

March 19, 1946.

R. W. MCBRIEN

2,397,028

LIGHT CIRCUIT ALARM SYSTEM

Filed May 21, 1942

3 Sheets-Sheet 1

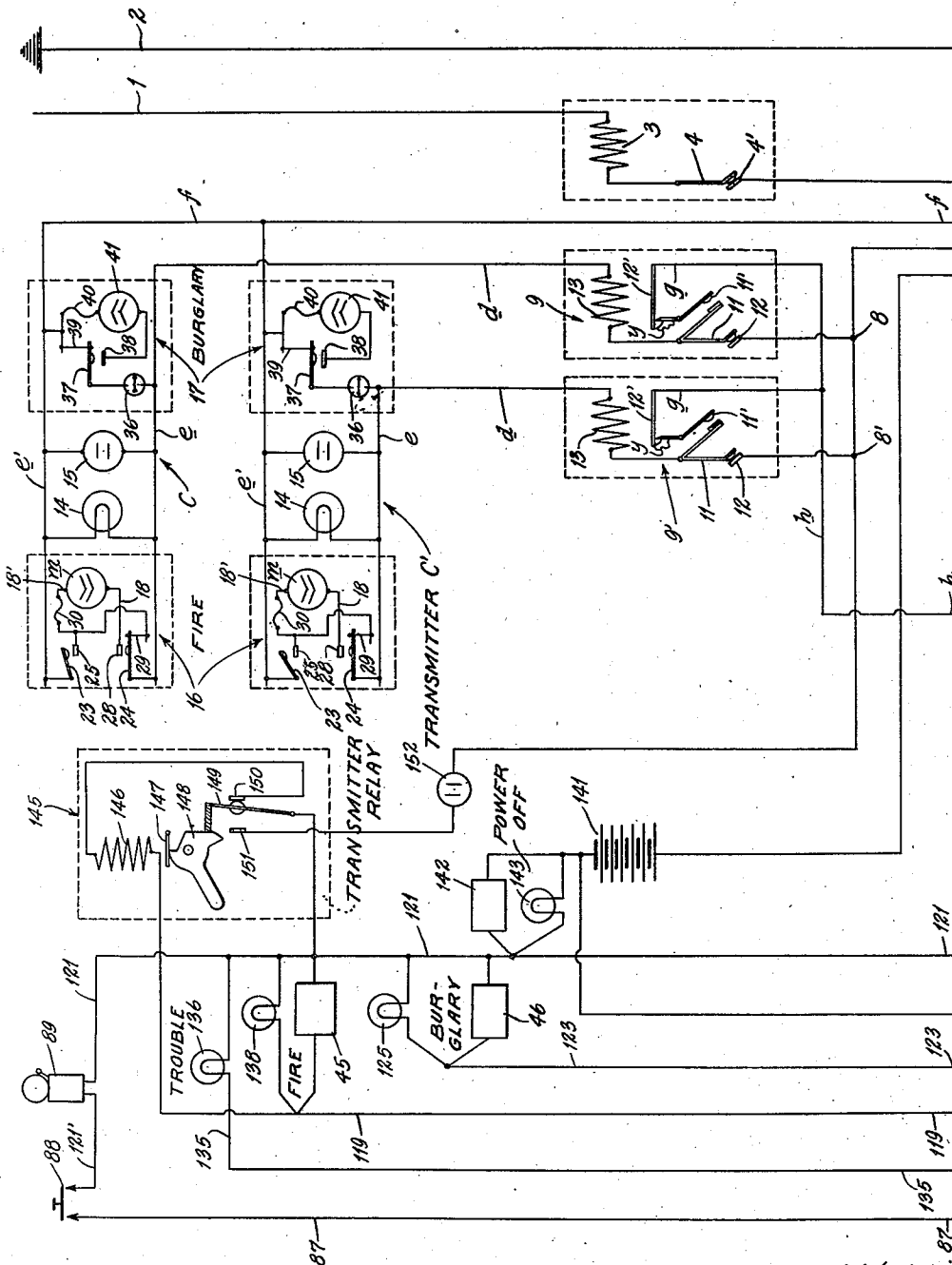


Fig. 1.

