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Vosbikian et al.

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[54] **CABINET WITH JAM SWITCH AND ALARM SYSTEM**

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[52] **U.S. Cl.**.....**340/274,** 200/61.76

[51] **Int. Cl.**.....**G08b 13/06**

[58] **Field of Search** ...340/274, 276, 282; 200/61.76, 200/61.8; 317/141

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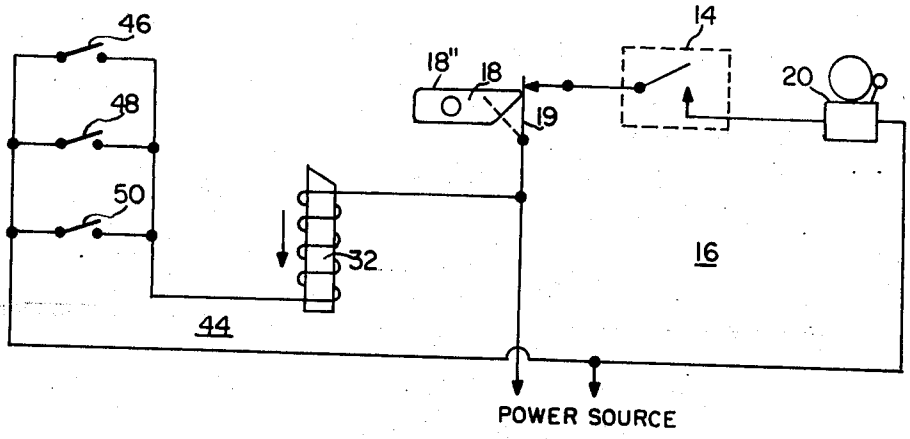
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[57] **ABSTRACT**

An alarm system for use in protecting structures such as houses, apartments and the like, having movable access means such as doors and windows. A signal actuating means is movable between a preset position and a signal actuating position through a set position. The movement of the actuating means from the preset position to the set position and from the set position to the signal actuating position is timed through the action of a mechanical timer. A trigger means is provided for engaging and stopping the movement of the actuating means in the set position. A tripping means is connected to the trigger means and is associated with a detecting circuit. The opening of the access means controls the detecting circuit to actuate the tripping means whereby the trigger means is moved out of engagement with the actuating means to permit the actuating means to continue its cycle from the set position to the signal actuating position. A signaling means, such as a bell, is energized when the actuating means reaches the signal actuating position to energize a signal control circuit. In a preferred embodiment of the invention, a self-contained, portable, low voltage power supply is utilized to drive both the detecting circuit and signal control circuit. In a second preferred embodiment of the invention, a high voltage alternating current source is utilized in conjunction with a step-down transformer to energize the detecting circuit and signal control circuit.

