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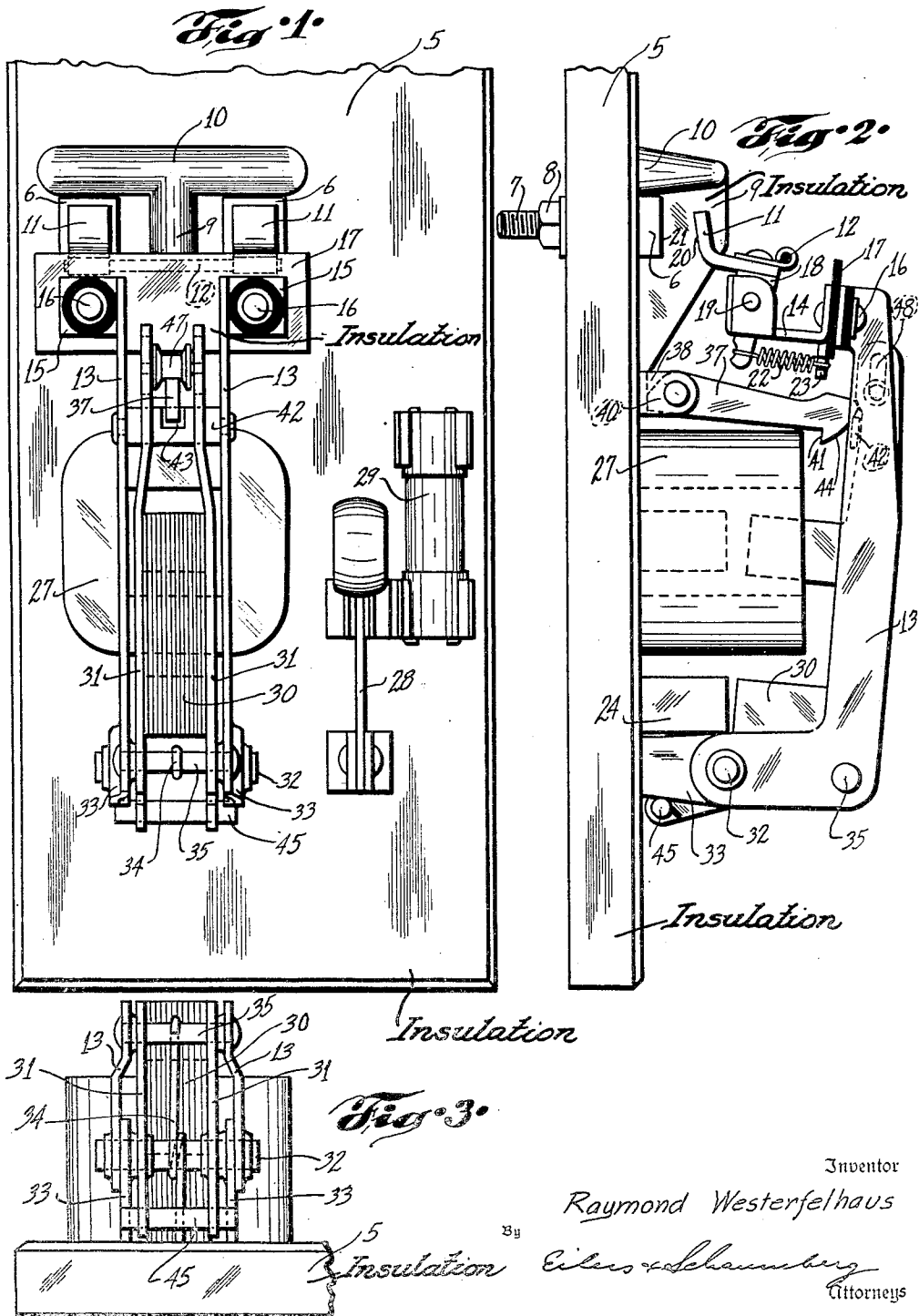
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LATCHED-IN CONTACTOR RELAY

