

Oct. 6, 1970

F. M. PERELMAN

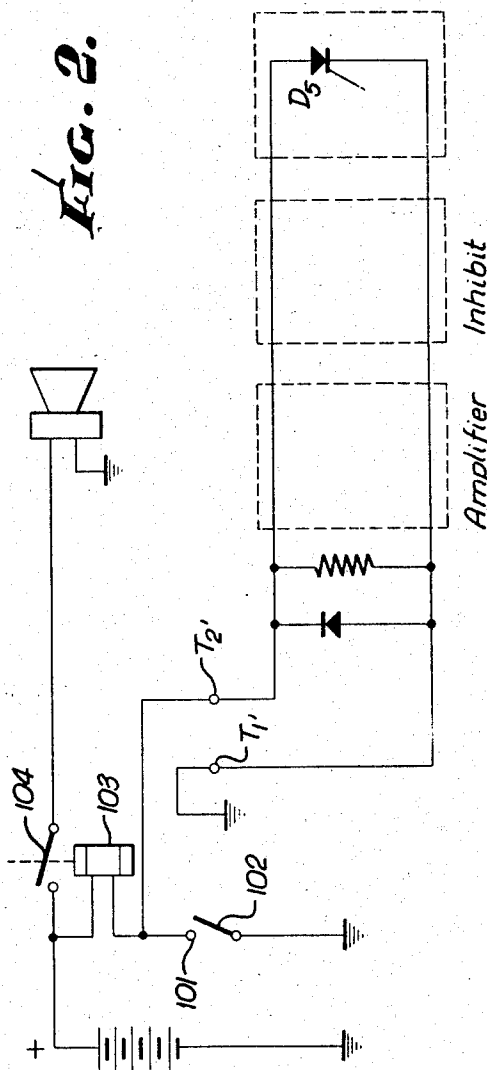
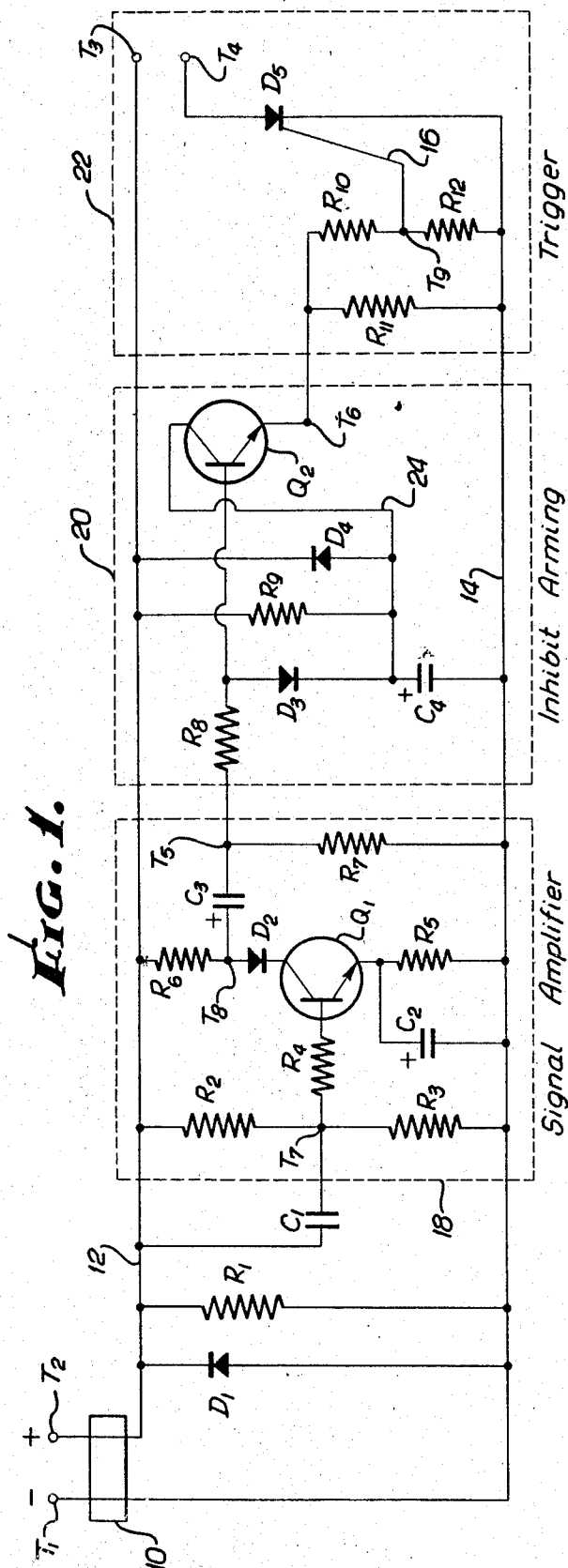
3,533,064

