

[54] ALARM SYSTEM

[76] Inventor: Milton Ronald Lederer, Jr., P.O.
Box 63, Lititz, Pa. 17543

[22] Filed: June 5, 1972

[21] Appl. No.: 259,655

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 122,614, March 1, 1971, abandoned.

[52] U.S. Cl. 340/147 MD, 307/10 AT, 317/134,
340/164 R, 340/274

[51] Int. Cl. G05b 1/00, H01h 47/00

[58] Field of Search 340/164 R, 147 R,
340/147 MD, 274; 317/134

[56] References Cited

UNITED STATES PATENTS

3,441,808	4/1969	Crane.....	340/164 R X
3,576,536	4/1971	Wolfe.....	340/164 R X
3,608,342	9/1971	Katz.....	340/147 R X

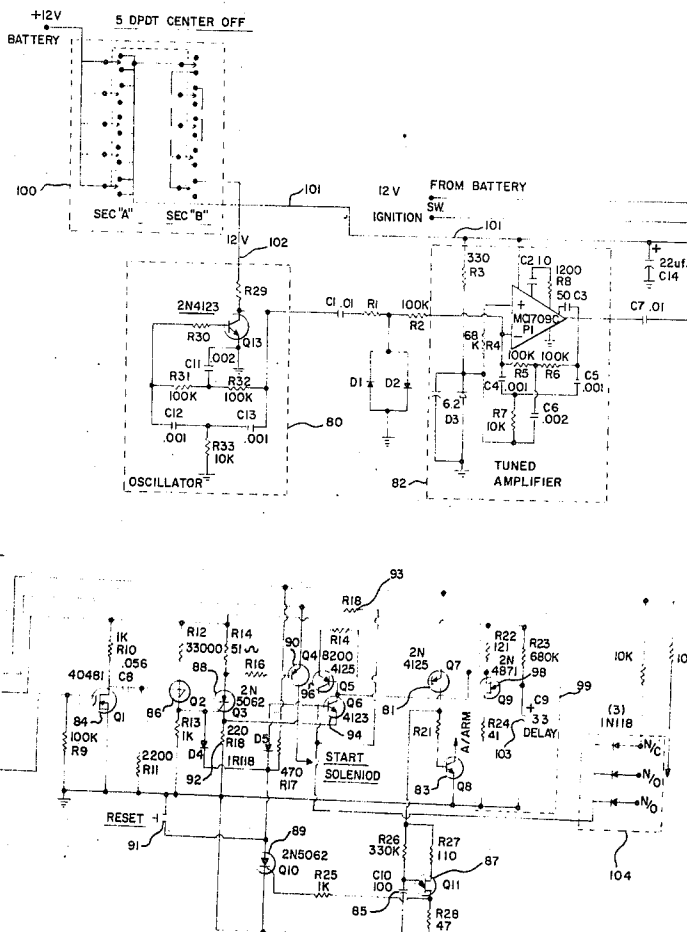
3,633,167 1/1972 Hedin..... 340/164 R

Primary Examiner—Donald J. Yusko
Attorney—Jay M. Cantor

[57] ABSTRACT

The disclosure relates to an alarm system wherein a key operated settable switch bank is provided as a part of a circuit which includes a circuit capable of operating in two conditions, one condition indicating that all of a plurality of switches have been properly positioned, the other condition indicating that all of the switches have not been properly positioned. Operation of the key closes a switch which provides an output after a predetermined time delay. If the switches are all properly positioned during the delay period, a power output is provided. If the switches are not all properly set during the predetermined time delay period, an alarm signal is provided.

