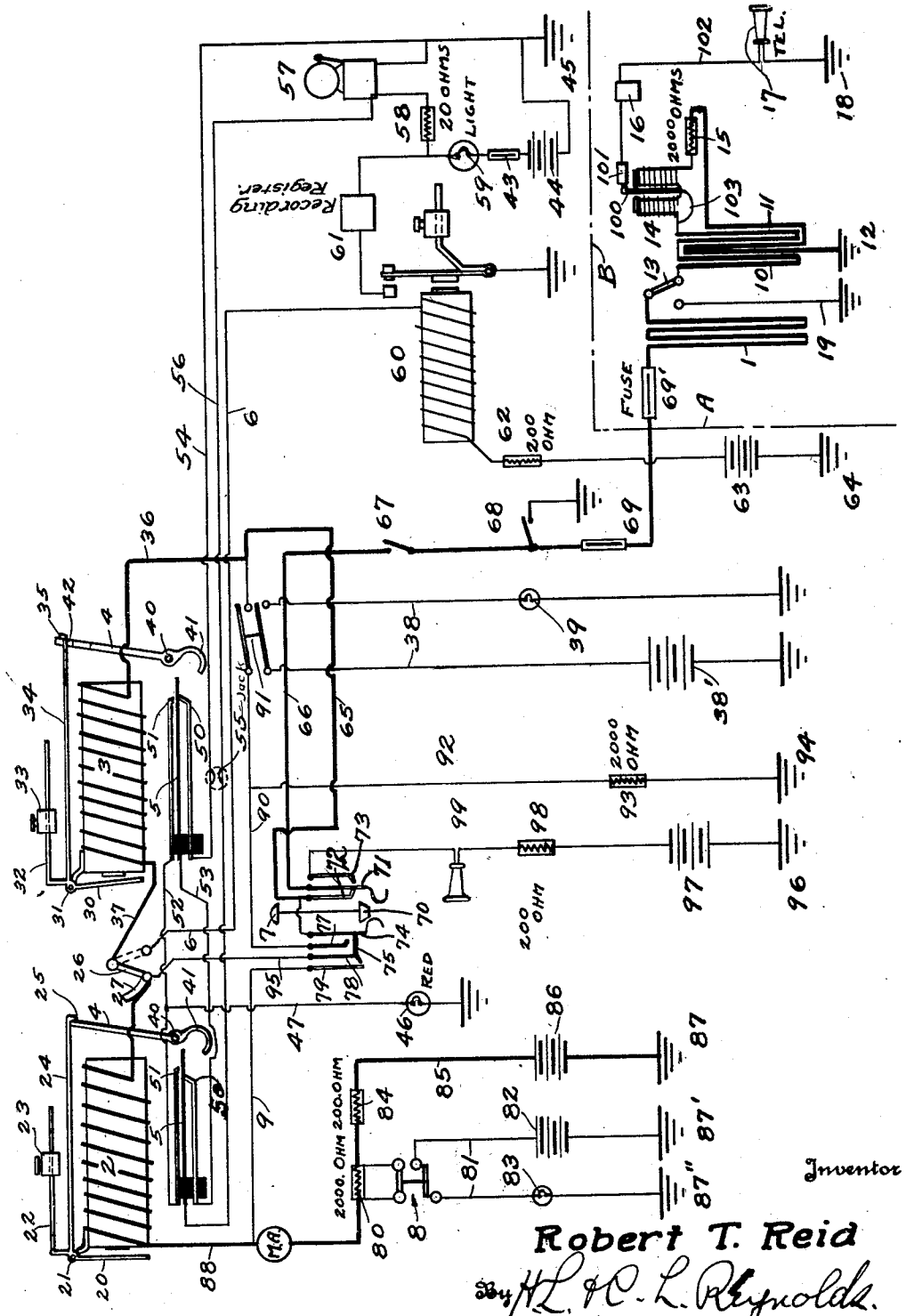
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BURGLAR ALARM SYSTEM

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BURGLAR ALARM SYSTEM

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My invention relates to burglar alarm systems, such as are adapted for installation in a large number of locations, and are operated in conjunction with a central station which, through electrical circuits and apparatus, maintains supervision over all such locations.