Filed Aug. 14, 1931

2 Sheets-Sheet 1



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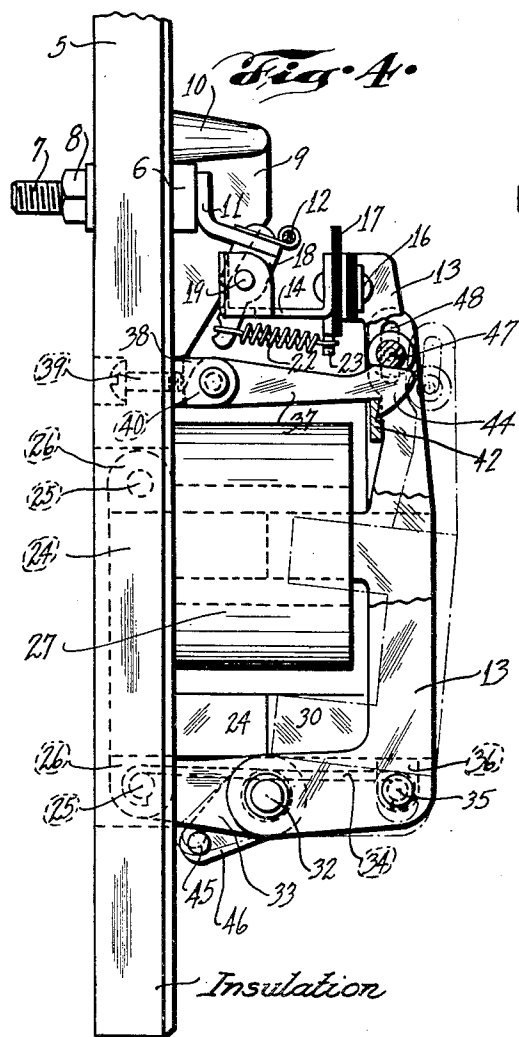
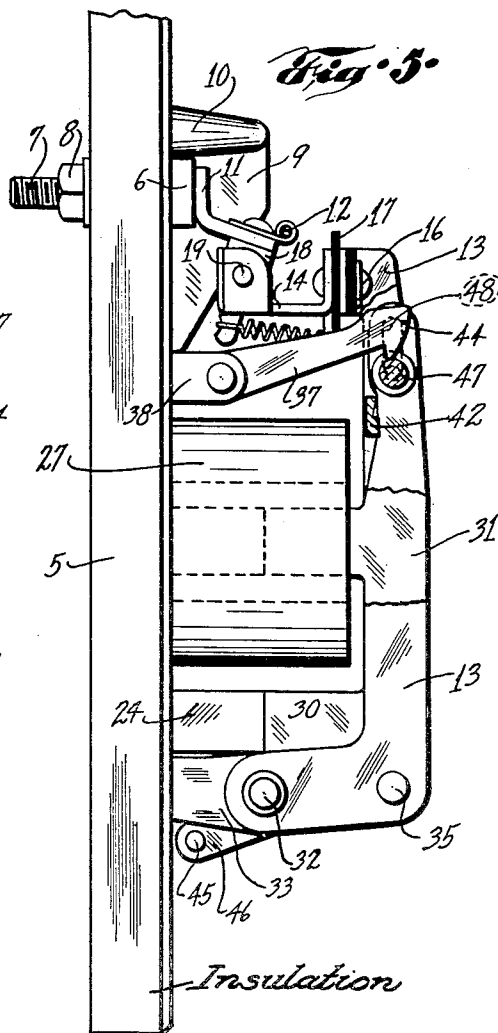
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Inventor

Raymond Westerfelhaus

By

C. S. Schrammberg
Attorneys

UNITED STATES PATENT OFFICE

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LATCHED-IN CONTACTOR RELAY

Raymond Westerfelhaus, St. Louis, Mo., assignor
to Frank Adam Electric Co., St. Louis, Mo., a
Corporation of Missouri

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6 Claims. (Cl. 200—87)

My invention relates to electrically operated switches, and more particularly to improvements in magnetic switches and relays of the types which employ mechanical means for holding the contacts in switch-closed position.

In general, there are two main classes of magnetic relays. As distinguished from those of the class mentioned above, certain relays employ an electro-magnet which is adapted, not only to close the relay, but also to remain energized for holding the contact elements in closed position. Obviously, because of the comparatively greater energy requirements, such relays are undesirable for controlling circuits which must remain energized for appreciable lengths of time, as, for example, certain theatre lighting circuits.