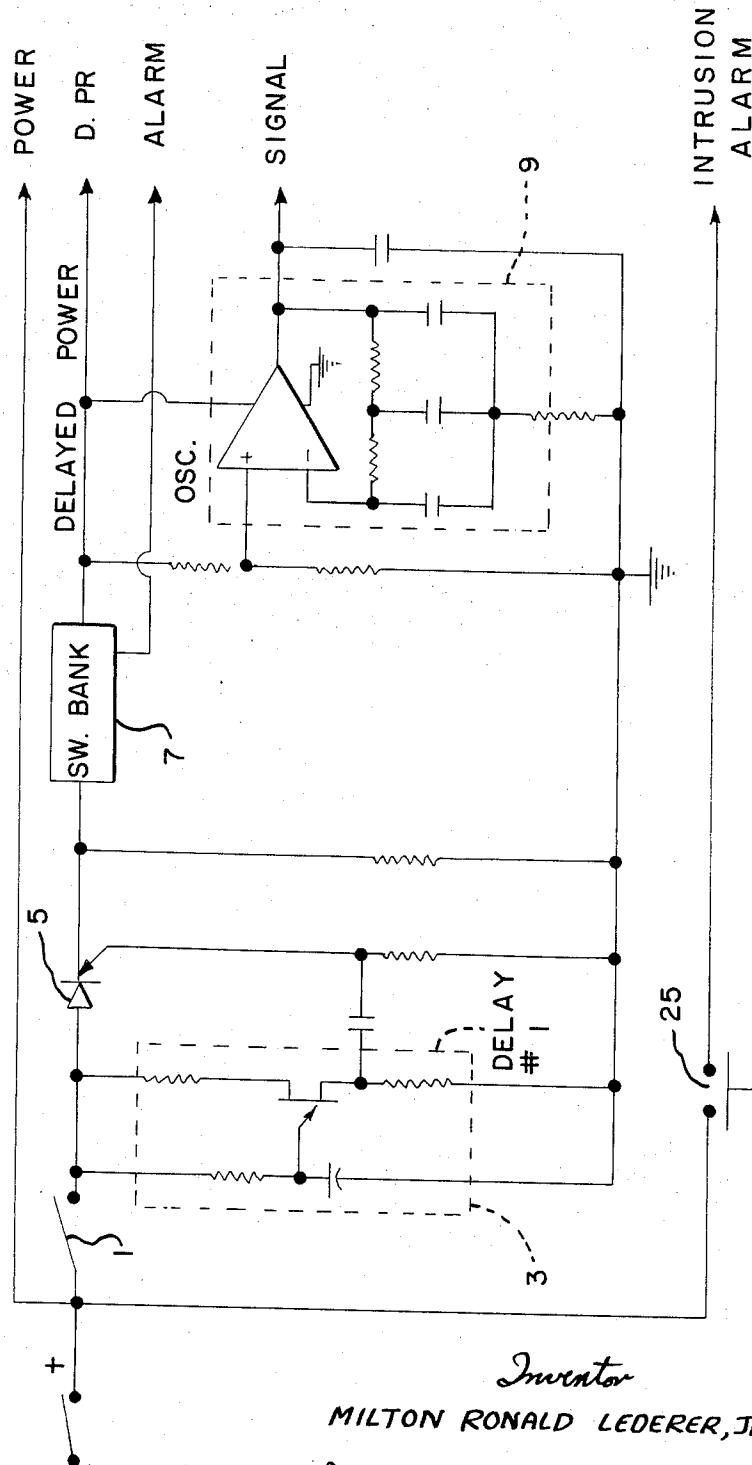
10 Claims, 10 Drawing Figures



PATENTED DEC 25 1973

3,781,804

SHEET 1 OF 7



Inventor

MILTON RONALD LEDERER, JR.