SUBSTITUTE FOR MISSING XR

VOLTAGE FLUCTUATION ALARM

Filed May 22, 1967

4 Sheets-Sheet 1



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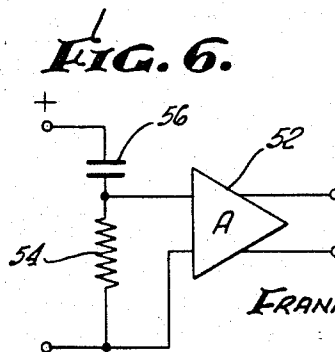
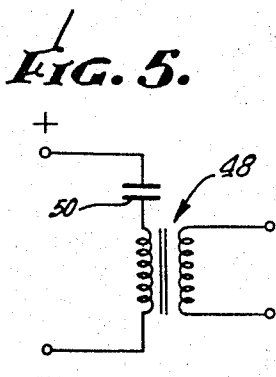
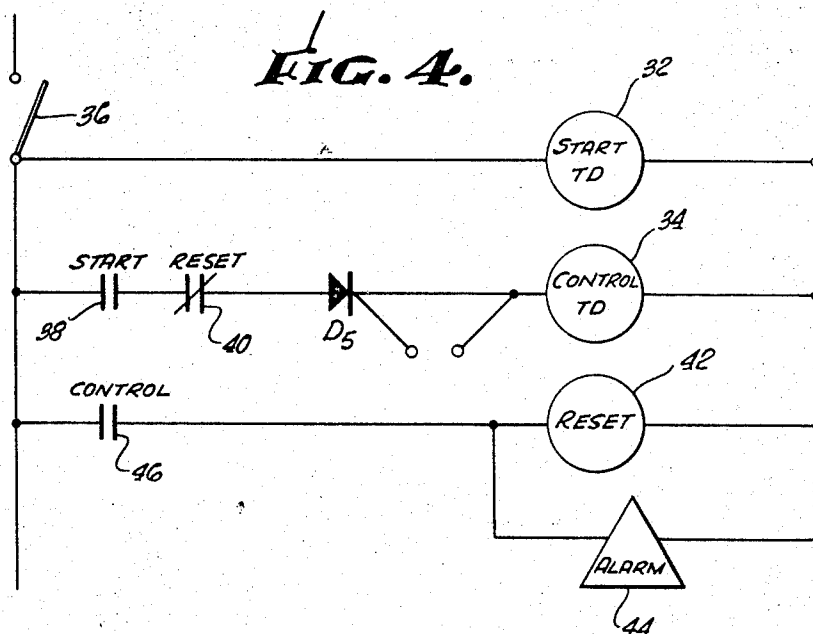
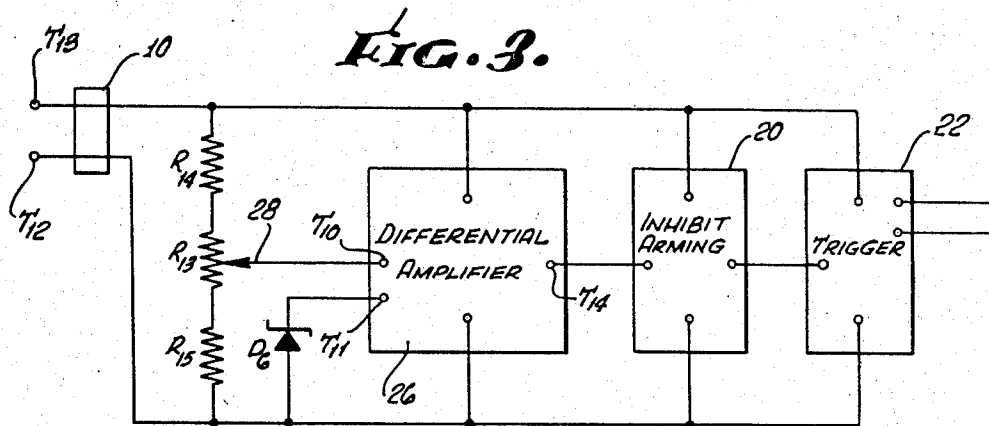
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VOLTAGE FLUCTUATION ALARM

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4 Sheets-Sheet 2



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VOLTAGE FLUCTUATION ALARM

3,533,064

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FIG. 7.

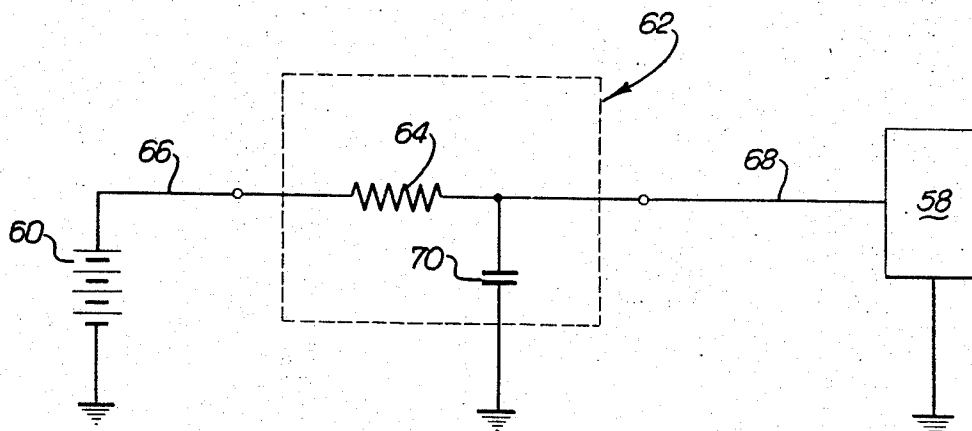
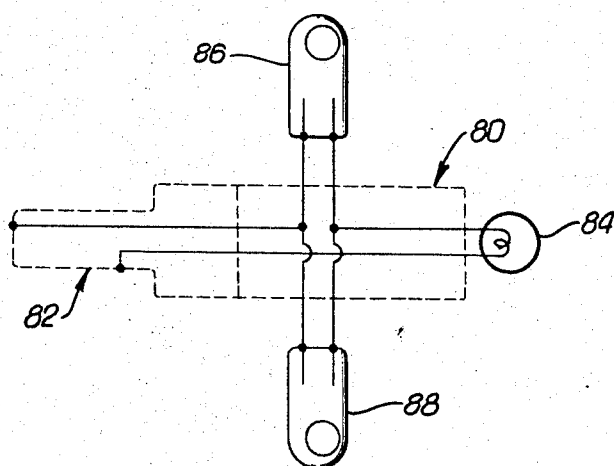


FIG. 8.