3 Claims, 6 Drawing Figures



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SHEET 1 OF 2

FIG. 1

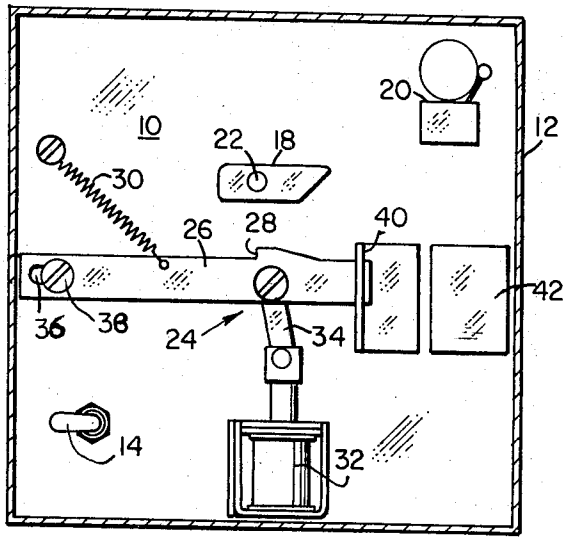


FIG. 3

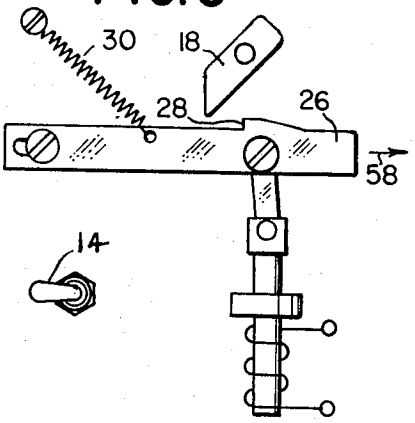


FIG. 4

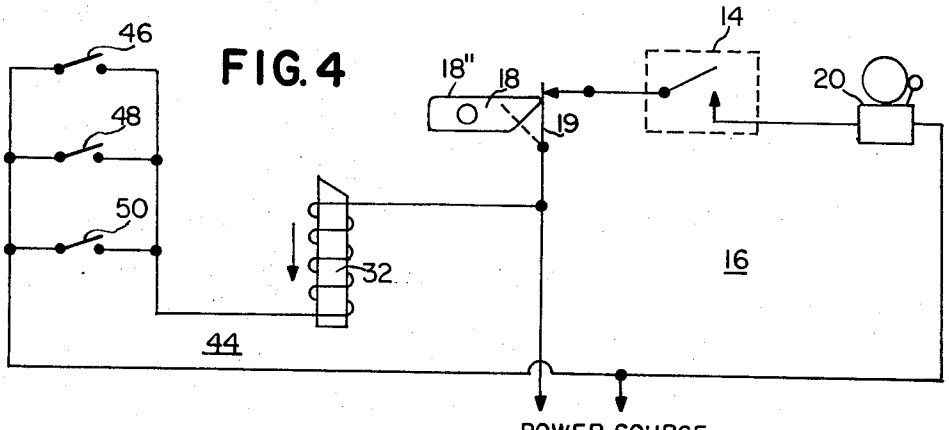
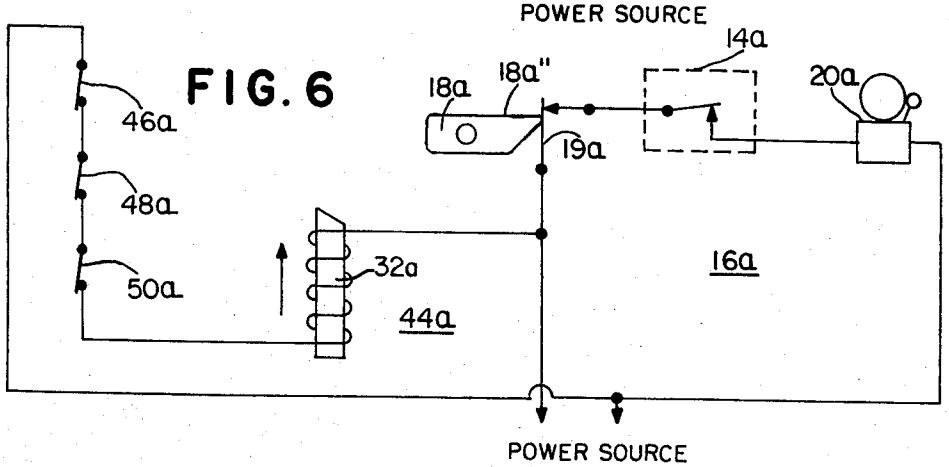


