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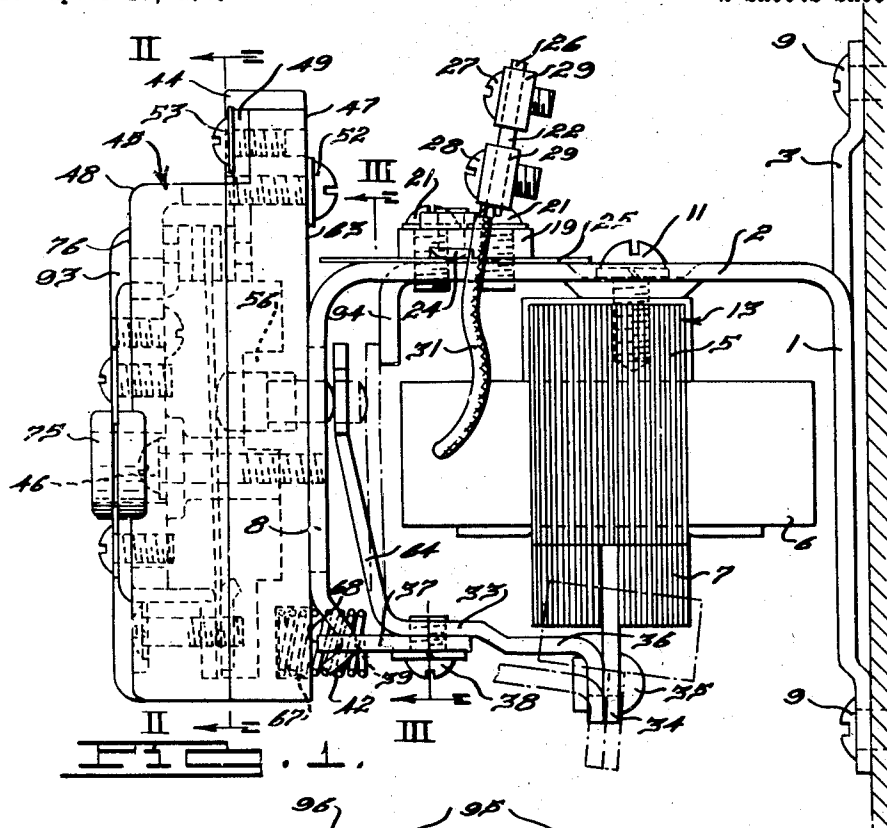
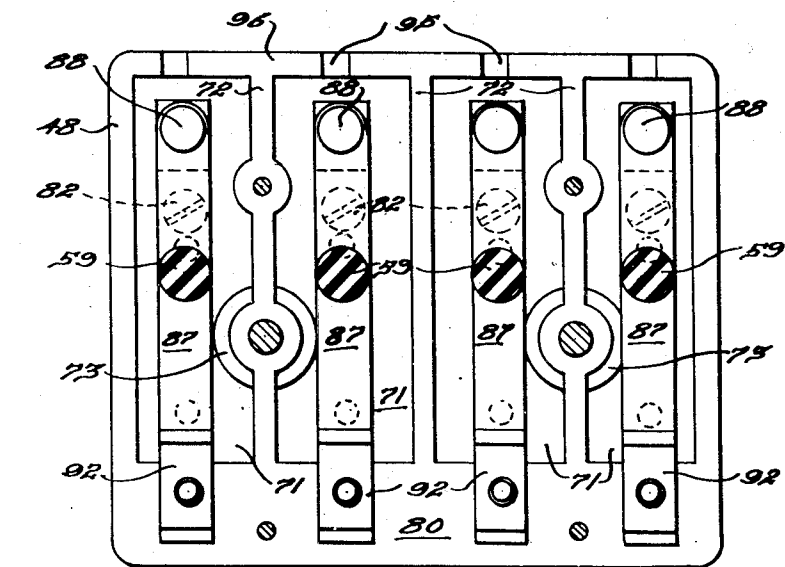
H. L. VAN VALKENBURG

