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[54] **SECURITY ALARM SYSTEM WITH BYPASS**

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[58] **Field of Search** ..... 340/276 R, 274 R

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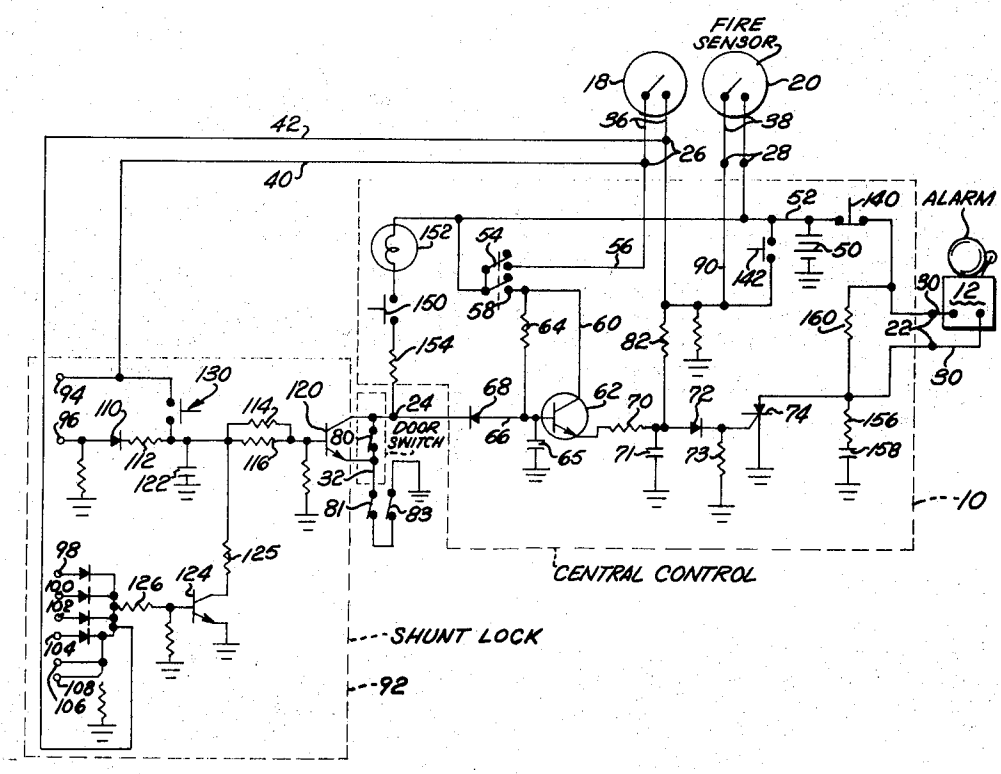
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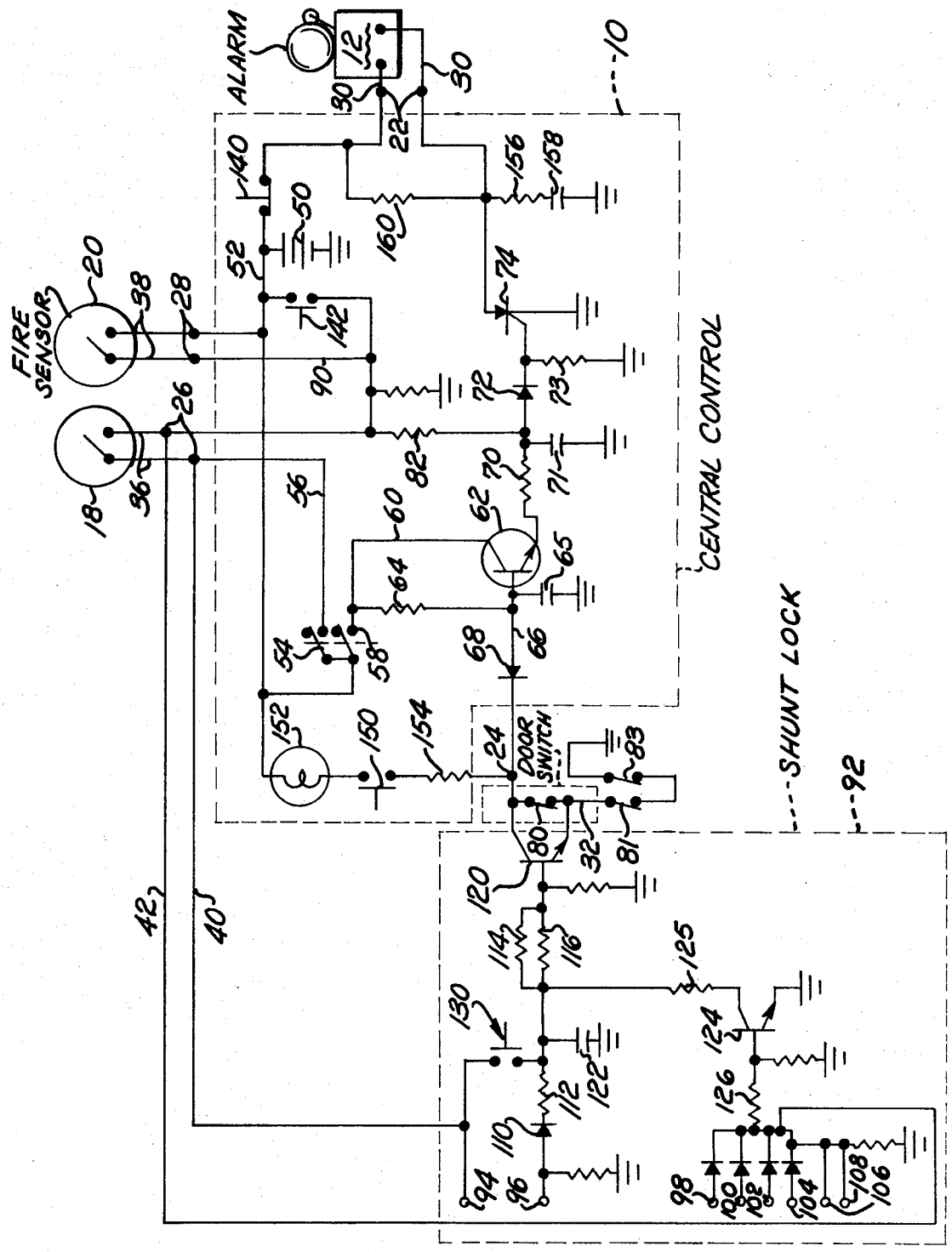
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[57] **ABSTRACT**