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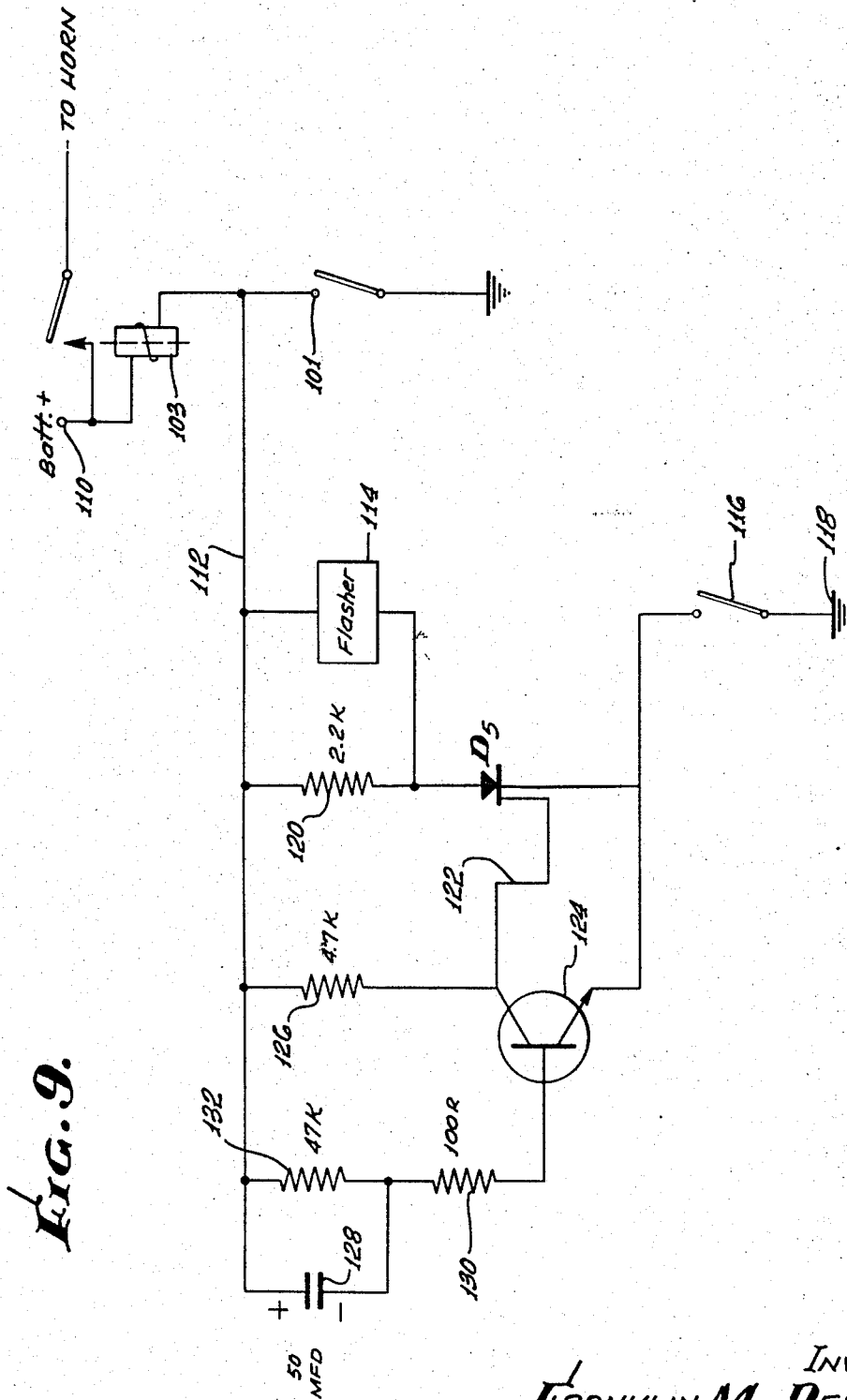
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3,533,064

VOLTAGE FLUCTUATION ALARM

Filed May 22, 1967

4 Sheets-Sheet 4



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3,533,064

VOLTAGE FLUCTUATION ALARM

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Continuation-in-part of application Ser. No. 575,755,

Aug. 29, 1966. This application May 22, 1967, Ser.

No. 640,276

Int. Cl. B60r 25/00; G08b 13/00

U.S. Cl. 340—63

22 Claims

ABSTRACT OF THE DISCLOSURE

A burglar alarm in parallel with a battery senses battery voltage fluctuations indicative of unauthorized tampering with load devices in the battery circuits. Isolating means are provided to prevent alarm actuation by normally operating load devices, and motion detectors are provided to warn of unauthorized motion.

RELATED APPLICATIONS

This is a continuation-in-part of application Ser. No. 575,755, filed Aug. 29, 1966, and now abandoned.

This invention relates to an alarm system for detecting unauthorized entry into a protected space or unauthorized use of electrical power and for operating an alarm.

In a motor vehicle, for example, a dome light or courtesy light may become energized upon opening of any door. This causes the flow of battery current, the detection of which may be used for operating an alarm. A system of this character is shown and described U.S. Pat. No. 2,935,730 issued May 3, 1960 to Samuel A. Proctor. This device utilizes as the sensing element, a current sensitive relay interposed between the battery and the load device that is operated when a door or trunk lid is opened. Consequently certain leads must be opened in order to install the current sensitive relay. I have discovered that operation of a dome or courtesy light also results in a fluctuation in battery voltage, which, with a sufficiently sensitive amplifier, is susceptible of detection. Accordingly the primary object of this invention is to provide an alarm system that detects unauthorized entry by sensing fluctuation, (dip or rise) in battery voltage whereby the device may be installed in parallel with the battery at any convenient terminals or outlets.

