May 6, 1947. H. M. LAFORD 2,419,957

ELECTRICAL PROTECTIVE ALARM SYSTEM

Original Filed May 6, 1939 2 Sheets-Sheet 1

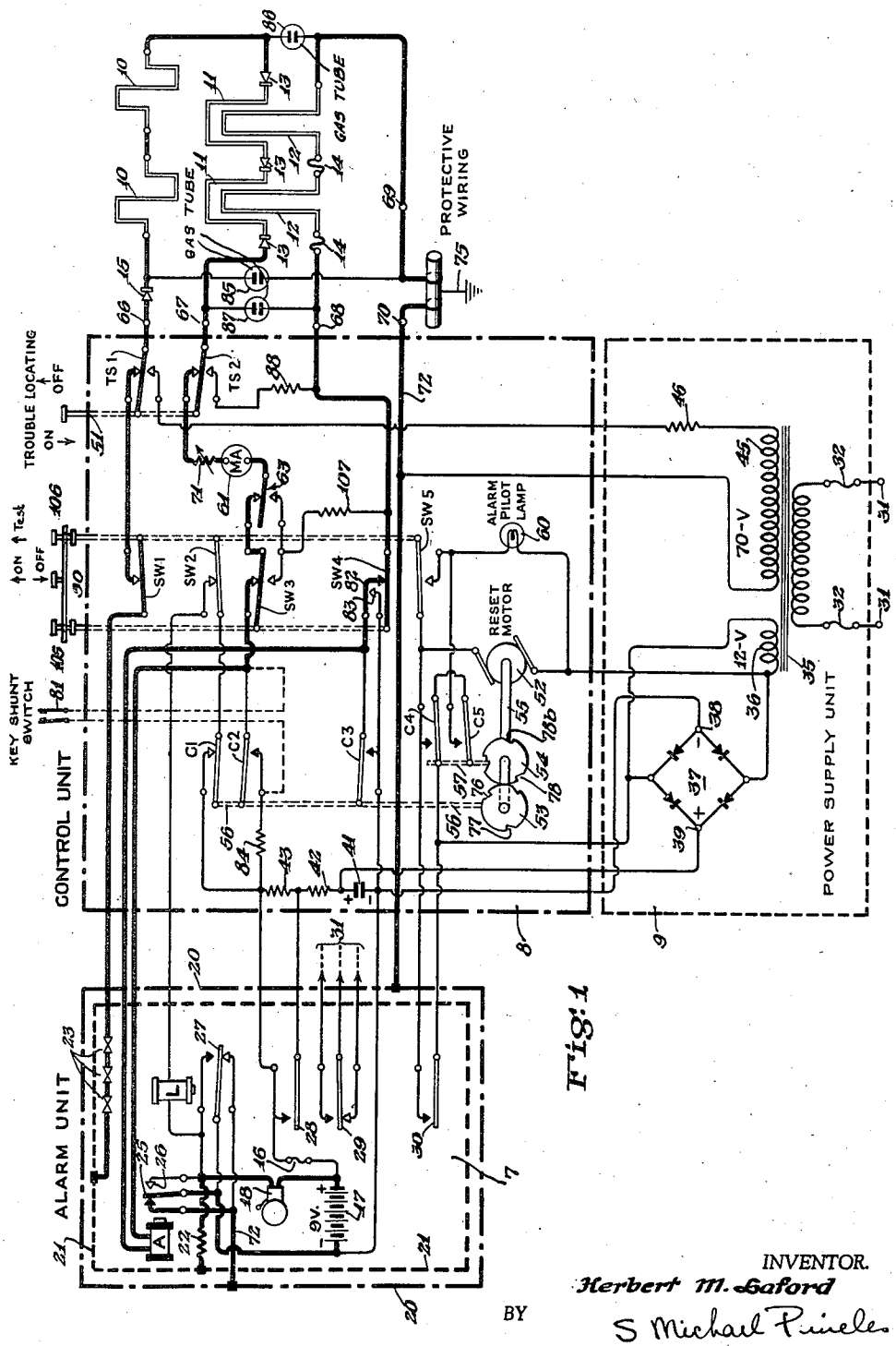


FIG. 1

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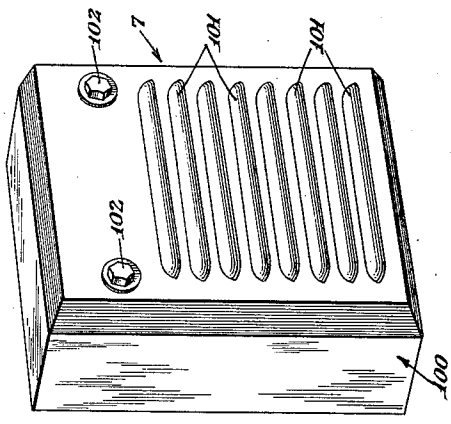