A battery operated alarm system including a more or less conventional closed circuit burglar alarm loop in which are sensors that may open the circuit so as to actuate a bell or other signaling device. In this system, a resistor limits the current passing in the normally closed loop, conserving battery power and also permitting further control of the loop by an electronic door lock. One of the sensors is a door switch that will be bypassed when a key is inserted into the lock, and there is a time delay holding the switch bypassed for a time that will permit a person to pass the door. The system also includes normally open circuit loops such as may be closed by operation of an electric floor mat, and one of those loops may be utilized for a fire sensor and will remain in operation at times when a switch has been actuated to place the other loops out of operation.

5 Claims, 1 Drawing Figure





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SECURITY ALARM SYSTEM WITH BYPASS

The present invention relates to a new and improved security alarm system and specifically to a battery powered alarm system which provides for low current flow from the battery and which is reliable, economical, and simple to install and service.

Known alarm security systems of the more effective types are generally extremely complex, expensive and difficult to install. The price of those systems is such that the market therefore is extremely limited. Moreover, the circuitry of the present systems tend to be extremely sensitive to noise and electrical disturbances which result in false alarms. Moreover, most known security systems rely on an outside source of power which when terminated renders the security system ineffective to sense an alarm condition.

Accordingly, an object of the present invention is to provide a new and improved security alarm system which overcomes the hereinabove disadvantages by providing a reliable, economical and easily serviceable and installable security alarm system.

