

- [54] **MOTION-SENSITIVE ALARM WITH
LINE-CORD-RESPONSIVE AUTOMATIC
ARMING MEANS**

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FOREIGN PATENTS OR APPLICATIONS

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- [21] Appl. No.: 420,536

Related U.S. Application Data

- [60] Division of Ser. No. 119,115, May 15, 1972, which is a continuation-in-part of Ser. No. 820,169, April 29, 1969.

- [52] U.S. Cl..... 340/280, 340/256, 340/261,
340/420

- [51] Int. Cl. G08b 13/14

- [58] **Field of Search** 340/280, 256, 261, 420

References Cited

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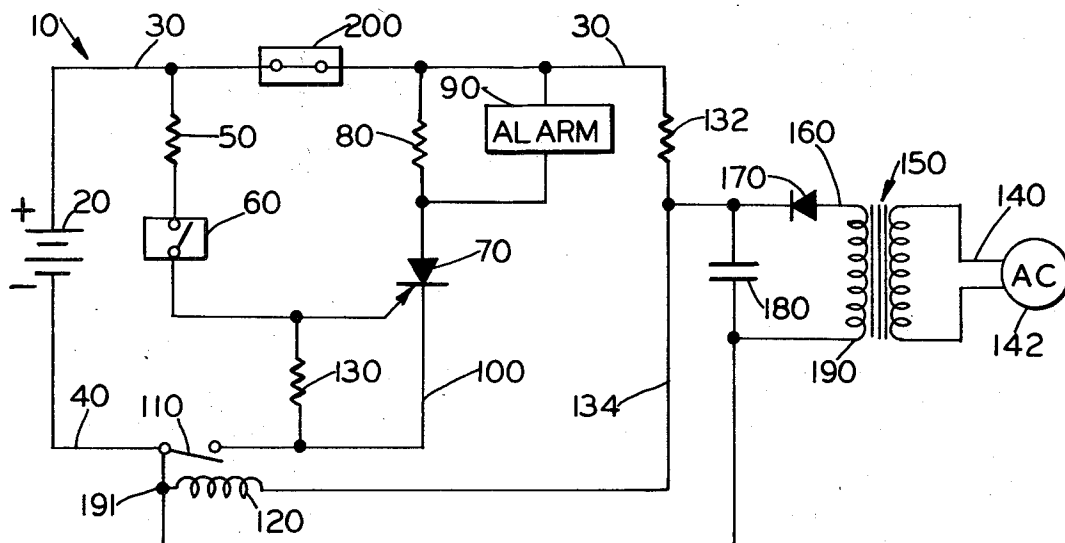
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[57]

ABSTRACT

A circuit and apparatus adapted to be mounted entirely or in part within the device to be protected includes an alarm circuit loop and a control loop, with the state of the control loop being determined by whether the line cord of the protected device is in or out of the wall socket. The control loop can thus disable or enable the alarm circuit, depending on the position of the power cord. However, actual operation of the alarm circuit requires both a change in the state of the control circuit due to the state of the line cord and a change in the alarm circuit due to movement of the protected device.

7 Claims, 2 Drawing Figures



PATENTED SEP 17 1974

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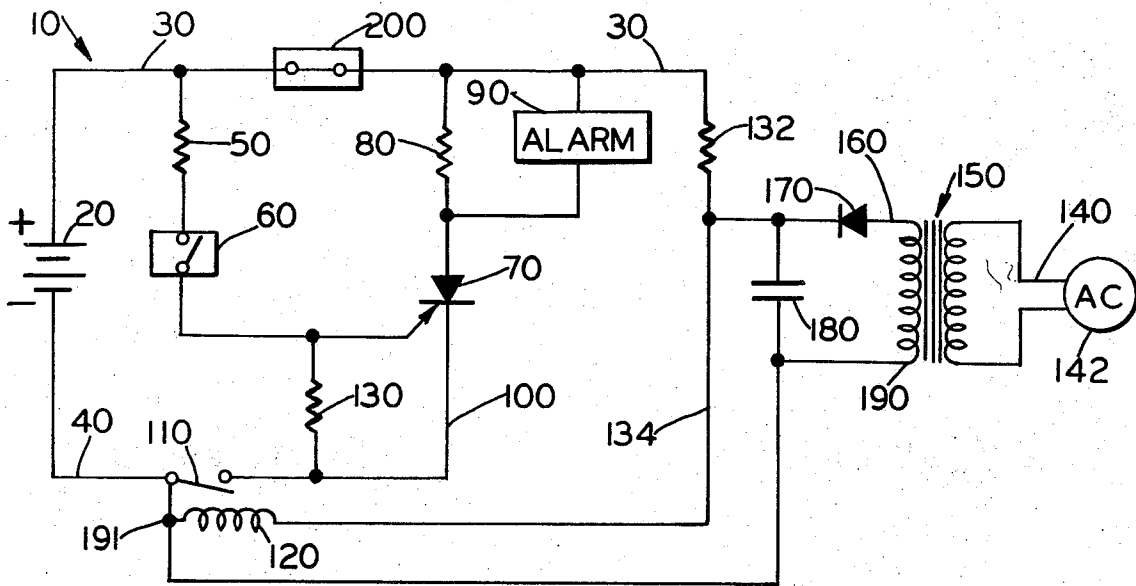


