

Sept. 16, 1947.

J. BIERENFELD

2,427,437

ELECTRIC RELAY

Filed Feb. 10, 1944

2 Sheets-Sheet 1

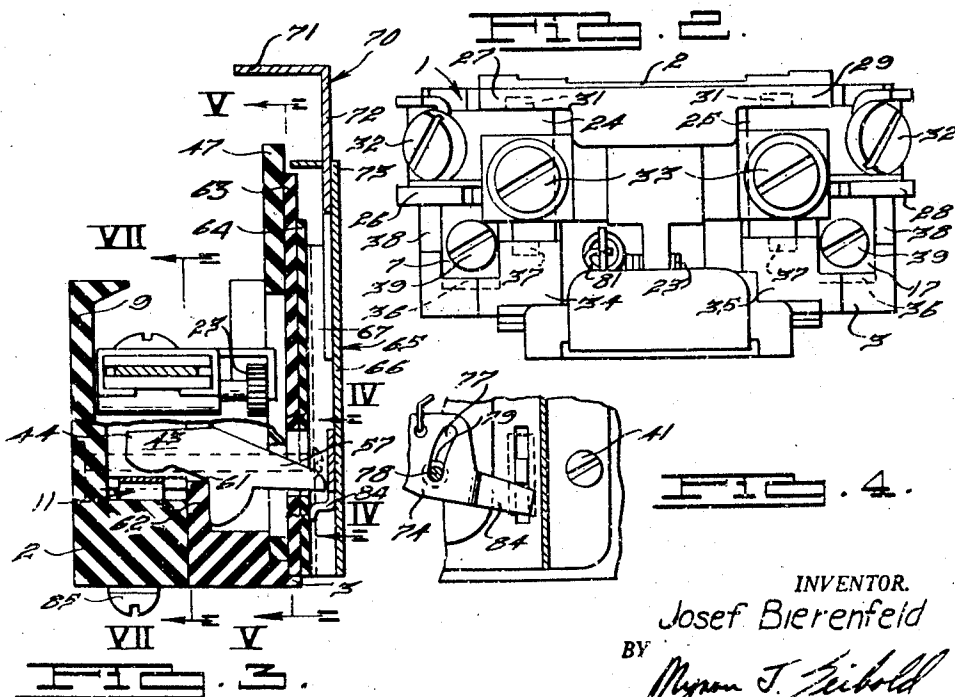
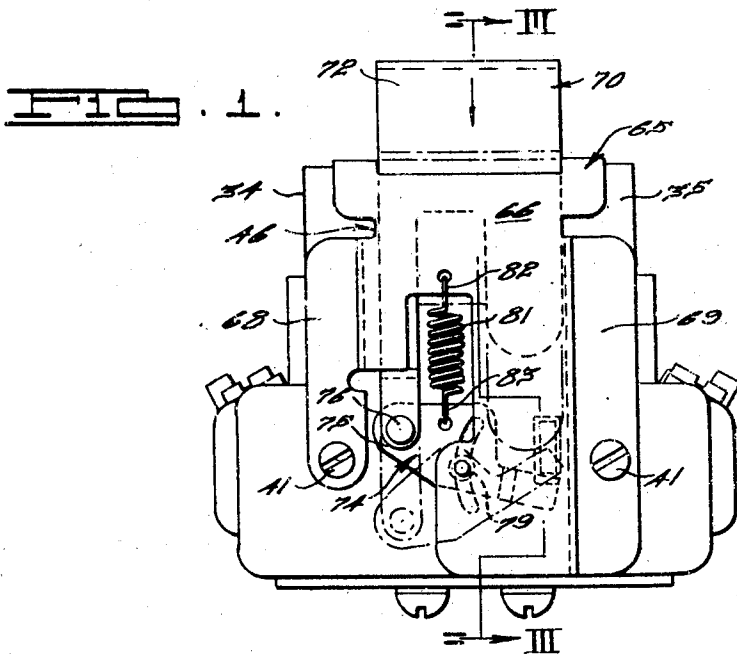


FIG. 4.