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ELECTRIC SWITCH

Filed April 17, 1943

2 Sheets-Sheet 1



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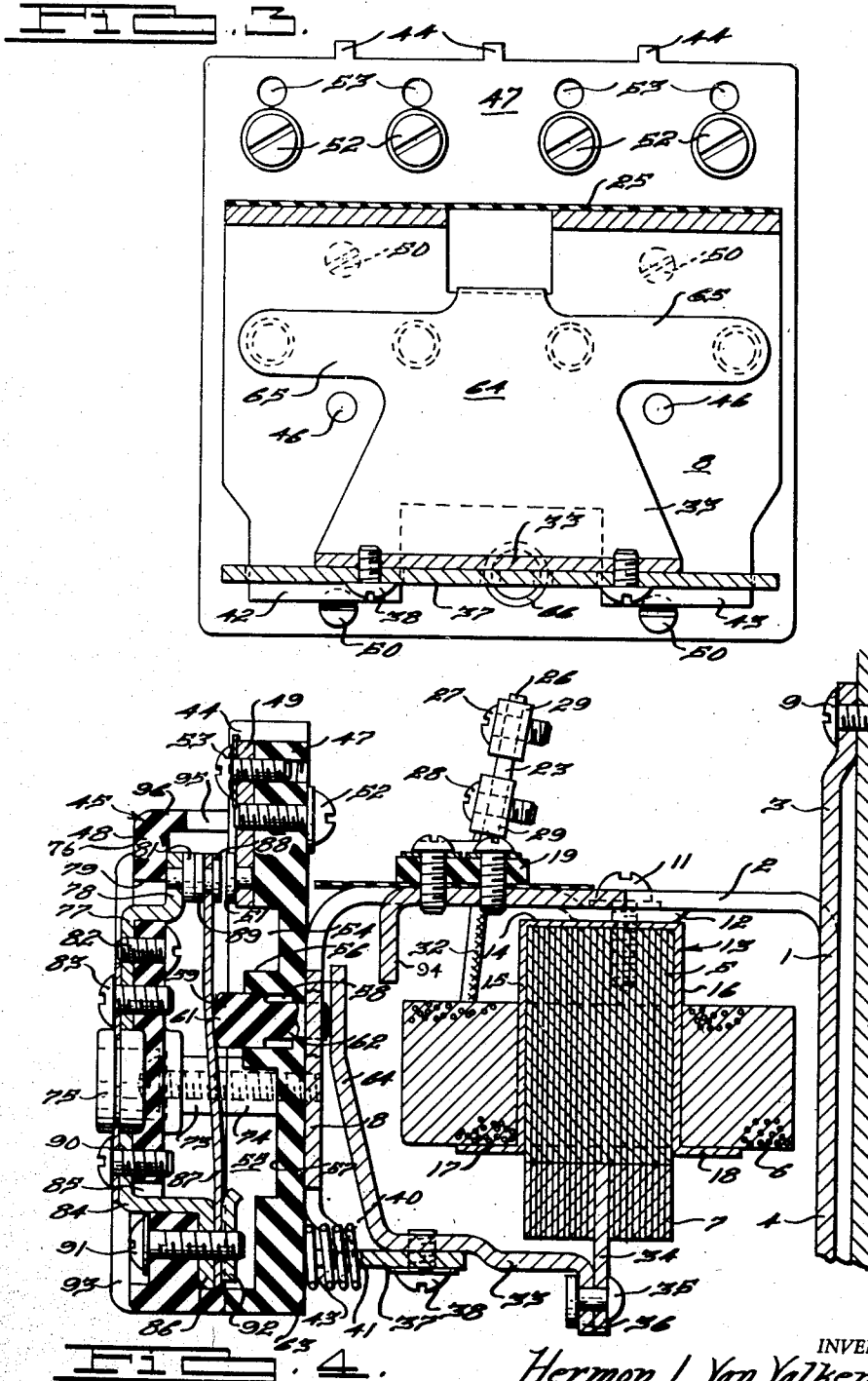
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ELECTRIC SWITCH

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4 Claims. (Cl. 200—87)

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This invention relates to electric switches and more particularly to electromagnetic relays.