The object of my invention is to improve upon both the apparatus employed and the system of control, both in the way of simplicity and of effectiveness.

A specific object of my invention is the provision of a system whose local alarm at the central station operates by the opening of a normally closed circuit.

A further specific object is the provision of means whereby should the protected premises, while under control, be entered by an authorized person, the central office may be informedof this, and such authorized person may be assured that the central office is aware of his presence and that he is authorized to enter upon the premises.

Other objects of my invention will be disclosed by a study of the accompanying drawing and the following specification.

The accompanying drawing is mainly of a diagrammatic character and illustrates a preferred arrangement of circuits and parts, and also the preferred construction of certain parts which are peculiar to my invention. That part of the drawing enclosed by the lines A, B, represents the equipment which is placed in the premises to be protected, while the remainder represents the constructions which are placed in the central station, this construction being, in the main, duplicated for each premise protected.

The circuits in the protected premises are divided into two parts, one part represented by the wires 1, which includes all entrance points which remain permanently closed, and a part represented by wires 10 and 11, which includes such points as are likely to be opened in the customary use of the premises, such, for instance, as doors and windows, which may at times be opened. These two parts are connected by a switch 13, by which the part, which includes 10 and 11, may be cut off by a ground made at 19.

This disconnectible circuit includes a polarized relay 14, a measured resistance of considerable value represented by 15, a signal device 16, say of the buzzer type, and a telephone receiver 17, all connected to a ground 18. A fuse, so labeled, is placed in the lead in circuit. Beyond the measured resistance 15, the conductor 11 leads to a ground 12. This arrangement is given merely as indicative of a typical protective system. The specific character of construction employed for such system is not an essential in my invention, so long as it will properly function with the other parts of the larger system.

A unit construction for the central station includes two relays represented in the drawing by 2 and 3. One of these, relay 2, is an overload relay, that is, a relay operated by a current flow exceeding a fixed amount, while the other, 3, is an underload relay, that is, one which operates by decrease of the current below a fixed amount. While I have shown particular constructions in said relays, the particular construction thereof is not the material part of my invention, and relays of other construction which will function in a similar manner, may be employed.

The armatures 20 and 30 of the respective relays are pivoted, respectively, at 21 and 31, and have horizontally extending arms 22, 32, upon which an adjustably movable weight, 23, 33, permits adjustment, whereby the magnetic pull at which the armature will swing, may be determined. Carried by or controlled from the armature 20 or 30, is an arm, 24 or 34, which is employed to normally retain drops 4 in raised position. The drops 4 are pivoted at 40, and their weight is so adjusted relative to their pivot that when unrestrained, they will drop, or swing, away from the relay.

The tip 25 of arm 24 is turned down, so as to hook over the drop 4 to normally prevent its dropping. A current, limited in volume, is normally passing through this relay, but adjustment of weight 23 is such as to prevent movement of armature 20 until the current strength reaches a limit set and materially greater than the normal. When this occurs, the drop 4 is released and falls.

The underload relay 3 has its weight 33 so

adjusted, relative to the attraction of the armature produced by a normal current strength, that its upturned tip 35 will prevent release of the drop 4, but if the current strength drops below a predetermined minimum, the weight 33 will cause the drop 4 to be released. The drops for each of these relays are alike, except that the one for relay 3 has a hole, 42, through which the end of arm 34 passes.

