while receiving no pulses from gate 66, flip-flops 76 and 78 are both set to apply enabling signals to gate 80. As a result upon the next pulse from pulse shaper 62 at the input of gate 80, that gate produces an output signal which sets flip-flop 82 to the "1" state. This, in turn, actuates the intrusion alarm 86.

The setting of flip-flop 82 also has the effect of enabling AND gate 90 since flip-flop 70 remains in the "0" state, to thereby cause gate 90 to apply an actuating signal to the segment S6 indicator light 108. Thus, as with an intrusion through any one of segments S1–S5, an intrusion into the final perimeter segment S6 produces both an alarm signal along with a positive identification of the segment in which the intrusion occurred.

The intrusion alarm system of the invention thus provides indications of both the presence and location of an intrusion into a protected area in a positive, unambiguous, and highly reliable manner. Significantly, the elements of the system are relatively inexpensive and yet of great accuracy and reliabilility. The system requires only a simple master transmitter and requires no separate cabling between the several repeaters and the master receiver.

The intrusion alarm system also has the beneficial capability of not responding to a transient, insignificant intrusion such as a falling leaf or a bird flying through the laser beam which will ordinarily interrupt only a single laser pulse. This is a result of the requirement that detector circuit 74 sense the interruption of at least two consecutive transmitter pulses before the intrusion alarm is actuated and the decoder enabled. For a temporary beam interruption of one transmitted segment only selector flip-flop 70 is set and the clock pulses are inhibited by gate 90. However, on the succeeding received transmitter pulse gate 72 is enabled and counter 94 and flip-flop 70 are both reset.

The intrusion alarm system of the invention has been herein specifically described as employing lasers in both the master transmitter and repeaters. However, other types of lasers as well as other beam sources could be used to equal advantage in the system of the invention such as, but not limited to, incoherent optical beams, microwave beams, or acoustical beams. Moreover, while gallium-arsenide lasers are suggested herein for use in the system for their low-cost and their amenability to pulse coding, other types of lasers could also be used in the system, if desired.

In addition, while the system of the invention has been particularly illustrated for protecting a six-segment perimeter, the capacity of the system to protect areas having a greater number of perimeter segments can be readily expanded merely by adding stages to counter 56 in the master transmitter and in counter 94 in the receiver, and increasing the master clock rate and the number of decode gates 96. As the segment capacity of the system is increased in this manner, it may become necessary to increase the precision of the timing signals such as by employing crystal clocks and crystal control timers for the master and repeater units of the system. In addition, coding techniques, other than the one specifically described herein, could also be utilized to locate the segments in which an intrusion occurs.

Thus, while only a single embodiment of the invention has been specifically described herein, it will be understood that variations may be made therein all without departing from the spirit and scope of the invention.

We claim:

1. An alarm system for indicating and locating the occurrence of an intrusion into an area enclosed by a perimeter having a plurality of interconnected segments, said system comprising means for directing a beam of electromagnetic energy along one segment of said perimeter, receiving means located adjacent said beam directing beams, and a plurality of means for receiving and then redirecting said beam about said perimeter to a succeeding one of said redirecting means including means responsive to the interruption of said beam in an immediately preceding one of said segments for producing a characteristic signal that is different for each of said redirecting means and for directing said characteristic signal to the succeeding one of said redirecting means of said receiving means, said receiving means including location indication means responsive to said characteristic signal when received at said receiving means for producing an indication of the one of said segments in which the interruption of said beam occurred, said redirecting means including means for producing a substantially non-delayed signal in response to a received non-interrupted signal and a delayed signal when the beam in the immediately preceding one of said segments is interrupted, said delayed signal defining said characteristic signal, said delayed signal producing means comprising means for generating a ramp signal, and means for comparing the instantaneous level of said ramp signal and a reference signal and for producing a signal when the level of the former bears a predetermined relation to the latter.

2. The system of claim 1, in which said characteristic signal producing means at said redirecting means successively further removed from said transmitting means includes means for producing signals that are delayed with respect to said transmitted beam signal by increasing time intervals.