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2 Sheets-Sheet 2

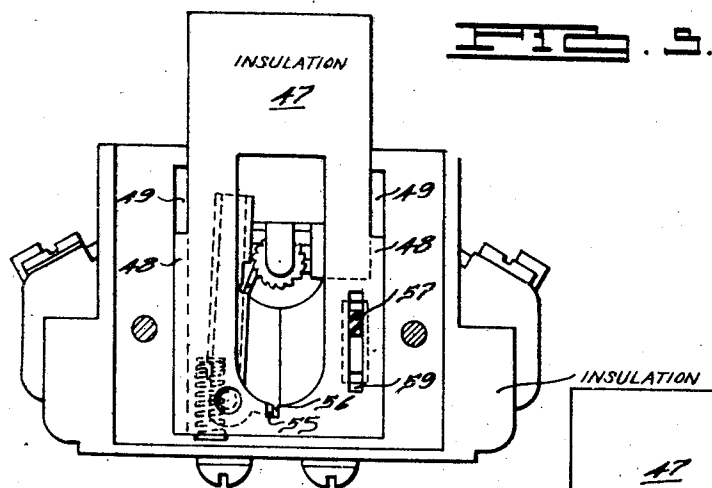


FIG. 6.

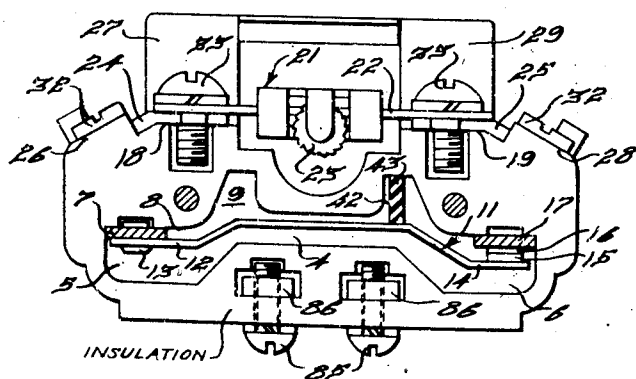
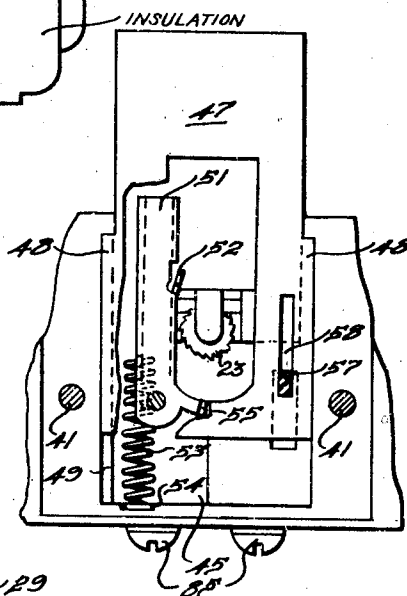


FIG. 7.

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2,427,437

ELECTRIC RELAY

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Application February 10, 1944, Serial No. 521,779

6 Claims. (Cl. 200—116)

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This invention relates to relays and more particularly to thermal overload protective relays.

One object of the present invention is to provide a relay automatically operable on the occurrence of an overload current and having improved and simplified reset mechanism therefor.

Another object of the invention is to provide an overload protective relay wherein the contacts are maintained in separated position on resetting of the overload responsive means.

Other objects and features of the invention will be readily apparent to those skilled in the art from the specification and appended drawing illustrating certain preferred embodiments in which:

Figure 1 is a rear elevational view of the relay according to the present invention.

Figure 2 is a top plan view of the invention.

Figure 3 is a vertical sectional view taken on the line III—III of Figure 1.

Figure 4 is a detail sectional view taken on the line IV—IV of Figure 3.

Figure 5 is a sectional view taken on the line V—V of Figure 3.

Figure 6 is a fragmentary view illustrating certain details similar to Figure 5 and showing the tripped position of these details.

Figure 7 is a sectional view taken on the line VII—VII of Figure 3.

The particular relay illustrated here is adapted for the protection of electric energy translating devices by opening the energizing circuit thereof on the occurrence of a current therethrough exceeding a predetermined value.