Another object of the present invention is to provide a new and improved security alarm system including a signaling device for indicating the presence of an alarm condition, control circuitry including a power supply for actuating the signaling device, sensing means associated with the control circuitry and responsive to the presence of an alarm condition for effecting actuation of the signaling device, a normally closed control loop associated with said control circuitry and having the sensing means series connected therein, the control loop being energized by the power supply, code receptive means including switch means for rendering the sensing means ineffective to effect actuation of the signaling device when the sensing means is in an alarm condition and a predetermined code has been entered in the code receptive means, and current limiting means connected in series with the power supply for limiting the flow of current from the power supply through the control loop to the sensing means when the alarm system is in an on condition to thereby provide for long life of the self contained power supply.

Still another object of the present invention is to provide a new and improved security alarm system as recited in the next preceding paragraph wherein the sensing means includes a first normally closed sensor disposed in the normally closed control loop for sensing the condition of an opening providing access to a secured area, and further including a second normally opened sensor disposed in a second normally opened control loop for sensing the presence of an alarm condition and a third normally opened sensor disposed in a third normally opened control loop for sensing the presence of a fire and wherein the control circuitry includes on-off switch means for rendering the first and second sensors ineffective to sense an alarm condition when the switch means is in an off condition and being inoperable to render the third sensor, for sensing fires, ineffective to sense a fire or alarm condition.

Still another object of the present invention is to provide a new and improved security alarm system including a signaling device for indicating the presence of an alarm condition, control circuitry for actuating the signaling device, a sensor associated with the control circuitry and responsive to the presence of an alarm condition for effecting actuation of the signaling device, means for rendering the sensor ineffective to effect actuation of the signaling device, and wherein the control circuitry includes a battery for supplying current to the sensor, and means series connected with the battery and the sensor for limiting the flow of current therefrom to the sensor.

A further object of the present invention is to provide a new and improved security alarm system including a signaling device for indicating the presence of an alarm condition, control circuitry for actuating the signaling device, a sensor associated with control circuitry and responsive to the presence of an alarm condition for effecting actuation of the signaling device and shunt lock means for rendering the sensor ineffective to sense an alarm condition, and wherein the shunt lock means includes an AND gate, bypass means responsive to the AND gate for shunting the sensor means in response to an input to the AND gate, time delay means for holding the bypass means in an on condition to thereby shunt the sensor for a predetermined period of time and an OR gate for rendering the AND gate ineffective to activate the bypass means in response to an input being entered on the OR gate.

Further objects and advantages of the present invention will become apparent from the following detailed description of the present invention taken in conjunction with the drawing, wherein:

The FIGURE shows a schematic circuitry of a preferred embodiment of the present invention.

The present invention relates to a security alarm system and more specifically to an economical, alarm system which is easy to install and service. The alarm system includes a signaling device, such as a bell for signaling the presence of an alarm condition, control circuitry for effecting actuation of the signaling device and a plurality of sensors associated with the control circuitry for sensing the presence of an alarm condition and effecting actuation of the signaling device. The control circuitry includes a self contained battery therein for providing power for the sensors, and the signaling device. A current limiting resistor is series connected with the battery and limits the flow of current therefrom to provide for long battery life. Code receptive means is associated with sensors which are utilized to control access to a particular area. The code receptive means is operable upon receiving a predetermined code therein, to render at least one of the sensors inoperable to effect actuation of the alarm means upon the occurrence of an alarm condition so that access to the area may be effected. The alarm condition in this particular case would be the opening of a door or window. It should be appreciated that if the door or window is opened when the code receptive means have the incorrect code or no code inserted therein an alarm would be sounded. Other sensors can also be utilized with the system which provide for sensing of movement of a person in a predetermined area or for sensing the occurrence of a fire. The fire sensors are connected to the control circuitry in such a manner that they will be always operable to sense a fire even if the control circuitry is turned to its off condition.

The security alarm system is schematically illustrated in the drawing and includes a central control **10** having a plurality of external terminals **22, 24, 26,** and **28.** Sensors **80, 81** and **83** are connected by lead **32** to the terminal **24,** a sensor **18** is connected by a pair of leads **36** to the terminals **26** and a sensor **20** is connected by a

pair of leads 38 to the terminals 28. Connected to the terminals 22 by the leads 30 is a signaling device 12 which is illustrated in the preferred embodiment as a bell. Generally, when one of the sensors 18, 20, 80, 81 or 83 senses an alarm condition the central control 10 will be actuated to effect energization of the signaling device 12.