Of the class of relays which employ a latch or other mechanical means in lieu of an energized coil for maintaining the switch contacts in circuit-closed position, the prevalent practice has been to provide, on such relays, two coils; a main coil for closing the relay, and an auxiliary coil associated with the latching mechanism and adapted, upon energization, to release certain of the contact elements, which are then free to return to switch-open position under the action of a spring or gravity. Of this type, momentary energization of the coils is usually sufficient to effect actuation of the switch.

An object of my invention is to provide an improved relay of the mechanical, latched-in type, which employs merely a single coil, momentary energization of which is sufficient to open or close the relay.

Another object of my invention is to provide a one-coil relay of the type described, adapted to be closed and opened by the effect of successive impulses in the magnet coil.

Yet another object of my invention lies in the provision of an improved latching mechanism for accomplishing the above mentioned objects.

Other objects and advantages will appear from the following description and accompanying drawings, Fig. 1 of which is a plan view showing a preferred embodiment of my invention; Fig. 2 is a side view, showing the relay in open position; Fig. 3 is a fragmentary end view of the relay proper, and Figs. 4 and 5 are side elevations, showing the positions of certain members during variant stages of operation, portions of certain members being broken away to clarify the illustration.

Referring now by characters of reference to the drawings, a switch base, or panel 5, preferably formed of molded insulating material, is provided with a pair of stationary contact blocks

6, spaced from each other and secured to the panel by means of threaded studs 7, which extend through to the rear of the panel for the reception of nuts 8. Line connections, by preference, are made at the rear of the panel with the studs, which may be of sufficient length to accommodate terminal lugs or other suitable junction members, not shown. To permit of a safe and compact assembly, a T-shaped insulating barrier, preferably integral with the base 5, is disposed on the face of the panel, having leg portions 9 and 10, respectively, located between and above the contact blocks. This barrier tends to eliminate any danger of short-circuiting between the contact blocks, or between the contact blocks and any equipment which may be located on the panel thereabove, a hazard which might otherwise result, should an arc be drawn when the relay is opened.

The contact blocks 6 are adapted to be connected electrically, when the relay is in closed position, by means of a pair of movable contact elements 11, which are, in turn, connected by a flexible conductor 12, the elements being disposed on the upper end of a carriage frame which is pivotally associated with the panel. This carriage is characterized by a pair of L-shaped side members 13 secured in spaced relation. A contact-supporting member 14, extending crosswise at the upper end of the carriage, is secured to flanges 15 on the side members 13, by means of screws or rivets 16. The member 14 is insulated from the carriage side members 13, by suitable non-conducting material, which includes a strip of fiber 17 or the equivalent, interposed between the contact supporting frame and the side members at the junction thereof. The contact elements 11, preferably of heavy gauge strip copper, are arranged for slight rotation independently of each other, and about an axis substantially parallel to their contact surfaces. The contacts 11 are separately mounted on toggle members 18 which, in turn, are pivotally mounted on the support 14 by means of a bearing or pivot pin 19, extending transversely therethrough. Normally, with the switch in open position, the contact surfaces 20 and 21, respectively, of the elements 11 and the stationary contact blocks 6, lie in planes disposed at a slight angle, relative to each other (see Fig. 2). Closing the switch causes slight rotation of the contact elements 11, until the surfaces 20 and 21 coincide. This rotation is opposed by tension springs 22, disposed between portions 23 of the support 14, and toggle members 18, and upon deenergization of the actuating coil, herein-

after described, the contact members are quickly separated by the action of these springs. The recited arrangement provides for sliding or wiping contact, insuring clean surfaces between the movable and stationary contact members.

A U-shaped, laminated magnet core 24, is supported, cradle-like, within a panel opening between pins 25, which extend through portions 26 projecting from opposite ends of the core. Surrounding the upper leg portion of the core is a magnet coil 27. A single-pole knife switch 28 and fuse 29 is provided for the coil, which switch and fuse are preferably mounted on the panel adjacent the coil, as shown in Fig. 1. The knife switch is operable to open the control circuit, independently of a control switch usually located remotely of the relay. This provision enables the relay to be maintained in either open or closed position without interruption, accidental or otherwise.