Another object of this invention is to provide an alarm system of this character that may be installed and armed by inserting a connector into a cigarette lighter socket.

Another object of this invention is to provide an alarm system of this character that utilizes simple inexpensive components, and which may be built into a car radio, stereo system, or the like to sound an external speaker, the horn, or the like.

Another object of this invention is to provide an auxiliary sensor responsive to unauthorized motion that operates an electrical load in turn to trigger the alarm.

Another object of this invention is to provide an alarm system of this character that incorporates unique circuitry utilizing simple components for preventing the alarm from operating for an initial period following arming. Accordingly the device itself may be located within the protected space, and the authorized user may arm it and then safely close and lock the space.

Another object of this invention is to provide an alarm system of this character that can be installed merely by connecting two terminals across the horn switch.

Another object of this invention is to provide an alarm system that may readily be adapted for use in detecting unauthorized use of electrical machinery.

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Another object of this invention is to provide means for preventing normal loads, such as an intermittently operable clock winding mechanism, from triggering the alarm.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of several embodiments of the invention. For this purpose, there are shown a few forms in the drawings accompanying and forming part of the present specification. These forms will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

FIGS. 1, 2, 3 and 4 diagrammatically illustrate various modifications of an alarm system incorporating the present invention;

FIGS. 5 and 6 illustrate alternate input circuits for use with the alarm system shown in FIG. 4;

FIG. 7 diagrammatically illustrates an isolation network for an electrical clock;

FIG. 8 diagrammatically illustrates an auxiliary motion sensor for operating the alarm; and

FIG. 9 diagrammatically illustrates a simplified circuit.

In FIG. 1 an alarm system that is designed to sense fluctuations in the voltage of an automobile battery and cause operation of a signalling device or horn. The device includes four terminals T₁, T₂, T₃ and T₄ for connection to the battery and the signalling device. Two terminals T₁ and T₂ are connected across the battery as by the aid of a connector structure 10 cooperable with a cigarette lighter socket; optionally the terminal may be wired to battery via an arming switch. The switch may be either key or combination operated, concealed, or inconspicuously located on the vehicle. The terminals T₃ and T₄ are adapted to be connected across the sounding or signalling device (not shown). For purposes of economics, the horn of the automobile may be used as the sounding device. For purposes of convenience, an additional horn, or sounder, accompanying the plug-in alarm, may be used as the sounding device. This affords quick installation.

The circuit for the sounding device is completed through the battery terminal T₂, a lead 12, terminals T₃ and T₄, the anode and cathode of a controlled rectifier D₅ to the other battery terminal via a lead 14. The controlled rectifier D₅ is normally in its off state, but may be switched to its on state upon the application of a suitable signal to a gate lead 16.

The signal ultimately applied to the gate lead 16 is created by a fluctuation in battery voltage due, for example, to the operation of courtesy lights. This signal is amplified by an amplifier 18. The output terminal T₅ of the amplifier 18 is connected to a device 20 that suppresses the signal until a predetermined time (say 30-40 seconds) following initial arming of the circuit as by insertion of the connector 10. The output terminal T₆ of the inhibit arming device 20 is applied to the trigger circuit 22 which incorporates the controlled rectifier D₅.

The signal amplifier 18 has an input capacitor C₁ that is connected between the input terminal T₇ of the amplifier and positive battery terminal T₂. The input terminal T₇ is connected through a feeder resistor R₄ to a base of an amplifying transistor Q₁. Resistors R₂ and R₃ form a voltage divider to determine a normal potential for the input terminal T₇ and thus the operating point of transistor Q₁. Resistor R₅ and capacitor C₂ both connected to the emitter of the transistor Q₁ form a suitable bias circuit. The collector of the transistor Q₁ is connected to the positive battery lead 12 through a collector resistor

R_6 and blocking diode D_2 , the function of which will be hereinafter described.

The output of the amplifying transistor Q_1 is derived from a terminal T_8 between the collector resistor R_6 and diode D_2 , and is fed to the output terminal T_5 via a coupling condenser C_3 . A resistor R_7 normally holds the output terminal T_5 at ground potential.

When the voltage of the battery suddenly dips, the capacitor C_1 transfers a negative pulse to the transistor Q_1 ; the terminals T_8 and T_5 accordingly swing positive. The positive pulse is applied through a feeder resistor R_8 to the base of a second amplifying transistor Q_2 incorporated in the inhibit arming device 20.

The base of the transistor Q_2 unlike that of transistor Q_1 is biased to ground through resistor R_7 . Accordingly the positive pulse must be of sufficient magnitude to overcome the threshold potential characteristic of the transistor Q_2 before any pulse is produced at the emitter of the transistor Q_2 . Moreover, the pulse that appears at the emitter of transistor Q_2 is applied to the gate lead 16, and hence must be of sufficient magnitude to overcome the threshold potential of the device D_5 if the alarm is to be operated.

The feeder resistor R_8 and a condenser C_4 prevent the pulses from reaching a value sufficient to fire the controlled rectifier D_5 until the condenser C_4 has charged sufficiently. One plate of condenser C_4 is connected to the positive battery lead 12 through a high resistor R_9 . The other plate is grounded.

Before the connector 10 is installed, the condenser C_4 has been discharged through a diode D_4 (which parallels the charging resistor R_9) and a relatively low resistor R_1 (to the left of the signal amplifier 18). When the connector 10 is inserted charge slowly begins to build on the capacitor C_4 , and the diode D_4 becomes back biased.

