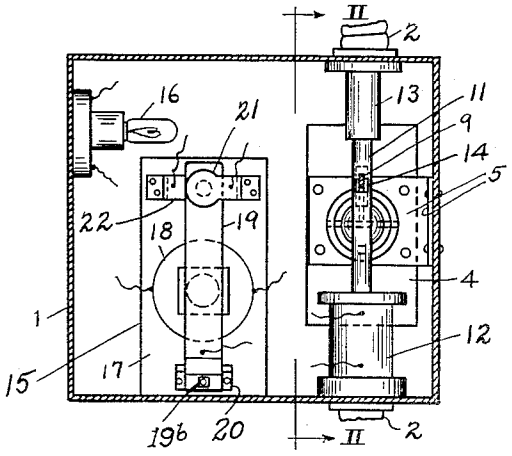
May 28, 1940. F. PEDATELLA 2,202,535

WALL BOX SWITCH

Filed March 25, 1937

Fig. I.



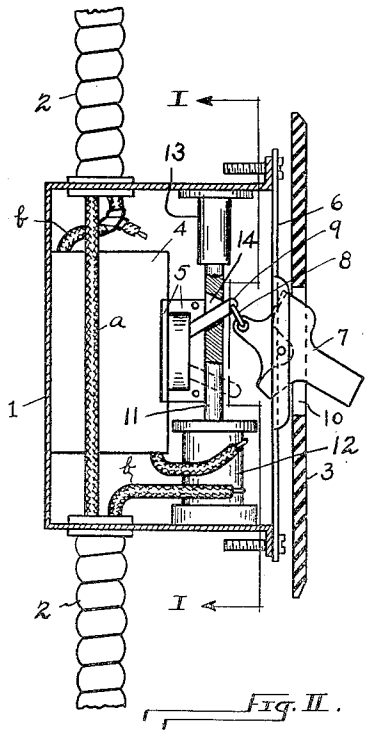


Fig. II.

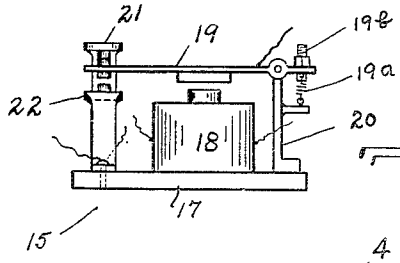


Fig. III.

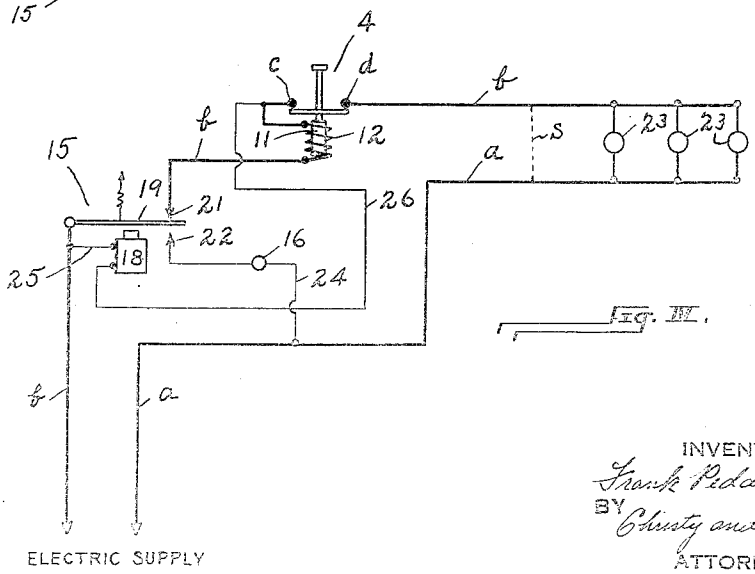


Fig. IV.

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Patented May 28, 1940 2,202,535

UNITED STATES PATENT OFFICE

2,202,535

WALL BOX SWITCH

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Application March 25, 1937, Serial No. 132,957

4 Claims. (Cl. 175—294)

My invention relates to the electrical wiring systems of homes and other buildings, and consists in a particularly effective organization of circuit-controlling and circuit-protecting means in a unitary structure.