By: Angie M. Cantor

11

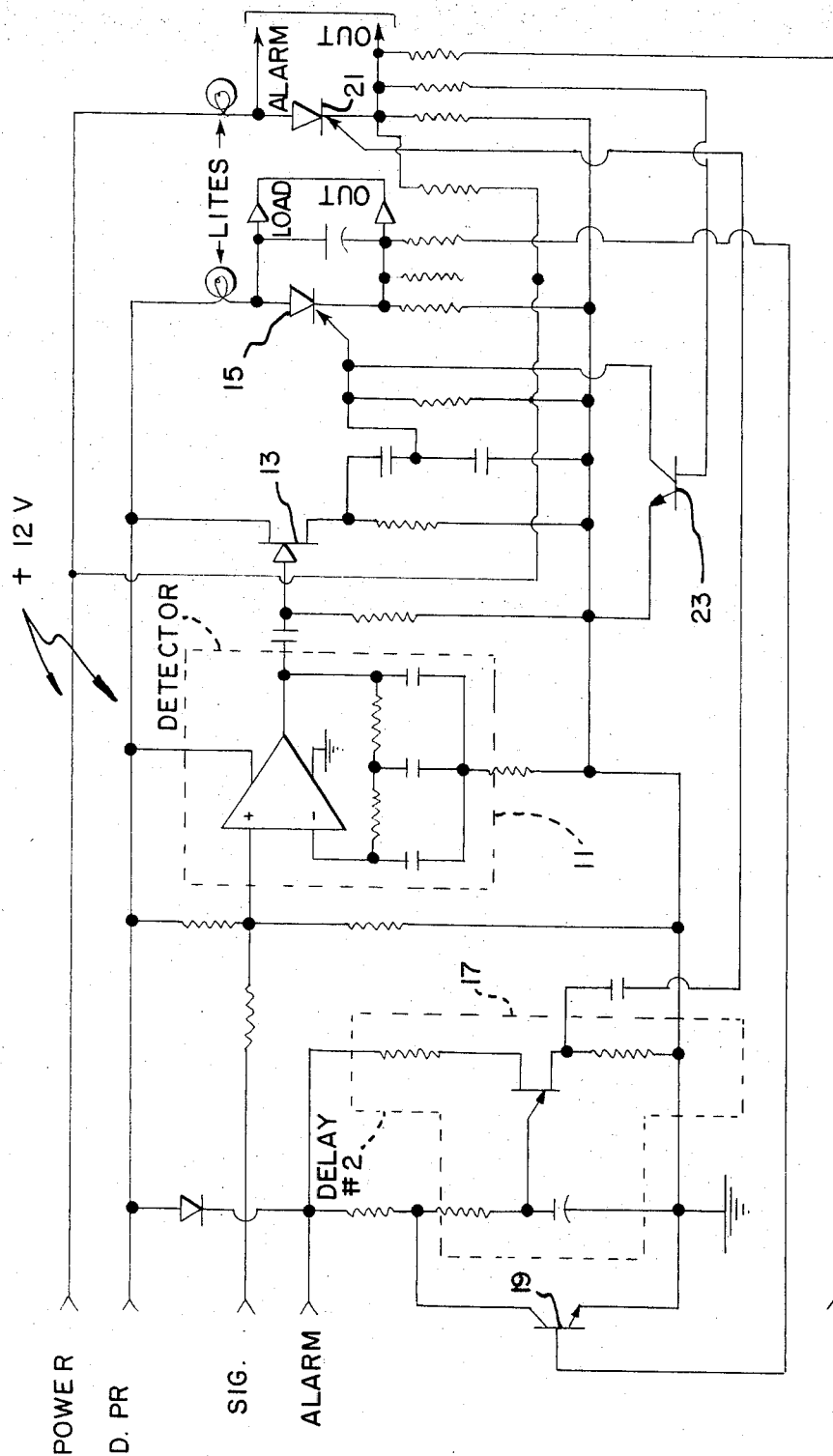
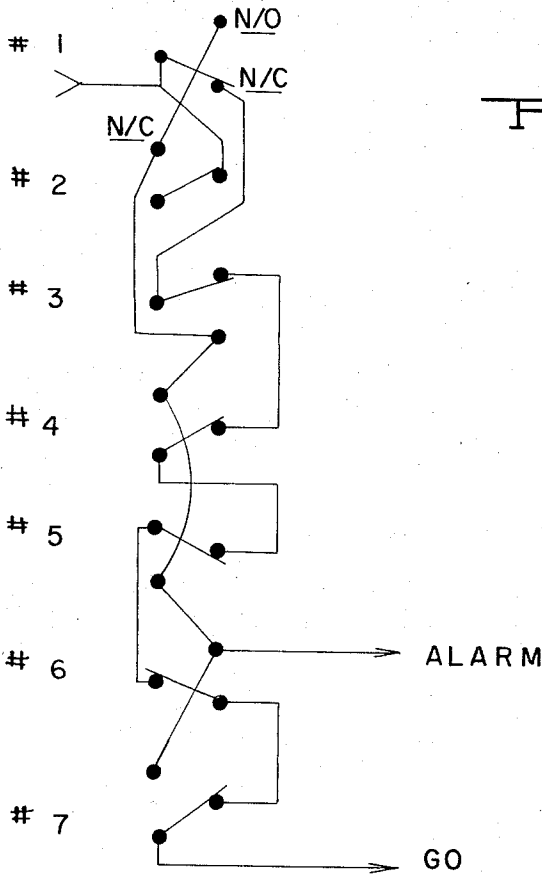
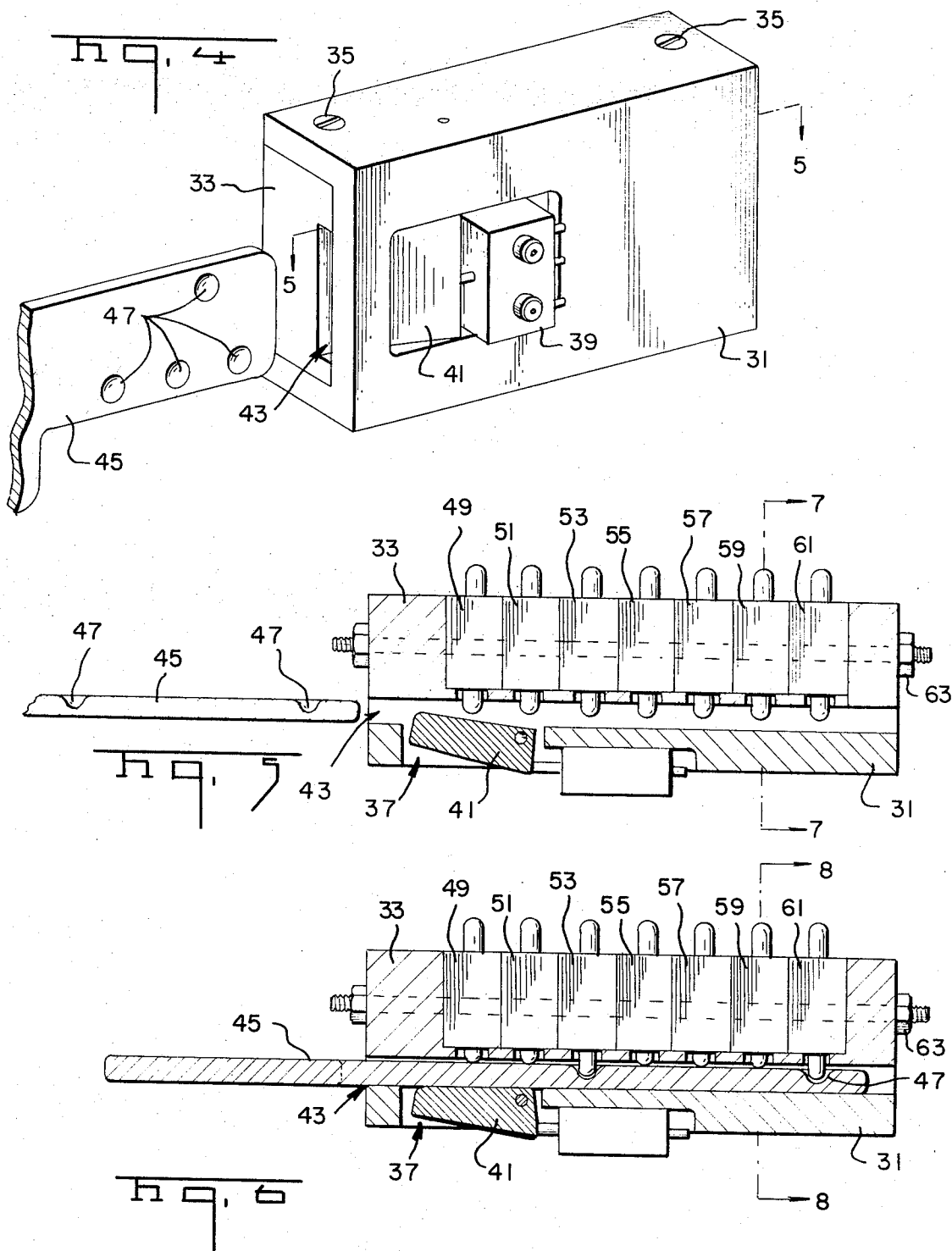