Any pulses appearing at terminal T_5 tending to rise above the then potential of condenser C_4 will be absorbed by the condenser C_4 and will be ineffective to operate transistor Q_2 . C_4 must therefore be charged to a voltage equal to the threshold voltage of Q_2 before transistor Q_2 conducts at all. This takes a certain time. After C_4 rises above the threshold voltage of Q_2 , it will still clip the signal. Hence, the clipped signal may not be adequate to fire rectifier D_5 even though the signal is passed by transistor Q_2 . The clipped pulses that operates Q_2 , moreover, cause condenser C_4 to discharge since the collector of Q_2 is connected to the condenser C_4 . Hence, signal during the transient period cause resetting of the inhibit arming device. Thus, before the condenser C_4 becomes sufficiently charged to permit passage of a signal adequate to fire rectifier D_5 , there must be a relatively long period (30 to 40 seconds) of substantially no disturbances.

Connecting the collector of transistor Q_2 to the condenser C_4 rather than to lead 12 thus lengthens the delay period without increasing the values of resistor R_9 and condenser C_4 . Inexpensive components are therefore acceptable since temperature and leakage remain non-critical. Diode D_3 isolates the positive potential of the condenser from the gate of the transistor Q_2 .

The resistors R_{10} and R_{12} together form an emitter load for the transistor Q_2 . The gate lead 16 is connected to the mid-terminal T_9 between the resistors R_{10} and R_{12} . The resistor R_{10} may be of approximately $\frac{1}{10}$ the ohmic value of the resistor R_{12} , and serves as a current limiting resistor for the gate of the controlled rectifier D_5 . The resistors R_{10} and R_{12} are scaled so as to obviate an extra stage of signal amplification while yet adequately limiting gate current. The resistor R_{12} stabilizes the characteristics of the controlled rectifier D_5 with respect to temperature, and prevents leakage currents from causing spurious firing. The resistor R_{11} provides an additional stabilization path from the gate 16 through R_{10} for temperature stability purposes without impairing the signal magnitude applied to the gate. Thus the resistor R_{12} is sufficiently low for temperature stability purposes; R_{10}

is high enough to provide current limiting functions without undue penalty to sensitivity. The judicious location of the resistor R_{11} stabilizes the controlled rectifier without reducing sensitivity.

Diode D_2 blocks direct transmission of transient signals through the low impedance collector path which would prematurely charge the condenser C_4 .

The diode D_1 serves two functions. It has a peak inverse voltage characteristic which is substantially lower than that of the devices Q_1 , Q_2 and D_5 . Accordingly any inductive voltages of positive polarity that might occur as a result of the stored energy in the sounding device will cause breakdown of the diode D_3 before it is permitted to rise to a level that might otherwise damage the components Q_1 , Q_2 and D_5 . Moreover the diode D_1 directly shunts induced voltages of the opposite polarity that might result from inductive effects.

The circuit shown can be coupled to an A.C. line by suitable transformers and rectifiers. The alarm will then operate to signal unauthorized activities, accompanied with the use of power, as for example the use of plant machinery after hours.

In the form of the invention illustrated in FIG. 2, the arrangement is identical except that the terminals T_1' and T_2' may be connected to the horn ring, as at the steering column. The terminal T_1' is connected to ground or the negative terminal of the battery as before. However, the terminal T_2' is connected to the horn ring 101 diagrammatically illustrated as a switch contact engaged by the blade 102. A horn relay 103 is in series circuit between the positive battery terminal and the horn ring 101. When the relay 103 is energized, a relay switch 104 completes the horn circuit. The horn relay 103 has a relatively low impedance and hence does not in any degree alter the operating characteristics of the amplifier, inhibit arming device or trigger. In this instance, the trigger device D_5 is connected directly across terminals T_2' and T_1' . When operative, the device D_5 provides a low impedance path for completion of the circuit of the relay 102, and the horn operates. In this instance, it is only necessary for two terminals to be connected to the existing apparatus.

The circuit illustrated in FIG. 9 connects to the horn relay 103 in the same manner as in FIG. 2. A trigger device D_5 is provided as before. When the device is switched on, a circuit is completed for the horn relay 103 as follows: Battery terminal 110, relay 103, lead 112, a flasher device 114, trigger device D_5 , and an on-off switch 116 to a ground terminal 118. The flasher 114 is a standard article of commerce comprising a normally closed switch that opens after a predetermined time period of operation. Hence, due to the action of the flasher, the horn is sounded periodically with a short delay between successive soundings. This is quite distinct from the continuous sound of a shorted horn that might go unnoticed.

Since the flasher operates intermittently, a holding circuit is required to maintain minimum current for the device D_5 adequate to prevent its returning to its high impedance state. For this purpose, a resistor 120 parallels the flasher. The current through the resistor 120 is adequate to keep the device D_5 in its low impedance state but inadequate to hold the relay 103.

This gate lead 122 connects to the midpoint of a divider network comprising the collector-emitter or a transistor 124 and a resistor 126. The divider network is connected across the source through relay 112 and on-off switch 116. The transistor 124 in a manner to be hereinafter described is normally saturated; hence the gate lead 122 normally has a potential approaching that of the ground terminal 118. This potential is inadequate to trigger the device D_5 . If the transistor is caused to operate in its controlled region or turned off, the voltage of the lead 122 will rise, and the device D_5 will be triggered.

The transistor 124 has an input circuit the operative element of which is a condenser 128 having a value of say, 50 microfarads. One end of the condenser connects to the

source lead 112, and the other connects to the base of the transistor 124 via resistor 130 of small ohmic value. The condenser 128 is paralleled by a resistor 132 of large ohmic value. This resistor could, if desired, be directly connected to the base of transistor 124. The resistor 130 protects the transistor 124 from excessive voltage rise which might otherwise occur upon large base currents.