FIG. 6



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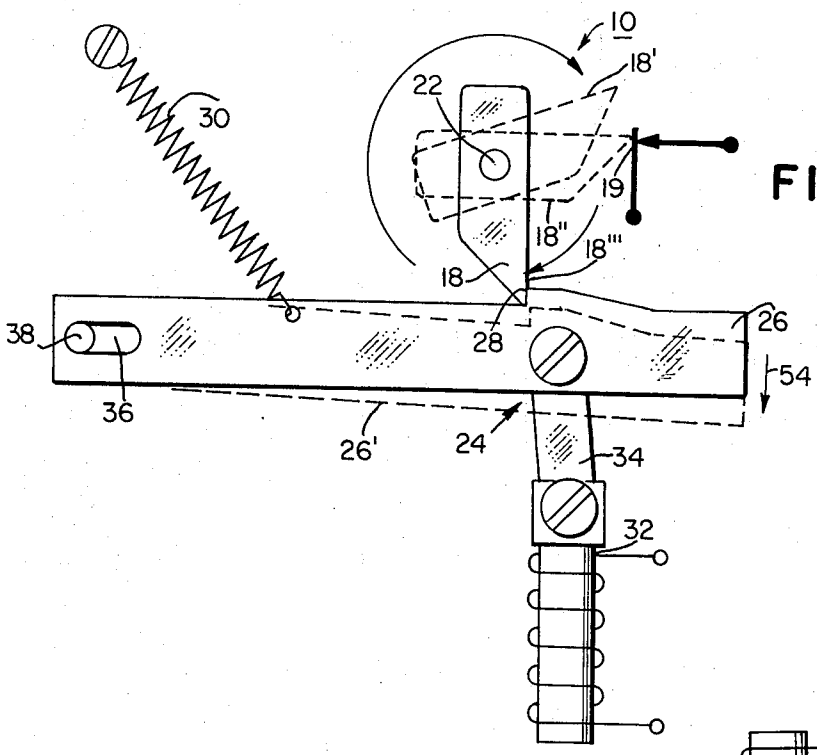


FIG. 2

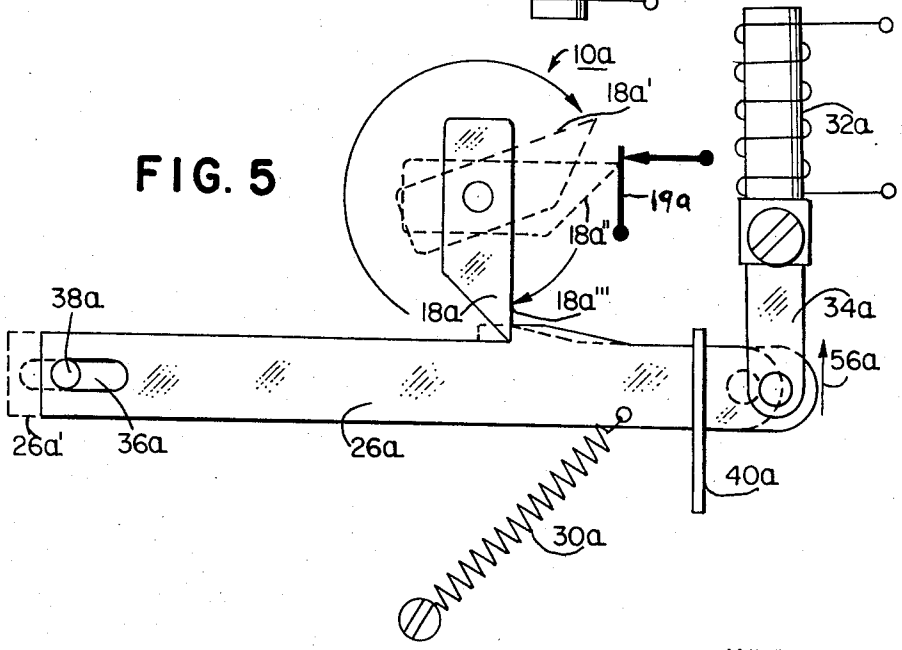


FIG. 5

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CABINET WITH JAM SWITCH AND ALARM SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to alarm systems, and more specifically, to burglar alarm systems for use in protecting structures such as houses, apartments, business establishments and the like.