FIG. 1

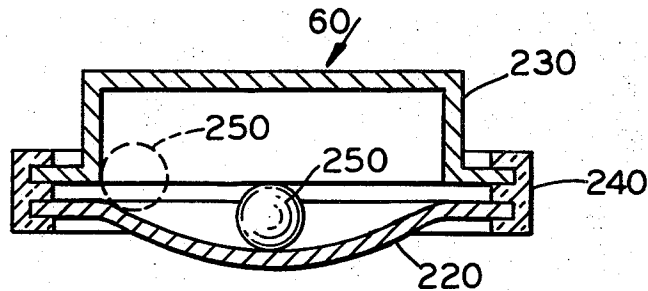


FIG. 2

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MOTION-SENSITIVE ALARM WITH LINE-CORD-RESPONSIVE AUTOMATIC ARMING MEANS

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a division of application Ser. No. 119,115, filed May 15, 1972 as a continuation-in-part of Ser. No. 820,169, filed Apr. 29, 1969.

BACKGROUND OF THE INVENTION

Many circuits and apparatus are known for operating alarm circuits, and at least one type of circuit is known for protecting TV sets, radios and the like in hotel and motel rooms and subject to considerable thievery. Some known circuits operate directly on removal of the power line cord, and others operate on movement of the protected device; however, none of the prior art provides a combination of controls, depending on both the condition of the line cord and movement of the protected device in the manner taught by the present invention. Such a combination is foolproof but permits authorized movement of the line cord and the protected device separately without energizing the alarm.

DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic circuit embodying the principles of the invention; and

FIG. 2 is a sectional view of one type of motion-sensitive switch useful in the circuit of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The circuit of the invention 10 includes a self-contained power source 20 such as a battery having a positive terminal connected to a bus 30 and a negative terminal connected to a bus 40. Bus 30 is connected through a resistor 50 to one side of a motion-sensitive switch 60 which is of the type which closes when it is moved or tilted. The other side of switch 60 is connected to the gate of a three-electrode controlled rectifier 70, known as an SCR. The anode of the SCR 70 is connected through a resistor 80 to the bus 30. SCR 70 is a three-electrode semi-conductor switch; however, other devices of this type might also be used to perform the indicated function. An alarm bell 90 or other signalling device is connected across the resistor 80. The cathode of the SCR 70 is connected by lead 100 through a reed switch 110 mounted inside a coil 120. A bias resistor 130 is connected between the gate and cathode of the SCR.

Bus 40 is connected through a resistor 132, lead 134, and coil 120 to bus 30 to permit a trickle charge to flow if battery 20 is a rechargeable battery such as a nickel cadmium battery.

The circuit 10 also includes the power cord of the device to be protected represented by numeral 140 and connected from the usual commercial A.C. power supply 142 to a transformer 150, the secondary of which has one end 160 connected through a diode 170 to lead 134 and to coil 120 with a capacitor 180 connected from the diode 170 to the other end 190 of the secondary of transformer 150. The diode 170 and capacitor 180 provide a D.C. voltage from the A.C. applied to the transformer 150 to energize the coil 120 of the reed

switch. The end 191 of the coil 120 is connected to bus 40 and to the end 190 of the transformer secondary.

A switch 200 operates by a key, so that authorized disabling of the alarm circuit can be effected, is provided in the alarm circuit, for example, in the bus 30, so that the battery 20 can be disconnected from the alarm portion of the circuit by authorized persons.

The alarm warning system 10 works in the following manner: If the line cord 140 is connected to the A.C. power line 142 and power is supplied to the primary of the transformer 150, the A.C. in the transformer secondary is rectified by the diode 170 and filtered by the capacitor 180 to produce a D.C. voltage which energizes the coil 120 of the reed switch 110. Energy generated in the coil opens the reed switch and thus opens the lead 40 which extends from the battery 20 through lead 100 to the cathode of the SCR 70 and disconnects the battery from the SCR and thus prevents the alarm 90 from being activated. In this condition, the alarm-protected appliance can be moved to the length of the line cord without setting off an alarm. The key switch 200 permits authorized personnel to remove the appliance when the line cord is disconnected by opening bus 30 and removes the battery power that operates the alarm.