The relay, as shown in the drawings, embodies a base 1 formed of insulating material and comprising a pair of base sections 2 and 3. Section 2 is provided with an elongated recess 4 extending horizontally therein for substantially the entire length thereof as shown in Figure 7. The recess 4 is enlarged at its left hand end to form a chamber 5 and at its right hand end to form a chamber 6. A conducting element 7 is disposed in chamber 5 adjacent the top defining wall 8 thereof and having an extremity disposed in a slot formed in a back wall 9 of section 2, which extremity is closely received therein to effect a support for the element 7. An elongated resilient member 11 is secured at one end 12 to the conducting element 7 by a rivet 13 and extends the length of recess 4 and into chamber 6; upon the end 14 of the resilient element 11 which is disposed in chamber 6 is mounted a contact element 15. Disposed above contact element 15, for co-

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operation therewith, is a contact element 16, which contact element is riveted to a conducting element 17. The conducting element 17 also has an extremity thereof closely received by a slot provided in the back wall 9, in the same manner as conducting element 7, and which effects a support therefor. Base section 2 provides horizontally spaced ledge formations 18 and 19 which effect a support for a thermal responsive unit 21. The unit 21 in itself forms no part of the present invention and will be but briefly described. Unit 21 comprises a conducting heating element 22 supporting a ratchet wheel 23 which is held against rotation by a fusible alloy adapted to be melted by an overload current in conventional manner to permit the rotation of wheel 23 under the force of mechanism to be described. A unit similar to unit 21 is more fully described in Patent No. 1,752,514 issued to H. L. VanValkenburg. A pair of conducting members 24 and 25 are disposed respectively on ledge formations 18 and 19, with member 24 being located between projecting formations 26 and 27 provided on ledge 18 and with member 25 located between similar projecting formations 28 and 29 on ledge 19. The conducting members 24 and 25 are provided with projections 31 which extend into slots formed in the projecting formations 27 and 29 and which are closely received thereby to prevent movement of the conducting members with respect to the base 2. Terminal studs 32 are carried by the conducting elements 24 and 25 for the securing of circuit wires thereto. The overload unit 21 is secured to the conducting members 24 and 25 by a pair of studs 33 to thereby place the unit 21 in an electrical circuit. With the unit 21 in position, the conducting members 24 and 25 will be firmly positioned and cannot be removed from the base without first removing unit 21.

Base section 3 is adapted to be placed adjacent base section 2 and has a plurality of slots formed in walls 34 and 35 thereof, with certain of the slots adapted to closely receive extremities 36 of the conducting elements 7 and 17 and with other of the slots closely receiving projections 37 of the conducting elements 24 and 25. This arrangement provides for the proper location of base section 3 with respect to base section 2 and firmly positions the conducting elements 7 and 17 on base 1, the latter elements 7 and 17 resting on flat surfaces 38 provided on base section 3. A pair of terminal studs 39 are carried by conducting elements 7 and 17 whereby electrical lead-in wires may be secured. A pair of

studs 41 maintains the base sections 2 and 3 in assembled relationship. Base section 3 provides wall surfaces which substantially seal off recess 4 in section 2 to provide a contact chamber which is totally enclosed except for an opening 42 leading thereinto. An actuating member 43 has one extremity 44 extending through opening 42 and projects over the resilient switching member 11 for actuation thereof in a manner to be described. Walls 34 and 35 of base 3 are separated by a recess 45 which receives the reset mechanism 46. The reset mechanism 46 includes a plate-like member 47 having longitudinal wing projections 48 which lie in recesses 49 whereby the member 47 is guided for rectilinear movement. Member 47 pivotally carries a latch 51 having a latching portion 52 adapted to engage the ratchet wheel 23 to maintain member 47 in a predetermined position. A spring 53 has one end thereof disposed about a portion of the latch 51 and the other end disposed within a recess 54 biases member 47 upwardly and latch 51 toward wheel 23. The latch 51 is provided with a projecting formation 55 which is received within a recess 56 in member 47 to limit the extent of clockwise movement of latch 51 and insure its always being in proper position to properly engage wheel 23. The switch actuating member 43 has an extremity 57 thereof extending through an opening 58 in member 47 and having a defining surface 59 thereof engageable with this extremity whereby member 43 when released by latch 51 can effect pivotal movement of member 43 about an edge 61 of a wall formation 62 on base 3 in a manner and for a purpose to be more fully described. A pair of insulating members 63 and 64 are secured to the base 3 by the studs 41 and serve to confine member 47 to limit its movement to a vertical one. Each of the insulating members 63 and 64 have openings therein through which extremity 57 of actuating member 43 extends.