2. Description of the Prior Art

Complex electronic burglar alarm systems are presently available for installation in homes and in other structures which are to be protected. Such systems are expensive to install and usually require professional personnel to maintain or to repair them when they malfunction. The operative components of many systems are encased in difficult to reach areas, such as within the confines of doors, as exemplified in U.S. Pat. No. 771,749. Because of the inaccessability of components of existing alarm systems, maintenance and installation work is extremely time consuming and expensive.

The need exists for a low cost alarm system which is reliable in operation, easy to install, and which can be maintained in effective operation at a low cost.

SUMMARY OF THE INVENTION

This invention relates to low cost, extremely reliable, electromechanical alarm systems for protecting structures such as houses, apartments, business establishments and the like. The alarm systems of this invention are designed to sell for approximately one hundred dollars, and can be installed and maintained by a relatively inexperienced mechanic, such as a homeowner with average mechanical capabilities. The majority of components in the alarm systems of this invention can be housed within a cabinet mounted on a wall and are therefore easily accessible for repair.

The alarm systems of this invention have a signaling device, such as a bell, which is energized to signal the opening of an access means of a structure to be protected. An actuating means is connected through a mechanical timing device to move from a preset position to a signal actuation position through a set position. A movable trigger means is provided for engaging and stopping the movement of the actuating means in the set position when all access means, such as doors, windows and the like, of a protected structure are closed. The rigger means is connected to a tripping means which in turn is controlled by a detecting circuit to trip the trigger means upon the opening of an access means. Tripping the trigger means releases the actuating means to permit said actuating means to move to the signal actuating position, whereat the signaling means is energized to indicate that an access means has been opened. The time required for the actuating means to move from the preset position to the set position allows an individual to exit from the protected structure before the actuating means reaches the set position. Opening of an access means, such as a door, to exit from the structure, trips the trigger means. However, since the actuating means has not reached the set position due to the time delay, the tripping of the trigger means does not release the actuating means from the set position to permit its movement to the signal actuating position. The time delay required for

the actuating means to move from the set position to the signal actuating position permits an occupant to enter the protected structure to disengage the alarm before the signaling means is energized. Because there is a time delay from the time an access means is opened until the alarm is energized, alarm de-energizing switches are not required to be mounted on the outside of the protected structure. The requirement for alarm de-energizing switches mounted on the outside of a protected structure, as well as the circuitry connecting such switches to the other alarm components, represents a cost factor which is not present in the alarm systems of the invention. In the alarm systems of this invention, jamb responsive switch means are mounted in door jambs, and in other access areas, such that the opening of any access means actuates an associated switch to control the detecting circuit.

In one preferred embodiment of this invention, the power supply for driving both the detecting circuit and signal control circuit is a low voltage, self contained, DC power supply, and each jamb-responsive switch is mounted in parallel with every other jamb responsive switch and in series with the tripping means. The jamb-responsive switches are closed when an access means is opened to thereby energized the detecting circuit to trip the trigger means and actuate the alarm. The only elements of the alarm system extending outside of a cabinet which houses the majority of the alarm system components, are jamb-responsive switches and the conductors connecting such switches to the tripping mechanism and power supply.

In a second embodiment of this invention, the power source for driving both the detecting circuit and signal controlling circuit is a high voltage, alternating current source which is utilized in connection with a step-down transformer. In this system, the jamb-responsive switches are closed when the access means are closed and are opened to de-energize the detecting circuit when an access means is opened. In this embodiment of the invention, the de-energizing of the detecting circuit trips the trigger means to actuate the alarm. The various jam responsive switches which are mounted in access means such as door jambs, window jambs, and the like, are mounted in series with each other, and in series with the tripping mechanism.

It is an object of the present invention to provide improved alarm systems of the type set forth.

It is a further object of this invention to provide alarm systems which are low in cost and reliable in operation.

It is a further object of this invention to provide alarm systems in which a time delay exists between the opening of an access means of a protected structure and the actuation of the signaling device of the alarm system.