Fig. 2

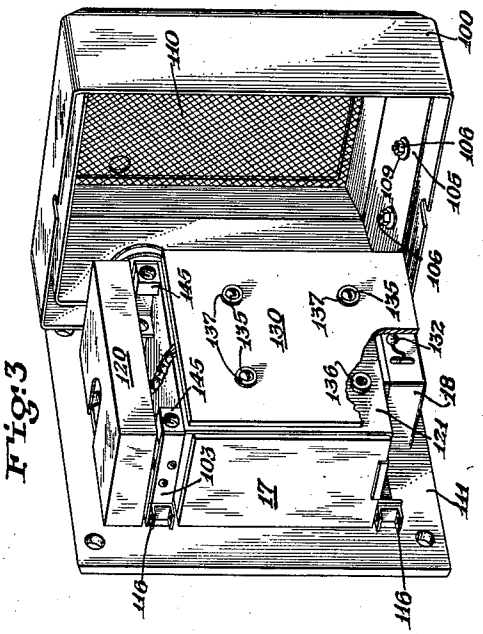


Fig. 3

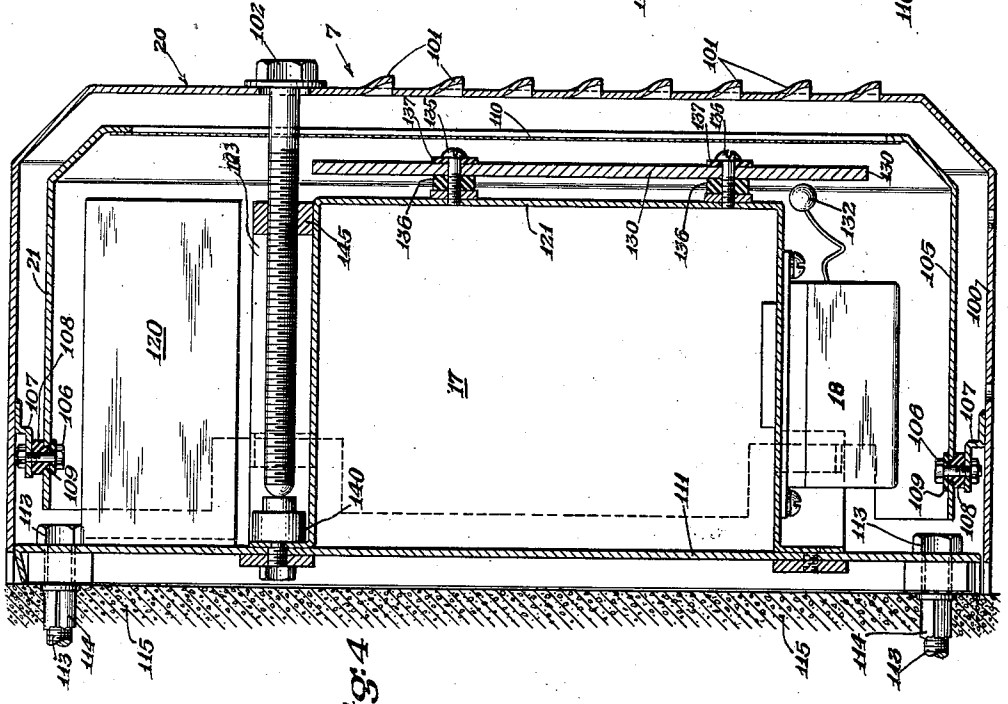


Fig. 4

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UNITED STATES PATENT OFFICE

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ELECTRICAL PROTECTIVE ALARM SYSTEM

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Original application May 6, 1939, Serial No. 272,084. Divided and this application July 9, 1943, Serial No. 493,971

8 Claims. (Cl. 177—314)

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This application is a division of my application Serial No. 272,084, filed May 6, 1939, on which Patent No. 2,346,171 was granted.

This invention relates to electrical protective alarm systems, such as burglar alarm systems for mercantile premises.

Among the objects of the invention is an improved electrical alarm system of the type used in burglar alarm systems, and the like, which is foolproof in operation, easy to maintain in its efficient operating condition, and simple to test and supervise; such system using an extremely compact outdoor alarm housing for housing the batteries and the alarm sounding device which is connected through a cable to the interior of the protected premises, and so arranged that when the cable is cut or short-circuited, the alarm device is actuated and automatically set in operation by the battery in the outdoor housing; such system with an outdoor housing having an alarm sounding member in the form of a plate-like structure which occupies only a negligibly small space within the housing; such arrangement in which the outdoor housing is provided with an insulating housing lining serially connected in the protective wiring circuit of the system and so arranged that when the outdoor housing is moved to its open position, the lining is moved with it to expose the interior elements for easy inspection and servicing.

The foregoing and other objects of the invention will be best understood from the following description of exemplifications thereof, illustrated in the accompanying drawings wherein

Fig. 1 is a diagrammatic view of an electrical protective burglar alarm system exemplifying the invention in its "protection on" condition;

Fig. 2 is a perspective view of the outdoor alarm housing;

Fig. 3 is a perspective view of the housing of Fig. 2 with the housing cover open; and

Fig. 4 is a sectional view of the alarm housings.

