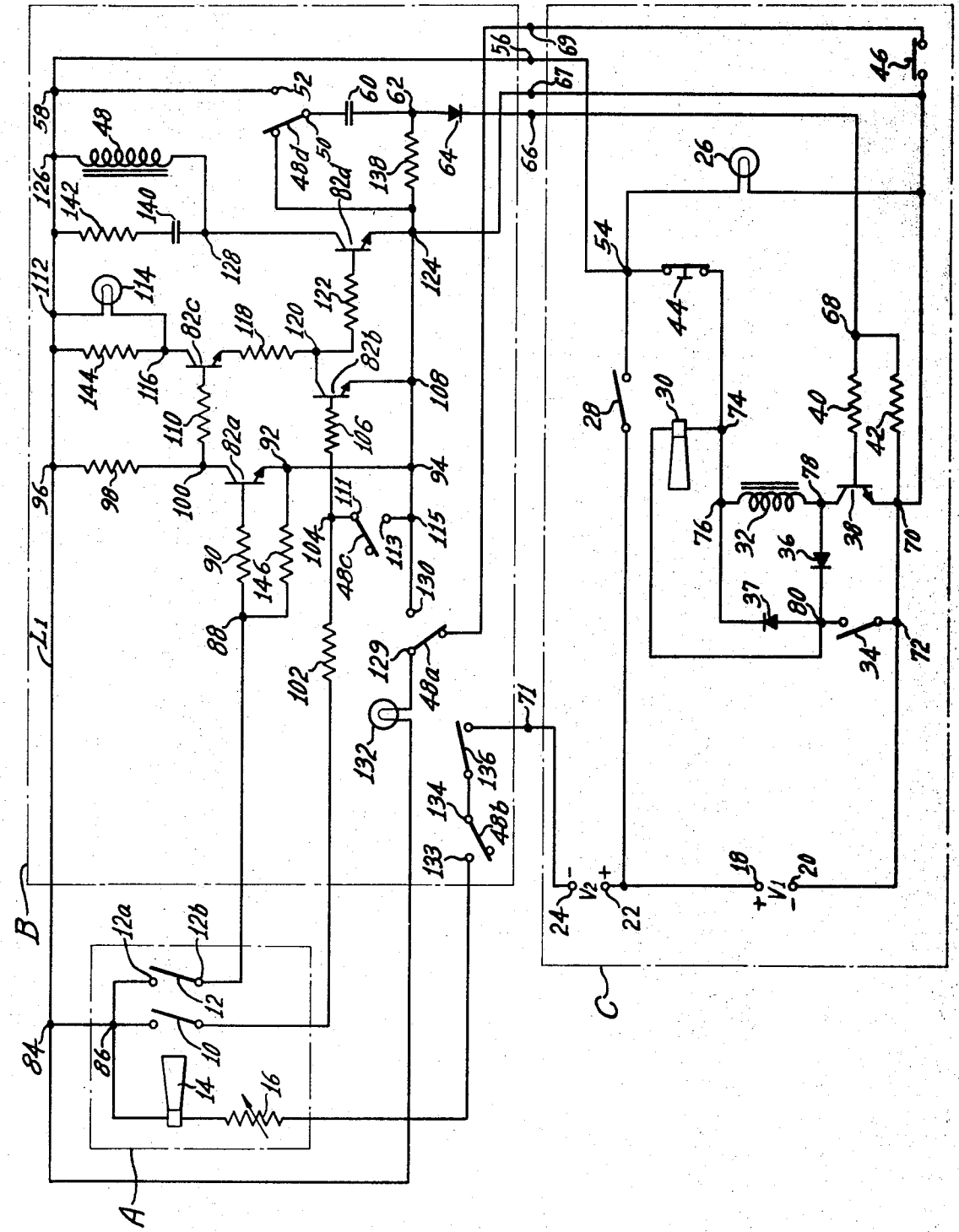
Oct. 27, 1970 E. M. TELLERMAN 3,537,105

ALARM SYSTEM

Filed July 25, 1967



INVENTOR.
Edward M. Tellerman
BY Edwin Levinson &
Henry R. Lerner
ATTORNEYS

United States Patent Office

3,537,105
Patented Oct. 27, 1970

3,537,105

ALARM SYSTEM

Edward M. Tellerman, East Rockaway, N.Y., assignor to Continental Instruments Corp., Lynbrook, N.Y., a corporation of New York

Filed July 25, 1967, Ser. No. 655,824
Int. Cl. G08b 7/06, 26/00
U.S. Cl. 340—409 9 Claims

ABSTRACT OF THE DISCLOSURE

An alarm system having one or more alarm units at remote locations for detecting violations such as unauthorized entries or exits. Each of the alarm units is wired into a central monitoring board which includes, for each remote alarm unit, means for providing visual indication of the condition of the unit at the remote location, namely, indication as to whether such alarm unit is armed and as to whether there is a violation thereat. The alarm system is also provided with means for producing an audible signal at the central monitoring board as well as at the remote alarm unit when a violation occurs.