The magnetic circuit is adapted to be completed through a U-shaped laminated armature 30, secured between L-shaped side members 31, constituting an armature frame. The armature frame is disposed for pivotal movement in planes parallel with the plane of movement of the contact carriage. Thus, the armature frame is disposed between the carriage side members 13, both armature frame and contact carriage being arranged for movement, independent of each other, on a single bearing pin 32. The ends of the pin 32 are secured to a pair of bearing arm members 33, which project from the face of the panel, the pin extending through apertures in the lower ends of the armature frame and contact carriage, and at the outer ends of the bearing arms. A torsional spring 34, (Fig. 3), on the bearing pin has one end fixed to the lower, core supporting pin 25, and the opposite free end fixed to a spacer element 35 disposed crosswise between the side members 13, of the contact carriage. This spring, in conjunction with the force of gravity (effective when the relay is mounted in an upright position) reacts to bias the carriage into switch open position. The spacer element extends through suitable openings or slots 36, (Fig. 4) in the armature frame, whereby the carriage and armature frame are free to rock independently of each other about the pin 32 as an axis.

Located, by preference, above the magnet coil, and centrally disposed relative to the carriage side members, is a latching member 37, which serves to hold the carriage in switch-closed position. This latch 37 is mounted for pivotal movement between suitable bearing arms 38, which are secured as to the base, as by a screw 39. Under the action of gravity or a spring, (not shown) the latch 37 assumes the position shown in Fig. 2 when the switch is open. Downward movement of the latch arm 37 is limited by the abutment of a projection 40 on the inner end thereof, with a cross portion of the latch bearing arm 38. The outer end of the latch is provided with a shoulder 41 for engagement with a keeper strap 42, extending crosswise between the carriage side members 13. A notch or recess 43 in the strap, provides a seat for the accommodation of the shoulder on the latch arm. The latch arm 37 terminates in an arcuate cam surface 44, the purpose of which will hereinafter appear.

As was previously mentioned, the armature frame and contact carriage, are mounted for pivotal movement relative to the base. The contact carriage preferably terminates at the pivot pin 32, but the side members 31 of the armature frame extend

beyond the pivot pin for the purpose of providing a stop effective for limiting the outward movement of both frame structures. Thus, as best appears in Fig. 3, a pin 45, or the equivalent, extends crosswise through end portions 46 of the armature frame side members 31, projecting end portions of the pin being adapted to abut side edges of bearing arms 33 as shown in Fig. 2. Obviously, the carriage cannot move outwardly beyond the armature frame, being so prevented by reason of the keeper 42, hence the pin serves as a limit stop for both frames.

At the upper end of the armature frame and arranged for limited movement endwise of the frame members, is provided an element 47 which is adapted to effect the release of the contact carriage by the latching member, in a manner to be hereinafter explained. This element, by preference, consists of a spool-like member disposed crosswise of and mounted for rotation between the frame side members 31, and has end projections which extend into, and are freely movable along slotted openings 48, in the side members. Under normal conditions, the bearing element locates itself, preferably under the action of gravity, at the lower extremities of the slots.

Before describing the operation of my device the following features should be noted. A momentary energization of the magnet coil is sufficient to actuate the relay into either closed or open position; the contact carriage and armature frame are arranged for pivotal movement relative to each other, whereby the armature frame (as shown in Fig. 4 by broken lines) is permitted to return to open position independently of the contact carriage, when the coil is deenergized.

Turning now to an explanation of the operation of my device, it will be assumed that the relay is in open position, as appears in Fig. 2. When the magnet coil is energized, the armature frame bears against the keeper strap on the contact carriage, and both frame structures are drawn, simultaneously, into closed position.

As appears in Fig. 2, the converging end portion of the latching member is directed between the strap 42 and the spool 47, and as the keeper strap moves inwardly with the contact carriage, the latching member slides over the strap to latched position (Fig. 4). During this operation, the latching arm is in no wise affected by the element 47, which rides upon the arm as it is displaced towards the upper portions of the slots 48. Upon deenergization of the coil, the armature frame drops back and resumes its former position, as shown in dotted lines, (Fig. 4), but the contact carriage, held by the latching member, remains in switch closed position.

When it is desired to open the switch, the coil is again energized, drawing the armature frame towards closed position. Since the latching member has been raised to a position above its normal non-latching position, (compare Fig. 2 and Fig. 4), the spool 47 now engages the lower cam surface 44 of the latching member, causing that member to be lifted free of the keeper 42, as appears in Fig. 5, which effects a release of the contact carriage. Under the combined actions of the terminal contact springs 22, the carriage spring 34, and gravity, the carriage is forced to open position with a speed which prevents any substantial amount of arcing at the contacts.