The principles underlying the invention will be explained in conjunction with a protective alarm system diagrammatically shown in Fig. 1 which exemplifies the general arrangement of a burglar alarm protective system suitable for mercantile establishments and similar premises. In such protective system the guarded premises are provided with a protective wiring arrangement extending along the show windows, doors, screens and other possible places of intrusion. In Fig. 1, the guard elements of the guarded structure included in the protective system are indicated schematically by the window foil lacings 10, 11, 12, door, window and screen tamper switches shown in the form of spring contactors at 13, 14, 15 which may be opened in the daytime during the normal occupance of the premises, contactor 15 being, for instance, the spring contactor of the main entrance door into the premises. These guard elements 10, 11, 12, 13, 14, 15 are interconnected into a protective wiring circuit which is provided with a control unit 8, usually located inside the protected premises, and is connected by a lead-covered multiconductor cable to an alarm sounding unit 7 which is usually disposed on the exterior of the protected premises so that the sounded alarm will be noticed by the passing people, being mounted high up on a wall, for instance, so that it can be reached only by a tall ladder.

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In the following specification and claims, the term "protective wiring" will refer to all the elements connected in the circuit of the protective system, which is generally a series circuit and includes window foil lacing, screens, trap doors, and other wired units and associated switch and spring tamper contacts. The term "protective wiring" as used herein is also understood to include all equivalent structures, such as those used for protection of safes, bank vaults or the like.

The alarm unit is formed of a rugged metal housing, its structural arrangement being shown in Figs. 2 to 4. The alarm housing consists, in addition to the outer housing structure indicated, in Fig. 1, at 20, of an interior metal lining 21 insulated from the exterior housing 20. Inside the alarm housing is mounted a local energy source, such as a dry cell battery 17, an alarm device, such as a bell 18, an alarm relay A with contacts 25, 26, a locking relay L with contacts 27, 28, 29, 30, and the various wiring elements referred to hereinafter. The alarm housing is protected against tampering by the usual bolt and pry-off tamper switches indicated schematically at 23.

The control unit 8 is formed of a cabinet usually mounted in the interior of the guarded premises, and houses a manually operated "on-off-test" control switch 50 with contacts SW1, SW2, SW3, SW4 and SW5, a milliammeter 61, and various other elements used for controlling and supervising the protective wiring circuits which interconnect through a lead-covered multiconductor cable the elements of the exterior alarm housing with the elements of the guarded premises. The control unit 8 also houses a resetting mechanism including a reset motor 52 with reset cams

53, 54 and cam controlled contactors C1, C2, C3, C4, C5 for automatically controlling the resetting of the protective system following the occurrence of an alarm condition as will be explained hereinafter, and a trouble-locating switch arrangement 51 for enabling quick and simple location of the point of the protective system which started the alarm or is defective. In addition, the control unit 8 is provided with a tamper switch 63 arranged to be connected in series with the protective wiring during the "protection on" condition so that upon opening the door of the control unit during the "protection on" condition shall set off the alarm. The trouble-locating switch 51 is so arranged in the control cabinet that closure of its cover automatically returns the switch 51 to its "off" position and thereby restores the normal operative circuits of the protective wiring.

As shown in Fig. 1, the protective system is also provided with a power supply unit 9 which is intended to serve as a principal supply of energy for the protective system, and thus reduce to a minimum the drain of current from the local battery 17 of the alarm housing 20. In addition, the power unit 9 supplies energy for operating the automatic resetting mechanism, the fault locating arrangement and for other auxiliary service, such as the pilot lamp illumination. The power supply unit may be formed of a transformer 35 having a primary winding connected through fuses 32 to terminals 30 leading to a standard 110 volt A. C. supply line. The transformer 35 has a low voltage transformer winding 36 which supplies through a copper oxide rectifier bridge 37 a rectified D. C. current of low voltage across the terminals of a filtering condenser 41 which are connected in series with the current limiting resistors 42, 43, by way of leads of the multiconductor cable and fuse 16 to the terminals of the battery 17 within the alarm housing 7.

In a practical installation of the type shown in Fig. 1, the relays and the other elements of the protective system are arranged and designed for operation from a nine volt supply source and the transformer winding 36 with the rectifier 37 and the associated filtering condenser 41 and series resistors 42, 43 are so arranged and adjusted that normally substantially no current flows into or out of the battery 17. The transformer winding 36 is, for instance, designed to deliver an output voltage of about 12 volts and the resistors 42, 43 are dimensioned to maintain across the battery 17 a voltage of about 9 volts, resistor 43 being adjustable so as to adjust the power supply circuit to the condition of 0 current battery drain from the battery. As a result, failure of the external power supply from the power unit 9 does not affect the operation of the protective system, but under normal conditions the local battery 17 serves only as a standby source, and the power supply unit 9 serves as a principal source of energy for the protective system. In addition, the transformer 35 has also a high voltage secondary winding 45 which, as described hereinafter, is used in connection with the trouble locating switch arrangement 51 for locating trouble points of the protective system, series resistance 46 preventing inadvertent short circuiting of the transformer winding.