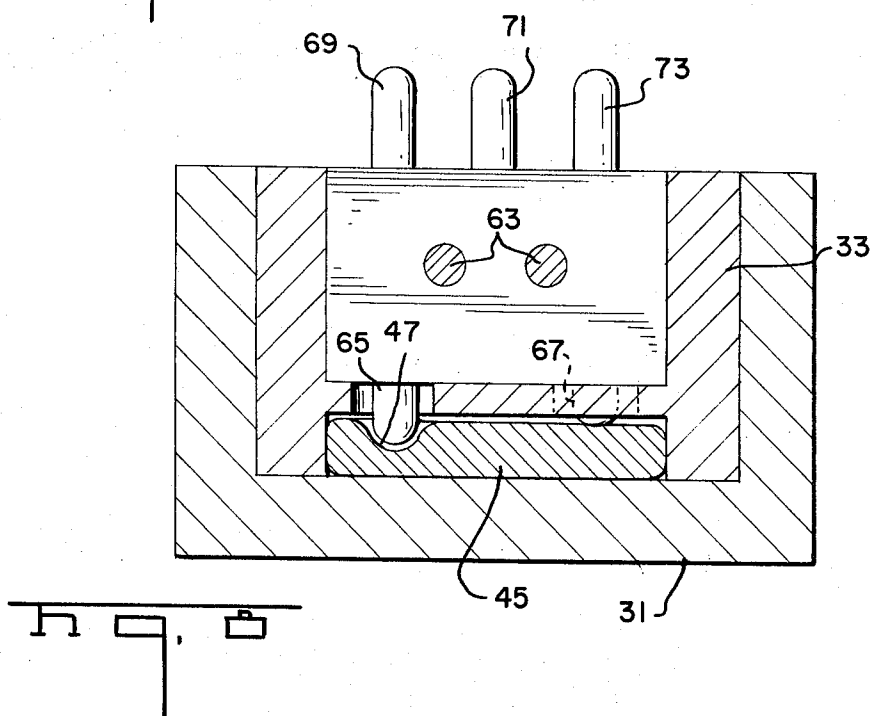
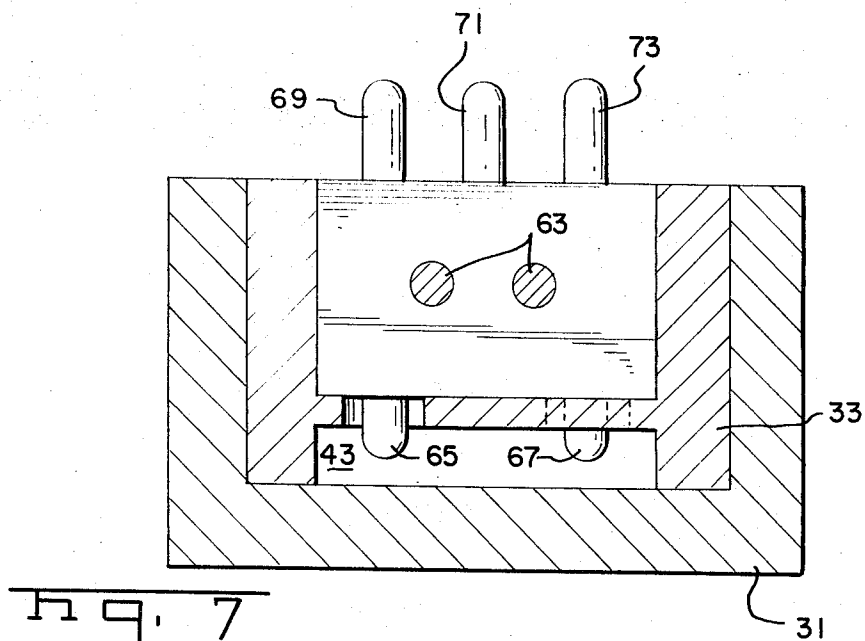
Fig. 2