Disposed on the back of base section 3 is a bracket 65, the central portion 66 of which is pan shape to provide a space 67 between portion 66 and the back surface of the insulating member 64, and having two leg portions 68 and 69 through which the studs 41 also pass to thereby secure the bracket to base 3. A generally L-shaped actuating member or manual operator 70 has the longer leg 72 thereof disposed through an opening 73 in bracket 65 and extends into the space 67 between insulating member 64 and portion 66. The shorter leg 71 of the member 70 extends over member 47 and is adapted under certain circumstances to effect movement thereof as will be described. Also disposed within space 67 is a member 74 having an end 75 pivotally secured to extension of leg 72 of the actuating member 70 by a pin 76. Member 74 is provided with an arcuate slot 77 in which is disposed the shank 78 of a pin 79 secured to portion 66 of bracket 65. A spring 81 has one extremity 82 thereof secured to portion 66 and the opposite extremity 83 is fastened to the pivoted member 74 and continually biases member 74 upwardly and maintains actuating member 70 in its uppermost position. The use of a radial slot 77 in member 74 extends the distance that the manual operator can be moved downwardly; upon initial movement of member 70, member 74 is pivoted about pin 79 in the lower end of the arcuate slot 77 until its free end engages the end 57 of switch actuating member 43 and rotates it to the position where it holds the re-

lay contacts open. Thereafter, member 74 pivots about its engagement at end 84 with the member 43, moving the arcuate slot 77 along pin 79 as shown in dotted lines in Figure 1. In this latter movement, leg 71 engages member 47, if released, and moves it to reset position.

A pair of mounting studs 85 and their nuts 86 are carried by base 2 and provide means for securing the relay in a desired location.

In the operation of the relay, the movable contact 15 is normally held in engagement with the stationary contact 16 under the inherent resiliency of the switching member 11. To effect a manual switching operation, the manual operator 70 is manually moved downwardly against the bias of spring 81 to rotate the pivotal member 74 counterclockwise about its pivot pin 76 and cause end 84 thereof to force the actuating member 43 to pivot counterclockwise about edge 61 and bring the end 44 into engagement with switching member 11 to move it to disengage contact 15 from contact 16. Release of manual operator 70 will allow it to return to its normal position of rest under the force exerted by spring 81.

On the occurrence of an overload in the circuit in which unit 21 is located, sufficient heat is developed to melt the solder holding ratchet wheel 23 to permit its turning to thereby release latching portion 52 and permit spring 53 to move member 47 upwardly. This upward movement of member 47 will bring surface 59 of opening 58 in member 47 into engagement with extremity 57 of the switch actuating member 43 to effect a pivoting thereof about edge 61 to engage and move switch member 11 to disengage the contacts and break the circuit.

To reset the latch 51, the manual operator 70 is moved downwardly to bring leg 71 thereof into engagement with member 47 and thus the latter member can be moved into a position where the latching portion 52 may reengage with ratchet wheel 23 and be held if the solder has solidified. In the downward movement of member 47, the surface 59 will be moved away from switch actuating member 43 and ordinarily the resilient switch member 11 would move toward contacts engaged position, but as surface 59 is being moved away, the pivotal member 74 is being actuated to bring its projecting portion 84 into engagement with member 43, as hereinbefore described, to maintain a force upon switch member 11 to retain the member 11 in contacts disengaged position. Release of manual operator 70 will then allow the parts to move in the manner described and the contacts to engage. It is apparent that with a relay as described, it is not possible to maintain the contacts engaged on overload because the contacts will be opened either by the upward movement of member 43 or by the action of the reset mechanism if it is held in reset position.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the term of the following claims:

What is claimed is:

1. An electrical relay comprising a stationary contact, a movable contact, a switching arm connected to the movable contact and constantly biased to contacts engaged position, current responsive means for effecting movement of the

switching arm into contacts disengaged position upon the occurrence of a current overload through the relay, a manually operated element having a pin and slot mounting and operable to prevent the return of the switching arm to contacts engaged position, means for rotating said element in its initial manual actuation about the engagement of said pin at one end of the slot to initially obstruct the return of the switching arm to contacts engaged position, and for thereafter maintaining said obstruction while effecting relative movement of the pin and slot to permit further movement of the manual element, and means for effecting the return of the current responsive means to its normal inoperative position during movement of said element.