The cooperative relationship of the various elements of the protective system will now be described for a normal "protection on" condition, for instance, when the premises have been closed for the night, and the elements of the system are connected to sound an alarm in case an attempt is made to enter the protected premises or to tamper with the system. In Fig. 1 the heavy line circuit shows the protective wiring connections during the "protection on" condition, the manual control switch 50 being in the "on" position and the trouble locating switch 51 in the "off" position. For the sake of clarity, the auxiliary connections of the protective wiring to the auxiliary power supply unit 9 are not shown in heavy lines, but whenever in the subsequent description general reference is made to the flow of current through the protective wiring, it is understood that the current is normally supplied by the power unit 9 and not by the local battery 17.

In the "protection on" condition, the alarm relay A is serially connected and energized by current flowing in the protective wiring circuit which may be traced as follows:

From the positive terminal of battery 17, through the actuating coil of the alarm bell 18, resistor 22, alarm housing lining 21, alarm housing tamper switches 23, by way of a cable conductor to the closed contacts SW1 of the manually controlled switch 50 in the control unit, upper closed contacts TS1 of the trouble locating switch 51, through the wiring conductor 66 of the live protective loop including loop elements 10, 11, back through wiring conductor 67, upper closed contacts TS2 of trouble locating switch 51, in the control unit, rheostat 71, milliammeter 61, control cabinet door tamper contacts 63, upper closed contacts SW3 of control switch 59, through a cable conductor to the actuating coil of the alarm relay A; and continuing therefrom back through a cable conductor to the lower closed contacts SW4 of the control switch 50 in the control unit, wiring conductor 68 of the grounded protective loop including connectors 14, lacings 12, to conductor 69 and ground 75, and continuing through a grounded conductor 70 passing the control unit, along the grounded cable conductor to the grounded outer alarm housing 20 and therefrom by way of the closed front contacts of the alarm relay armature 25 to the negative terminal of the battery 17. In addition, the actuating coil of the locking relay L is energized in parallel with the bell 18 through a circuit leading, from the positive bell terminal connection, by way of fuses 16 through a cable conductor to the closed cam contacts C1 of the resetting mechanism in the control unit 8, closed contacts SW2 of the manual control switch 50 back through the cable and the coil of the locking relay L to the other terminal connection of the bell 18.

The alarm relay A, the locking relay L, and the bell 18 and the associated circuits are so designed and proportioned and the current flowing through the protective wiring is so adjusted by the rheostat 71 that under normal "protection on" conditions, only the alarm relay A is sufficiently energized for keeping its armature front contacts 25 closed while the bell 18 and the locking relay L receive insufficient current for sounding the bell or actuating the locking relay L. The milliammeter 61 facilitates the adjustment of the normal "protection on" current flow condition. In a practical installation, the current flowing in the wiring under normal "protection on" conditions is adjusted to 10 milliamperes. With the protection wiring circuit so maintained in the "protection on" condition, the occurrence of a break or a cross in the protective wiring of the premises will bring about the de-energiza-

tion of the alarm relay A in the alarm housing 20 and instantaneous release of its armature 25 from its normal closed front-contact position to the alarm closed back-contact 26 position. In the closed back-contact 26 position, the armature 25 of the alarm relay connects the bell 18 and the parallel locking relay L circuit directly across the full voltage of the battery 17, and thereby energizes the bell 18 and the locking relay L with sufficient current for instantaneously starting the sounding of the alarm bell 18, and for actuating the locking relay contacts 27, 28, 29, 30 to their front contact positions. Resistor 22 connecting the alarm housing lining 21 to the bell lead is proportioned so as to enable the silencing of the bell 18 by the key shunt switch 31 when a cross or short circuit occurs between the lining 21 and the outer housing 20.

Under the "protection on" conditions described above, the energized position of the locking relay L, establishes at its closed front contacts 27, 28, 29, 30 the following operating circuits:

Its closed front contacts 27 complete a holding circuit for the locking relay L so as to retain its contacts locked in the front contact position and at the same time maintain itself as well as the bell 18 fully energized for continuously sounding the alarm, even if the fault condition of the protective wiring disappears immediately following its occurrence; its closed front contacts 28 short circuit the series resistor 43 in the 12 volt rectified power supply circuit so as to draw the electric energy required for sounding the alarm and keeping the locking relay L in the locked position mainly from the power supply unit 9 and thus preserve the charge of the battery 17; its closed front contacts 29 complete a signalling circuit for leads 31 to the police headquarters for transmitting thereto an alarm; and its closed front contacts 30 energize the reset motor 52 and start the automatic resetting cut-off mechanism which is combined with the control unit 8.

The automatic resetting mechanism comprises the reset motor 52 which drives through a shaft 55 rotary cams 53, 54 which operate through cam followers 56, 57, cam contactors C1, C2, C3, C4, C5 arranged and operating in the way shown in Fig. 1. The resetting motor 52 may be of the self-starting synchronous type, and, as shown in Fig. 1, may be energized from the 12 volt transformer winding 36 so as to rotate the cams, for instance, in clockwise direction, at the rate of one complete revolution per hour. Depending upon the particular requirements, such one revolution cam cycle may be arranged to have a different period.