Associated with each relay 2 and 3 is a switch device which is controlled by the drops 4. This is shown as composed of three fingers 5, 50 and 51, extending in parallel relation and close together. The central finger 5 should be of spring character and bendable by a slight effort, so as to change the circuit connections. Fingers 5 and 50 are normally in contact. The fingers 51 of the two devices are connected by the conductor 52, while conductor 53 connects central finger 5 of one device with finger 50 of the other device. The other central finger 5 is connected with conductor 56, which leads to the alarm bell 57, while the finger 50 of the other device is connected with conductor 54 which leads to the other side of the alarm bell. The battery 44 for operating this alarm bell is connected with the bell through a fuse 43, a tell-tale light 59, and a measured resistance 58.

The switch members 5 and 50 are thus connected in shunt about the bell 57. As there is much less resistance in this shunt circuit than through the bell, the bell will not ring as long as the shunt circuit is intact, but will ring when the shunt circuit is broken. The breaking of the shunt circuit occurs when either of the drops 4 are released. They are pivoted at 40 and the end 41 is positioned to engage the projecting end of spring finger 5 and lift it so as to break its contact with finger 50 and to make contact with finger 51. Only one of these drops would be released at a time, but either will break the shunt circuit 54, 56 and compel sufficient current from battery 44 to flow through bell 57, producing an audible signal, the circuit in this instance flowing from the battery 44 through fuse 43, lamp 59, resistance 58, bell 57, wire 54, back to battery 44. At the same time, connection of one of the fingers 5 with the finger 51 cuts into the circuit a warning light 46, the circuit in this instance flowing from the battery 44 through 59, 58, 56, 5, 51, 47, lamp 46 to the ground through which it returns to grounded side of battery 44. There is thus provided both a visible and an audible signal. Light 59, which is at all times in the circuit of battery 44, is used to positively show at all times that the bell circuit is in operative condition.

Should the current flow in any line circuit be stopped or very materially reduced in amperage, from any cause, then the magnetic pull of the underload relay will decrease to a point where its drop is released. In falling, the drop, by engagement of its short end 41 with the spring finger 5, opens the shunt circuit through lines 54, 65 compelling sufficient current to flow through the alarm light 46 and bell 57 to ring the bell. The same result is secured when, by any cause, as by a short circuit, the current amperage on the line circuit is materially increased, this operating the overload relay 2 to release its drop and thus break the shunt circuit 54, 56 to ring bell 57 and light lamp 46.

In case the circuit leading to or contained in any protected premise is broken or altered so as to cause a material increase or decrease of the current which is at all times flowing, one or the other of the drops 4 will fall and the warning signals described will be produced at the central office.

Such signal would be produced by a return of an authorized person after the premises had been closed for the night or over a holiday. Provision has been made so that this condition may be positively determined. Should such an alarm indication be followed at once by the restoration of the circuit to its normal condition, this would indicate that some person, authorized to enter the premises, had opened a door and closed it behind him, and, in accordance with established regulations, will soon confirm this by transmitting an agreed-upon code signal. The attendant then throws the switch at 26 from the position shown in the drawing in which it connects the two relays 2 and 3, to one in which connection with relay 2 is broken and connection made with the conductor 6 leading to the relay 60, which relay operates a recording mechanism represented by 61. From the other side of relay 60, connection is made through a relatively low resistance element 62 to battery 63, the latter being grounded at 64. Switch 26 has an arm or head 27 of sufficient transverse extent to not break connection with relay 2 until after connecting with conductor 6.

The person entering sends his signal by closing a key which grounds the circuit a prescribed number of times, or in any distinctive manner, thereby identifying himself and his right to enter the premises to the operator at headquarters. For this purpose the key 13 may be used, or a special signal sending mechanism may be supplied.

When the circuit is thus grounded so that it need not pass through the resistance coil 15, the strength of current will be largely increased, thus causing operation of the recording relay 60 and the registering mechanism 61, and producing a permanent record. Shorting out the overload relay 2, as was done by shifting of switch 26, prevents its being affected by this increase in current strength.

Upon completion of the code signal, switch 26 is restored to normal position and the subscriber turns a switch, as switch 13, which

grounds the line and cuts out the 2,000 ohms resistance 15. This produces a current strength 50% or more above normal, thereby causing attraction of the aramature 20 of the overload relay and releasing the drop 4 of this relay.