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3 Sheets-Sheet 2

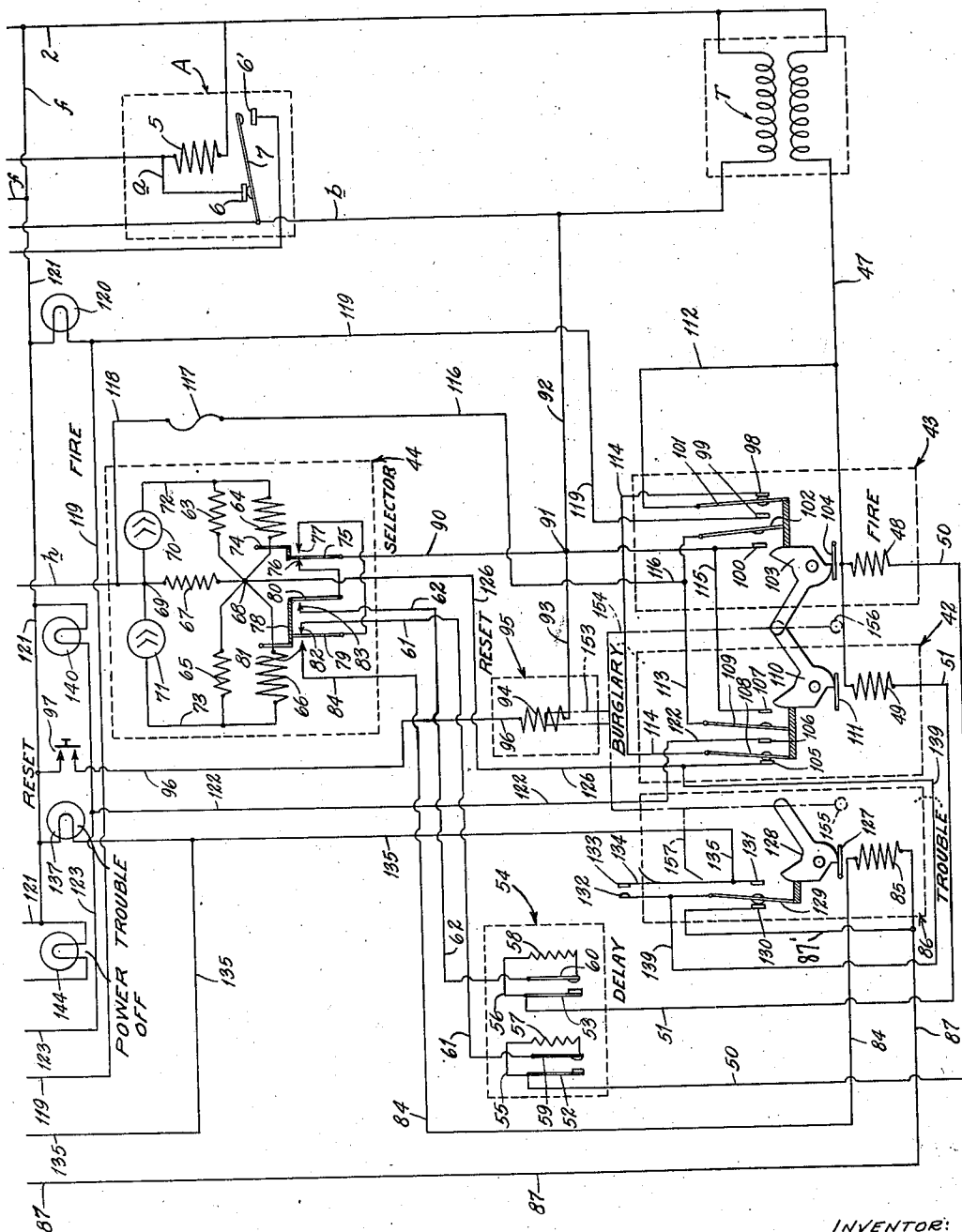


Fig. 2.

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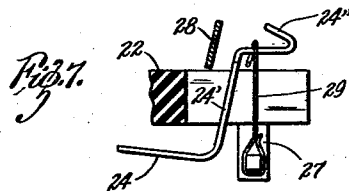
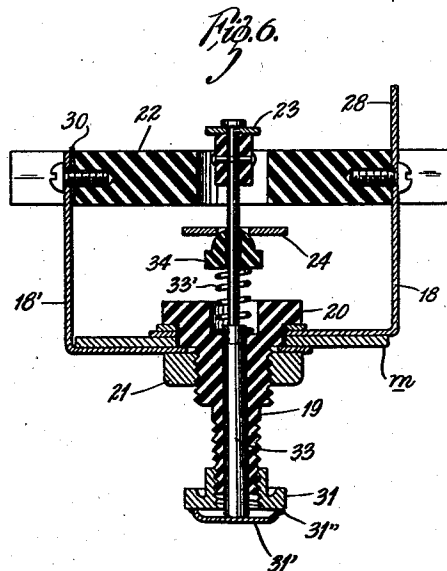
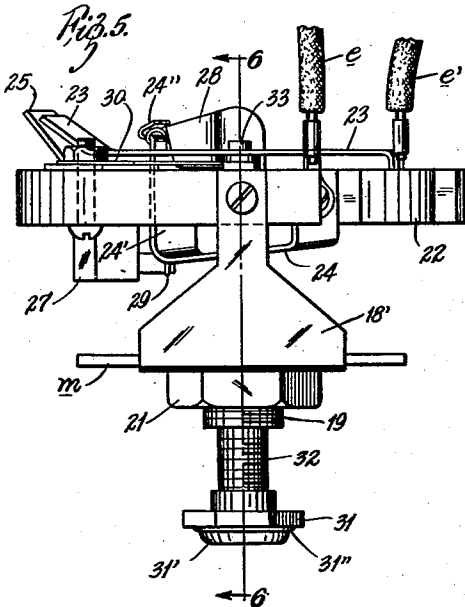
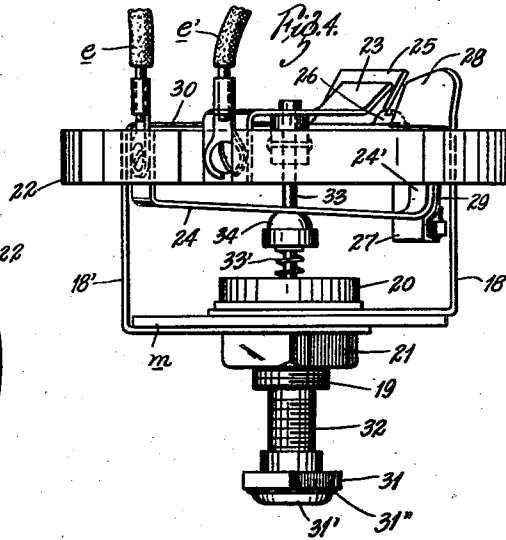
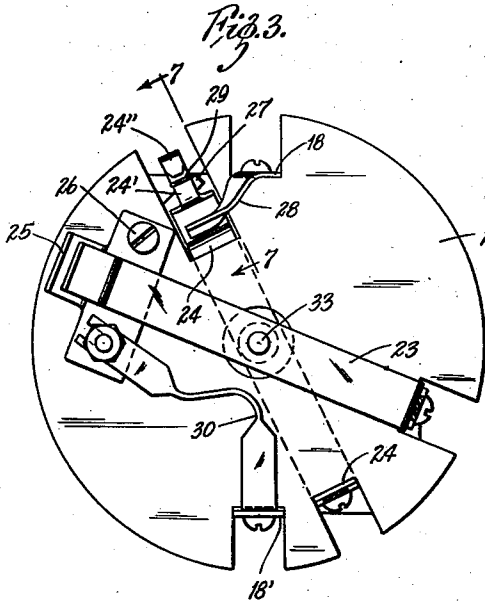
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3 Sheets-Sheet 3