The circuit is armed by closing the switch 116. The then uncharged condenser 128 conducts the source potential terminal 110 to the base of the transistor 124, and the gate lead 122 is appropriately biased. The base potential decreases as the condenser 128 comes up to charge, and current is passed through the base-emitter circuit via the resistor 132 just adequate to maintain saturation. There is thus an inherent time delay corresponding to the time constant of the condenser circuit and which may be adequate to allow location of the switch 116 within the protected space. Alternately, the switch 116 may be located exteriorly of the protected space.

Should any electrical load be operated after the sensing circuit reached equilibrium, the reduction in source voltage will be immediately transferred through the condenser 128, and the transistor 124 will assume a decreased conductivity adequate to trigger the device D_5 . Once triggered, the device D_5 will remain on, and the alarm operates. To reset the system, the switch 116 is operated.

In the form illustrated in FIG. 3, a differential amplifier 26 serves to detect a deviation of the source voltage from a preset value. The differential amplifier 26 may be of a known type, as for example manufactured and sold by George A. Philbrick Researchers, Inc. The amplifier has two input terminals T_{10} and T_{11} . The input T_{10} provides a reference voltage provided in this instance by Zener diode D_6 . The other terminal T_{11} cooperates with a potentiometer resistor R_{13} . Resistors R_{14} and R_{15} connect the ends of potentiometer resistor to the battery terminals T_{13} and T_{12} respectively. The slider 28 is adjusted so as to equal the breakdown voltage of the Zener diode D_6 under quiescent conditions of the battery. The voltage at slider 28 will, of course, deviate upon completion of any load circuit, as for example, a courtesy light. Thus, should the voltage at the input terminal T_{12} and T_{13} vary, the differential amplifier will provide a signal at its output terminal T_{14} . The signal is then supplied to inhibit arming device 20 such as that described in connection with FIG. 1. The output terminal of the inhibit arming device is in turn applied to trigger circuit 22, such as shown in FIGS. 1 and 2. Accordingly, an alarm will operate if the battery voltage signifies some disturbance.

To arm any of the devices of FIGS. 1, 2 or 3, the user simply installs the connection 10 (FIG. 2 or 3) or operates key switch 25 (FIG. 2). After a predetermined time, the inhibit arming gate becomes operative to transmit pulses of sufficient magnitude for firing the controlled rectifier D_5 . When the authorized user later re-enters the protected compartment, he immediately opens the key switch 25 or pulls the connector 10 from the cigarette lighter or the like, thus preventing all but minimal sounding of the alarm.

In the form illustrated in FIG. 4, a time delay start relay 32 is provided in place of the inhibit arming device 20. A time delay control relay 34 allows the authorized user to disarm the device after he created a disturbance (as for example, by opening the car door) without causing the alarm to operate.

The start relay 32 has an energization circuit dependent only upon closure of an arming switch 36, which may be key operated and located in the protected compartment. After a certain time corresponding to the time delay characteristic of relay 32, the control relay 34 is conditioned for operation upon firing of a controlled rectifier D_5 as by a change in battery voltage. Thus the control relay has an energization circuit that includes normally open contacts 38 of the start relay 32, normally closed contacts 40 of a reset relay 42, and the controlled rectifier D_5 . Should the

rectifier D_5 be fired, then relay 34 operates. After a predetermined time corresponding to the time delay of relay 34, the alarm 44 is operated. Thus the energization circuit for the alarm 44 includes only contacts 46 of the control relay 34.

A reset relay 42 is also energized upon closure of the contacts 46. This relay 42 has a time delay characteristic. Thus after the alarm has sounded for a certain time, it is disabled by the virtue of the opening of contacts 40. A subsequent fluctuation in battery voltage is then required in order to operate the system. The time delay of relay 42 should be long enough to provide the requisite security function, but short enough to prevent an undue battery drain.

The controlled rectifier may be operated by any suitable sensing circuit. In FIG. 5, a sensing circuit is illustrated that comprises a transformer 48, the primary winding of which is connected across the battery by a capacitor 50. Any voltage deviation appears as a pulse across the transformer secondary, which is connected to the gate of diode D_5 .

In FIG. 6, in place of a transformer, an amplifier 52 is provided. This amplifier has an input circuit that includes a resistor 54 and a capacitor 56 together connected across the battery terminals. The output of the amplifier is applied to the gate of the controlled rectifier D_5 .

In FIG. 7, there is diagrammatically illustrated a conventional electrical clock 58 that normally connects to the car battery 60. When the spring motor (not shown) incorporated in the clock runs down, a solenoid mechanism (not shown) is actuated and the spring motor is rewound. Typically, the clock winding solenoid of this character may draw considerable current, a current normally adequate to produce a voltage fluctuation adequate to trigger the sensitively set circuit.

In order to prevent spurious response, I provide an isolation network 62. This network comprises a resistor 64 serially inserted in the power lead 66-68 to the clock 58. A condenser 70 parallels the clock, and may receive charge only via the resistor 64. The condenser 70 is large enough to store energy adequate to actuate the clock solenoid. The resistor 64 has a sufficient ohmic value to limit the voltage fluctuation to a value inadequate to trigger the alarm system. Accordingly, the clock mechanism is isolated. Yet when the clock spring runs down, the solenoid is operated by the stored energy of the condenser 70.

In FIG. 8 there is illustrated a module 80 incorporating a conventional connector structure 82 adapted to be installed in the usual cigarette lighter socket of an automobile. Alternatively, other means may be provided for connecting the module to the battery source.

The module mounts an electric load conveniently in the form of an incandescent lamp 84. The lamp may be energized from the battery source, upon closure of either of two symmetrically disposed mercury switches 86 and 88 mounted on the module.

