

[54] **ELECTRIC CONTROL DEVICE**

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[51] Int. Cl. H01h 50/04

[58] Field of Search 335/132, 202

[56] **References Cited**

UNITED STATES PATENTS

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Primary Examiner—Harold Broome

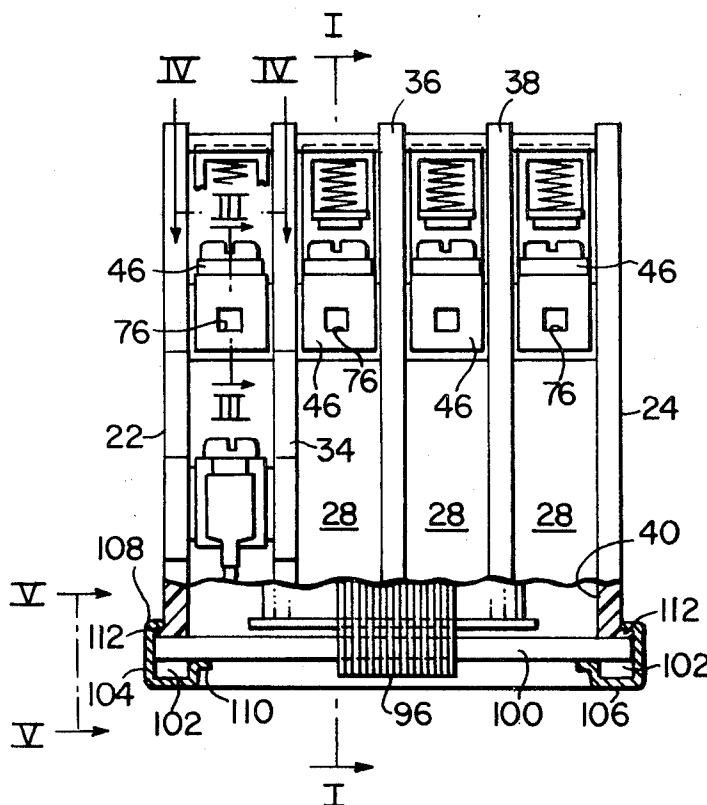
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[57] **ABSTRACT**

An electric control device or contactor devoid of a mounting bracket and adapted for mounting on a mounting panel and comprising an electrically insulating housing, a stationary contact structure and a movable contact structure within the housing; the device also comprising electromagnetic means for actuating the movable contact carrier structure between opened and closed positions with respect to the stationary contact structure, the movable contact carrier structure also comprising a magnetic coil, an armature, and a magnet; the housing having walls forming an axial opening through which the movable contact structure is inserted or withdrawn from the housing; and means for detachably mounting the assembly of the movable contact structure, armature, the coil, and the magnet in an operative position within the housing and said means including a detachable clip mounted on two opposite housing walls and including a retaining pin extending through an opening in the magnet which pin includes opposite end portions seated within corresponding notches in the housing and retained therein by the clip. The stationary contact structure includes a conducting strap having a downturned portion which strap includes opposite end notches for engagement with corresponding projections in the housing to prevent longitudinal movement of the strap and the downturned portion includes an aperture adapted to receive corresponding projection of the housing, whereby the strap is detachably seated in place on the housing.

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7 Claims, 9 Drawing Figures



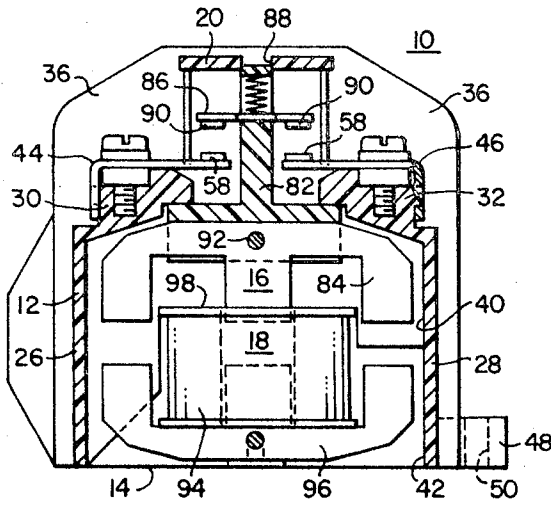


FIG. 1.