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2,397,028

LIGHT CIRCUIT ALARM SYSTEM

Roger W. McBrien, Alton, Ill.

Application May 21, 1942, Serial No. 443,881

2 Claims. (Cl. 177—356)

My invention has relation to improvements in electric alarm circuits and it consists in the novel features of construction more fully set forth in the specification and pointed out in the claims.

The present invention is an improvement over that shown in Patent No. 2,021,423 granted to Roger W. McBrien and Norval F. Wilson on November 19, 1935, and like said invention is particularly directed to electric circuits which may be connected to various power circuits in buildings and residences primarily for sounding and otherwise giving alarm in case of fire, burglary, or overload resulting from a short circuit.

The principal object of the present invention is to simplify the alarm circuit of the patent above referred to and to adapt said circuit for the use of standard electrical apparatus such as relays, circuit breakers, etc., that are readily procurable on the market. In other words, specialized apparatus is eliminated except for the thermostatic switch assembly which sets the fire alarm in operation.

It is also one of the objects of the present invention to provide a thermostatic switch assembly that is a compact unitary device such that it may be readily connected into any circuit that is to be protected.

It is a further object of the invention to embody in my improved alarm circuit automatic relays that may be easily reset after they shall have been operated to actuate the circuit.

It is also an object of the invention to utilize low voltage in actuation of the alarm circuit whereby economy of operation is obtained and also longer life for the respective parts embodied in the circuit.

Other advantages will be apparent from a detailed description of the invention in connection with the accompanying drawings, in which:

Figure 1 is a diagrammatic representation of my improved alarm circuit showing the manner of connection with the power line and power (or house service) circuit; Fig. 2 is also a diagrammatic representation of the alarm circuit showing the signal selector unit and associated relays and should be considered in connection with Fig. 1 with which it forms a part; Fig. 3 is a top plan of the fire alarm switching unit; Fig. 4 is a side elevation thereof; Fig. 5 is also a side elevation at an angle of 90° from that of Fig. 4; Fig. 6 is a vertical cross-sectional detail taken on the line 6—6 of Fig. 5; and Fig. 7 is a cross-sectional detail taken on the line 7—7 of Fig. 3.

Referring to the diagrammatic view (Fig. 1) 1 and 2 represent the conductors of a power line to

which are connected (in a manner about to be described) service or power circuits C, C'. Obviously there is no limit to the number of circuits C that may be protected by my improved alarm system.

A main circuit breaker comprising a coil 3, switch element 4, and contact 4' is connected to conductor 1 and to coil 5 of a power supply relay A. The end of coil 5 connected to contact 4' is also connected by a conductor a to contact 6 which is normally engaged by armature 7 of the relay which, in the event of power failure, becomes disengaged from contact 6 and engages contact 6'.

The armature 7 is connected to conductor b which leads to one end of the primary coil of a transformer T and also to junction points 8, 8' which are connected respectively to branch circuit breakers 9, 9' connected to circuits C, C' respectively, as follows:

Branch circuit breakers 9, 9' are identical in construction and may be described together. Each circuit breaker has a switch element 11 normally in engagement with contact 12 connected to junction point 8, said switch element also being connected to one end of coil 13, the other end of said coil being connected by conductor d to one side e of circuit C. The other side e' of circuit C is connected by conductor f to the grounded side 2 of the power supply.

We thus see that during the normal operation of circuits C, C' the flow of power is from line wire 1 through main circuit breaker coil 3, switch element 4, power supply relay A, junction points 8, 8', branch circuit breakers 9, 9' through circuits C, C', back through conductor f to line wire 2. Of course, the primary of transformer T is also permanently connected across the line wires 1, 2, as is readily apparent from the diagram, so that on closing of any circuit, including the secondary of transformer T, a low voltage current will flow through such circuit as may be closed.

The circuits C, C' have the usual lamps and receptacles represented by devices 14 and 15 for the utilization of their power, but in addition thereto are also provided with fire alarm switching unit 16 and a burglary alarm switching unit 17.