Fig. 1 shows the normal "protection on" position of the reset cams 53, 54 before the reset motor 52 is started by the occurrence of an alarm condition during "protection on" conditions. The various features of the resetting mechanism of the invention and of its operation are described in my application Serial No. 272,084, filed May 6, 1939, which has matured into Patent No. 2,346,171.

In order to enable an authorized person to enter the protected premises without starting the alarm, there is provided in the entrance door to the premises a key operated switch 81 which in the closed position places a shunt around the part of the live protective wiring loop which includes the break contacts of the main entrance door and other removable attachments, such as windows, in such a way that they may be opened without affecting the current flow conditions through the alarm relay A and the other parts of the protective wiring.

As shown in Fig. 1, the key shunt switch 81 has its contacts connected parallel to the cam contacts C2 so that when the key switch 81 is closed, it provides a shunting by-pass from the positive battery terminal through fuse 16, resistor 84, closed key shunt switch 81 to the closed control switch contact SW3, which by-passes the part of the live protective loop extending from the side of the positive battery, through bell 18, resistor 22, alarm housing lining 21, alarm housing tampers 23, control switch contact SW1, trouble locating contact TS1, the live protective loop including the main door break contacts 15, back through the loop conductor 67, milliammeter 61 to the control switch contact SW3. Upon closure of the key shunt switch 81, the main door with its main door contact break 15 as well as the other protective break elements included in the shunted live loop, may be opened without sounding the alarm.

Upon entering the premises, the authorized party opens the control unit, and operates its main control switch 50, which is usually arranged in the form of a key switch actuable to either the "on," "off" or "test" positions, to the "off" position, and thereby establishes the "protection off" circuit conditions. This opens at contacts SW1, SW3, SW4 the circuits to the live loop conductors 66, 67 and to the grounded loop conductors 68, and at the contacts SW2 the holding circuit for the locking relay L is opened, the tampers contact switch 63 being in the downward, open door, position. At the same time, there is completed at the "off" position of contacts SW5 an energizing circuit for the reset motor so as to return the reset mechanism to its starting position shown in the drawings.

In addition, the control switch 50 establishes in its downwardly shown "off" position, a holding circuit for the alarm relay A leading from the positive battery terminal by way of fuse 16, resistor 84, closed key shunt switch 81, coil alarm relay A, and the closed contacts 82, 83 associated with contact blade SW4, to the negative battery terminal. The resistance 84 included in this "protection off" alarm relay holding circuit is so chosen as to energize the relay with its normal holding current, 10 milliamperes, for instance. Relay A remains thus energized and keeps the alarm silent. Negligible energy is consumed in this "protection off" or daytime condition, and only the power supply circuit 9 delivers the current for the alarm relay circuit.

If on arriving on the premises, the authorized party finds the alarm pilot lamp 60 lighted, indicating that an alarm condition existed during the "protection on" period, he has to locate the cause of the alarm condition and see to it that it is removed. The trouble locating arrangement combined with the protective system of the invention greatly simplifies this task.

In the form shown in Fig. 1, the trouble locating arrangement utilizes the trouble locating switch 51 and a series of neon lamps, such as 85, 86, 87 connected at different points of the protective wiring loops between live and grounded portions of the loops. The various features of the trouble locating arrangement of the invention and of its operation are described in my application Serial No. 272,084, filed May 6, 1939, which has matured into Patent No. 2,346,171.

In Figs. 2 to 4 is shown the special construction and arrangement of the outdoor alarm housing

unit 7 of the protective system with its outer housing structure 20 and inner insulated lining 21 shown diagrammatically in Fig. 1. The outer housing structure 20 comprises a rectangular strong housing body of metal which has a louvered sound pervious front wall 101 and is secured by long bolts 102 to a flanged base wall 111 which is firmly clamped to the wall 115 of the building by the threaded engagement of clamping bolts 113 with expansion sleeves 114 anchored in the building wall 115, the bottom walls of the housing 20 having holes to allow drainage of any water that may enter. The major part of the space within the housing is occupied by a rectangular battery compartment 121 formed of a U-shaped bent sheet metal plate having flanged bottom and top wall portions which are firmly clamped to the mounting plate 111 in the way shown in Fig. 4, so as to support the set of electric supply batteries 17 of the alarm system indicated at 17 in the diagram of Fig. 1. The bolts 102 which clamp the upper flange of the battery compartment 121 to the base wall 111 hold also clamped thereto bolt brackets 103 terminating at their front ends in solid strong mounting blocks 145 having threaded holes for receiving the bolts 102 which hold the housing 20 clamped to the mounting plate 111. Near the ends of the top wall and bottom wall of the battery compartments are mounted hinge brackets 116 for hingedly mounting thereon by removable hinge pins hinge ears extending from the adjacent side walls of the alarm housing 20 so that the housing may be swung either to the right or left of the base wall 111 when the housing is opened.