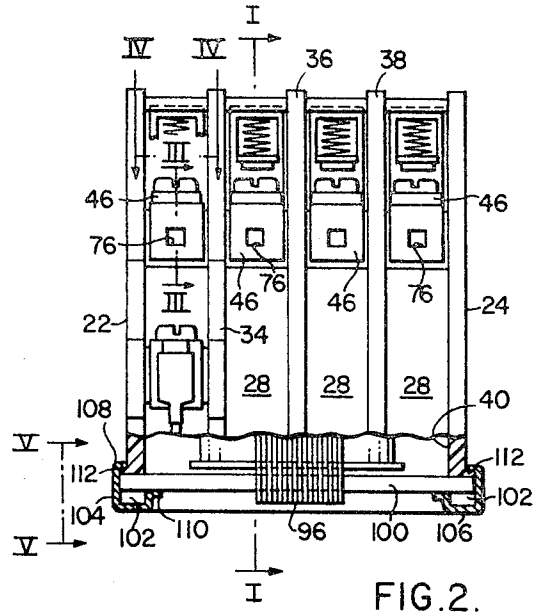


FIG. 2.

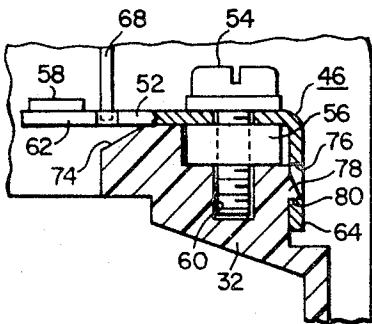


FIG. 3.

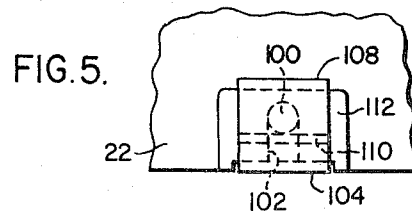
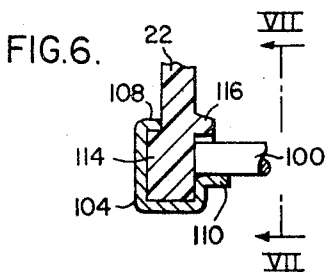


FIG. 5.



ELECTRIC CONTROL DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an electric control device such as a contactor or relay and, more particularly, it pertains to such a device which is devoid of a panel mounting plate.

2. Description of the Prior Art

Electric control devices, such as contactors or relays, are usually mounted on a mounting panel in proximity to other electrical devices for convenience and accessibility. Contactors of prior known construction have been provided primarily for mounting on a mounting panel in a more or less permanent manner. Indeed, many contactors are mounted on a panel without ever being dismounted for any purpose. However, it is frequently necessary to remove a contactor for such purposes as changing the coil to a different load capacity or replacing a broken or worn-out part. One disadvantage of removing the contactor is that it is out of service for the time necessary for making repairs.

Associated with the foregoing have been problems of assembly during manufacture. Preassembly of major components such as crossbar armature, and moving contact structure have not been conducive to efficient manufacturing techniques. Conversely, assembly of the device for maintenance purposes has been complicated by an unnecessary number of parts which prevent easy removal of the assembly of the coil, magnet, and crossbar armature.

SUMMARY OF THE INVENTION

It has been found in accordance with this invention that the foregoing problems may be overcome by providing an electric control device for mounting on a mounting panel comprising an assembly of electrically insulating housing which comprises a stationary contact structure and a movable contact structure within the housing. Means for electromagnetically moving the stationary and movable contacts between closed or opened positions; the movable contact carrier structure comprising a magnetic coil, an armature, and a magnet; and retaining means for the assembly of the coil, armature, and magnet including a retaining pin extending across the housing opening through which the assembly is inserted and pin retaining clip attached to opposite walls of the housing for holding the pin in place.