It is a further object of this invention to provide alarm systems wherein jamb-responsive switches are mounted for actuation by the opening and closing of access means.

It is a further object of this invention to provide an alarm system utilizing a relatively low cost, low voltage, self-contained DC power source for driving a detecting circuit and signal control circuit.

It is a further object of this invention to provide an alarm system utilizing a high voltage, alternating cur-

rent source in conjunction with a step-down transformer for driving the detecting circuit and signal control circuit.

Other objects and a fuller understanding of the invention will be had by referring to the following description and claims of the preferred embodiments thereof, taken in conjunction with the accompanying drawings wherein like reference characters refer to similar parts throughout the several views and in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic front elevation view of a first embodiment of this invention.

FIG. 2 is a schematic representation showing the components of the first embodiment of this invention in one position.

FIG. 3 is a schematic representation of the first embodiment of this invention showing some of the components thereof in a different position.

FIG. 4 is a schematic representation of the circuitry associated with the first embodiment of this invention.

FIG. 5 is a schematic representation of a second embodiment of this invention.

FIG. 6 is a schematic representation of the circuitry for controlling the second embodiment of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

For simplicity of discussion, the alarm systems of this invention will be described for use in homes. It is understood, however, that the alarm systems of this invention can be used to protect any other type of structure having access means.

The construction and operation of a first preferred embodiment of an alarm system of this invention will be described with reference to FIGS. 1–4. The alarm system **10** is housed within a cabinet **12** which can be provided with a lockable door (not shown). The cabinet **12** mounts on a wall or in any other suitable location. The cabinet **12** is shown in section in FIG. **1** to expose details of construction of the alarm system. An alarm conditioning switch **14** (FIG. **1**) is provided for conditioning a signal control circuit **16** (FIG. **4**) in such a manner that when an actuating arm **18** is in the alarm actuating position **18''** (FIGS. **2** and **4**) to close an actuating switch **19**, a signaling device **20** which in the preferred embodiment of the invention is a bell, will be actuated. The actuating arm **18** is rotatably movable between a preset position **18'** and the alarm actuating position **18''** through a set position **18'''** (FIG. **2**). Prior to conditioning the alarm for operation, the actuating arm **18** is normally disposed in the alarm actuating position **18''**. Therefore, before setting the alarm, the system can be checked out by merely flipping the alarm conditioning switch **14** to its "on" position which will complete the alarm control circuit to actuate the signaling device **20** to assure that the system is operative. Once the system is checked out, the actuating arm **18** can be rotated in a clockwise direction (FIG. **2**) out of the alarm actuating position **18''**, through the set position **18'''** to the present position **18'**.

The actuating arm **18** is connected to a conventional mechanical timer (not shown) through a shaft mount **22** in well known manner. The mechanical timer can be similar to those commonly utilized on stoves and other appliances. One timer suitable for use in conjunction with the alarms of this invention is manufactured by M. H. Rhodes & Co. of Hartford, Connecticut, as hereinafter more fully set forth, the mechanical timer controls the time duration for rotative movement of the actuating arm **18** from the preset position **18'** to the set position **18'''**, and from the set position **18'''** to the alarm actuating position **18''**.

A triggering assembly **24** (FIGS. **1** and **2**) is provided for triggering the operation of the alarm system in response to the opening of a door, or other protected access means of a house. The triggering assembly **24** comprises a trigger bar **26** having an upstanding stop surface **28** for engaging the actuating arm **18** and stopping the latter's rotative movement in set position **18'''**. (FIG. **2**). The trigger bar **26** is connected to a tripping means in the form of a tensioned coil spring **30** and a solenoid **32**. The solenoid **32** connects to the trigger bar **26** through a connecting link **34** which pivotally connects to the solenoid and trigger bar. The trigger bar **26** is mounted for substantially longitudinal movement at one end through the interaction of an elongated slot **36** and a pin **38**, and is supported at the other end through a channel member **40**. (FIG. **1**) A power supply, in the form of a self contained, low voltage, heavy duty battery **42** (FIG. **1**) is provided for driving a detecting circuit **44** and the signal control circuit **16** (FIG. **4**).