BACKGROUND AND SUMMARY OF THE INVENTION

With the ever increasing frequency of unauthorized entries and exits, and burglaries, occurring in places such as apartment houses, hospitals, warehouses, and other establishments of a similar nature, a great need has arisen for alarm units to provide audible signals upon the occurrence of such unauthorized entries or exits for the dual purpose of frightening the trespassers and soliciting assistance from nearby the place of violation. Such alarm devices, while useful, have several limitations which have been overcome by wiring the several alarm devices into a central station so that a monitoring function can be performed on a continuous basis in order to enable a violation to be immediately perceived at the central station.

Existing alarm systems of the type referred to above have not been entirely satisfactory, either because the cost involved severely limits its applicability and/or because they are too complex in their circuitry creating too many possibilities for malfunction, and opportunities for successful tampering.

The present alarm system overcomes the disadvantages of existing systems because it is simple in circuitry, low in cost, and generally beyond serious vulnerability from malfunction or tampering.

The alarm system in accordance with the invention is highly flexible in operation. It provides, at the central monitoring board, visual indication of whether or not the remote alarm unit is armed, visual indication of a violation at any of the remote units, and audible indication of a violation at any of the remote locations. Further, it provides the conventional audible signal at the point of violation which can, however, be shut off from the central monitoring board. Additional safeguards are provided which prevent the alarm status from being terminated by removing the violation or by tampering with the remote alarm unit.

Finally, the circuitry of the present alarm system is of such nature and compactness that wiring the remote units into the central monioring board is a matter requiring no more than the plugging in of a self-contained module.

BRIEF DESCRIPTION OF THE DRAWING

The drawing represents a schematic circuit diagram of the alarm system in accordance with the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, there is shown at A the circuitry associated with the alarm device itself, such circuitry being located within the device at the zone where a violation is intended to be detected. The alarm device illustrated herein is an exit alarm, namely, an alarm of the type which detects the opening of a door. The alarm device is mounted in a conventional manner, adjacent to the door or on the door itself, and its circuitry includes a switch **10** which is closed when the door is closed and open when the door is open, a key switch **12** operable under the control of a key for placing switch **12** either in the set (armed) position, in which contacts **12***a* and **12***b* are open, or in the off (unarmed) position, in which contacts **12***a*, **12***b* are closed. Finally, the alarm device itself is equipped with a horn **14**, in series with variable resistor **16**, to provide an audible signal at the violated zone upon the occurrence of a violation, all as will hereinafter be more fully described.

All of the circuitry disclosed in the drawing, except only for that contained in alarm device A, is located at the central monitoring board (CMB). The part of the circuitry shown in the drawing within delineated area B is required for alarm device A and, therefore, identical circuitry (not shown here) is required for each additional alarm device connected into the CMB. The circuitry appearing within delineated area C is associated with the CMB requiring no duplication for the additional zones monitored at the board.

CIRCUITRY ASSOCIATED WITH THE CENTRAL MONITORING BOARD

The circuitry within area C is that specifically associated with the CMB and is common to all the remote alarm devices which are wired into it.

Two DC power supplies are provided, namely, a main DC supply V1 across terminals **18** and **20** and a supplemental DC supply V2 across terminals **22** and **24**, the positive terminals of both voltage supplies being common by virtue of the direct electrical connection between terminals **18** and **22**. Both power supplies V1 and V2 can be provided either from a direct DC source, such as a battery, or from a source of AC applied to a transformer whose secondary is connected to a conventional full wave rectifier. A light **26** is in series with a toggle switch **28**, both across terminals **18** and **20**. Toggle switch **28** must be closed to operate circuitry C with light source **26** providing a visual signal indicating that the power supply is on. There is further provided at the CMB a horn **30**, a relay **32** which, when energized, is operative to close switch **34**, one-way diodes **36** and **37**, transistor amplifier **38**, resistors **40** and **42**, normally closed reset button **44** and test button **46**.