The object of the invention is to eliminate the necessity of circuit-protecting fuses in such systems.

A further object is to provide with each of the circuit-controlling switches of such systems means for protecting the individual load circuits, so that a failure in one or another of the several load circuits will not interfere with normal operation of the others. In other words, I aim to provide a combined circuit-controlling and circuit-protecting unit for each room of a building, say each room of a home, whereby a defect in the electric circuit of one room will not impair normal service of the circuits of the other rooms.

I am aware that others have hitherto proposed means for automatically opening a switch upon the occurrence of a short-circuit or other overload in the controlled circuit, and I know that lock-out relays have been used to prevent damage in case the automatically opened circuit be manually reclosed while the overload still prevails. (Note Letters Patent, No. 2,080,502, granted to me May 18, 1937.) However, to these known ends no one has provided structure which may be arranged in compact, unit assembly within a small switch-box, of the sort now commonly installed within the walls of dwellings, nor has anyone provided an automatic circuit-breaker and lock-out relay assembly which is serviceable with a snap-action switch mechanism of the type which the laws of the various localities specify for use in the home. More specifically, my invention consists in particularly effective organization of circuit-protecting means with a snap-action switch. My structure is compact; the several instrumentalities of the organization are of simplified and economical construction, and are assembled within the relatively small confines of an outlet-box, in such manner as to meet the usual municipal construction codes.

In the accompanying drawing Fig. I is a sectional view of an outlet-box, showing the internal organization of the invention in front elevation; Fig. II is a view in cross-section of the box, showing certain parts of the assembly partly in side elevation and partly in vertical section. The broken plane of section of Fig. I is indicated by the lines I—I in Fig. II, and the plane of section of Fig. II is indicated at II—II in Fig. I. Fig. III is a view in side elevation of the relay device embodied in the structure. And Fig. IV is a wiring diagram.

Referring to the drawing, the reference numeral 1 is applied to a box, a so-called outlet-box, or switch-box, of the sort commonly in use at the present time for housing switches or other electrical devices within the walls of buildings. The box 1 is made of sheet metal, and in accordance with known practice its side-walls are provided with knock-out openings (not shown) for the introduction of circuit wires *a* and *b*. In usual manner the terminals of flexible metal conduits 2 for the circuit wires are secured to the side walls of the box, and it will be understood that in service the box 1 and conduits 2 are embodied within the walls (not shown) of the building. Over the mouth of the installed box, the usual cover plate 3 is secured.

Within the box 1, I mount a snap-action switch mechanism. Such mechanisms are known to the art, and the particular type I use need not be considered in detail herein. Suffice it to say that the mechanism is arranged within a housing 4 of hard rubber or other insulating material, and comprises snap-action means, which are responsive to the movement of an arm 9 between its full-line and dotted line positions in Fig. II, electrically to open and close circuit wire *b*. The housed switch mechanism 4 is secured in the box, by means of an L-shaped bracket 5.

A switch-operating lever or trigger 7 is pivotally mounted on a bridge member 6, secured across the mouth of the box 1, as shown in Fig. II. The trigger includes a portion that extends into the box and is articulated to the end of switch arm 9, by means of a link 8, and a portion that extends through a slot 10 in the cover-plate 3, whereby in known way the trigger may be "snapped" between "on" and "off" positions, and the switch mechanism shifted between circuit-closing and circuit-interrupting positions. This articulation or flexible connection of the trigger 7 to the arm 9 of the switch mechanism is an important feature of my construction.

Between the housed switch mechanism 4 and the trigger 7, I organize in compact assembly within the box 1 an electromagnetic plunger 11. This plunger extends at one end into a low-resistance actuating coil 12, and at the opposite end extends with sliding fit into a supporting sleeve 13. Both coil 12 and sleeve 13 are secured to the walls of the box, and the terminals of the coil are electrically connected in series in circuit wire *b*, as shown in Figs. II and IV.