It is seen from the foregoing description that identical successive pivotal movements of the armature frame, toward the base 5, serve to effect, through the keeper 42 and the spool mem-

ber 47, alternate latching and unlatching operations. The first of these operations serves to close the relay and latch it in closed position, and the succeeding actuation, through energization of the magnet coil 27, serves the purpose of unlatching the member 37, so that as soon as the magnet coil is deenergized, the parts are permitted to return to switch-open position. The foregoing result is attained, according to the present example, through the alternate engagement, of the spool member 47 with the oppositely disposed or relatively divergent cam faces at the outer extremity of the latch member 37. The relation and coaction of parts is thus such that when the contacts are in circuit closing position (Fig. 4) the actuation of the armature frame serves to lift or disengage the latch, while movement of the same parts, in the same direction, when again the coil is energized, and the parts are in open circuit position, causes the latch to be positively positioned so as to keep the contacts in circuit closing relation.

For brevity of description, the device has been described by making reference to what is, in effect, a single switch, which would usually be wired, as shown, for closing one side of a single circuit. It will be obvious that by provision of a suitable mechanical connection, such as a connecting rod, (not shown), between a plurality of contact carriages, that two or more devices of the type shown might obviously be employed for the simultaneous control of several circuits, employing only a single latch, a single armature and a single coil. In lieu of a mechanical connection, the actuating coils of several relays may be suitably electrically connected so that they may be actuated by a common control switch. Several of the devices interconnected as above described may be used as a multi-pole switch.

It will thus be seen that the relay is actuated into closed and open position by successive energizations of a single magnet coil in accordance with the foregoing objects. Obviously, certain changes may be made in the structure as herein shown and described, without departing from the spirit and full intended scope of the invention as defined by the appended claims.

I claim:

1. A magnetic switch including in combination, a fixed contact, a movable contact, a carriage frame for said movable contact, means for latching said carriage frame in circuit-closing position, a magnet coil, an armature and armature frame therefor, and means including a roller pivotally and slidably carried by said armature frame, effective to open said switch upon alternate energizations of said magnet coil.

2. In a magnetic switch including, in combination, a base, fixed contact members, movable contact members, a switch actuating coil, a supporting member for said movable contact members, a carriage frame for said supporting mem-

ber, pivoted on said base, an armature adapted for independent pivotal movement relative to said base and frame, latching means for the carriage frame, and a latch releasing element including a roller member pivotally and slidably carried by said armature and adapted operatively to effect the latching means only when the carriage frame is in circuit closing position.

3. In a remote control switch, a base, relatively fixed and movable contact members, a support for said movable contact members, a carriage frame for said support disposed for pivotal movement on said base, a coil, and an armature adapted to be actuated by said coil, a latch element for holding said support and frame in circuit closing position, and a roller element pivotally and slidably associated with said armature, adapted to actuate said latch element to release the frame.

4. In a magnetic relay, a base, relatively fixed and movable contact members, an electromagnet, a contact carrying frame having spaced side members pivotally associated with said base, an armature having spaced side members located between said frame side members and adapted for pivotal movement independently of said frame, a latch engaging said contact carrying frame, and a latch releasing device including a roller disposed between the side members of said armature.

5. In a relay including fixed and movable contacts, a pivoted contact carrier, a magnet coil, an armature, a pivoted armature lever having a slot, a pivoted latch arm extended toward the armature lever, and provided with cam surfaces on opposite edges, a latch-actuating roller carried by said lever and adapted selectively to engage said cam surfaces, and adapted for movement endwise of said lever in the slotted portion thereof.

6. In a relay including a base, fixed and movable contacts, a contact carrier, a magnet coil, an armature frame and an armature element carried thereby, a pivot carried by the base, and common to said carrier and armature frame, the frame being disposed within the contact carrier, and arranged for pivotal movement independently of said carrier, an abutment on said carrier adapted for engagement by the armature frame upon actuation of the armature, to displace the contact carrier toward and into switch closing position, means biasing said carrier into switch-open position, a pivoted latch arranged for latching engagement with said abutment to hold the carrier in switch-closed position, and a roller element pivotally and slidably carried by said armature frame, and adapted upon a second actuation of said armature, to release said latch, whereby to permit the biasing means to operate the carriage to its switch-open position.

RAYMOND WESTERFELHAUS.