Before proceeding with the description of the operation of circuitry C, brief reference is made at this time to the signal received by circuitry C at the CMB upon occurrence of a violation at alarm device A. As will more fully be described hereinafter, a violation at the alarm device A is operative to energize relay **48** which controls switches **48***a*, **48***b*, **48***c* and **48***d*. Specifically, a violation

causes the placement of switch 48*d* into position for closing contacts 50 and 52, thus completing a circuit as follows: terminal 18, closed toggle switch 28, terminals 54, 56, 58, closed contacts 52 and 50, condensor 60, terminal 62, one-way diode 64, terminal 66, terminal 68, resistor 40, emitter of transistor 38, terminal 70, terminal 72, and back to negative terminal 20. Such completed circuit provides for DC current flow therethrough until condensor 60 is charged, creating a pulse which is sufficient to trigger transistor 38 and render the latter conducting. With transistor 38 conducting, a circuit is now completed from terminal 18, through closed toggle switch 28, reset button 44, terminal 74, terminal 76, relay 32, terminal 78, transistor 38 (now conducting), terminal 70, terminal 72 and back to negative terminal 20, energizing relay 32 and thereby causing the closing of switch 34. Such closing of switch 34 now results in the completion of a circuit path from positive terminal 18, through toggle switch 28, reset button 44, terminal 74, horn 30, terminal 80, switch 34, terminal 72 and back to negative terminal 20. The completion of said circuitry energizes horn 30 which provides an audible signal at the CMB. The closing of switch 34, in addition to providing a completed path for horn 30, also helps define a holding circuit for relay 32 from terminal 76 through relay 32, terminal 78, diode 36, terminal 80, switch 34, terminal 72 and back to negative terminal 20 whereby said relay 32 remains energized even after transistor 38 ceases to conduct due to the cessation of trigger current flow once condensor 60 is fully charged. Thus, the only way to shut off horn 30 and de-energize relay 32 is by pushing reset button 44 to interrupt all current flow therethrough. It is seen that the pulse resulting from a violation at the alarm causes instantaneous current flow sufficient to trigger transistor 38 to energize relay 32 and activate horn 30 at the CMB.

Diode 37 shorts out the back E.M.F. of the horn, and resistor 42 reduces the sensitivity of transistor 38 to prevent accidental triggering thereof.

CIRCUITRY ASSOCIATED WITH THE SPECIFIC ALARM DEVICE

Circuitry B is associated with the particular alarm A but is located at the CMB. Circuitry B includes relay 48, previously mentioned, which controls switches 48*a*, 48*b*, 48*c* and 48*d*. These switches are shown in the diagram in the unenergized condition of relay 48. It has already been demonstrcated that when relay 48 is energized, it places switch 48*d* in position to close contacts 50 and 52 for providing the pulse which produces, in turn, the audible signal at the CMB.

Transistor amplifiers 82*a*, 82*b*, 82*c* and 82*d* are each, similarly to transistor 38 in C, of the type which become conducting only after they have been triggered. Accordingly, it will be noted that transistors 82*a* cannot be triggered when key switch 12 is in the open position, which is the set or armed position of the key switch. On the other hand, when key switch 12 is in the unarmed position so as to close contacts 12*a*, 12*b* thereof, triggering current can flow therethrough from line L1 (electrically connected to positive terminal 18) through terminal 84, terminal 86, closed switch 12, terminal 88, resistor 90, emitter of transistor 82*a*, terminal 92, and terminal 94, which is electrically connected to negative terminal 20 of power supply V1. Such triggering of transistor 82*a* renders the latter conducting to provide current flow from L1, terminal 96, resistor 98, terminal 100, transistor 82*a*, terminal 92 and terminal 94. Thus it is seen that transistor 82*a* is conducting only when key switch 12 is closed (unarmed) and is not conducting when key switch 12 is open (armed).