Referring now to FIG. **4**, the detecting circuit **44** contains a plurality of contactors, or jamb-responsive switches, three of which are shown at **46**, **48** and **50**.

It is understood that the number of jamb-responsive switches which are provided will depend on the number of access means which are to be wired into and protected by the alarm system. The jamb-responsive switches are wired in parallel with respect to each other, and are mounted in series with the solenoid **32**. The jamb-responsive switches are mounted in association with access means, such as doors, windows, and the like, such that said switches are in an open, or circuit breaking position, when the access means are closed. The opening of an access means will close its associated switch for completing the detecting circuit **44** to energize the solenoid **32**. Closing an access means which has previously been opened will de-energize the detecting circuit, and thereby de-energize the solenoid **32** (assuming all other access means are closed). The signal control circuit **16** contains the alarm conditioning switch **14** therein. When the switch **14** is in the "off," or open position, the signal control circuit **16** will remain de-energized, regardless of the condition of the detecting circuit **44**. When the alarm conditioning switch **14** is in the "on," or closed position, the signal control circuit **16** will remain de-energized until the actuating switch **19** is closed by the movement of the actuating arm **18** into the alarm actuating position **18''**.

The alarm system **10** is operated in a manner which will now be described. Prior to setting the alarm system, the actuating arm **18** is usually in the alarm actuating position **18''**; however, it is not critical to the invention that the actuating arm be in this position. With the actuating arm **18** in the alarm actuating position **18''**, the alarm conditioning switch **14** is flipped to the "on," or, closed position to test out the signal con-

trol circuit to assure that it is operating properly. Referring to FIG. 4, it is obvious that when the alarm conditioning switch 14 is in the closed position and the actuating arm 18 is in the alarm actuating position 18'', the signal control circuit 16 is closed and energized to operate the signaling device 20. Once the alarm system has been checked out, the actuating arm 18 is turned in a clockwise direction as indicated in FIG. 2, to the preset position 18'. The time required for the actuating arm to move from this preset position 18' to the set position 18''' under impetus of the mechanical timer (not shown) is sufficient to permit occupants of the house to exit through a door and close the door prior to the actuating arm 18 reaching the set position 18'''. This is critical to the operation of the device, since the opening of a door will close an associated jamb-responsive switch (e.g., 46, 48 or 50) to energize the solenoid 32 to move the trigger bar in a downward direction as indicated by the arrow 54 to the position 26' (FIG. 2) as indicated in phantom lines. If the actuating arm 18 rotates to the set position 18''' before the door is closed, the rotation of the actuating arm will not be stopped by the trigger bar stop surface 28 and will continue on to the alarm actuating position 18'' to energize the circuit 16 and thus sound the signal device 20. Once the occupants in the house leave and shut the door, the solenoid 32 will de-energize, and the trigger bar 26 will return to the position shown in solid lines in FIG. 2. In this position, the stop surface 28 of the trigger bar will engage the actuating arm and stop said arm in the set position 18'''.

Prior to the engagement of the actuating arm with the stop surface 28 of trigger bar 26, the trigger bar will be in the position illustrated in FIG. 3. Engagement of the actuating arm with the stop surface 28, will move the trigger bar 26 in the longitudinal direction indicated by arrow 58 to the position shown in FIG. 2.