The sensor 80 is a normally closed switch such as a proximity switch which senses the opening and closing of a door that offers access to a particular area in which the alarm system is utilized. The proximity switch 80 is a normally closed switch and is connected in series with the loop formed by the lead 32 between the terminal 24 and the ground. The loop formed by the lead 32 has a normally closed condition. When the door is opened the normally closed loop will be broken by opening of the contacts of the proximity switch 80. Sensors 81 and 83 are normally closed switches actuated by opening of windows which are associated with the particular area to be secured. The sensors 81 and 83 are series connected with the proximity switch 80 in the normally closed loop formed by the lead 32. When one of the windows, not illustrated, associated with the sensors 81 and 83 is opened the normally closed loop will be broken. It should be appreciated, that while only three switches have been utilized in the first normally closed control loop further normally closed switches could be series connected in the loop to sense other accesses to the secured area.

The sensor 18 has a normally opened condition and is connected in a second normally open control loop formed by the leads 36. The sensor 18 may comprise a floor mat of a type which closes a circuit in response to weight acting thereon. The closing of the contacts of the sensor 18 will complete a circuit through the normally opened loop formed by the leads 36. While only a single floor mat sensor has been illustrated it should be appreciated that a plurality of normally open floor mat or other sensors could be connected in parallel across the normally opened loop formed by the leads 36. Closing of any one of the normally opened sensors would enable current to flow through the normally opened loop formed by the leads 36.

The sensor 20 is a normally opened sensor and is connected across the leads 38 to form a third control loop. The third control loop has a normally opened configuration and closing of the sensor 20 effects the flow of current therethrough much in the same manner as closing of sensor 18 effects the flow of current through the control loop formed by the leads 36. The sensor 20 is preferably a fire sensor which closes upon the occurrence of a fire sensed thereby. A plurality of normally opened fire sensors could be utilized in the loop formed by the leads 36 by connecting the sensors in parallel to the fire sensor 20 illustrated.

A change in normal condition of the sensors such as opening of the proximity switches 80, 81 or 83 or closing of the floor mat sensor 18 or the fire sensor 20 will actuate the central control 10 to effect energization of the signaling device 12.

The central control 10 includes a battery 50 disposed therein whose positive terminal is connected to a lead 52. The lead 52 is connected to one of the terminals 28 of the loop formed by the leads 38 to which the fire sensor 20 is connected. Upon the occurrence of a fire the sensor 20 will close and a circuit will be completed from the battery 20, through the lead 52 and across the terminals 28 through the closed contacts of the fire sensor 20. Current will then flow from the terminals 28 through a lead 90, through a resistor 82 and through a diode 72 to the gate of a SCR 74. The application of a potential to the gate of the SCR 74 will effect conduction of SCR 74 and a circuit will be completed from the battery 50 across the terminals 22 via the signaling device 12 to the anode of the now conducting SCR 74. Thus, closing of the fire sensing switch 20 will effect conduction of SCR 74 to thereby energize the signaling device 12.

An on-off switch 54 is connected to the battery by the lead 52. Closing of the switch 54 will effect energization of the terminals 26 via a lead 56. Thus, when the switch 54 is closed the floor mat sensor 18 will be in a condition in which it may sense someone stepping thereon. If the floor mat sensor 18 is closed, a circuit will be completed from the battery 50, through the switch 54, through the door mat sensor 18, through the resistor 82, through the diode 72 to the gate of the SCR 74 to thereby effect conduction of the SCR 74. Conduction of the SCR 74 will energize the signaling device 12 to signal an alarm condition.

Closing of switch 54 will also energize the terminal 58 of the switch 54 to effect energization of the proximity switches 80, 81 and 83 through a resistor 64, line 66, and a diode 68. Since the proximity switches 80, 81 and 83 are in a normally closed condition, current will flow from the battery 50, through the switch 54 through the resistor 64 and through the switches 80, 81 and 83 to ground when the switch 54 is closed. The resistor 64 provides a high resistance path through the normally closed loop formed by the lead 32 and the normally closed proximity switches 80, 81 and 83 to limit the current flow through the closed loop. The resistor 64 thus limits the current drain from the battery 50 when the system is in its normal operating condition. Thus, only a small current will flow through the normally closed loop formed by the lead 32 and the proximity switches 80, 81 and 83 and long life for the battery 50 will be provided.