Transistor 82*b* can be triggered only when switch 10 is closed. In this connection, it will be recalled that switch 10 reflects the condition of the door to be monitored. When switch 10 is closed, corresponding to the door being closed, there is current flowing from line L1, terminals 84, 86, closed switch 10, resistor 102, terminal 104, resistor 106, emitter circuit of transistor 82*b*, and terminal 108 which is electrically linked to negative terminal 20 of the power supply. Such current, which renders transistor 82*b* conducting, will flow provided that switch 48*c* is in the position shown in the drawing corresponding to the unenergized condition of relay 48. In the event, however, that relay 48 is energized (upon a violation), switch 48*c* will close contacts 111, 113, effectively shorting out the triggering circuit of transistor 82*b*. More specifically, any current flow through closed switch 10 will, when reaching terminal 104, flow down to terminal 115 preventing any current flow through the triggering circuit of transistor 82*b*. Thus, transistor 82*b* is conducting solely when switch 10 is closed and relay 48 is unenergized.

Transistor 82*c*, as is the case with the other transistors, conducts only when it has been triggered. There can be no triggering current for transistor 82*c*, it will be noted, if transistor 82*a* is conducting as such transistor 82*a* will shunt the triggering circuit of transistor 82*c*. More specifically, when transistor 82*a* conducts, all current flow from line L1 through terminal 96, resistor 98 and terminal 100 will flow through transistor 82*a*, preventing any current flow through resistor 110 and the triggering circuit for transistor 82*c*. Accordingly, transistor 82*c* can be triggered only when transistor 82*a* is non-conducting which occurs only when key switch 12 is in the set or armed condition. Thus, when transistor 82*a* is non-conducting, rendering transistor 82*c* conducting, there is current flow from line L1, terminal 112, lamp 114, terminal 116, transistor 82*c*, resistor 118, terminal 120, transistor 82*b* (if it is conducting), terminal 108 and back to negative terminal 20 of the power supply. Such completed circuit which takes place only when transistor 82*a* is not conducting and transistor 82*b* is conducting, results in the lighting of lamp 114. This condition corresponds to switch 10 being closed and key switch 12 being in the set position. Such condition is in effect an armed condition for the alarm, visually indicated by the energized lamp 114.

Transistor 82*d*, the fourth transistor, is triggered only when transistor 82*c* conducts provided, however, that transistor 82*b* is not conducing. This condition exists when the alarm system is in the previously described armed condition and switch 10 is opened. In such condition, there is current flow from line L1, terminal 112, lamp 114, terminal 116, transistor 82*c*, resistor 118, terminal 120, resistor 122, triggering circuit of transistor 82*d*, terminal 124, and back to negative terminal 20. Such completed circuit renders transistor 82*d* conducting so as to provide current flow from line L1, terminal 126, relay 48, terminal 128, transistor 82*d*, terminal 124 and back to negative terminal 20. Thus it is seen that the opening of switch 10 following the placing of the alarm in the armed condition, which constitutes a violation, is operative to energize relay 48, in turn actuating switches 48*a*, 48 *b*, 48*c* and 48*d* thereof. The actuation of switch 48*d* has previously been described and is operative to provide the pulse to energize horn 30 at the CMB. The actuation of switch 48*a*, closing contacts 129, 130 completes a circuit through lamp 132 to provide a visual indication of the alarm state. The actuation of switch 48*b* closes contacts 133, 134 and completes a circuit so as to provide DC supply V2 to horn 14 at the place of violation, provided of course that door horn toggle switch 136 has been previously closed. Finally, the actuation of switch 48*c* closes contacts 110, 112 to prevent any triggering current for transistor 82*b* from flowing. In this way, the reclosing of switch 10, corresponding to a reshutting of the door which has been violated, will not change the alarm status of the system.

It will be noted that when the system is in armed condition, transistor 82*b* is conducting permitting current flow through lamp 114, to give visual indication that the

alarm was armed. Upon the opening of switch **10**, creating the alarm condition, transistor **82***b* ceases to be conducting providing triggering current flow for transistor **82***d*. More specifically, at such moment there is current flow for transistor **82***d*. More specifically, at such moment there is current flow from line L1 through terminal **112**, lamp **114**, terminal **116**, transistor **82***c*, resistor **118**, terminal **120**, resistor **122**, emitter of transistor **82***d* and terminal **124**. Resistor **122**, however, is of sufficiently high magnitude to restrict the current flow so that lamp **114** is lit to a substantially imperceptible amount.