The channel in channel member 40 through which the trigger bar 26 extends is dimensioned to permit and guide such longitudinal movement. In this position, the coil spring 30 is tensioned to bias the trigger bar 26 back to the position shown in FIG. 3 once the trigger bar is moved downwardly to position 26' (FIG. 2) such that the surface 28 of the trigger bar disengages from the actuating arm 18. The alarm system 10 is conditioned to indicate the opening of a door or other access means when the actuating arm is disposed in the set position 18''', against the stop surface 28 of the trigger bar 26 (FIG. 2). If a person attempts to enter the house by opening a window, door, or other access means having a jamb-responsive switch associated therewith, such switch will be closed to actuate the solenoid 32. Actuation of the solenoid 32 will cause a downward movement of the trigger bar 26 to position 26' shown in phantom line representation in FIG. 2. In this position, the stop surface 28 of the trigger bar rides clear of the actuating arm 18 and the coil spring 30 functions to pull the trigger bar 26 into the position shown in FIG. 3 to thereby positively insure the disengagement of the trigger bar from the actuating arm 18. Once the actuating arm 18 is disengaged from the trigger bar 26, the timed cycle of the actuating arm 18 initiates from the set position 18''' to the alarm actuating position 18''. When the actuating arm reaches the alarm actuating position, the switch 19 (FIG. 4) closes to energize the signal control circuit 16 and thereby energize the bell, or other signal device 20. Means have been incorporated to vary the time operation of the actuating arm 18 by adjusting the location of the preset position 18'. Thus, a longer rotative period or a shorter period may be provided as desired by the operator.

The time delay between the opening of an access means and the energizing of the signal control circuit enables the occupants of the house to enter the house, open the alarm containing cabinet 12 and de-energize the system prior to the energizing of the signal control circuit. The system is de-energized by merely flipping the alarm conditioning switch 14 to the "off," or open position.

If the alarm is conditioned for operation, and an individual opens a door or other access means, there is no way of de-energizing the alarm circuit without getting into the cabinet structure 12, since the complete signal control circuit, including the power supply, is housed within said cabinet structure. The only components which are not enclosed within the cabinet structure are the jamb-responsive switches, e.g., 46, 48 and 50, and their associated connectors.

As hereinbefore set forth, the provision of a time delay between the opening of an access means to the house, and the actuation of a signal device makes it unnecessary to provide external de-energizing switch means on the outside of the house. The elimination of this requirement makes the alarm system 10 of this invention more economical than those systems requiring such an external de-energizing switch means.

In the alarm system 10, the only time there is an electrical drain on the power supply 42 is when an access means is opened to close one of the jamb-responsive switches, or when the signal control circuit 16 is completed by the closing of actuating switch 19 and alarm conditioning switch 14. Since there is relatively little demand on the power supply supply, the alarm system 10 of this invention is readily adaptable for use with a heavy duty, low voltage direct current power supply, such as a 6 volt heavy duty battery.

It is also within the scope of this invention to provide a detecting circuit conditioning switch in one of the lines of the detecting circuit 44. Such a switch will have the same function in the detecting circuit, as the alarm conditioning switch 14 has in the signal control circuit 46. Such a switch might be desirable, since it may be common during various times of the year to leave windows and other access means opened. By providing a detecting circuit conditioning switch, the detecting circuit can be de-energized so that there will not be any drain on the power supply in the event that windows or other access means are left open.

Referring now to FIGS. 5–7, a second embodiment of this invention will now be described. In this embodiment of the invention, components which are similar to components of the first embodiment of this invention will be designated by the same numerals with a suffix *a* thereafter.

The second embodiment of this invention operates in the same manner as the first embodiment of the invention, except as to those differences in operation and construction which will now be described. In the second embodiment of the invention the alarm system 10*a* is adapted to be operated with a high voltage power

supply, and requires a transformer (not shown) since the solenoid **32***a* is continually energized when the access means of a house are closed. The alarm system **10***a* is conditioned for operation when the actuating arm **18**a is in the set position **18***a'''*, as shown in FIG. **5**. The trigger bar **26***a* is maintained in engagement with the actuating arm **18***a*, by the action of the energized solenoid **32***a* which tends to pull the trigger bar **26***a* upwardly in the direction of arrow **56***a* against the counteracting force of the tension coil spring **30***a*. Upward movement of trigger bar **26***a* is limited by a channel member **40**a. Note, that when alarm system **10**, described in FIGS. **1–4**, is conditioned, the solenoid **32** is not energized, whereas when the alarm system **10***a* is conditioned, the solenoid **32***a* is energized.