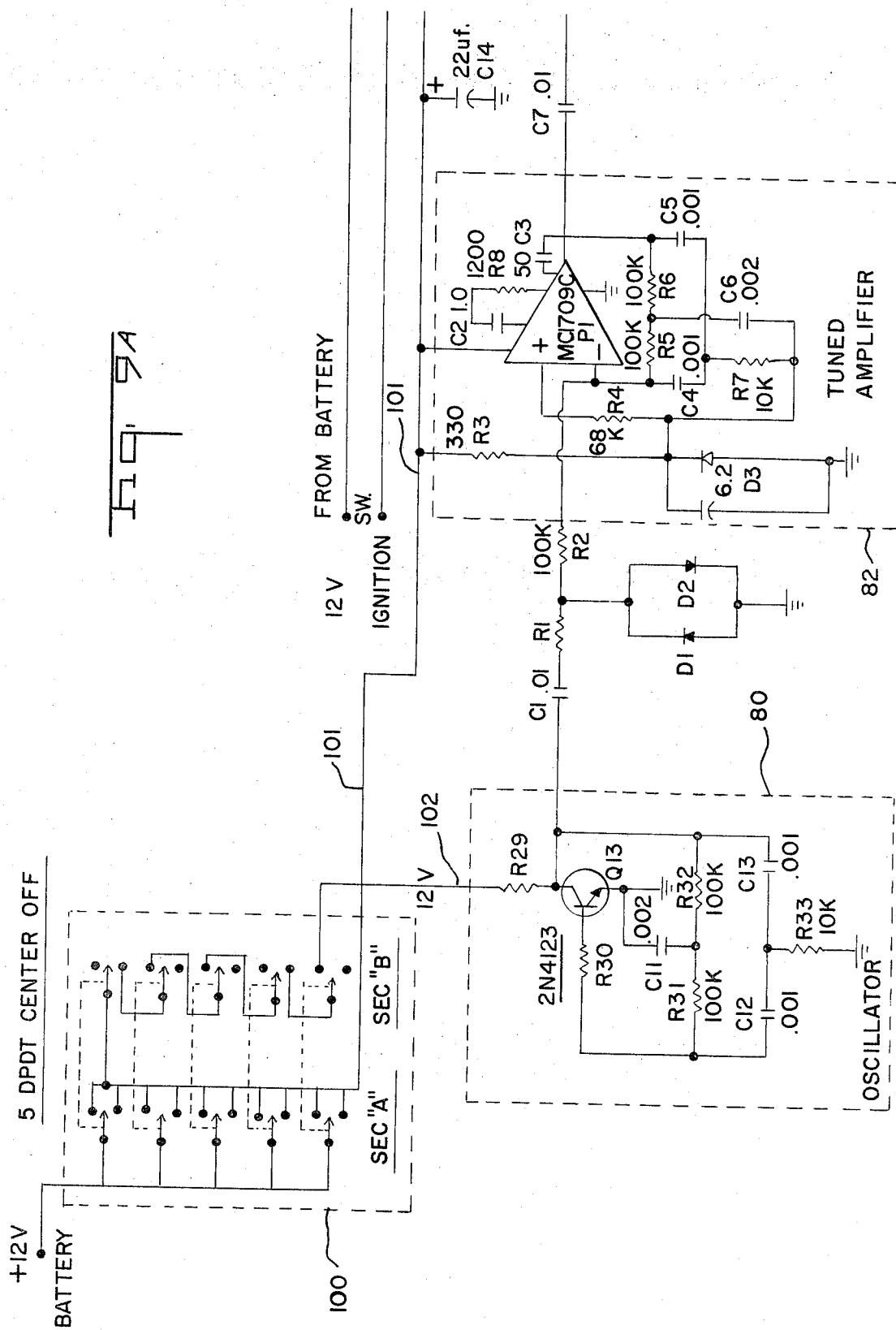
SWITCH CODE

POS.	#	N/O	N/C
	1	OPEN	
	2	CLOSED	OPEN
	3	CLOSED	OPEN
	4	CLOSED	OPEN
	5	OPEN	
	6	OPEN	
	7	CLOSED	OPEN





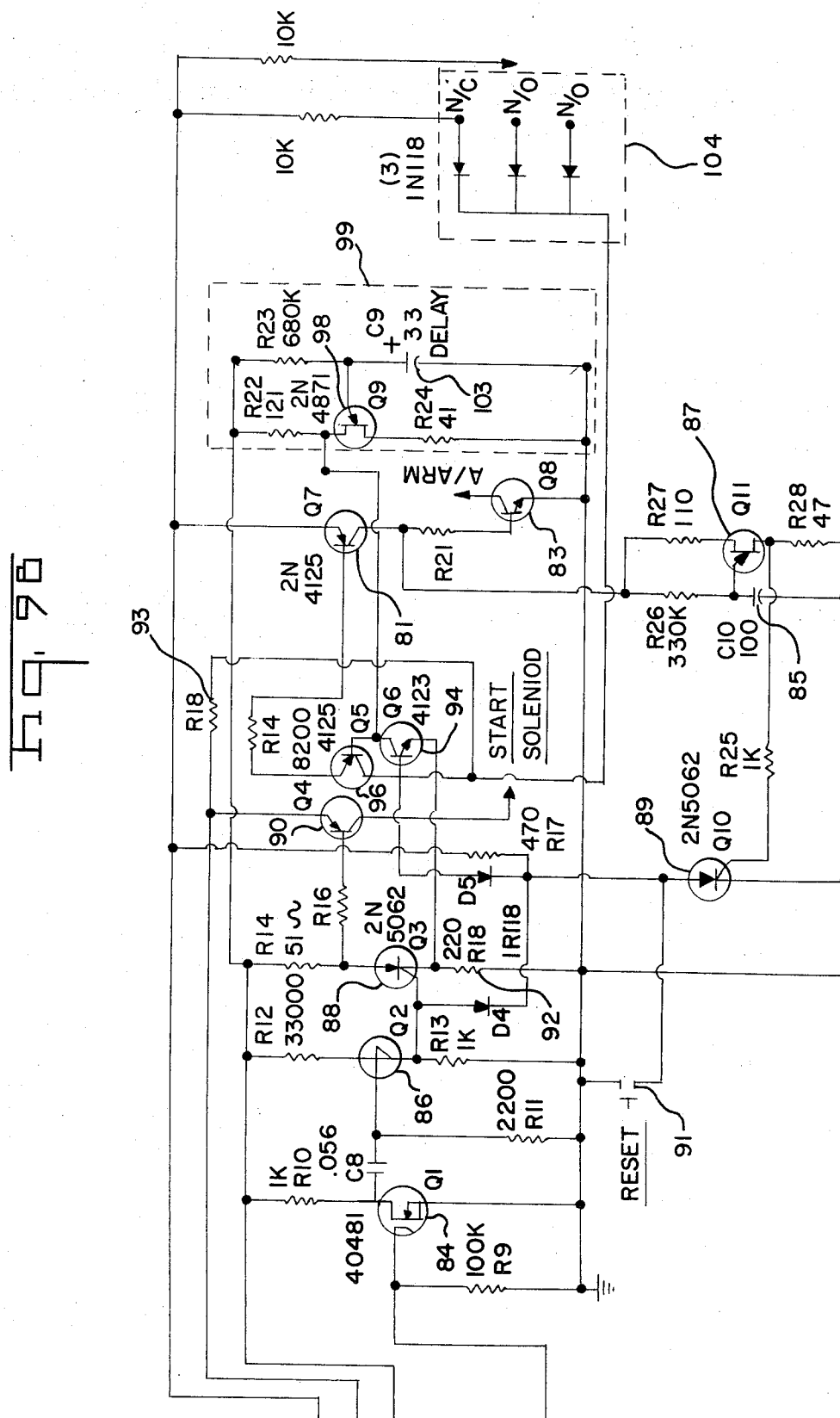




PATENTED DEC 25 1973

3.781.804

SHEET 7 OF 7



ALARM SYSTEM

This application is a continuation-in-part of my prior copending application for Alarm System, Ser. No. 122,614, filed Mar. 1, 1971 and now abandoned.

This invention relates to an alarm system for use in theft prevention, intrusion, vapor and liquid level detection and the like and, more specifically, to an alarm system responsive to the sequential operation of a key operated switch and a combination-type or permutation-type switch within a predetermined time period to provide alarm-free operation.

Systems for detecting alarm type conditions are well known in the prior art. For example, in the automotive area, alarm devices have been provided to signal unauthorized use and the like. However, such prior art devices have been easily circumvented by cutting the alarm wires or removing or bypassing the alarm circuit and by other means.

In accordance with the present invention, the above noted problems of the prior art are overcome by providing an alarm system which is not easily circumvented and which is placed physically into the electrical system, such as the starter housing of an automobile, so that a potential unauthorized user would have to tear into the physical automotive structure to circumvent the alarm and start the car. Also, an unauthorized user would have to properly set a combination of switches in a short predetermined time period to prevent the alarm system from operating.

Briefly, according to one embodiment of the invention, the system is operated by closure of a starting key operated switch. Closure of the switch sets a first time delay circuit into operation, a switch bank containing a plurality of switches being set during this period. If the switch bank is properly set, at the end of the time delay period a signal is provided from the switch bank to provide power to the remainder of the system and also to operate an oscillator circuit for providing a signal of predetermined frequency as set by the circuitry of the oscillator. A detector circuit is set for receipt of signals of the same frequency as those of the oscillator which, in conjunction with the power provided through the switch bank energizes a controlled rectifier and provides the output power for the ignition system or the like.

In the event the switch bank was not properly set in the delay period of the first time delay circuit, an alarm signal is provided which operates a second delay circuit, the output of the delay circuit energizing a second controlled rectifier to provide an alarm output signal. Energization of the second rectifier provides a signal to the gate of the first rectifier to prevent or inhibit operation thereof.