The module is rotated about the axis of the cigarette lighter socket until both switches are open, depending upon the orientation of the car. Then, should the car be moved, as for example by attempted unauthorized entry or by jacking it up, one or the other of the switches will close, thus energizing the lamp 84. This will produce a voltage fluctuation and accordingly operation of the alarm system.

For purposes of definition and scope, a battery may be considered to be any power supply having sufficiently slow voltage regulation characteristics to provide the requisite signal, say, of the order of ten millivolts or greater. However, in some applications, it might be necessary to detect voltage fluctuations even as low as ten microvolts.

I claim:

1. An anti-tampering alarm system for actuating an alarm signal in response to unauthorized disturbance of apparatus to be protected, said apparatus having a power

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supply with a relatively poor voltage regulation characteristic and one or more electrical current consuming load devices adapted to be connected for energization by said supply, at least one of said load devices being so situated that it will become connected for energization by said supply upon unauthorized disturbance of said apparatus, said system comprising: voltage sensing means connected effectively in parallel across said supply independently of said electrical current consuming load devices for monitoring fluctuations in the voltage of said power supply caused by the energization of one of said load devices; and alarm trigger means responsive to said voltage sensing means for triggering said alarm signal in response to a voltage fluctuation sensed by said voltage sensing means.

2. An alarm system as set forth in claim 1 further comprising means for initially arming the alarm trigger means; and means rendering the alarm trigger means insensitive to said fluctuations in the voltage of said power supply occurring during a transient period following arming.

3. An alarm system as set forth in claim 1 in which said apparatus is a vehicle and in which said voltage sensing means is connected at an accessible outlet across a battery which comprises said power supply.

4. An alarm system as set forth in claim 3 together with a connector cooperable with a conventional cigarette lighter socket for effecting the parallel connection of said voltage sensing means to said battery.

5. In a vehicle having a battery with a relatively poor voltage regulation characteristic, a relatively low impedance horn circuit, and terminals selectively shunted by a horn actuator for causing battery current to be conducted to the horn circuit, said vehicle having one or more electrical current consuming load devices adapted to be connected for energization by said battery upon unauthorized disturbance of said vehicle: an anti-tampering alarm system for actuating an alarm signal in response to unauthorized disturbance of said vehicle, comprising voltage sensing means, for monitoring fluctuation in battery voltage, and connected in parallel across said terminals independently of said load devices, said voltage sensing means having a relatively high impedance; a controllable switching device connected across said terminals, having a high impedance state but capable of assuming a low impedance state for conducting current to said horn circuit, and by virtue of its characteristics, maintaining itself in a low impedance state during continued passage of current therethrough; and means operatively connecting the voltage sensing means to said controllable switching device for switching said switching device from its high impedance state to its low impedance state in response to the existence of a fluctuation in battery voltage of a predetermined magnitude caused by one of said load devices being connected for energization by the battery upon unauthorized disturbance of said vehicle.

6. The combination as set forth in claim 5 together with means for initially arming the controllable switching device; and means rendering the controllable switching device insensitive to fluctuations in battery voltage during a transient period following arming.

7. An anti-tampering alarm system for actuating an alarm signal in response to unauthorized disturbance of apparatus to be protected, said apparatus having a power supply with a relatively poor voltage regulation characteristic and one or more electrical current consuming load devices adapted to be connected for energization by said supply upon unauthorized disturbance to the apparatus, said system comprising: voltage sensing means for sensing a fluctuation in supply voltage caused by the energization of one of said load devices, and providing a pulse output; selectively operable arming and disarming means; a condenser, a slow resistive charging circuit for the condenser initiated upon operation of said arming means; an alarm trigger circuit operated by said pulse output but only by a pulse output of predetermined voltage magnitude; uni-

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directionally conductive means between said pulse output and said condenser paralleling said charging circuit whereby said condenser according to the voltage thereof, imposes an increasing limit to the voltage of said pulse output, thereby providing a delay to allow the authorized user to create disturbances during a transient period following arming.

8. The combination as set forth in claim 7 together with means for quickly discharging said condenser upon operating of said disarming means, including another unidirectionally conductive means.

9. The combination as set forth in claim 7 together with means for discharging said condenser upon the existence of pulses having a voltage of predetermined lesser magnitude or more.

10. An anti-tampering alarm system for actuating an alarm signal in response to unauthorized disturbances of apparatus to be protected, said apparatus having a power supply with a relatively poor voltage regulation characteristic and one or more electrical current consuming load devices adapted to be connected for energization by said supply upon unauthorized disturbance to the apparatus, said system comprising: voltage sensing means connected effectively in parallel across the supply independently of said load devices for sensing a fluctuation in supply voltage caused by the energization of one of said load devices and providing a pulse output; a controllable switching device having a gating electrode, said controllable switching devices having terminals adapted to be serially connected to an audio, visual or other electrically energizable alarm device; a current limiting resistor connecting said pulse output to said gating electrode; a stabilizing resistor connecting said gating electrode to one of said terminals to provide temperature stability and current limiting resistor and said stabilizing resistor being connected in series with said gating electrode connected therebetween; and a third resistor paralleling the series connected resistors to provide increased temperature stability for said switching device without penalty to sensitivity.

11. An anti-tampering alarm system for actuating an alarm signal in response to unauthorized disturbance of apparatus to be protected, said apparatus having a power supply with a relatively poor voltage regulation characteristic and one or more electrical current consuming load devices adapted to be connected for energization by said supply upon unauthorized disturbance to the apparatus, said system comprising: voltage sensing means connected effectively in parallel across the supply independently of said load devices for sensing a fluctuation in supply voltage caused by the energization of one of said load devices and providing a pulse output; an amplifying transistor having an input circuit coupled to the output of said sensing means; a condenser; a charging resistor for the condenser; means serially connecting the condenser and the charging resistor effectively across said supply, there being a terminal intermediate the condenser and the resistor; unidirectionally conductive means between the said terminal and the input circuit of said amplifying transistor for charging said condenser by the output of said sensing means; means deriving operating voltage for said amplifying transistor from said condenser whereby said condenser is discharged upon operation of said transistor; and an alarm controlling trigger circuit controlled by the output of said amplifying transistor.