From the above it is clear that at the CMB there is provided, for alarm device A (as well as for each additional alarm device wired into the CMB), a lamp **114** and a lamp **132**. Lamp **114** is lit only when the associated alarm is armed, i.e., key switch **12** thereof has been set and the door has been closed, corresponding to the closing of switch **10**. Lamp **132** becomes lit only when there has been a violation at the associated remote alarm device. For convenient identification, all lamps **114** should be of one particular color, for example, green indicating the ready armed condition, and all lamps **132** might be red indicating the alarm condition. The CMB is equipped with common horn **30** which is activated in the event that a violation occurs at any one of the remote alarm devices wired into the CMB. Horn **30** will continue to sound, regardless of what else may take place in the system, until reset button **44** has been pushed. Such resetting will, however, merely discontinue the audio signal at the board following a violation but will not discontinue the visible signal obtainable from lamp **132**. The pushing of reset button **44** at the CMB is desirable so that in the event of an additional violation at another remote alarm device, the attendant at the board will receive a new audible signal from horn **30**. At the location of a remote alarm device, a violation produces an audible signal from horn **14**, provided of course that toggle switch **136** is closed. If for some reason it is desired to avoid any audible signal upon a violation at a particular remote alarm device, the associated toggle switch **136** is opened, whereby the only signals, audible and visual, are available at the CMB. A test button **46** is provided to test all the red lamps **132** associated, respectively, with all the alarm devices wired into the CMB.

It has already been noted that the alarm condition which is produced in response to a violation, resulting in the energization of relay **48**, persists even though switch **10** may be reclosed. The only way in which the alarm condition can be terminated is by turning the key switch to the off position, wherein contacts **12***a* and **12***b* are closed. Such placing of key switch **12** in the off position will render transistor **82***a* conducting which will in turn, immediately cause the discontinuance of conduction through transistors **82***c* and **82***d*. Once transistor **82***d* stops conducting, relay **48** will be unenergized removing the system from the alarm condition. The subsequent resetting of the key switch **12** and the closing of switch **10** places the remote alarm device again in the armed condition, ready to provide the visible and audible signals at the CMB upon the occurrence of a new violation.

It has previously been noted that the horn **14**, located at the remote station is energized through supplementary voltage supply **V2**. Such arrangement is desirable so that, in the event that there is an overload or a short in the remote horn power circuit, such will not interfere with the operation of the remainder circuitry powered from **V1** which provides the power for producing the requisite violation signals at the CMB. Thus, the tampering with the horn at the remote location does not defeat the basic intelligence provided at the central board in the event of a violation. Supply **V2** is of slightly higher voltage than **V1** to compensate for transmission line resistance and resistor **16** is adjustable to permit compensation for line over-voltages.

Resistor **138** is provided to permit condensor **60** to discharge when the system is removed from the alarm condition. Condensor **140** defines a momentary power source for relay **48** in the event of a momentary power loss arising out of a switchover in the power supply from rectified AC power to DC, in the event of power failure. Resistor **142** is for the purpose of limiting the current while condensor **140** is charging in order to prevent transistor **82***d* from being injured from the sudden surge of current. Resistor **118** is a limiting resistor to protect the transistors in the event of a momentary short in lamp **114**. Resistor **144** defines an alternate path for current flow through transistor **82***c* in the event that lamp **114** burns out. Lamp **114**, it will be recalled, provides a visual indication of the armed condition at the remote. In addition, however, lamp **114** provides a path of current necessary for permitting the circuitry to perform its other signalling functions. Resistor **146** reduces the sensitivity of transistor **82***a* so as not to be sensitive to voltages which may otherwise be induced.

It will be understood that while the system has been described in connection with a single remote alarm device A, additional remote alarm devices identical to the one described herein can be provided and connected into the circuitry at terminals **56**, **66**, **67**, **69** and **71**, with diode **64** preventing feedback from one alarm device into the pulsing circuit of another alarm device. It will be understood that circuitry B, located at the CMB but associated with a particular remote alarm device, can consist of a module (containing all the constituent components) which can be plugged into the CMB.

While I have herein shown and described the preferred embodiments of my invention, it will be understood that the invention may be embodied otherwise than as herein specifically illustrated or described, and that in the illustrated embodiment certain changes in the details of construction and in the form and arrangement of parts may be made without departing from the underlying idea or principles of this invention within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. An alarm system comprising:

(a) a central monitoring board,

(b) first circuitry means (C) associated with and located at said central monitoring board and including audible signalling means.