The plunger 11 is provided with a slot 14 through which the switch-operating arm 9 extends, and, when the trigger 7 is "snapped" between "on" or "off" positions and in consequence the arm 9 swings, the plunger 11 slides to or fro in the sleeve 13 and coil 12. In Fig. II the trigger 7 and switch arm 9 are shown in the positions in which they rest when a nominal electrical load is closed across the circuit *a*, *b*, and, as will presently appear in greater detail, the actuating coil 12 is effective, when a short-circuit or other overload occurs in the circuit, to draw the plunger 11 downward, with the consequence and effect that the switch arm 9 is instantaneously swung clockwise, shifting the switch mechanism into circuit-interrupting position, and simultaneously swinging the trigger 7 into "off" position. Thus, the circuit *a*, *b* is automatically opened when an overload occurs.

In compact assembly with the above-described automatic switch mechanism, I organize in the box 1 a relay device 15 and an electric glow lamp 16, to safeguard the circuit in case the trigger 7 be inadvertently thrown into "on" position and the automatically interrupted circuit *a*, *b*, reclosed while the overload conditions still prevail. The relay device consists of a base 17 of insulating material, which is secured to the inner, vertical wall of the box 1. A high-resistance electromagnet or actuating coil 18 is mounted on base 17, and across the usual core of the electromagnet or coil an armature 19 extends. The armature is pivotally supported at the upper end of a standard 20 upstanding from the base 17; the distal end of the armature lies between two contacts 21 and 22 that are mounted in electric isolation from one another on the said base 17; and a tension spring 19*a* is organized with the proximal end of the armature, such spring tending to maintain the distal end of the armature in engagement with contact 21, as shown in Fig. III. It will be understood that in this position of the parts the armature 19 stands in circuit-closing position in the circuit *a*, *b*. In the event that the circuit *a*, *b* is overloaded, the low-resistance electromagnet or coil 12 attracts the armature 11 and opens the switch mechanism 4, before the high-resistance electromagnet or coil 18 is adequately energized to swing the relay armature 19 away from contact 21. If, then, the automatically opened switch mechanism 4 is manually reclosed, the high-resistance electromagnet 18 operates to draw the armature 19, against the tension of spring 19*a*, away from contact 21, and into engagement with contact 22, thereby opening the load circuit *a*, *b* and closing an auxiliary circuit through the glow lamp 16. The lamp 16 is thus energized and provides a visual indication that an overload prevails in the load circuit. The electromagnet 18 is effective to hold the armature in its emergency, circuit-guarding position, so long as the switch mechanism remains closed in the overloaded circuit. It will be understood, of course, that the cover-plate 3 includes a window (not shown) through which the warning light of the lamp 16 may be seen.

The tension of spring 19*a* may be regulated by adjusting the position of screw 19*b* in the proximal end of the armature, and, by so regulating the tension of the spring, the armature may be made delicately sensitive in its operation to currents of predetermined magnitude.

The electrical hook-up of the several elements of my unit is illustrated in Fig. IV. It will be observed that the normal load of the circuit *a*, *b* comprises in exemplary way a plurality of lamps 23. The low-resistance electro-magnet or actuating coil 12 that is adapted automatically to open the switch mechanism 4 is connected in the circuit wire *b* in series with the terminals *c*, *d* of such switch mechanism. The armature 19 of the relay device 15, in its normal position, engages the contact 21 and stands in series with the actuating coil 12 and switch contacts *c*, *d*. Accordingly, subject to the manual operation of the snap-action switch mechanism 4, the energizing circuit *a*, *b* of the lamps 23 may be normally opened and closed. And it will be understood that the operating current for the normal load (lamps 23) is inadequate to energize the low-resistance coil 12 to such degree that the switch-operating plunger 11 is disturbed. When, however, a short circuit S or other overload occurs in the closed circuit *a*, *b*, the abnormal current flowing in the circuit energizes the coil 12 far in excess of its normal value, with the result that the plunger 11 is immediately shifted and the switch mechanism simultaneously shifted into circuit-interrupting position. When the switch mechanism 4 is thus operated automatically to open the overloaded circuit, the armature 19 of the relay 15 remains in engagement with contact 21.