Opening of the door with which the switch 80 is associated, by an intruder not properly actuating a shunt lock 92 more fully described hereinbelow, will open the contacts of the switch 80 to thereby open the normally closed loop. Opening of the normally closed loop will cause the current flowing through the resistor 64 to bias the base of transistor 62. When the base of transistor 62 is biased to the proper potential by opening of the normally closed loop, the transistor will conduct to complete a circuit through a lead 60, through the collector emitter circuit of the transistor 62, through a resistor 70 and through the diode 72 to the gate of the SCR 74. Connected to the anode of diode 72 is a capacitor 71 which provides for an increased threshold to the gate of SCR 74. A resistor 73 is connected to the cathode of diode 72 to control the leakage current. Conduction of transistor 62 will thus gate SCR 74 to an on condition to thereby effect actuation of the signaling device 12. The resistor 64 cooperates with capacitor 65 to provide a slight delay before biasing transistor 62 to its on condition. The time delay is caused by the RC time constant of resistor 64 and capacitor 65 and eliminates noise in the system to prevent false alarms.

A code receiving means which will act as a shunt lock 92 is provided to shunt the proximity switch 80 in the event that an authorized person having the correct

code to the shunt lock desires to enter through the door controlled by the proximity switch **80.** The shunt lock **92** includes terminals **94, 96, 98, 100, 102, 104, 106,** and **108.** The terminals are adapted to have a key, such as a key disclosed in U.S. Pat. No. Re. 27,013, which is a binary coded key, engaged therewith to insert the correct code into the shunt lock **92.**

The terminals **94** and **96** comprise an AND gate and the terminals **98–108** comprise an OR gate. A correct key will short the terminals **94** and **96** and an incorrect key will apply a signal to any one of the terminals **98–108** in a manner such as described in the Hedin, Balzano U.S. Pat. No. Re. 27,013. The terminal **94** is connected to the battery **50** by the line **40.** When a correct key is applied to the shunt lock **92** the terminals **94,** and **96** are shunted by the key and a signal will be applied through a diode **110,** through a resistor **112** and through the parallel resistors **114** and **116** toward the base of a transistor **120.** The signal applied the via terminal **96** will cause a capacitor **122** to charge. When capacitor **122** is fully charged, it will turn on the transistor **120** through the resistor **116.** When the transistor **120** in its conductive state affected by the application of a potential to the base of the transistor **120,** a circuit will be completed through the collector emitter circuit of the transistor **120** from the line **32** to ground to thereby shunt the proximity switch **80.** Thus, when a current code is applied to the shunt lock **92,** transistor **120** will be turned on and opening of switch **80** will be ineffective to turn on transistor **62** to bias the SCR **74** into conduction so as to actuate the signaling device **12.** The capacitor **122** holds a charge and slowly decays through resistor **114** so that after the key is removed a person may enter the door controlled by the proximity switch **80** for a predetermined period of time.

If an incorrect key is utilized, a signal will be applied through at least one of the terminals **98–108.** The signal will be applied through the terminals **98–108,** through a resistor **126** to the base of a transistor **124** to bias the transistor **124** into conduction. When the transistor **124** is turned on, current flowing toward the base of transistor **120** will be directed to ground via the resistor **125** and the collector emitter circuit of conductive transistor **124.** Accordingly, the capacitor **122** will be prevented from charging and effecting conduction of the transistor **120.** Thus, transistor **120** will not be able to conduct and opening of the proximity switch **80** will effect actuation of a signaling device **12.**

It should be apparent, that if a signal is applied to the correct terminals **94** and **96** of the AND gate the transistor **120** will conduct to shunt the proximity switch **80** to enable a person to enter the door without actuating the signaling device **12.** However, if a signal is applied to any one of the inputs to the OR gate, **98–108,** the transistor **124** will conduct to prevent conduction of transistor **120** regardless of the condition of the AND gate and opening of proximity switch **80** will effect actuation of the signaling device **12.**

Attached to the terminals **98–108** is a conductor **42** which is operable to receive a signal thereon when an input is inserted in one of the terminals **98–108.** When a potential is applied to the lead **42** it will be directed to the terminals **26,** through the resistor **82** and to the gate of the SCR **74.** Thus, insertion of an incorrect key in the shunt lock will effect conduction of the SCR **74** and actuation of the signaling device **12** even if the proximity switch **80** is not opened.