(c) an alarm device remote from said central monitoring board,

(d) second circuitry means (A) associated with and located at said remote alarm device and including a first switch actuated in response to the occurrence of an event to be detected and a second switch having an armed and off condition,

(e) third circuitry means (B) associated with said remote alarm device and located at said central monitoring board, said third circuitry means being electrically interposed between said first and second circuitry means and including a pair of signal lamps,

(f) a power supply for said system provided at said first circuitry means,

(g) the placing of said second switch of said second circuitry means in the armed condition thereof being operative to energize one of said signal lamps in said third circuitry means to provide a visual indication at said board of the armed condition at said remote alarm device,

(h) the actuation of said first switch of said second circuitry means in response to the occurrence of an event to be detected being operative, provided that said second switch is in said armed condition, to create an alarm condition within said alarm system,

(i) said third circuitry means including

(1) a first transistor amplifier (**82***a*) having its emitter in series with said second switch in said second circuitry means whereby said first tran-

sistor is rendered conducting only when said second switch is closed, corresponding to the off condition thereof,

(2) a second transistor amplifier (**82***b*) having its emitter in series with said first switch in said second circuitry means whereby said second transistor is rendered conducting only when said first switch is closed, corresponding to the unactuated condition thereof,

(3) a third transistor amplifier (**82***c*) having its emitter shunted by said first transistor whereby said third transistor is rendered conducting only when said first transistor is non-conducting, corresponding to the armed condition of said second switch,

(4) a fourth transistor amplifier (**82***d*) having its emitter in series with said third transistor and shunted by said second transistor whereby said fourth transistor is rendered conducting only when said third transistor is conducting and said second transistor is non-conducting corresponding, respectively, to the armed condition of said second switch and the actuated condition of said first switch, corresponding to said alarm condition.

2. An alarm system in accordance with claim **1**, wherein said third circuitry means includes a relay in series with said fourth transistor amplifier whereby the conduction of said fourth transistor amplifier, corresponding to the alarm condition, energizes said relay, said relay being operative when energized to close a first switch thereof (**48***d*) which completes a circuit path from said third circuitry means to said first circuitry means for passing through said circuit path a pulse of current.

3. An alarm system in accordance with claim **2**, wherein said first circuitry means includes a transistor amplifier having its emitter in series with said circuit path whereby the flow of said pulse of current triggers said transistor amplifier causing the energization of said audible signal means in said first circuitry means.

4. An alarm system in accordance with claim **3**, wherein said first circuitry means includes a relay energized when said transistor amplifier in said first circuitry means is trigged and a switch controlled by said relay, said switch defining means for maintaining said audible signal means energized after the interruption of triggering current flow upon termination of said pulse.

5. An alarm system in accordance with claim **1**, wherein said one of said signal lamps is in series with said third transistor whereby said one of said signal lamps is energized when said third transistor conducts, corresponding to the armed condition of said second switch.

6. An alarm system in accordance with claim **1**, wherein said third circuitry means includes a relay in series with said fourth transistor amplifier whereby the conduction of said fourth transistor amplifier, corresponding to the alarm condition, energizes said relay, said relay being operative when energized to close a second switch thereof (**48***a*) which completes a circuit path through the other signal lamp in said third circuitry means for providing a visual signal at said board of an alarm condition at said remote alarm device.

7. An alarm system in accordance with claim **1**, wherein said third circuitry means includes a relay in series with said fourth transistor amplifier whereby the conduction of said fourth transistor amplifier, corresponding to the alarm condition, energizes said relay, said relay being operative when energized to close a third switch thereof (**48***c*) which shunts the emitter of said second transistor to terminate conduction therethrough upon the occurrence of an alarm condition, whereby de-actuating said first switch in said second circuitry means following the creation of an alarm condition will not terminate said condition.

8. An alarm system in accordance with claim **1**, wherein said second circuitry means includes audible signal means energized upon the occurrence of said alarm condition.

9. An alarm system in accordance with claim **8**, wherein said third circuitry means includes a relay in series with said fourth transistor amplifier whereby the conduction of said fourth transistor amplifier, corresponding to the alarm condition, energizes said relay, said relay being operative when energized to close a fourth switch thereof (**48***b*) which completes a circuit path through said audible signal means in said second circuitry means.

References Cited

UNITED STATES PATENTS

2,994,073	7/1961	Pelovitz	340—213.1
3,099,825	7/1963	Harriman	340—213
3,452,345	6/1969	Kinsey	340—276 X

THOMAS B. HABECKER, Primary Examiner

C. M. MARMELSTEIN, Assistant Examiner

U.S. Cl. X.R.

340—213