If the switch mechanism 4 is manually reclosed, while the overload S still exists, the high-resistance coil 18 of the relay device is energized and swings armature 19 into engagement with contact 22, thereby opening the normal circuit through the coil 12 and switch contacts *c*, *d*, and closing an auxiliary circuit 24 through the warning light 16. Considering the organization of the relay device more specifically, it will be noted that one terminal of the high-resistance electromagnet or coil 18 of the relay device is by a lead 25 connected to the circuit wire *b* at a point between the source of electric supply and the relay contact 21, while the other terminal of such electromagnet is by a lead 26 connected to circuit line *b* at a point between the switch mechanism 4 and the actuating coil 12; that is, the coil 18 of the relay is connected in shunt across the actuating coil 12 of switch 4 and the contact member or armature 19 of the relay. When the circuit *a*, *b* is operating under normal conditions, the current leaking through the high resistance electromagnet 18 is substantially nil, and the power of attraction of such magnet upon the armature 19 is insignificant. When the circuit is overloaded, however, and the automatically opened switch mechanism 4 is inadvertently reclosed, a circuit *b*, 25, 18, 26, *c*, *d*, S, *a* is closed, and the abnormally high current flowing therein, because of the short circuit or overload, effectively energizes the electromagnet 18, whereupon the armature 19 is instantly attracted into its safety position, immediately closing the circuit *a*, *b* through the warning lamp 16. And as already mentioned the electromagnet 18 remains energized and the armature 19 is held in its safety or emergency position so long as the switch mechanism 4 is closed in the overloaded circuit. Thus, it will be perceived that my structure is fool-proof; it provides all the protection that the usual fuses afford, and in addition presents many practical advantages which will be at once apparent to those skilled in the art.

I claim as my invention:

1. In a unit switch structure including a snap-action switch mechanism for controlling an elec-

trical load circuit, a manually operable trigger arranged in conventional organization with said switch mechanism and movable between "on" and "off" positions for throwing said mechanism between circuit-closing and circuit-interrupting positions, a circuit-protecting device, including an actuating coil, adapted upon an electrical overload in said circuit to throw said switch mechanism from circuit-closing to circuit-interrupting position, while simultaneously shifting said trigger from "on" to "off" position; the improvement herein described that consists in an auxiliary circuit-protecting device including an actuating coil electrically connected in shunt across the actuating coil of the device first mentioned, with the effect that, when said trigger is thrown into "on" position while an overload exists, the actuating coil of said auxiliary device is effectively energized to produce a circuit-protecting operation of such auxiliary device.

2. In a unit switch structure including a switch mechanism adapted to control an electrical load circuit, manually operable means for shifting said switch mechanism between circuit-closing and circuit-interrupting positions, a circuit-protecting device, including an actuating coil connected in service to said circuit, effective upon an overload in said circuit to move said mechanism into circuit-interrupting position, and an auxiliary circuit-protecting device including an actuating coil; the improvement herein described in which the actuating coil of said auxiliary circuit-protecting device is connected in shunt across the actuating coil of the device first mentioned, whereby, when an overload prevails in said circuit, with the switch mechanism in closed position, the voltage drop across the actuating coil of the first circuit-protecting device produces an effective energizing of the actuating coil of the auxiliary circuit-protecting device.

3. The structure of claim 2, in which said auxiliary circuit-protecting device includes an armature, said armature being connected with the actuating coil of the first-mentioned circuit-protecting device between the terminals of said shunt connection of the coil of the auxiliary circuit-protecting device.

4. The structure of claim 2, in which said auxiliary circuit-protecting device includes an armature, said armature being connected with the actuating coil of the first-mentioned circuit-protecting device between the terminals of said shunt connection of the coil of the auxiliary circuit-protecting device, and a normally open signal circuit arranged to be connected across said load circuit and subject to said armature.

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