In accordance with a second embodiment of the invention, the first time delay of the first embodiment is eliminated and a first time delay circuit is operated by entry of the key and operates the alarm after the predetermined delay as well as a second time delay and a load inhibit circuit.

It is therefore an object of this invention to provide an alarm system operable upon sequential operation of a switch and a signal switching bank within a predetermined time period.

It is a further object of this invention to provide an alarm system for operation upon sequential operation of a key and a permutation coded switch bank within a predetermined time period.

It is a still further object of this invention to provide an alarm system for automotive systems and the like which is designed to circumvent removal thereof during attempted unauthorized use of the vehicle and the like.

It is a yet further object of the invention to provide a switch bank of patentably novel design.

The above objects and still further objects of the invention will immediately become apparent to those skilled in the art after consideration of the following preferred embodiment thereof, which is provided by way of example and not by way of limitation, wherein:

FIG. 1 is a circuit diagram of the key, delay and signal source in accordance with the present invention;

FIG. 2 is a circuit diagram of the second delay, detector and sensing gate circuitry in accordance with the present invention;

FIG. 3 is a diagram of a typical switch bank which can be used with the present invention and the switch code therefor;

FIG. 4 is a view in elevation of the switch bank in accordance with the present invention;

FIG. 5 is a view taken along the line 5—5 of FIG. 4 before the key is inserted;

FIG. 6 is a view taken along the line 5—5 of FIG. 4 but after the key has been inserted;

FIG. 7 is a view taken along the line 7—7 of FIG. 5;

FIG. 8 is a view taken along the line 8—8 of FIG. 6;

and FIG. 9a and 9b show a circuit diagram of a second embodiment of the invention.

Referring now to FIG. 1, there is shown a source of positive voltage which could be a battery or the like which feeds a switch 1 which can be operated by the normal car key or the like or by a special key as described in detail hereinbelow. Closure of the switch 1 causes a delay circuit 3 in the form of a normal double base diode oscillator circuit to be energized, the delay determined by the RC time constant thereof, and to cause a rectifier 5 to conduct current to a switch bank 7. The switch bank is a permutation type switch of the like having two outputs, one being an alarm output only in the event it is not properly set after the rectifier 5 begins to conduct and a delayed power output which provides power in the event the switch bank 7 is properly set when the rectifier 5 begins to conduct. A typical switch setting which can be used in accordance with the present invention is shown in FIG. 3 and a preferred switch bank is shown in FIGS. 4 to 8, though it should be understood that any permutation type apparatus which provides the types of output described above can be used.