The fire alarm switching unit (illustrated in Figs. 3 to 7, inclusive) comprises a pair of L-shaped metallic brackets 18, 18' secured in opposing relation on a hollow threaded stem 19 terminating at its upper end in a head 20 between which and a nut 21 said brackets are clamped. The brackets 18, 18' are also connected to an

asymmetric cell *m* which is clamped between them. The upright portions of the brackets are also connected to an insulating disc 22 on which are mounted spring contacts 23 and 24, the former being disposed above the disc 22 and the latter below. A fixed contact 25 is secured to the disc 22 in proximity to spring contact 23 and has electrical connection through a screw 26 with a bracket 27 arranged beneath disc 22.

It will be observed that the spring contact 24 has an upwardly extending portion 24' in proximity to a contact 28 formed integrally with bracket 18, and a hook 24'' is formed at the extremity of the portion 24', between which and bracket 27 a trip link 29 is connected. The function of the trip link 29 is to hold the spring contact 24 out of engagement with the contact 28. The upwardly extending portion of supporting bracket 18' is connected to contact 25 by a fusible link 30. Normally the spring contact 23 is held out of engagement with fixed contact 25 by a nut 31 capable of operating as a fusible thermo element, which nut is screwed over the threaded extremity 32 of stem 19, and impinges on the end of a stem 33 which traverses the hollow stem 19, passing through but having no connection with spring contact 24 and fixed to the spring contact 23.

When the nut 31 is screwed in place it pushes upwardly on stem 33 and holds the spring contact 23 out of contact with the fixed contact 25. The rounded end 31' of the nut is held in place on the nut 31 by a solder having a low melting point so that when the nut is exposed to temperatures above atmospheric temperature, the extremity 31'' will fall from the nut, releasing the stem 33 and permitting spring contact 23 to engage fixed contact 25. The spring contact 24, when released by the destruction of the fusible link 30, is urged upwardly by a coiled spring 33' disposed over stem 33 and confined between head 20 of stem 19 and an insulating member 34 bearing against the underside of spring contact 24.

The burglary alarm switching unit 17 comprises a switch 36 connected to conductor *e* and to a spring contact 37 held normally out of engagement with fixed contact 38 by a fusible link 39 which is also connected to conductor *e'*. Connected in parallel with the parts just described is a fusible link 40, asymmetric cell 41 and contact 38. When the switch 36 is closed by unauthorized entry on the premises the current from the high voltage power circuit passes through fusible link 39 causing the effected branch circuit breaker to open a high voltage circuit and close a low voltage circuit, the current of which passes through link 39 melting the same and releasing spring contact 37 so that it will come into engagement with contact 38. The effect of this action on the circuit will be described in connection with the description of the operation of the burglary alarm circuit.

I will now describe the apparatus employed to give the alarms when either of the service circuits C, C' is closed through the operation of either the fire alarm or burglary alarm switching units 16 or 17.

A burglary alarm relay 42 and fire alarm relay 43 are operatively associated with a signal selector unit 44 for the purpose of causing either the fire alarm 45 or burglary alarm 46 to operate, depending upon whether the fire alarm switching unit 16 or burglary alarm switching unit 17 has been actuated. The circuits including the signal selec-

tor unit and the fire and burglary alarm relays are as follows:

A conductor 47 leads from one end of the secondary of transformer T to coil 48 of fire alarm relay and coil 49 of burglary alarm relay, the opposite ends of said coils being connected respectively by conductors 50 and 51 to contacts 52, 53 of delay thermo-switch unit 54. Contacts 52 and 53 are connected respectively by conductors 55 and 56 to heater resistors 57 and 58 operable on being heated to cause switching elements 59 and 60 to contact with contacts 52 and 53. The switching elements 59 and 60 are also connected by means of conductors 61 and 62 to the signal selector unit 44 in a manner presently to appear.

Within the signal selector unit 44 there is a resistor 63 and operating coil 64 for the fire alarm, and a resistor 65 and operating coil 66 for the burglary alarm, all of which are connected in parallel with a resistor 67 through junction point 68. Resistor 67 is also connected through junction point 69 to half wave asymmetric cells 70 and 71 which are arranged to pass opposing one-half alternating current waves. The positive (+) half wave asymmetric cell 70 is also connected by a conductor 72 to resistor 63 and operating coil 64 of the fire alarm, while the negative (-) half wave asymmetric cell 71 is connected by a conductor 73 to resistor 65 and operating coil 66 of the burglary alarm.

Operating coil 64, when energized, actuates an armature 74 which controls switch element 75 disposed between contacts 76 and 77. Operating coil 66 actuates armature 78 which controls switch elements 79 and 80, the former operating between contacts 81 and 82, while the latter operates to and from contact 83. Contacts 82 and 83 are respectively connected to switching elements 59 and 60 of the delay thermo-switch unit 54 by the conductors 61 and 62. Contact 81 is connected by a conductor 84 to actuating coil 85 of a trouble relay 86, the other end of said coil is connected by a conductor 87 to contact 130, armature 129, conductor 139 to burglar alarm relay 42, fire alarm relay 43, conductors 112, 47, transformer T back to line wire 2 as hereinafter described.

Push button 88 for doorbell 89 is also connected to conductor 87.