One object of the present invention is to provide an electromagnetic relay inexpensive to construct and efficient in operation.

Another object of the present invention is to provide a double throw, multiple pole electromagnetic relay of improved construction.

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

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

Figure 2 is a vertical sectional view taken along the line II—II of Figure 1.

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

Figure 4 is a side elevational sectional view of the relay.

The relay as illustrated in the drawings comprises a generally U-shaped supporting member or frame 1 of metallic material and having a piece cut out of the bight 2 of the frame 1 and outwardly bent to provide a mounting flange 3, which flange forms an extension to leg 4 of the supporting member 1. A pair of studs 9 mount the support 1 at a desired location.

The operating electromagnet for the relay comprises a laminated magnetic member or magnetizable core 5, an energizing winding 6 and a movable armature 7, and is located within the space defined by legs 4 and 8 of the U-shaped frame 1. The magnetic member 5 is secured to frame 1 by a stud 11, being mounted on a depressed portion 12 provided on bight 2. A generally U-shaped coil holder 13 is closely disposed upon the magnetic member 5, with the bight 14 thereof located between the depressed portion 12 and the upper face of the magnetic member 5, and with the legs 15 and 16 thereof extending longitudinally adjacent opposite sides of the magnetic member 5. The screw 11 passes through bight 14 of the coil holder 13 and retains the coil holder in place upon magnetic member 5. The energizing winding or coil 6 is provided with an opening extending centrally therethrough whereby the coil may be fitted about the legs 15 and 16 of coil holder 13. After the coil 6 is moved onto

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the legs 15 and 16 the ends of the latter are bent outwardly as at 17 and 18 to provide supporting surfaces that retain the coil 6 in the required position. The coil holder 13 is formed of aluminum so that the supporting surfaces 17 and 18 have sufficient rigidity to support coil 6 without being displaced by the weight thereof.

A terminal block 19 of insulation is mounted on the upper surface of bight 2 and is secured to the frame 1 by a pair of studs 21 which are threaded into the frame. The terminal block 19 carries a pair of spaced generally L-shaped conducting members 22 and 23 which are held to the block by rivets 24. An insulating liner member 25 is disposed between terminal block 19 and the metallic frame 1 and insulates the rivets 24 from the latter. Each of the L-shaped members 22 and 23 carry upon legs 26 thereof a pair of terminal studs 27 and 28 and their cooperating terminal clips 29. A pair of coil leads 31 and 32 are secured to the pair of lower terminal studs 28 to place coil 6 in circuit. The upper terminal studs 27 are adapted to secure cable leads (not shown) from an external power source to the L-shaped members 22 and 23 to provide electrical energy for the energization of coil 6.

The armature 7 is maintained in cooperating relationship with magnetic member 5 and coil 6 by a generally L-shaped armature lever 33. Armature 7 is of laminated construction and includes a piece 34 which is adapted to be secured by a rivet 35 to a bent over portion of leg 36 of the armature lever 33. A flat plate-like member 37 is rigidly secured to leg 36 of armature lever 33 by a stud 38 and has a pair of openings 39 and 41 extending therethrough. Leg 3 of frame 1 has the free end thereof so formed as to provide a pair of spaced generally hook-shaped portions 42 and 43. These hook-shaped portions 42 and 43 are adapted to be received within openings 39 and 41 in member 37 and provide bearing surfaces which engage with defining surfaces 40 of openings 39 and 41, to effect a pivotal or hinge connection between the armature lever 33 and leg 3. With this arrangement, it is seen that armature 7 in moving into and out of engagement with the pole face of magnetic member 5 on energization and deenergization of the coil 6 will be given a pivotal movement.