If the line cord 140 is removed or disconnected from source 142, the primary power to the transformer is removed from the circuit and coil 120 is de-energized and reed switch 110 closes. This supplies battery power to the cathode of the SCR 70. Now any motion or vibration of the TV set causes the motion switch 60 to close, and the closing of this switch, no matter of what duration, supplies a positive voltage pulse to the gate of the SCR 70, and this causes the anode and cathode of the SCR to conduct. This conduction supplies a current flow over the anode resistor 80 from the battery, and the current across this anode resistor activates the alarm 90 which is connected in parallel with the resistor.

Those skilled in the art will appreciate that the utility of the circuit of the invention goes beyond that specifically disclosed. For example, it could be adapted to other types of uses than protecting a TV set or the like. By selecting a different alarm condition sensing member other than the motion-sensitive switch 60, other conditions could be detected such as the opening or closing of doors or windows or conditions such as fire or the like.

Considering the motion-sensitive switch 60, a particularly suitable structure is shown in FIG. 2 and includes a relatively shallow, slightly concave annular lower plate 220 and a generally cup-shaped annular upper plate 230 spaced apart and secured together by a suitable annular insulating member 240 which may be of rubber or the like. A ball-type contact member 250 which may be solid and of a suitable metal or which may be of mercury is seated in the lower plate, and it can be seen that, if the lower plate is sufficiently shallow, then the slightest tilting of the protected device which carries the switch 60 will cause the ball 250 to roll to a side, shown in dash lines, and make contact between the top and bottom plates which are the two electrodes of the switch. In the circuit 10, even the slightest contact of the ball to the two plates, represented by the dash line position of the ball, is sufficient to operate the alarm system. Other motion-sensitive switches, such as pendulum switches, may also be used.

3

Of course, the alarm itself may be of any suitable type and number and may include an alarm on the protective device itself and/or remote alarm signal devices.

What is claimed is:

1. An alarm circuit for protecting an electrical device 5 including
 - a multi-electrode electronic switch having a first current flow path,
 - a first power source connected to said first flow path,
 - an alarm means in said first flow path of said multi-electrode switch,
 - said electronic switch having a control electrode which normally prevents current flow from said first power source through said first flow path and said alarm means,
 - a first motion-sensitive switch in series with said control electrode, with said first power source being connected to a second flow path including said motion-sensitive switch and said control electrode,
 - a second switch in said first flow path between said first power source and said multi-electrode switch,
 - a second power source removably coupled to said second switch, said second switch being open and said first current flow path being inoperative when said second power source is connected to said second switch, said second switch being closed and said first current flow path being closed when said second power source is disconnected from said second switch,
 - flow of current from said first power source through said multi-electrode switch and said alarm means being then controlled by the state of said motion-sensitive switch operating said control electrode and coupled with closure of said first switch permitting current flow through said first path and said alarm to operate said alarm.
2. An alarm circuit for protecting an electrical device including
 - a multi-electrode electronic switch having a first current flow path through two of its electrodes,
 - a first D.C. battery power source connected to said first flow path,
 - an alarm means in said first flow path of said multi-electrode switch,
 - said electronic switch having a control electrode which normally prevents current flow from said first power source through said first flow path and said alarm means,

4

- a first motion-sensitive switch in series with said control electrode, with said first battery power source being connected to a second flow path including said motion-sensitive switch and said control electrode,
 - a second relay-controlled switch in said first flow path between said first battery power source and said multi-electrode switch,
 - a second A.C. power source removably coupled to said second switch, said second switch being open and said first current flow path being inoperative when said second power source is connected to said second switch, said second switch being closed and said first current flow path being closed when said second power source is disconnected from said second switch,
 - flow of current from said first power source through said multi-electrode switch and said alarm means being then controlled by the state of said motion-sensitive switch which operates said control electrode, closure of said first switch permitting current flow through said first path and operation of said alarm.
3. The circuit defined in claim 2 wherein said first switch means closes when said electrical device is physically moved, and
 - said electrical device includes a power cord for connection to said second power supply and said second switch closes when said power cord is disconnected from said power supply due to the operation of the relay, the operation of said first and second switches serving to directly connect said power source to said alarm to cause it to operate.
 4. The circuit as defined in claim 2 wherein said electronic switch is a controlled rectifier having anode, cathode and control electrode, said anode and cathode being in said first current flow path.
 5. The circuit defined in claim 1 and including an isolating power transformer connected between said second power source and said second switch, whereby said circuit is isolated from said second power source.
 6. The apparatus defined in claim 1 wherein said motion-sensitive switch includes at least one curved, dish-shaped plate on which a conductive ball is seated.
 7. The apparatus defined in claim 1 wherein said motion-sensitive switch includes upper and lower plates secured together but insulated from each other with one being concave and the other convex and with a conductive ball seated on the lower plate.

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