Switch element 80 is electrically connected directly to contacts 76, while switch element 79 is electrically connected directly to contact 77. Switch element 75 is connected by a conductor 90 to a junction point 91, whence a conductor 92 leads to conductor *b* and a conductor 93 leads to one end of coil 94 of a reset relay 95, the opposite end of said coil being connected by a conductor 96 to a push button 97 for operating the reset relay in a manner that will hereinafter appear.

The signal selector unit circuits above described are rendered active by either fire alarm relay 43 or burglary alarm relay 42. At this point it is to be understood that these relays are standard electrical equipment such as may be procured from any reliable manufacturer and no claim is made herein to the specific apparatus per se.

The fire alarm relay has fixed contacts 98, 99 and 100, the first two being adapted for engagement with the switching member 101 and the latter being adapted for engagement with the switching member 102, which are caused to be actuated by a cam lever 103, in turn put into operation by an armature 104 through the energizing of coil 48. The burglary alarm relay likewise has fixed contacts 105, 106 and 107, the

first two being adapted for engagement with switch member 108 and the last being adapted for engagement with switch member 109, which are caused to be actuated by cam lever 110 through armature 111 under the influence of coil 49.

The switch member 101 is connected to the secondary of transformer T by a conductor 112 joined with conductor 47, while switch member 109 is connected by a conductor 113 to switch member 102. Switch member 108 is connected by a conductor 114 to contact 98. Contacts 100 and 107 are joined by a conductor 115, which conductor has electrical connection with junction point 91. Conductor 113, which connects switch members 102 and 109, is connected by a conductor 116 to a lag fuse 117, and thence from said fuse to conductor h by a conductor 118.

Contact 99 is connected by a conductor 119 to fire alarm lamp 120, which lamp is also connected by a conductor 121 to conductor f which leads to line wire 2. The conductor 121 also extends to the doorbell 89, said doorbell also being connected by conductor 121' to push button 88. Contact 106 is connected by a conductor 122 which leads to a conductor 123 connected to burglary alarm 46 and burglary alarm lamp 125, said alarm and lamp also being connected to conductor 121.

Contact 105 is connected by conductor 126 to junction point 68 in the signal selector unit.

In addition to coil 85 the trouble relay 86 has an armature 127 for actuating cam lever 128, which latter is effective upon switch member 129, releasing the latter when the lever is tripped to disengage contact 130 and engage contact 131. Switch member 129 has a contact 132 for engagement with contact 133 connected to contact 131, preferably by a metallic reed 134. The member 134 is connected by a conductor 135 to auxiliary trouble indicating lamp 136 which is also connected to conductor 121. The main trouble indicating lamp 137 is connected between conductor 135 and conductor 121.

The fire alarm 45 and the fire alarm lamp 138 are connected in parallel between conductor 119 and conductor 121. Switch member 129 of trouble relay 86 is connected by conductor 139 to fixed contact 105 of the burglary alarm relay 42. A second burglary alarm lamp 140 is connected between conductor 123 and conductor 121.

A battery 141 is provided for use in the event of failure of the power line supplying the house circuits. One end of this battery is connected to contact 6' of power supply relay A, while the other end of the battery is connected in parallel to an alarm 142 and auxiliary lamps 143, 144, the opposite sides of said alarm and lamps being connected to conductor 121. The signal transmitter relay 145 includes a coil 146, armature 147 and trip lever 148, effective on switch element 149 whereby the latter is placed in electrical connection either with contact 150 or 151.

Normally the lever 148 is in position to hold the switch element 149 in contact with the contact 150 but when the lever 148 is released by the actuation of armature 147 the switch element 149 moves out of contact with 150 and engages contact 151. The engagement of the switch element 149 with contact 151 connects the plug receptacle 152 across the line wires 1 and 2 so that any automatic signal transmitter (not shown) that may be connected to the receptacle 152 will be put into action. It is understood that the au-

tomatic signal transmitter and of course signal transmitter relay are not necessarily a part of the invention and may be dispensed with if desired.

The reset relay 95 is provided with an armature 153 which carries a frame 154 to the extremities of which are secured bars 155 and 156. Bar 155 will engage the lever 128 while the latter is in its lowermost position and the bar 156 will engage levers 103 and 110 when in their lowermost positions, so that when the coil 94 is energized and the armature 153 pulled upwardly the frame 154 will also be raised so that the bars 155 and 156 will raise the levers 128, 103 and 110, and restore them to their at-rest positions. There is an extension arm 157 projecting from the frame 154 which will engage the spring element 134 to force the same into electrical connection with contact 132 when the reset relay coil 94 is energized.

Having described the various parts and circuits that make up my improved light circuit alarm system, I shall now describe the operation of the device.

Referring to Figs. 1 and 2, 1 is the high side of the power line and 2 the grounded side which services the premises to be protected. The circuit is from line wire 1 through main circuit-breaker coil 3, switch element 4, contact 4', to holding coil 5 of power relay A. The magnetic attraction of coil 5 holds the armature 7 in contact with contact 6 extending the power line to junction points 8, 8' of branch circuit-breakers 9, 9', respectively. The power line is also extended to automatic signal transmitter 152 and the primary of transformer T, the other side of the transformer primary being connected to line wire 2. Since the branch circuit-breakers 9, 9' for the circuits C, C' are identical, only one will be described.

Referring to branch circuit-breaker 9, the circuit continues from junction point 8 to contact 12 through the switch element 11, to trip coil 13, conductor d, to one side e of the circuit C. It will be observed that the other side e' of circuit C is connected by conductor f to line wire 2. As previously explained, the fire alarm switching unit 16 is connected across the circuit C and its operation will now be described.