Associated with the operating electromagnet

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above described is a contact assembly or switching unit 45 which is mounted on the outer surface of leg 8 of frame 1 and is secured thereto by a pair of mounting studs 46. The contact assembly 45 comprises a pair of hollow blocks 47 and 48 formed of molded insulating material and held in assembled relationship by the studs 46 and by a plurality of studs 50 to form an insulating enclosure. A plurality of conducting elements 49 having a contact surface 51 at one end is secured to the upper part of insulating block 47 by studs 52 entering at the back of the block 47. Each of the conducting elements 49 carries a terminal stud 53 for securing circuit wires thereto. Block 47 is divided into a plurality of individual compartments 54 by a plurality of vertical barrier walls 55, which barrier walls are extended as at 44 to form barriers between conducting elements 49 and insulate them one from the other. A series of projections 56 is provided in a horizontal line across the bottom surface 57 of block 47, one in each of the compartments 54, and each is apertured as at 58, which aperture 58 extends through to the exterior of block 47, and is formed with the diameter of the opening varying as shown. An actuating pin 59 is movably disposed within each of the apertures 58 and comprises an enlarged portion 61 and a shank portion 62 which portion 62 extends beyond the exterior surface 63 of the block 47 and passes through an opening in leg 8 of supporting member 1 and into engagement with leg 64 of the armature lever 33 and is actuable thereby for rectilinear movement. Leg 64 of armature member 33 is formed with a pair of extended portions 65, as seen in Figure 3, which extended portions enables the armature member 33 to move all the pins 59 simultaneously. A coiled spring 66 is provided at the exterior of block 47 and has one end thereof disposed within a recess 67 provided in the exterior surface 63 of block 47, and the opposite end extends into a cutaway portion located substantially centrally in an edge 68 of the plate-like member 37 and is held therein by a projection provided on this edge and which extends into the coiled spring 66. The coiled spring 66 exerts its bias upon the plate 37 to maintain the engagement between the spaced hook-shaped portions or bearings 42 and 43 and the surfaces 40 of the openings 39 and 41 provided in plate 37 to provide a stable and efficient pivotal hinge for the armature lever 33. Insulating block 48 is disposed adjacent block 47 and in contacting face to face relationship therewith. Block 48 is of a generally cup shape with the interior thereof divided into a plurality of compartments 71 by a plurality of barrier walls 72. Each of the compartments 71 aligns with a compartment 54 in block 47 and barrier walls 72 engage, for their length, with barrier walls 55 to form therebetween a plurality of enclosed chambers. A pair of substantially circular portions 73 are formed integral with the two outer barrier walls 72, as seen in Figure 2, and each has an aperture therethrough; portions 73 are adapted to engage portions 74 formed on the walls 55 of block 47 aligning with the above mentioned two outer barrier walls 72, and each of the portions 74 has an opening therethrough, which latter openings align with the first openings in portions 73. A pair of formations 75 are provided on the exterior surface of base 76 of block 48 and each has an aperture therein leading to the aperture in portion 73. The studs 46 which

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mount the blocks 47 and 48 to leg 8 of frame 1 pass through these aligned openings in portions 73, 74 and 75, and into threaded engagement with leg 8 of the supporting frame.