The central office operator then shifts a switch 8, which is in shunt about a 2,000 ohm resistance 80, placed in the circuit 88 leading from the overload relay 2 to operating battery 86 and ground at 87. A smaller 200 ohm resistance 84 is between said battery and the said shunt circuit. This shift restores the resistance lost to the circuit by cutting out the resistance coil 15, reducing the current flow through the relays 2 and 3 to the normal which will not operate either relay.

The switch 8 being a double pole switch, when thrown as described, will cut light 83 into the local circuit of battery 82, thus producing visible indication that the subscriber's switch is in day position. When the subscriber desires to place the premises under "night" or vacant protection, he throws his switch 13 to cut out the direct ground connection and to include the resistance 15. This places coil 15 in series with resistance coil 80 at the central station, which reduces the current flow more than 50%, or to an amount insufficient to hold attracted the armature 30 of the underload relay 3, which results in releasing the drop 4 of this relay. This causes the end 41 of the drop to engage the tip of the spring finger 5, raising it and breaking the circuit 54, 56, which forms a shunt about the bell 57, thereby ringing this bell. This also establishes a circuit through conductors 51, 52 and 47, causing red signal light 46 to glow.

Such action shows the operator that the subscriber's switch has been placed in protective position. He, therefore, throws switch 8 back to normal position, thereby restoring the shunt about the resistance coil 80, restoring the normal resistance to the line. To advise the subscriber that the central office is aware that he has placed the circuit in protecting condition, the operator presses a test key 7. This test key controls a number of switch members to make a series of circuit changes in a definite and fixed order.

In normal condition of the circuits, all parts controlled by the test key 7 are out of contact, that is, in open circuits, except the two parts 71 and 72, which parts are connected with the conductors 65 and 66 forming a part of the line leading to the protected premises. The conductor 66 contains a series jack 67, one side of a grounded jack 68, and a fuse 69. A fuse 69′ is also shown as in this line upon the protected premises.

The first result on pushing upon the test key 7 is that its head 70 engages the bar 74 to push it outward. This bar carries an insulating finger or pin 75, which engages a yielding bar or finger 78 to cause contact thereof with finger 79, thereby closing a break normally existing between conductors 9 and 95, these being tap or shunt connections with opposite sides of the overload relay 2. Closing this break therefore forms a shunt about relay 2. The next in sequence of the acts performed by the test key is to make contact between spring bars 74 and 77. This, through conductors 90 and 92, connects the line with ground 94, through a 2,000 ohm resistance 93, placing the latter momentarily in parallel with the like resistance coil 15 at subscriber's premises.

The next act in the sequence performed by the continued movement of the test key is to break the normal circuit to the protected premises by pushing outward the yielding finger 71, breaking its contact with finger 72, and next making contact of finger 71 with finger 73, which connects the subscriber's end of a protective circuit with the ground 96 and battery 97, through a 200 ohm resistance 98 and a telephone receiver 99. Battery 97 is of opposite polarity to the battery 86, which normally supplies current to the line. This change of direction of current through the magnet coils of polarized relay 14 causes a reversal of its armature 100 and brings this armature 100, which is connected with conductor 10 by a tap 103, into contact at 101 with earth through alternate circuit 102 thus completed, which circuit includes a buzzer 16 and a telephone receiver 17.

By the action of the buzzer while test key 7 is held down, a wide and rapidly intermitting variation of current strength in the line may be produced, which will cause the two telephone receivers 99 and 17, one at the central station and the other at the protected premises, to vibrate and produce a sound which will inform the subscriber that the central office is aware that he has placed the premises again under the protection of the system, and also inform the central office operator that the protecting circuit is complete and in working order. When the test key is released, the circuits are restored to their normal condition.