Operation of fire alarm

A better understanding of the operation of the fire alarm will be had by referring to Figs. 3 to 7, inclusive, wherein the fire alarm switch unit is shown in detail. The heat of a fire melts the fusible material 31' causing the extremity 31' to fall from the nut 31 and release the stem 33 which allows spring contact 23 to engage with the fixed contact 25. The resulting current which flows through spring contact 23 also flows through fusible link 29 and contact 24, causing a momentary overload across the conductors e, e' of circuit C.

Branch circuit-breaker 9 is tripped, opening the circuit through contact 12, which disconnects it from the power line, and closing the circuit through contact 11'. The closing of the circuit from switch element 11 to contact 11' causes a low voltage current to flow from the secondary of transformer T to the fire alarm relay 43 and burglary alarm relay 42, thence to junction point 68 of alarm selector 44 through switch members either 102 or 109 to conductors 113, 116, fuse 117, conductor 118 and resistor 67. From the junction point 68 the current divides and flows through five parallel parts to junction point 69 as follows:

1st: From junction point 68 both positive and negative impulses flow through resistor 67 to junction point 69.

2nd: Positive impulses flow from junction point 68 through resistor 63, positive (+) $\frac{1}{2}$ wave rectifier unit 70 to junction point 69.

3rd: Positive (+) impulses flow from junction point 68 through coil 64, $\frac{1}{2}$ wave rectifier unit 70 to junction point 69.

4th: Negative impulses flow from junction point 68 through resistor 65, $\frac{1}{2}$ wave rectifier unit 71 to junction point 69.

5th: Negative (—) impulses flow from junction point 68 through coil 66, $\frac{1}{2}$ wave rectifier unit 71 to junction point 69. From junction point 69 the alternating current flows through the bi-metallic link 12', contact 11', switch element 11, coil 13, and fusible link 29 of the switching unit 16. The heat of the current which thus flows through link 29 causes said link to fuse so that the current will now flow through the fusible link 30 and the positive $\frac{1}{2}$ wave rectifier unit (asymmetric cell *m*) to bracket 25', spring contact 24, spring contact 23, back to the line wire 2.

While the link 29 was fusing and before the circuit therethrough was broken the following operation took place: Coils 64 and 66 of the signal selector unit 44, having been energized, actuated their respective armatures 74 and 78, the former moving the switch element 75 out of contact from the contact 76 and into engagement with the contact 77 while the latter armature 78 causes switch element 79 to move away from contact 82 and into engagement with contact 81. At the same time switch element 80 is moved into engagement with contact 83. As a result of this operation, a current flows from the power supply line through junction point 91, contact points 77 and 81, and coil 85 of trouble relay 86. Current will also flow through contact 108 and 105 of the burglar alarm relay 42 and contact 98 of fire alarm relay 43, thence through the line wire 47 and the secondary coil of the transformer T back to line 2.

The current from the high voltage line breaks the connection between switching armature 129 and contact 130 in the trouble relay 86 and closes the circuit through contact 131. This causes the trouble indicating lamp 137 to be energized, as well as auxiliary trouble lamp 136.

The doorbell 89, together with its switch button 88, were rendered inoperative when the switching element 129 broke contact with the contact 130. The normal operating circuit for the bell 89 is from the low voltage line 47 through contact 98, 105, 130, push-button 88, bell 89, conductor 121, conductor *f*, and line wire 2.

Selective function of rectifier units for fire alarm

After the fusing of link 29 which resulted in the closing of the circuit from contact 24, 24' to contact 28, as above stated, the current which flowed through the plus (+) $\frac{1}{2}$ wave rectifier unit *m* acted in a selective manner as follows: The plus (+) $\frac{1}{2}$ wave current flowed from conductor 47 to contact 98 of the fire alarm relay 43, contact 105 of the burglar alarm relay 42, junction point 68, alarm selector coil 64, plus (+) $\frac{1}{2}$ wave rectifier unit 70, junction point 69, bi-metallic strip 12', contact 11', coil 13, conductor *d*, conductor *e*, spring contact 24, contact 28, to bracket 18 asymmetric cell *m* to bracket 18', clearing fuse 30, contact 25 to spring contact 23 to conductors *e'* and *f* back to line wire 2 and the secondary of transformer T. The plus (+) $\frac{1}{2}$ of the current wave cannot flow through coil 66

or resistor 65 to junction point 69 as it is blocked by the minus (—) $\frac{1}{2}$ wave rectifier unit 71, and the minus (—) $\frac{1}{2}$ of the wave cannot pass through the plus (+) $\frac{1}{2}$ wave rectifier unit *m*.

The fire alarm circuit

The fire alarm circuit is completed as follows: From contact 6 to conductor *b*, to conductor 92, to junction point 91, contact 77 (now engaged by switching armature 75), contact 82, conductor 61, to bimetal 59 of the time relay 54, to resistor 57 of the time relay 54 to coil 48 of fire alarm relay 43, then to line wire 47, to transformer T, and power line 2. The current flow through resistor 57 causes the resistor to impinge upon contact 52 in a period of approximately from four to five seconds, after which sufficient current flows through coil 48 to energize the same and attract its armature 104 which trips latch 103 and allows the switching elements 101 and 102 to engage contacts 99 and 100. The closing of the gap between contact 99 and switching element 101 completes the circuit of the local alarm bell (or siren) 45, as well as that of the lamps 138, 120, and coil 146 of the signal transmitter relay 145.