The terminals **94–108** are disposed outside of the area which is guarded by the proximity switch **80.** Thus, entry into the area can be made only when the correct binary coded key is inserted to engage the terminals of the shunt lock **92.** A manually operable switch **130** is provided to shunt the terminals **94** and **96.** The switch **130** is preferably disposed internally of the area controlled by the proximity switch **80,** Thus, if a person wishes to exit from the door controlled by the proximity switch **80** he need only depress switch **130** momentarily which will effect charging of capacitor **122** to thereby turn the transistor **120** on. Conduction of the transistor **120** will shunt the proximity switch **80** and enable a person to leave the area without effecting actuation of the signaling device **12.** However, if a person desires to enter he must have the correct key and cannot actuate the switch **130** as it will be out of his reach.

It should be appreciated that while an electrical lock is not actually shown in conjunction with controlling access to the secured area controlled by the sensor **80** such a lock could easily be incorporated in the present system. The electrical lock could be of the type disclosed in the Hedin and Balzano U.S. Pat. No. Re. 27,013 and could be connected to a lead from the AND gate formed by the terminals **94** and **96.** The lock would control locking of the door associate with the proximity switch **80** and would release the door when a correct signal was applied to the shunt lock **92.** It should be apparent that when such a lock is utilized, minor modifications could be made in the present circuitry to provide on-off control of the shunt lock **92** and the electrical lock for controlling access to the secured area. For example, the line **40** could be connected to the opposite side of switch **54** to provide for constant energization of the shunt lock and the electrical lock controlled thereby. Other obvious modifications could also be utilized depending on the type of operation in which it is desired to utilize the present system.

Once the signaling device **12** is actuated a signal will continue to be emitted until the battery **50** is worn down or until a stop switch **140** is depressed. The stop switch **140** is disposed in a series relationship between the battery **50** and the signaling device **12.** Depressing of the stop switch will break the series circuit between the signaling device **12** and the battery **50.** A resistor **156** and a capacitor **158** are connected between the SCR **74** and the signaling device **12** to act as rate suppressors to keep the SCR **74** from triggering once the switch **140** is released. Moreover, a resistor **160** is disposed between the terminals **22** to which the signaling device **12** is connected to provide enough current through the SCR **74** to keep it on until the system is reset by actuation of the switch **140.**

A testing circuit comprising a normally opened switch **150,** an indicator or light **152** and a resistor **154** is connected between the lead **52** and the terminal **24** associated with the normally closed loop formed by the lead **32** and the proximity switches **80, 81** and **83.** The switch **150** is operable to test the system to determine whether the proximity switches **80, 81** and **83** are closed prior to closing of the on-off switch **54.** Closing of the switch **150** will complete a circuit from the battery **50** through the light **152** and switch **150** and through the normally closed proximity switches to ground. If the proximity switch **80** is opened or one of the other switches **81** or **83** which are mounted in series

with the switch **80** is opened the lamp **152** will not light to thereby notify the operator of the system of the condition of the proximity switches. Moreover, if the battery **50** is low the light **152** will only light in a dim fashion to signify that replacement of the battery **50** is needed. If the proximity switches **80, 81** or **83** are closed, the closing of the switch **150** will cause the lamp **152** to light. The diode **68** prevents current from flowing to turn on transistor **62** upon closing of the switch **150.**

A panic switch **142** is provided on the central control **10** to effect actuation of the signaling device **12** in the case of an emergency. Closing of the switch **142** completes a circuit from the battery **50** through the resistor **82** and to the gate of the SCR **74** to turn on the SCR **74** and effect actuation of the signaling device **12.**