12. An anti-tampering alarm system for actuating an alarm signal in response to unauthorized disturbance of apparatus to be protected, said apparatus having a power supply with a relatively poor voltage regulation characteristic and one or more electrical current consuming load devices adapted to be connected for energization by said supply upon unauthorized disturbance to the apparatus, said system comprising: voltage sensing means connected effectively in parallel across the supply independently of said load devices for sensing a fluctuation in supply voltage caused by the energization of one of said load devices

and providing a pulse output; a time delay start relay; an arming switch for operating said time delay start relay; a control relay; an energization circuit for said control relay, including, in series, normally open contacts of said start relay and a controllable switch operated by said sensing means; said control relay having a time delay characteristic; and an alarm device having an energization circuit including normally open contacts of said control relay.

13. The combination as set forth in claim 12 in which said control relay energization circuit also includes normally closed contacts of a time delay reset relay; said reset relay having an energization circuit including normally open contacts of said control relay.

14. In an anti-tampering alarm system cooperable with a power supply of apparatus to be protected, said power supply having a relatively poor voltage regulation characteristic and one or more electrically current consuming load devices adapted to be connected for energization by said supply upon unauthorized disturbance of said apparatus; an alarm device having a relatively low input impedance; voltage sensing means sensing fluctuation in supply voltage caused by the energization of one of said load devices; said sensing means having a relatively high impedance; means serially connecting said sensing device with said alarm device independently of said load devices; a controllable switching device paralleling said sensing means, having a high impedance state but capable of assuming a low impedance state for conducting a high level of current to said alarm device, and by virtue of its characteristics, maintaining itself in a low impedance state during continued passage of current therethrough; and means operatively connecting the sensing means to said controllable switching device for switching said switching device from its high impedance state to its low impedance state in response to the existence of a fluctuation in supply voltage of a predetermined magnitude caused by the energization of one of said load devices.

15. The combination as set forth in claim 1 together with electrical load means for drawing current from said power supply; and a motion detector for connecting said electrical load means to said power supply upon the existence of predetermined motion.

16. The combination as set forth in claim 15 in which said detector comprises gravity operated switches, and connector means mounting said switches at a cigarette lighter socket of an automobile; said connector being adjustable about the axis of said lighter socket for adjustment of said switches according to the orientation of the automobile to the vertical.

17. For use with a vehicle having a battery, said vehicle having one or more electrical current consuming load devices operable with said battery and operated upon unauthorized disturbances to the vehicle, said vehicle having a clock having a spring motor and a solenoid for winding said motor in response to a predetermined loss of spring tension, the combination therewith of: means connected effectively in parallel across said battery independently of said load devices for sensing fluctuation in supply voltage; alarm trigger means operated by said voltage sensing means; an energization circuit for said motor including a serial resistor for limiting voltage fluctuation; and a condenser for preventing actuating of said alarm trigger means in response to energization of said solenoid, said condenser paralleling said solenoid and being connected across said battery through said resistor for storing energy adequate to operate said solenoid and adapted

to discharge said stored energy into said solenoid for energizing said solenoid to wind said motor in response to said loss of spring tension.

18. The combination as set forth in claim 1 in which said alarm trigger means includes a controlled rectifier having a load circuit operable to provide an alarm, said controlled rectifier having a gate lead; said sensing means comprising a voltage divider network including as elements, a resistor and a variable impedance device having a control circuit; said gate lead being connected between the elements of said voltage divider network; control means normally causing said variable device to assume an impedance value such that said controlled rectifier remains off; and a voltage sensing means, including a condenser, for changing the impedance of said variable impedance device upon a decrease in source voltage adequate to trigger said controlled rectifier.

19. The combination as set forth in claim 18 in which said controlled rectifier has a load circuit including a flasher and a paralleling resistor.

20. The combination as set forth in claim 1 in which said alarm trigger means includes a controlled rectifier having a load circuit operable to provide an alarm, said controlled rectifier having a gate lead; said sensing means comprising a voltage divider network including as elements, a resistor and the emitter-collector circuit of a transistor; said gate lead being connected between the elements of said voltage divider network; said transistor having a base; control means normally causing said transistor to be saturated whereby the voltage of said gate lead is inadequate to trigger said controlled rectifier; and a condenser paralleling said control circuit and connecting said source to the base of said transistor whereby a decrease in source voltage immediately shifts said transistor into the operating range to provide gate voltage adequate to trigger said device.

21. The combination as set forth in claim 1 in which said sensing means includes a detecting device having a controllable impedance characteristic and an input circuit including a coupling capacitor; means initially arming said sensing means; means discharging said capacitor when said sensing means is disarmed; means causing said coupling capacitor to be charged to a quiescent value when said sensing means is armed; and means determining an operating characteristic of said detecting device to stay operation of said alarm trigger means while said capacitor comes up to its quiescent value whereby a time delay is superimposed upon said arming means.

22. The combination as set forth in claim 8 together with means for discharging said condenser upon the existence of pulses having a voltage of predetermined lesser magnitude or more.

References Cited

UNITED STATES PATENTS

2,935,730	5/1960	Procter	340—64 X
3,184,729	5/1985	Freedman et al.	
3,286,250	11/1966	Teitelbaum	340—276
3,422,398	1/1969	Rubin	340—63

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340—64, 248, 276