The energizing of coil 146 results in the operation of the manual reset transmitter relay 146, together with the breaking of the contact between switching element 149 and contact 150 and the making of contact between said switching element and the contact 151, which completes the connection of the signal transmitter receptacle 152 as it is now connected directly across the power lines 1 and 2 through contact 6 and contact 151.

The closing of the gap between contact 100 and switching member 102 completes the circuit from line wire 1 through armature 7, conductor *b*, conductor 92, junction point 91, conductor 113, conductor 116, lag-fuse 117, conductor 118, conductor *h*, conductor *g*, bi-metallic strip 12', flexible lead *y*, contact 11, switch element 11, coil 13, conductor *d*, conductor *e*, spring contact 24, contact 28, to bracket 18 asymmetric cell *m* to bracket 18', clearing fuse 30, contact 25 to spring contact 23 to conductors *e'* and *f* back to line wire 2. The resistance of this circuit is such as to limit the flow of current to safe limits and the clearing fuse 30 operates more quickly and at lower current value than the lag-fuse 117 or bi-metallic strip 12'. The destruction of clearing fuse 30 restores the lighting service to the circuit C through the branch circuit-breaker 9. The bi-metallic strip 12' and the lag-fuse 117 act as a protection for the circuit.

Resetting of fire alarm relay

The fire alarm relay may be reset by means of the push-button 97 and the reset relay 95. Upon closing push-button switch 97, the current flows from conductor 93 through coil 94 and the switch 97, through conductor 121 to line wire 2.

The operation of the relay 95 restores the fire alarm relay 43, burglar alarm relay 42, and the trouble relay 86, through the lifting of the plunger armature 153 and the associated frame 154, together with its bars 155 and 156, in a manner well understood in the art.

While the reset relay 95 is energized, extension arm 157 projecting from the frame 154 operates to hold spring element 134 in contact with the contact 132 so as to close the circuit through the trouble indicating lamp 137. If for some reason the armature 153, together with its frame 154,

should fail to release when the push-button 97 is released, the continuous glowing of the lamps 137 and 136 will indicate that there is trouble so that the proper steps may be taken to rectify the same. Under these conditions the circuit through lamps 137 and 136 is as follows: From the secondary of transformer T, conductor 47, conductor 112, switching element 101, contact 98, conductor 114, switching element 108, contact 105, conductor 139, contact 132, to spring contact 133 held in engagement with contact 132, conductor 135, lamp 137, conductor 121, conductor *f*, to line wire 2.

Burglar alarm

The operation of the burglar alarm unit 17 is similar to that of the fire alarm unit 16 in that with the closing of the burglar alarm switch 36, a circuit is completed across the conductors *e* and *e'* through fusible link 39. The resultant flow of current immediately actuates the switching armature 11, disconnecting the power line from the branch circuit-breaker 9 and closing a circuit from the secondary of transformer T, through the fire and burglar alarm relays (similar as in the case of the closing of the fire alarm unit 16), to the fusible link 39, and finally line wire 2.

The destruction of the link 39 allows the switching member 37 to contact with the contact 38, whereupon the low voltage negative (—) $\frac{1}{2}$ wave rectified impulses from the transformer T flow through the fire alarm and burglar alarm relays and selector relays to the switch 36, negative (—) $\frac{1}{2}$ wave rectifier unit 41, fuse 40, and line wire 2.

The burglar alarm side of the selector unit 44 now operates to open the circuit between switching armature 79 and contact 80 and close the same from said switching armature to contact 81. This action completes the circuit from line wire 1 to conductor 92, junction point 91, switching armature 75, contact 76, switching armature 80, contact 83, conductor 62, to the resistor 58 of the burglar alarm time relay 54, thence through conductors 56 and 51 to coil 49 of the burglar alarm relay 86 and to the secondary of transformer T. The flow of current through the thermo-resistor 60 closes the gap therebetween and the contact 53, permitting sufficient current to flow through the coil 83 to trip the latch 110 and operate the burglar alarm relay 42. In the operation of said relay, the switching armature 108 breaks contact with the contact 105 and makes contact with contact 106 while the switching armature 109 makes contact with contact 107, thus energizing the alarm 46 together with lamps 125 and 140. The circuit is from the secondary of transformer T through switching armature 101, to contact 98, conductor 114, to switching armature 108, to contact 106, to conductor 122, conductor 123, alarm 46, in parallel with the lamps 125 and 140, all of which are connected to conductor 121 leading back to line wire 2.

The burglar alarm relay is reset in the same manner as the fire alarm relay.