If the switch bank 7 has been properly set in the time period as set by the delay 3, a signal is provided to the delayed power bus and also to the oscillator circuit 9 to provide an output from the oscillator of frequency determined by the oscillator components as is well known in the art. It will also be noted that power from the positive source or battery is always supplied.

Referring now to FIG. 2, the signal from the oscillator 9 is detected in a detector 11 in conjunction with the power from the delayed power bus and provides an output signal via a transistor 13 to a controlled rectifier 15 to provide output power signals therefrom. The output signal from the rectifier 15 also provides a signal to the delay 17 via the transistor 19 to short circuit the

double base diode oscillator of the delay 17 and inhibit same.

Assuming that only an alarm signal was provided from the signal bank 7, the alarm signal would energize the delay 17 and, after a predetermined time period, an output from the delay 17 would be provided to the gate of the controlled rectifier 21 and cause said rectifier to conduct, thereby providing an alarm signal to an alarm device. The alarm output signal from the rectifier 21 causes a transistor 23 to conduct, thereby inhibiting the rectifier 15 from operation. It can therefore be seen that the load signal will not be provided when there is an alarm signal. The lights in FIG. 2 can be replaced by resistors.

In order to prevent tampering with the circuit, the circuit of FIG. 1 can be placed in the automobile ignition or the like or in the vicinity thereof and the electrical circuitry thereof can be encapsulated. The circuitry of FIG. 2 can also be encapsulated and placed at a position remote from the starter switch, as, for example, in the starter housing, the fuel pump or the like.

Referring now to FIG. 3 there is shown one typical switch bank 7 in accordance with the present invention. It can be seen that seven switches are provided in FIG. 3 each having positions A and B to which it can be connected. An analysis will show that power from the battery is provided only when the switches are connected in accordance with the chart accompanying FIG. 3.

With reference again to FIGS. 1 and 2, it can be seen that an additional circuit is provided from the source of positive voltage through the switch 25 to provide an alarm circuit. The switch 25 could be an intrusion alarm type of switch, such as a magnetic reed switch or the like or any other type of detector such as a vapor detector, water level detector, over temperature alarm or the like. A plurality of such switches 25 could be placed in parallel if it is desired to have the extra alarm capability.

As an extra protective feature to prevent the possibility that an unauthorized user may operate the switch bank 7 properly within the prescribed time, the oscillator 9 can have a variable element thereon to provide changes in the operating frequency thereof, whereby only proper operators knowing the receiving frequency of the detector will be able to set the oscillator 9 at the proper frequency of transmission, thereby providing an extra protective feature.

It should further be noted that delay 3 (delay No. 1) may be used in conjunction with a solenoid latch in domestic or industrial applications to gain protection from "lock picking" and provide alarm capabilities.

It can be seen that, in accordance with the present invention, unauthorized personnel would have to operate a switch bank in a very short predetermined time period after operation of the key to prevent an alarm condition. Accordingly, it can be seen that an extra margin of safety is built in which is not found in the prior art.

Referring now to FIGS. 4 to 8, there is shown a preferred embodiment of a switch bank 7 in accordance with the present invention. The switch bank includes a pair of housing portions 31 and 33, the portions being secured to each other by screw 35 or the like. The housing portion 31 defines an aperture 37 in which is secured a microswitch 39 operated by a cam 41. The microswitch 39 has three output terminals so that it can

be set for normally closed or normally open operation. The cam 41 extends into a slot 43 formed in the housing portion 33, the cam 41 being moved by the entry of key 45 into slot 43 to operate switch 39.

The key 45 is designed to slide in the slot 43, the key including depression 47 for operation of a bank of microswitches (to be described hereinbelow). As shown in FIG. 4, the key 45 would produce an alarm condition because it is entering slot 43 with the depressions 47 positioned on the side away from the switches with which they are to mate. Key 45 should enter slot 43 after 180° rotation of the key as shown in FIG. 4. Key 45 can be keyed mechanically to prevent improper insertion.

The housing portion 33 includes a plurality of microswitches 49, 51, 53, 55, 57, 59 and 61. The switching member of each of these microswitches extends into the slot 43 as shown in FIGS. 5 and 7. The bank of microswitches is held together by fastening member 63.

With reference to FIGS. 6 and 8, when the key 45 is inserted into slot 43, cam 41 is rotated and operates switch 39. Also, when key 45 has entered fully into slot 43, predetermined ones of the microswitches will have their switching members in depressions 47, there being only one configuration wherein a signal will pass through all of the switches.

It should be noted with reference to FIGS. 7 and 8 that each microswitch has one switching lever or actuating button, the lever depending into slot 43 either into the left side thereof as viewed in FIG. 7 or the right side thereof. Accordingly, this arrangement permits two possible configurations for each microswitch and increases the number of switching combinations. The microswitches can also be either normally open or normally closed, thereby further increasing the number of combinations. The contact members 69 and 73 are associated with a lever being in the left or right row in slot 43 respectfully, contact member 71 being reference or common.

It can be seen that in accordance with the present invention, microswitch 39 corresponds to switch 1 of FIG. 1 and microswitches 49 to 61 comprise the switch bank 7.

Referring now to FIG. 9, there is shown a schematic diagram of a second embodiment of the invention. In this embodiment the switch bank 100 comprising five double-pole double-throw center off switches and an oscillator 80 are located at a console remote from the remainder of the circuit. One section of each switch shown as SEC A is connected to the next successive switch so that all center arms of section A are in parallel and power is applied on line 101 when any of the switches is operated in either direction. An output is provided on line 102 only when all five switches in SEC B have been operated in the proper direction to complete the series circuit from the battery to line 102.