On a bracket secured to the base wall 111 above the battery compartment are assembled the sensitive alarm relay A, the locking relay L and a terminal board with the fuse 16 and terminal clips by means of which the various elements of the protective wiring that are housed in the alarm housing 111 are interconnected through the multi-conductor lead-cable to the elements of the protective system located on the protected premises. These relays A, L and the other circuit elements are covered by a removable rectangular compartment cover 120. In the interior of the hinged housing 20, slightly spaced from its interior walls, is carried its inner housing or lining 21 so that when the housing 20 is opened on its hinges, the lining 21 moves with it as a unit to expose its interior. As shown in Fig. 4, the lining 21 is insulatingly held within the housing 20 by means of bolts 106, brackets 107 and insulating bushings 108, and spacers 109. The front face 110 of the lining 21 is made of a perforated sheet so that the sound generated in the interior of the housing 20 will travel unimpeded to the exterior while preventing tampering with the interior of the housing 20 because any metal object pushed through the louvers will produce a short circuit, or an electric connection, between the outer housing 20 and the inner insulated lining 21 and start the alarm.

Since the alarm housing 20 is placed high on the building wall and must be serviced from a ladder, it is important to keep its size and volume as small as possible. In the housing arrangement of the invention, extreme compactness of the alarm housing is secured by making the alarm bell or gong in the form of a flat gong plate 130 which is mounted on the front wall 121 of the battery casing without substantially taking up any space within the alarm housing 20. As shown in Figs. 3 and 4, the gong plate extends substantially across the whole height and width of the alarm housing unit except for the space in front of the relay cover 120 which is left free in order to permit inspection and servicing of the relays. In a practical installation, the gong plate 130, nine inches square, formed of a hard brass plate, ⅛ inch thick and occupying negligibly little space within the alarm housing, is able to generate as much sound as the very bulky alarm bells mounted over the bell clapper mechanism of all prior commercial burglar alarm systems. The clapper mechanism 18 for striking the gong plate 130 requires only little space, and as shown, is housed in the small space available within the housing between the bottom wall of the battery compartment 121 and the insulated inner lining 21. In order to produce a large sound energy, the square gong plate is mounted at its 4 antinodal points, namely, the points of minimum or zero vibration when hit by the clapper. These points may be determined by any well-known way. In order to secure efficient sound generation the antinodal points of the gong plate are resiliently clamped between washers 136, 137 of yielding material, such as rubber, by means of screws 135 threadedly engaging holes in the battery plate 121.

The alarm housing 20 is additionally protected by the usual bolt and pry-off tampers. As shown in Fig. 4, one such tamper switch 140 is mounted on the base wall 111 of the housing opposite the end of the housing bolt 102 that upon loosening the bolt, the tamper switch 140 sets off the alarm. The bolts 102 are long and have a fine thread, for instance, 20 threads per inch so that, in the event an attempt is made to tamper and open the housing 20, a substantial time is consumed from the moment the bolt tamper switch 140 is actuated by the initiation of the bolt unscrewing operation until the bolt has been fully unscrewed from its engagement with the mounting bracket block 145.

In the protective alarm system exemplifying the invention as described above, the batteries which are used as standby power in the event of a failure of the electric power supply circuit, are located in the alarm housing allowing the use of a multi-conductor lead covered cable and eliminating the use of costly conduit construction between the part of the system with its control unit that are located on the protected premises and the alarm system elements which are located in the outdoor housing. As a result, it is impossible to defeat the protection by severing the multi-conductor lead covered cable between the outdoor alarm housing and the control unit located in the protected premises.

A fuse in the outdoor housing is so arranged that the batteries cannot be short-circuited by immersing the severed end of the cable in mercury or other conducting fluids.

The outdoor alarm housing in which are located the batteries, the alarm sounding device and the control relays is compact and small, for instance, only 16 inches high, 12 inches wide, and 8 inches deep, and is protected against tampering by bolt and pry-off tampers. The compact structure of the outdoor alarm housing is made possible by making the sound emitting alarm device in the form of a flat metal plate having a size of about nine inches square and being only ⅛ of an inch thick.

The insulating housing lining is not mounted in the customary manner, but is insulatingly supported in the outer housing cover and may be removed therewith as a unit. A removable hinge

arrangement is provided on the housing so that on proper insertion of the hinge pins, the housing cover may be swung either to the right or to the left on the base wall of the housing which is mounted on the wall of the building and remains stationary when the housing is opened.

The relays and the terminal panel are mounted across the top of the housing base wall and are protected by a separate removable cover. The alarm relay is arranged for connection by plugging into a five prong socket which allows the alarm relay to be readily removed or replaced when trouble is experienced with its operation. The locking relay serves not only to lock the alarm circuit, but also for controlling the circuit to the police headquarters, the operation of the resetting mechanism, and the special arrangement for raising the supply voltage and supplying the alarm ringing current when the alarm sounding device is actuated to sound the alarm.