Effect of short circuit

In case the conductors of either circuit C or C' are shorted, the branch circuit-breakers 9 or 9', as the case may be, operate so as to break the contact between switching element 11 and contact 12 and close the contact between switching element 11 and contact 11'. This action permits a current to flow from the secondary of the transformer T to the switching element 101 and switching element 108, through conductor 126 to

junction points 68 and 69, conductors *h* and *g*, to the bi-metallic strip 12', contact 11', switching element 11, coil 13, conductor *d*, and thence through the short circuit to the line wire 2. The warping of the bi-metallic strip 12' opens the circuit between switching element 11 and contact 11', disconnecting the low voltage power from the circuit. The circuit can only be restored to operative condition by removing the short and resetting the branch circuit-breaker 9 or 9', as the case may be. The action of the bi-metallic strip 12' is not instantaneous so that a suitable time delay is provided to complete the operation, as in the case of a fire or burglar alarm. The coils 64 and 66 of the signal selector unit 44 are effected by both plus and minus impulses of the alternating current wave so that coil 66 operates armature 78 to break the connections between switching elements 79, 80 and contact 81, 82. Coil 64 actuates armature 74 so as to break the connection between switching element 75 and contact 76 and make connection between said switching element and contact 77. There is now a current flow from the high voltage power supply line, conductor *b*, conductor 92, junction point 91, conductor 90, conductors 77 and 81, conductor 84, to coil 85 of the trouble relay 86, thence to contact 130, switching element 129, conductor 139, to contact 105 of the burglar alarm relay 42, contact 98 of the fire alarm relay 43, thence through conductors 112 and 47, to the secondary of the transformer T, back to line wire 2.

Operation of trouble relay lamps 137 and 136

The high voltage current from the line actuates the trouble relay 86 and causes the opening of the connection between switching element 130 and contact 129 and the closing of the connection between said switching element and contact 131. This operation energizes the trouble indicating lamps 137 and 136 as follows: From the conductor 47, switching element 101, contact 98, conductor 114, switching element 108, contact 105, conductor 139, switching element 129, contact 131, conductor 135, lamps 137 and 136, conductor 121, to line wire 2. The auxiliary trouble lamp 136, being in parallel with lamp 137, is also energized.

Doorbell rendered inoperative

Since the doorbell circuit includes switching element 129 and contact 130, the breaking of this contact through the operation of the trouble relay renders the doorbell inoperative, and giving supervisory feature to the circuit.

Power failure

In the event of a power failure the coil 5 of relay A will release its armature 7, breaking the circuit from contact 6 to said armature and closing the circuit from contact 6' to the armature. This action provides a local alarm circuit in the event a fire should originate while the power service is discontinued. This circuit is as follows: From battery 141 to contact 6', switching armature 7, conductor *b*, junction point 8, contact 12, coil 13, conductor *d*, conductor *e*, through either the fire alarm unit 16 or burglar alarm unit 17, to conductor *f*, conductor 121, alarm 142, lamps 143 and 144 (in parallel), to the negative terminal of battery 141.

Résumé

From the foregoing it should be apparent that in the event of a fire in either service circuit C or C', the fire alarm relay 43 is actuated through the coils 63 and 64 of the signal selector unit 44;

on the other hand, when either of the burglar alarm switches 36 are closed, the burglar alarm relay 42 is activated through coils 65 and 66 of the signal selector unit. Thus the signal selector unit responds either to the thermally operated switch 23 to close the fire alarm circuit and cause fire alarm 45 to sound or to the mechanical switch 36 to close the burglar alarm circuit and cause the burglar alarm 46 to sound.

While I show electrical means for resetting the fire and burglar alarm relays, mechanical means could also be used.

Having described my invention, I claim:

1. A power and alarm system comprising a power circuit connected to an alternating current source of electric power, a fire alarm switching unit and a burglar alarm switching unit connected across the power circuit, a thermo-electric switch connected in and controlling the action of the fire alarm switching unit, a mechanical switch connected in and controlling the action of the burglar alarm switching unit, a transformer having its primary connected across the power circuit, a circuit breaker connected in series with the power circuit and transformer primary, fire and burglar alarm relays, said circuit breaker having a switch element and contact for connecting both the fire alarm and burglar alarm switching units to the transformer secondary, a signal selector unit having a pair of switch-actuating coils and switch contacts connected in parallel between the circuit breaker and the fire and burglar alarm relays, fire and burglar alarm circuits, asymmetric cells connected in series respectively with the thermo-electric switch of the fire alarm unit and the mechanical switch of the burglar alarm unit, and an asymmetric cell connected in series with each of said switch actuating coils,

whereby said switches are selectively actuated to connect either the fire or burglar alarm relays to the transformer secondary and thereby close either the fire or burglar alarm circuit.

2. A power and alarm system comprising a power circuit connected to an alternating current source of electric power, a fire alarm switching unit and a burglar alarm switching unit connected across the power circuit, a thermo-electric switch connected in and controlling the action of the fire alarm switching unit, a mechanical switch connected in and controlling the action of the burglar alarm switching unit, a transformer having its primary connected across the power circuit, a circuit breaker connected in series with the power circuit and transformer primary, fire and burglar alarm relays, said circuit breaker having a switch element and contact for connecting both the fire alarm and burglar alarm switching units to the transformer secondary, a signal selector unit having a pair of switch-actuating coils and switch contacts connected in parallel between the circuit breaker and the fire and burglar alarm relays, fire and burglar alarm circuits and trip links associated with the thermo-electric switch and burglary alarm switch, auxiliary switches actuated by said trip links, whereby the power circuit is opened and the alarm circuit closed, asymmetric cells connected in series respectively with the thermo-electric switch of the fire alarm unit and mechanical switch of burglar alarm unit, and an asymmetric cell connected in series with each of said switch actuating coils, whereby said switches are selectively actuated to connect either the fire or burglar alarm relays to the transformer secondary and thereby close either the fire or burglar alarm circuit.

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