The switch bank 100 provides a voltage to the tuned amplifier 82, SCR 88 and time delay 99 immediately upon operation of any of the switches in any direction. The output along line 101 is provided at the collector of the transistor of oscillator 80.

When one of the switches of the switch bank 100 is operated, the delay circuit 99 commences operation via line 101 to charge capacitor 103. The capacitor charges according to preset rate until the voltage thereon is sufficient to cause double base diode 98 to fire, this delay being preferably about 4 ½ seconds.

During this 4 ½ second delay period, all five switches of the switch bank 100 must be properly operated to provide a power signal on line 102 to prevent an alarm signal.

If the switch bank has been properly operated during the 4 ½ second period power will be provided to oscillator 80. Application of power to the circuit will cause the oscillator 80 to be activated and provide an output of predetermined frequency to the tuned amplifier 82. The output of oscillator 80 will be amplified in amplifier 84 and turn on the silicon unilateral switch 86 causing the silicon controlled rectifier (SCR) 88 to fire. The firing of the SCR 88 provides a holding signal to the base of transistor 90 and biases the transistor to the "on" state. This also provides a 6 volt potential across resistor 92 and at the collector of transistor 94 of the transistor pair 94, 96 and prevents these transistors from conducting. If power is now applied through the ignition switch to the emitter of transistor 90, this transistor will conduct, having been previously biased into the on state and energize the starting solenoid and crank the engine.

If proper signal was not introduced to amplifier 82 in the predetermined time period from the switch bank 100, delay circuit 98, which has a time delay of about 4 ½ seconds will trigger transistors 94 and 96 into conduction, this causing transistor 81 to conduct and, in turn, transistor 83 to conduct and operates the alarm. Simultaneously, capacitor 85 is charged and causes double base diode 87 to conduct and, after about one minute, triggers SCR 89 to bias the gate of SCR 88 as well as the base of transistor 94 to ground potential. This causes transistors 94, 96 to unlatch and also prevents SCR 88 from becoming conductive. Transistor 89 will now continue to hold the entire circuit inoperative until the reset button 91 is depressed and unlatches transistor 89.

A resistor 93 is provided in the ignition switch circuit between the emitter of transistor 90 and a base of double diode 98. This circuit is for the purpose of providing an immediate alarm in the event of an attempt to use the starter switch prior to properly unlocking the alarm circuitry.

The tuned amplifier 82 could, for example, be replaced by a single NPN transistor having its collector connected to line 102 and the emitter connected to ground. A pair of series resistors and a pair of series capacitors is connected across the base collector circuit, the junctions of the resistors and capacitors being grounded.

Referring again to FIG. 9, there are shown a plurality of auxiliary alarm inputs 104.

Though the invention has been described with respect to a specific preferred embodiment thereof, many variations and modifications thereof will immediately become apparent to those skilled in the art. It is therefore the intention that the appended claims be interpreted as broadly as possible in view of the prior art to include all such variations and modifications.

What is claimed is:

1. A security alarm system comprising:

an alarm circuit,

a load circuit,

a first timing means,

permutation switch means having an input terminal and normally set to provide an output to a first terminal and settable by a selectively coded key

means movable toward the switch means to provide an output to a second terminal when the input terminal is energized,

means in the path of movement of a key toward the switch means for initiating operation of the first timing means,

means responsive to the first timing means after a predetermined time following initiation of its operation to energize the input terminal of the switch means,

second timing means initiated by an output from the first terminal of the switch means, to cause energization of the alarm circuit a predetermined time following its initiation,

said load circuit being connected to the second terminal of the switch means for energization by an output therefrom,

and means responsive to energization of the alarm circuit for inhibiting energization of the load circuit.

2. A security alarm system in accordance with claim 1 including means responsive to energization of the load circuit prior to energization of the alarm circuit to inhibit operation of the alarm circuit.

3. A security alarm system in accordance with claim 2 wherein the alarm circuit includes means for maintaining itself in continuous operation following its energization even after the output from the first terminal is terminated as by withdrawal of the key means.

4. A security system according to claim 2 wherein the means responsive to the energization of the load circuit, operates to render the second timing means inoperative to prevent operation of the alarm circuit.

5. A security system according to claim 1 wherein the permutation switch means is mounted within a housing provided with a keyway for the entry of said key means, the means in the path of movement of the key means comprising a switch control means adjacent the entry to the keyway.

6. A security alarm system according to claim 1 wherein the alarm circuit includes means for maintaining itself in continuous operation following its energization even after the output from the first terminal is terminated as by withdrawal of the key means.

7. A security alarm system in accordance with claim 1 wherein the load circuit includes means responsive to the output from the second terminal of the switch means for producing a signal of a selected frequency, detecting means responsive to the selected signal frequency for producing an output.

8. A security alarm system in accordance with claim 6 wherein the means for producing a signal of a selected frequency is adjustable to produce signals of different frequencies.

9. A security alarm system according to claim 1 wherein said load circuit includes a manually operated switch for applying power from a source to energize the load when the load circuit is energized by an output from the second terminal,

and means controlled by operation of the manual switch to apply power from the source in the absence of an output from the second terminals for immediately energizing the alarm.

10. A security alarm according to claim 9 including means responsive to energization of the load circuit prior to energization of the alarm circuit to inhibit operation of the alarm circuit.

* * * * *