The commercial power supply unit is arranged to provide a circuit for supplying a low voltage current for operating the automatic reset motor, the alarm indicating lamp, and maintain the normal protective current in the protective wiring circuit without drain on the battery, and in addition, to supply a current of a higher voltage of about 70 volts for operating the trouble indicating and locating devices, such as the neon lamps.

An adjustable rheostat is combined with the power supply unit for adjusting the circuit so that substantially no current is either flowing in or out of the standby batteries which are located in the outdoor alarm housing, and a resistor is so combined with the circuit as to prevent the ground of the normally ungrounded protective loop from causing a short-circuit across the higher voltage supply terminals which are used for energizing the indicator devices.

A key control switch which enables the user to set the alarm and leave the premises without sounding the alarm after it is set, is so arranged as to permit testing of the entire protective circuit including the main door tamper switches before the user leaves the premises. In addition, the key control switch is so arranged that an alarm will be sounded if the user attempts to leave the premises and operate the shunt switch before setting the system to its "protection on" condition.

The protective wiring circuit and its elements are so arranged that when the protected premises are to be opened, the key control switch is operated to the "off" position thereby placing a shunt around the tamper contacts of the main entrance door and the other removable attachments allowing entrance without sounding the alarm. The control unit is then opened and the key switch returned to its "on" position. If an alarm has occurred during the previous "protection on" period, the alarm indicating lamp in the control unit would be lighted. When the key switch in the control unit is operated to its "off" position it establishes a circuit through the reset motor mechanism causing the motor to return the resetting mechanism to its initial starting position.

In setting up the system, all doors, windows, and other protective devices including the main door are closed and locked. The switch in the control unit is then operated to its test position and a check is made to determine whether the "protection on" current has its normal value. If no reading is given by the meter, it indicates an improperly closed attachment or a defect or trouble in the wiring. Such trouble or defect may be easily located by the trouble locating arrangement. If the meter reading is proper, the key switch in the control unit is turned to the "on" position, the key is removed, and the control unit is closed and locked. The door of the premises is then locked, and thereby the shunt switch is moved to the locked "protection on" position placing the protective system in its operation condition.

It will be apparent to those skilled in the art that the novel principles of the invention disclosed herein in connection with specific exemplifications thereof will suggest various other modifications and applications of the same. It is accordingly desired that in construing the breadth of the appended claims they shall not be limited to the specific exemplifications of the invention described herein.

I claim:

1. In an electrical protective arrangement having a signal controlling protective-wiring circuit system: a signal device and a battery in said circuit system; a source of uni-directional power current having circuit connections forming part of said system; alarm relay means in said circuit system and arranged to be connected to said battery and said source and be maintained energized through said circuit system for holding said signal device inoperative in absence of alarm conditions and to effect operation of said signal device upon occurrence of an alarm condition on said system; said circuit connections including limit means operative in absence of alarm conditions to limit to a predetermined level the flow of current from said power source and to cause said alarm relay means and said device to be energized by said battery in the absence and presence of alarm conditions if current fails to flow from said source; and additional relay means in said circuit system and having switch contacts in said circuit connections and operative during an alarm condition of said system to pass substantially more current to said device from said source than from said battery.

2. In an electrical protective arrangement having a signal cntrolling protective-wiring circuit system: a signal device and a battery in said circuit system; a source of uni-directional power current having circuit connections forming part of said system; alarm relay means in said circuit system and arranged to be connected to said battery and said source and be maintained energized through said circuit system for holding said signal device inoperative in absence of alarm conditions and to effect operation of said signal device upon occurrence of an alarm condition on said system; said circuit connections including limit means operative in absence of alarm conditions to limit to a predetermined level the flow of current from said power source and to cause said alarm relay means and said device to be energized by said battery in the absence and presence of alarm conditions if current fails to flow from said source; said circuit connections including means operative in absence of alarm conditions to limit to a negligible value the flow of current from said battery; and additional relay means in said circuit system and having switch contacts in said circuit connections and operative during an alarm condition of said system to pass substantially more current to said device from said source than from said battery.

3. In an electrical protective arrangement having a signal controlling protective-wiring circuit system: a signal device and a battery in said cir-

cuit system; a source of uni-directional power current including alternating current rectifying means having circuit connections forming part of said system; alarm relay means in said circuit system and arranged to be connected to said battery and said source and be maintained energized through said circuit system for holding said signal device inoperative in absence of alarm conditions and to effect operation of said signal device upon occurrence of an alarm condition on said system; said circuit connections including limit means operative in absence of alarm conditions to limit to a predetermined level the flow of current from said power source and to cause said alarm relay means and said device to be energized by said battery in the absence and presence of alarm conditions if current fails to flow from said source; and additional relay means in said circuit system and having switch contacts in said circuit connections and operative during an alarm condition of said system to pass substantially more current to said device from said source than from said battery.