3. The system of claim 1, in which said redirecting means further comprises first transducer means for receiving an input beam signal and for producing an output signal in response thereto, an output transducer, and means for coupling one of said output signals and the signal produced by said comparing means to said output transducer.

4. The system of claim 3, in which said redirecting means further comprises means for coupling the output signal of said first transducer to said ramp signal generating means for resetting the latter.

5. The system of claim 4, in which said location indication means includes a plurality of indicators, one of said indicators being provided for each of said perimeter segments, said receiving means further including alarm means, and means responsive to the sensing of an interruption of said beam in any one of said segments for actuating said alarm means, said indication producing means comprising means for actuating one of said segment indicators corresponding to the one of said segments in which said beam is interrupted.

6. The system of claim 5, in which said beam interruption sensing means includes gating means, and means for periodically enabling said gating means for a predetermined first time period, and for disabling said gating means for a second predetermined time period following said first time period.

7. The system of claim 6, in which said receiving means further comprises second gating means, and means for enabling said second gating means when said first-mentioned gating means is disabled and for disabling said second gating means when said first gating means is enabled.

8. The system of claim 7, in which said receiving means further includes counting means, means effective when enabled to provide a series of counting signals to said counting means, means responsive to the sensing of an interrupted beam signal for disabling said counting signal providing means, and decoding means coupled to said counting means and said segment location means and effective when enabled to selectively actuate one of said segment indicators in accordance with the state of said counting means at the time of the disabling of said count signal providing means.

9. The system of claim 8, in which said receiving means further comprises means for enabling said decoding means in response to the sensing of an interrupted beam signal in any of said segments and the operation of said alarm actuating means.

10. The system of claim 9, in which said receiving means further comprises means coupled to said first gating means for sensing the absence of at least two consecutive undelayed signals at said receiving means from the one of said redirecting means immediately preceding said receiving means, and means coupled to said two consecutive signal sensing means for enabling said alarm actuating means in response to that sensing.

11. The system of claim 10, in which said plurality of segment indicator includes a last segment indicator, and further comprising means for enabling said last segment indicator in response to the actuation of said alarm means and the absence of a received interrupted pulse from said redirecting means.

12. An alarm system for indicating and locating an intrusion into an area enclosed by a perimeter having a plurality of interconnected segments, said system including means located adjacent one of said segments for transmitting a beam of electromagnetic energy along said one of said segments, receiving means located adjacent said transmitting means, beam redirecting means located at the ends of the others of said segments for receiving and redirecting said beam about said perimeter to said receiving means, each of said redirecting means including means for transmitting a first substantially undelayed output signal upon the receipt thereat of an uninterrupted beam signal, and for transmitting a characteristic signal different than said output signal when no beam signal is received thereat for a predetermined time interval following the receipt of the immediately preceding one of said beam signals, said receiving means including a plurality of segment indicators and means responsive to a received one of

said characteristic signals when said beam is interrupted in one of said segments for actuating one of said segment locators corresponding to the segment in which the transmitted beam is interrupted, said delayed signal producing means comprising means for generating a ramp signal, and means for comparing the instantaneous level of said ramp signal and a reference signal and for producing a signal when the level of the former is substantially equal to that of the latter.

13. The system of claim 12, in which said characteristic signal producing means at said redirecting means successively further removed from said transmitting means includes means for delaying said characteristic signals with respect to the time of the uninterrupted beam signal by increasing time intervals.

14. The system of claim 12, in which said redirecting means further comprises first transducer means for receiving an input signal and for producing an output signal in response thereto, an output transducer, and means for coupling one of said output signals and the signal produced by said comparing means to said output transducer.

15. The system of claim 14, in which said redirecting means further comprises means for coupling the output signal of said first transducer to said ramp signal generating means for the purpose of resetting the latter.

16. The system of claim 14, in which said transmitting means and said output transducer in each of said redirecting means includes a laser.

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