A plurality of substantially Z-shaped conducting members 77 is carried upon the upper part of the base 76 of block 48 and above the formations 75; and each of the conducting members 77 has a portion 78 thereof extending through an opening 79 in the base 76 and into a compartment 71 within the block 48. Each of the interiorly disposed portions 78 of conducting members 77 carries a contact surface 81 thereon which will be located opposite a stationary contact surface 51 and spaced therefrom. The conducting members 77 are secured in place on base 76 of block 48 by studs 82. A terminal stud 83 is carried by each of conducting members 77 and passes into an opening in base 76, cooperating therewith to help prevent the members 77 from turning out of position. A second group of generally Z-shaped conducting members 84 is provided upon block 48 and upon the lower half thereof. The conducting members 84 extend through openings 85 provided in base 76 and extend into the compartments 71. Leg 86 of member 84 is positioned within a recess formed in the ledge 80 of block 48 and is closely received therein. A resilient member 87 is disposed within each of the compartments 71, having contact surfaces 88 and 89 disposed upon one end thereof and upon either side. The opposite end is provided in engagement with leg 86 of conducting member 84. A stud 91 passes through base 76 of block 48 and with the threaded piece 92 secures the conducting member 84 to base 76 and also secures the resilient contact or switching member 87 in place. A terminal stud 90 is provided on each of the conducting members 84 and extends into an opening in base 76 to prevent the conducting members 84 from turning. A plurality of barrier ledges 93 are provided on the face of block 48 and insulate the conducting members 77 and 84 provided for one compartment 71 from the other compartments 71. The upper or contact carrying end of the switching member 87 extends into the space between the spaced stationary contact surfaces 51 and 81, and the contact surfaces 88 and 89 thereon are adapted to engage respectively with contacts 51 and 81. Each resilient member 87 is so disposed within its compartment 71 that contact 88 thereon will normally engage with its cooperating contact 51, and movement of the resilient member 87 to carry contact 89 into engagement with contact 81 will be had against the inherent bias of resilient member 87. The motivating force for effecting movement of the resilient member to carry contact 89 into engagement with contact 81 and to break the normally engaged contacts 51 and 88 is provided through the actuating pin 59 which is moved inwardly into the interior of the blocks when armature 7 moves upon energization of magnetic member 5. On deenergization of the magnetic member 5, armature 7 returns to its deenergized position, as shown in dotted outline in Figure 1, pivotally moving in a clockwise direction under the influence of gravity and the force exerted by the resilient members 87, for the inherent bias of the resilient members 87 will be exerted upon actuating pins 59 to effect movement thereof, rectilinearly to the right, to provide a force on leg 64 of armature lever 33 for pivotal movement thereof. A

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piece 84 depending from bight 2 of frame 1 effects a stop which engages leg 64 of armature lever 33 to limit the amount of movement of this member in a clockwise direction and to thereby establish its position of rest when the magnetic member 5 is deenergized. A plurality of vents 95 are provided in the top wall 96 of the insulating block 48 and positioned immediately above the sets of movable and stationary contacts carried within the blocks 47 and 48 and provide a ready exit for any arc gases that might be formed during the switching operation.

With the arrangement of parts as described, it is noted that the armature lever 33 cannot be disassembled from the relay without first removing the contact assembly 45, comprising the insulating blocks 47 and 48, for the hook-shaped portions 42 and 43 are so placed with relation to the back surface 63 of block 47 that the plate 37 cannot be moved sufficiently to enable its being slipped off hooks 42 and 43.

With magnetic member 5 deenergized, the armature 7 will occupy its lowermost position, as shown in dotted outline in Figure 1, and leg 64 be engaged by stop 94. Contacts 88 carried by the plurality of resilient members 87 will all be in engagement with their cooperating stationary contacts 81 and the actuating pins 59 will have been pushed to the right. If the magnetic member 5 were now energized, the armature 7 will be attracted to the pole face of member 5 and will cause the armature lever 33 to move, pivoting in a counterclockwise direction about the hinged engagement of plate 37 with hooks 42 and 43; leg 64 of the armature lever 33 will be carried toward the block 47 and has engagement with all of the actuating pins 59 to effect the simultaneous movement thereof into the interior of their respective enclosed compartments; the actuating pins 59 will each engage and flex their respective resilient members 87 to effect a simultaneous breaking of the circuits controlled by the plurality of contacts 88 and 81. The resilient members 87 will be moved a sufficient distance by pins 59 to carry the contacts 89 thereon into engagement with the various stationary contacts 81 to effect a simultaneous making of the plurality of electrical circuits controlled by the contacts 81 and 89. When the magnetic member 5 is again deenergized, the armature 7 will be released and armature lever 33 will move in a clockwise direction releasing the force applied to the actuating pins 59; the flexed resilient switching members 87 will assume their normal position, simultaneously breaking the plurality of circuits controlled by contacts 81 and 89, and will move the contacts 88 thereon back into simultaneous engagement with the contacts 81, while moving the actuating pins 59 to the right to apply a force on leg 64 of the armature member 33 to aid in pivotally moving it to deenergized position and to prevent sticking of the armature 7 to pole face 44 by reason of any residual magnetism that might exist.