Referring to FIG. **6**, the contactors or jamb-responsive switches **46***a*, **48***a* and **50***a*, which are associated with access means such as doors, windows and the like, are connected in series with respect to each other and also with respect to the solenoid. These switches are closed when associated access means are closed. Therefore, when all access means are closed, there is a continual flow of electrical current through the solenoid. Note, that in the alarm system **10** described in FIGS. **1–4**, the switches **46**, **48**, and **50** are in an open position when all access means are closed, and the solenoid **32** is de-energized.

When the alarm system **10***a* is conditioned for operation, and an individual opens an access means, the jamb-responsive switch associated with that access means will open to thereby de-energize the solenoid **32***a*. When the solenoid **32***a* is de-energized, the coil spring **30***a* will pull the trigger bar **26***a* downwardly whereby the stop surface **28***a* will clear the actuating arm **18**, and the coil spring will then pull the trigger bar **26***a* rearwardly to the position shown at **26***a'* (FIG. **5**).

Since the solenoid **32***a* is continuously energized when the alarm system **10***a* is conditioned for operation, a transformer associated with a high voltage source must be utilized. A self contained low voltage DC source would not be suitable for the alarm system **10***a*, since it would be quickly drained, and therefore have a short useful life. The alarm system **10***a*, could be adapted for operation off a standard 110 volt line.

We claim:

1. In an alarm system for use in protecting window and door openings in a structure of the type employing jamb-responsive switches, a power supply, an alarm signal device and having no alarm de-energizing switch exterior of the structure, the combination of

A. a cabinet including a channel member;

B. a triggering assembly mounted within the cabinet and movable relative to the channel member,

1. said triggering assembly comprising a trigger bar which has a first end and a second end,

a. said first end being pivotally connected to the said cabinet,

b. said second end being slidingly restrained by the said channel member,

c. said trigger bar being formed to provide an upstanding stop surface,

d. said trigger bar being movable from a first position to a second position;

C. a tripping means assembly associated with the triggering assembly, and including a solenoid, a coil spring and a connecting link,

1. said solenoid being movable from a first position to a second position in response to a function of a said jamb responsive switch,

2. said solenoid pulling the trigger bar about its said pivotal connection to its second second position when moved to its second position by function of a jamb operated switch,

3. said spring biasing between a portion of the cabinet and the trigger bar to continuously urge the trigger bar to its said first position;

D. an actuating arm rotatably mounted upon the cabinet through a mechanical timer,

1. said actuating arm being rotatable from a preset position to a set position to an alarm actuating position through a timed cycle of operation,

2. said actuating arm being retained in the said set position by engagement against the said upstanding stop surface when the trigger bar is in its first position,

3. said actuating arm being rotated to its alarm actuating position when the solenoid pulls the trigger bar to its second position to disengage the actuating arm from the upstanding stop surface; and

E. an alarm circuit including the power supply, the jamb responsive switches, the solenoid and the alarm signal device,

1. said alarm circuit including a normally open actuating switch,

a. said actuating switch being closed by the actuating arm when the actuating arm is permitted to rotate to its alarm actuating position when the trigger bar is moved to its second position,

b. said alarm signal device being powered to emit a warning sound when the actuating switch is closed.

2. The invention of claim **1** wherein the first end of the trigger bar is pivotally connected to the cabinet by means of a cabinet mounted stationary pin interacting with an elongated slot provided in the said first end.

3. The invention of claim **2** wherein the trigger bar has both rotative movement and longitudinal movement relative to the said pin to positively insure disengagement of the trigger bar from the actuating arm when the solenoid functions to pull the trigger bar to its said second position.

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