4. In an electrical protective arrangement having a signal controlling protective-wiring circuit system: a signal device and a battery in said circuit system; a source of uni-directional power current including alternating current rectifying means having circuit connections forming part of said system; alarm relay means in said circuit system and arranged to be connected to said battery and said source and be maintained energized through said circuit system for holding said signal device inoperative in absence of alarm conditions and to effect operation of said signal device upon occurrence of an alarm condition on said system; said circuit connections including limit means operative in absence of alarm conditions to limit to a predetermined level the flow of current from said power source and to cause said alarm relay means and said device to be energized by said battery in the absence and presence of alarm conditions if current fails to flow from said source; said circuit connections including means operative in absence of alarm conditions to limit to a negligible value the flow of current from said battery; and additional relay means in said circuit system and having switch contacts in said circuit connections and operative during an alarm condition of said system to pass substantially more current to said device from said source than from said battery.

5. In an electrical protective arrangement having a signal controlling protective-wiring circuit system: a signal device and a battery in said circuit system; a source of uni-directional power current having circuit connections forming part of said system; alarm relay means in said circuit system and arranged to be connected to said battery and said source and be maintained energized through said circuit system for holding said signal device inoperative in absence of alarm conditions and to effect operation of said signal device upon occurrence of an alarm condition on said system; said circuit connections including limit means operative in absence of alarm conditions to limit to a predetermined level the flow of current from said power source and to cause said alarm relay means and said device to be energized by said battery in the absence and presence of alarm conditions if current fails to flow from said source; additional relay means in said circuit system operative upon occurrence of an alarm condition for establishing a locking circuit maintaining said device connected to said battery and said circuit connections irrespective of the operating condition of said alarm relay means; said additional relay means having switch contacts in said circuit connections and operative during an alarm condition of said system to pass substantially more current to said device from said source than from said battery.

6. In an electrical protective arrangement having a signal controlling protective-wiring circuit system: a signal device and a battery in said circuit system; a source of uni-directional power current having circuit connections forming part of said system; alarm relay means in said circuit system and arranged to be connected to said battery and said source and be maintained energized through said circuit system for holding said signal device inoperative in absence of alarm conditions and to effect operation of said signal device upon occurrence of an alarm condition on said system; said circuit connections including limit means operative in absence of alarm conditions to limit to a predetermined level the flow of current from said power source and to cause said alarm relay means and said device to be energized by said battery in the absence and presence of alarm conditions if current fails to flow from said source; said circuit connections including means operative during normal conditions to limit to a negligible value the flow of current from said battery; additional relay means in said circuit system operative upon occurrence of an alarm condition for establishing a locking circuit maintaining said device connected to said battery and said circuit connections irrespective of the operating condition of said alarm relay means; said additional relay means having switch contacts in said circuit connections and operative during an alarm condition of said system to pass substantially more current to said device from said source than from said battery.

7. In an electrical protective-wiring alarm arrangement for premises to be protected having a signal controlling protective-wiring circuit system: a signal device and a battery in said circuit system; a source of uni-directional power current having circuit connections forming part of said system; alarm relay means in said circuit system and arranged to be connected to said battery and said source and be maintained energized through said circuit system for holding said signal device inoperative in absence of alarm conditions and to effect operation of said signal device upon occurrence of an alarm condition on said system; said circuit connections including limit means operative in absence of alarm conditions to limit to a predetermined level the flow of current from said power source and to cause said alarm relay means and said device to be energized by said battery in the absence or presence of alarm conditions if current fails to flow from said source; additional relay means in said circuit system and having switch contacts in said circuit connections and operative during an alarm condition of said system to pass substantially more current to said device from said source than from said battery; and an auxiliary switch in said circuit system and operable from the exterior of the premises to maintain said first relay means energized when in closed position for preventing actuation of said alarm system upon proper entry and leaving of the premises and to de-energize said first relay for actuating the alarm system when the auxiliary switch is opened upon leaving the premises while the protective system is improperly set up.

8. In an electrical protective-wiring alarm arrangement for premises to be protected having a signal controlling protective-wiring circuit system: a signal device and a battery in said circuit system; a source of uni-directional power current having circuit connections forming part of said system; alarm relay means in said circuit system and arranged to be connected to said battery and said source and be maintained energized through said circuit system for holding said signal device inoperative in absence of alarm conditions and to effect operation of said signal device upon occurrence of an alarm condition on said system; said circuit connections including limit means operative in absence of alarm conditions to limit to a predetermined level the flow of current from said power source and to cause said alarm relay means and said device to be energized by said battery in the absence or presence of alarm conditions if current fails to flow from said source; additional relay means in said circuit system operative upon occurrence of an alarm condition for establishing a locking circuit maintaining said device connected to said battery and said circuit connections irrespective of the operating conditions of said alarm relay means; said additional relay means having switch contacts in said circuit connections and operative during an alarm condition of said system to pass substantially more current to said device from said source than from said battery; and an auxiliary

switch in said circuit system and operable from the exterior of the premises to maintain said first relay means energized when in closed position for preventing actuation of said alarm system upon proper entry and leaving of the premises and to de-energize said first relay for actuating the alarm system when the auxiliary switch is opened upon leaving the premises while the protective system is improperly set up.

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