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 terms of the following claims.

What is claimed is:

1. In an electromagnetic device comprising a

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supporting member having a plurality of leg portions, a magnetizable core and its energizing winding supported upon one of said leg portions of said supporting member, hook-shaped formations provided at the extremity of a second of said leg portions, a generally L-shaped member, an armature supported upon one leg of said L-shaped member and actuable by said magnetizable core, a member secured to said L-shaped member and having openings therethrough adapted to receive said hook-shaped formations to provide a pivotal mounting for said L-shaped member, a switching unit mounted on said supporting member, said switching unit comprising an insulating enclosure, stationary and movable contacts disposed therein, an operating member mounted therein and movable to move said movable contact into and out of engagement with said stationary contact, an actuating member carried by said enclosure for moving said operating member, a leg of said L-shaped pivotal member being operable to move said actuating member on movement of said armature.

2. An electromagnetic relay comprising a generally U-shaped supporting member, a magnetizable core and its energizing winding supported upon the bight portion of said supporting member and within the space defined by its legs, a generally L-shaped member having an extending portion providing a hook and eye engagement with a leg of said U-shaped supporting member to provide a pivotal mounting for said L-shaped member, an armature carried by a leg of said L-shaped member, said armature being movable on energization of said magnetizable core to effect pivotal movement of said L-shaped member about its mounting, a switching unit carried by said supporting member, said switching unit comprising an insulating enclosure, a stationary contact mounted therein, a movable contact, an operating member disposed therein and movable to move said movable contact into and out of engagement with said stationary contact, a leg of said L-shaped member engaging said operating member whereby movement of said L-shaped member effects movement of said operating member, said switching unit enclosure being disposed across the open portion of the hook of said hook and eye engagement to prevent disassembly thereof.

3. In an electric switch, a pair of hollow insulating members, barrier walls provided within each of said hollow insulating members and dividing each of them into an equal number of individual compartments, the outer defining walls and the barrier walls of said insulating members mating when the members are disposed together in assembled relation to provide a plurality of enclosed chambers, a pair of stationary contacts mounted within each of said enclosed chambers, one contact of each pair being mounted on each of the insulating members so that when the insulating members are disassembled one contact of each pair of said stationary contacts is readily accessible in each of the insulating members, movable contacts in said enclosed chambers cooperating with said pairs of stationary contacts, and operating means extending into each of said enclosed chambers for effecting movement of the movable contacts to perform the switching operation.

4. In an electrical relay, a pair of hollow insulating members, barrier walls provided within each of said hollow insulating members, said

barrier walls dividing each of said hollow insulating members into an equal number of individual compartments, the barrier walls on one insulating member being engageable with the barrier walls of the other insulating member when said insulating members are assembled to provide a plurality of enclosed chambers, a pair of stationary contacts mounted within each of said enclosed chambers, one contact of each pair being mounted on each of the insulating members so that when the insulating members are disassembled one contact of each pair of stationary contacts is readily accessible in each of the insulating members, an elongated resilient strip within each of said chambers, oppositely facing movable contacts disposed at one of the ends of said strips for cooperation with said stationary contacts, and means extending through the walls of said enclosed chambers into engagement with said resilient strips for effecting movement thereof to perform the switching operation.

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