2. An electrical relay comprising a stationary contact, a movable contact, a switching arm connected to the movable contact and constantly biased to contacts engaged position, an element engageable with said switching arm to move it to contacts disengaged position, an actuator biased to move said element but normally latched in inoperative position, current responsive means for releasing said latch to permit said actuator to move said element to separate the contacts, and manual means for returning said actuator to its latched position, and including a member engageable with said element to retain it in contacts disengaging position, said member having a pin and slot mounting with a biasing means for said member at the side of said pin opposite to the point of engagement with said element, initial movement of said manual means effecting rotation of said member about the point of engagement of said pin with one end of said slot to immediately effect a restraint on said element, continued movement of said manual means to effect return of the actuator causing relative movement between said pin and slot against said biasing means while the member pivots about its engagement with said element.

3. An electrical relay comprising a stationary contact, a movable contact, a switching arm connected to said movable contact, a pivotal element having one end disposed to engage said switching arm and move it to contacts disengaged position, a pair of generally parallel slide members, both of which are biased upwardly, means for latching one of said slide members in a downward position, current responsive means for releasing said one of said slide members upon the occurrence of a current overload through the relay, said one of said slide members in its released position effecting movement of said element to move the switching arm to contacts disengaged position, the second of said slide members being connected to move said element into contacts disengaged position as said second of said members is moved downwardly, said second of said members when so moved engaging said one of said members to return it to its latched position.

4. An electrical relay comprising a stationary contact, a movable contact, a switching arm connected to the movable contact and constantly biased to contacts engaged position, an element engageable with said switching arm to move it to contacts disengaged position, current responsive means for moving said element to contacts disengaged position on the occurrence of a current overload through the relay, manual means for effecting the return of said current responsive

means to its normal inoperative position including a floating member which pivots about one point in the initial movement of said manual means to engage said element and retain it in contacts disengaged position and, in the continued movement of said manual means to return the current responsive means to normal position, pivoting about the engagement of said member with said element, and biasing means for said member exerting a force on said element in said further movement of the manual means to overcome the normal bias of said switching arm.

5. An electrical relay comprising a stationary contact, a movable contact, a switching element carrying said movable contact and biased to contacts engaged position, an operating element engageable with said switching element to move it to contacts disengaged position, an automatic actuator, means biasing said actuator to move said operating element, current responsive means normally retaining said actuator in non-operating position but releasing the same upon the occurrence of a current overload to effect contact separation, and manually operable means for resetting said actuator in retained position and including a floating member pivoting about an axis, upon initial movement of said manual means, into engagement with said operating element to retain it in its contact disengaging position, and pivoting about its engagement with said operating element upon further movement of said manual means to reset the actuator whereby said contacts are maintained disengaged during the resetting operation.

6. An electrical relay comprising a stationary contact, a movable contact, a switching element carrying said movable contact and biased into contacts engaged position, a rotary member for moving said switching element to contacts disengaged position, a rectilinearly movable member, means biasing said rectilinearly movable member to move said rotary member, current responsive means normally latching said rectilinearly movable member in inoperative position but releasing the same upon the occurrence of a current overload to effect separation of said contacts, a second rectilinearly movable member manually operable to effect resetting movement of said first mentioned rectilinearly movable member after an automatic operation, and a floating member connected to said second rectilinearly movable member, movement of said second rectilinearly movable member effecting initial rotation of said floating member about a first axis into engagement with said rotary member and rotation thereafter about its engagement with said rotary member while the first mentioned rectilinearly movable member is reset, whereby the contacts are maintained separated during the resetting operation.

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