Should the circuit upon the protected premises be broken, as by the movement of a window, door or other protected spot, the armature of the underload relay would be moved to release its drop and produce a signal at the central office, as has been described. To prevent continuous ringing of the alarm bell, the operator would close the double pole single throw switch 91, the upper side of which would connect the grounded line 92 and its 2,000 ohm resistance 93 with the main line 36 near the relay 3. This restores normal conditions in the main line circuit through the relays 2 and 3.

The lower bar of switch 91 closes a local circuit 38, which contains a battery 38′ and a

green signal light 39, which light is on whenever the line is broken outside of the central office and while switch 91 remains closed. Should the break in the line close while switch 91 is closed, the resistance coils 93 and 15 are placed in parallel, which permits sufficient increase of current flow to operate the overload relay. This would cause local alarm bell 57 to operate, advising the operator that the circuit was again complete and switch 91 would be thrown to its open position, thus cutting out the green light 39.

As has been stated, relay 60 together with recording register 61, alarm bell 57, resistance coil 58, light 59, fuse 43 and battery 44 are common to a multiplicity of protective circuits units. This is also true of shunt circuit 54, 56. It, therefore, follows that should the contact fingers 5 of relay 2 or 3 of any unit of a group of units, fail to close the circuit by contacting with finger 50 after drop 4 has been raised, the magnets of bell 57 would be energized and the bell would continue to ring until the shunt circuit 54, 56 was closed. To accomplish the prompt closing of this circuit in such a contingency, each such unit is provided with an open jack 55 inserted between its parallel conductors. The insertion of a closed circuit plug into this jack will close or short circuit this shunt circuit, thereby preventing the continuous ringing of alarm bell 57. To effect an immediate transfer of the line leading to protected premises from a unit thus defective to a spare unit which is in good order, a plug attached to a single cord is inserted in jacks 67 of each unit. The alarm system is thus restored to normal operating condition.

In using a system, the local or alarm circuit of which is normally closed, such as is described, certain advantages of operation are secured. It is a well known fact that dry dust, or any substance of relatively high electrical resistance, accumulated upon or between contact points of an open circuit, often prevents the completion of the circuit when desired, thus defeating the object sought. Through other causes a sufficient movement of parts to insure proper closure may be prevented. Where a normally closed circuit is employed, this liability of failure is entirely overcome. By local or alarm circuit is meant the circuit containing the conductors 54, 56 and the alarm bell 57, or an equivalent mechanism.

It is well known that the tension of metal springs is affected by variations of temperature and other causes beyond practical control. This variation of tension is liable to prevent the proper operation of delicately adjusted electrical instruments, such as relays employed in burglar alarm units. It is, therefore, necessary to provide such springs, when employed, with means of adjustment to enable the operator in charge to compensate for changes of tension by lengthening or shortening the spring, as may be necessary. Should the adjustment of a spring be unskillfully made, or should the adjustment be altered from any cause, failure of the affected relay to function in event of an attack on the protected premises is liable to result.

In order to reduce this liability of failure to a minimum, I have employed relays 2, 3, whose movable parts depend upon gravity alone to cause them to change position when released, said movable parts being so weighted and pivoted as to enable them to overcome all frictional resistance and perform their proper functions by the action of gravity.

What I claim as my invention is:

In a burglar alarm system, a main circuit between a central station and a protected premises, an overload relay and an underload relay in series in the main circuit at the central station, circuit breaking devices controlled by said relays, an alarm circuit at the central station including an alarm member and a measured resistance, a normally closed shunt circuit of relatively low resistance about the alarm member, two contact members associated with each relay and in series in the shunt circuit; one of said contact members of each relay being movable by the circuit breaking device of its associated relay to break said shunt circuit, other contact members arranged to be engaged by the said movable contacts, a recording apparatus having a circuit, a relay which includes the latter mentioned contacts in series therein controlling the recording circuit, a switch adapted to be moved to connect a circuit for the relay through the main circuit and to simultaneously short out the overload relay and a signaling key in the main circuit.

Signed at Seattle, King County, Washington, this 11th day of February, 1927.

ROBERT T. REID.