It should be appreciated that the present system provides three separate control loops two of which are normally open and which draw no current from the battery while the system is in an operational mode. The two open control loops having the sensors **18** and **20** therein and draw current from the battery **50** only when an alarm condition is sensed and one of the normally opened sensors **18** or **20** is closed. The third control loop, which is a normally closed control loop draws only minimal current due to the fact that the current limiting resistor **64** is series connected between the control loop and the battery. Thus, since the normally closed control loop, having the proximity switches **80, 81** and **83** therein, draws only a minimum amount of current when the circuit is in operation and the normally open control loops draw no current when in normal condition, long life will be provided for the battery **50.** The construction of the shunt lock **92** which is associated with the third normally closed control loop is inexpensive and extremely simple due to the fact that the shunt lock is utilized for current control of a very low current. Thus, it should be apparent that the current limiting resistor **64** not only provides for long battery life but also reduces the complexity and cost of the shunt lock since only a low current normally flows in the normally closed control loop.

From the foregoing, it should be apparent, that the present invention provides a new and improved, economical, and highly reliable alarm system. The alarm system includes a central control plane having a signaling device associated therewith. A panic switch is provided to effect energizing the signaling device upon the occurrence of an emergency situation. Moreover, a plurality of sensors are connected with the control circuitry and form normally opened and normally closed control loops. When an alarm condition occurs the normally closed control loop will be opened or the normally opened control loop will be closed to effect actuation of the signaling device. A battery is provided in the control circuitry and prevents the system from being inoperable due to failure of the power supply supplying the area which the system controls.

What I claim is:

1. A security alarm system comprising a signaling device for indicating the presence of an alarm condition, control circuitry including a power supply for actuating said signaling device, first sensing means associated with said control circuitry and responsive to the presence of an alarm condition for effecting the actuation of said signaling device, a first normally closed control loop associated with said control circuitry and energized by said power supply, means limiting the flow of current from said power supply through said normally closed loop, said first sensing means being series connected in said first control loop and having a normally closed condition and assuming an open condition upon the occurrence of an alarm condition, latching means responsive to said first sensing means having a latched condition for effecting energization of said signaling means and an unlatched condition preventing the energization of said signaling means, said latching means assuming said latched condition in response to said first sensing means sensing the occurrence of an alarm condition, code receptive means offering a first signal when presented with a predetermined code and a second signal when presented with a code other than said predetermined code and bypass means connected in parallel to said sensing means and responsive to said first signal of said code receptive means to conduct the limited flow of current past said sensing means to render said sensing means ineffective for actuation of said signaling device and responsive to said second signal to prevent the conduction of the limited flow of current past said sensing means to allow said sensing means to actuate said signaling device.

2. A security system as defined in claim **1,** in which said control circuitry includes switch means that are electrically actuated for actuating said signaling device, and said means that limit the current flow through said normally closed loop being connected in common to said loop and to said switch means, said switch means being actuated by a rise in the potential of the limited current flow thereto affected when the current flow in said loop is interrupted by an open condition of said sensing means.

3. A security alarm system as defined in claim **1** further including time delay means responsive to said first signal of said code receptive means to maintain said bypass means effective for a time after said first signal is removed to prevent actuation of said signaling device during that time.

4. A security system as defined in claim **1** further including second and third normally open control loops associated with said control circuitry and energized by said power supply, second and third sensing means each series connected in the corresponding second or third control loop and having a normally open condition and assuming a closed condition upon the occurrence of an alarm condition for effecting actuation of said signaling means and switch means for controlling the flow of current through the first mentioned control loop and said second control loop, said switch means having an on condition providing for current flow through said first and second control loops to enable said first and second sensing means to sense the presence of an alarm condition, said switching means having an off condition preventing the flow of current through said first and second control loops to prevent said first and second sensing means from sensing the presence of an alarm condition, said switch means being inneffective to control current flow through said third control loop to enable said third sensing means to be effective to effect actuation of said signaling means when said switch means is in an off condition or an on condition.

5. A security alarm system as defined in claim **1** including means responsive to said second signal for actuating said signaling device independently of said sensing means.

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