The advantage of a device of this invention is the provision of means for expedient access to the interior of the electrical contactor as well as minimizing the number of parts necessary for an efficiently operative contactor.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view taken substantially on the line I—I of FIG. 2, of a contactor embodying the principals of the invention;

FIG. 2 is an end elevational view partly in section of the contactor shown in FIG. 1;

FIG. 3 is an enlarged fragmentary vertical sectional view taken on the line III—III of FIG. 2;

FIG. 4 is a horizontal sectional view taken on the line IV—IV of FIG. 2;

FIG. 5 is an enlarged fragmentary elevational view taken on the line V—V of FIG. 2;

FIG. 6 is an enlarged fragmentary vertical sectional view showing a portion of the contactor;

FIG. 7 is a vertical sectional view taken on the line VII—VII of FIG. 6; and

FIGS. 8 and 9 are vertical sectional views of other embodiments of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, an electrical control device or contactor is generally indicated at 10, and it comprises a housing 12 having a base 14. The device also includes a movable contact carrier structure 16 and electromagnetic means 18 for actuating the contact carrier structure.

The housing 12 is composed of an electrically insulating or dielectric material such as phenolic resin. The contactor 10 is a multipole type such as a four pole contactor. The housing 12 is a shell-like member having a top wall 20, opposite side walls 22 and 24 (FIG. 2), and opposite end walls 26 and 28. The upper ends of the walls 26 and 28 include enlarged housing portions 30 and 32, respectively, which extend between opposite side walls 22 and 24. In addition, the housing includes spaced partitions 34, 36 and 38 extending from the end walls 26 and 28.

The side walls 22 and 24 and the end walls 26 and 28 form an inner compartment 40 which is open at 42 to the lower end or base 14 of the housing. The movable contact carrier structure 16 as well as the electromagnetic means 18 are inserted into the chamber 40, to the opening 42 where they are retained in place in a manner as set forth hereinbelow.

As shown in FIGS. 1 and 2 eight stationary contact structures are provided in pairs of contact structures 44 and 46 at opposite end walls 26 and 28 to provide a four poled contactor. Each pair of contact structures are disposed between similar pairs of partitions 34 and 36 or an end wall and a partition such as the end wall 22 and the partition 34 (FIG. 2).

The housing is also provided with a pair of mounting lugs at diagonally opposite corners and only one of which lugs 48 is shown in FIG. 1. Each lug is provided with a pole 50 by which the contactor is secured by screws to a mounting panel in a conventional manner.

Each stationary contact structure 44 and 46 comprises an L-shaped conducting strap 52 (FIG. 3) a terminal bolt 54 with a nut 56, and a contact 58. Lead wires (not shown) are attached to the contact structures 44 and 46 by means of the bolts 54, the lower ends of which together with the nuts 56 are disposed in molded openings 60 in the thickened transverse portions 30 and 32 which openings are slightly larger than the nut and bolt. Each conducting strap 52 having an L-shaped configuration includes an elongated portion 62 and a downturned portion 64, which portions are in snug fitting engagement with the top and outer surfaces of the thickened portion 32.

In accordance with one feature of this invention the constructing straps 52 are secured in place in a manner shown in FIGS. 3 and 4. More particularly, each strap 52 is provided with a pair of oppositely disposed notches 66 and 68 on opposite edges of the strap which notches are adapted to engage a pair of oppositely disposed ridges 70 and 72 extending inwardly from the side wall 22 and the partition 34. The strap is inserted in place by preliminary twisting or tilting the strap at an angle and inserting through a clearance between the

lower ends of the ridges 70 and 72 and a surface 74 of the thickened portion 32. The right end portion of the strap, as viewed in FIG. 3, is then rotated counterclockwise until the surface of the strap is brought into contact with the upper surface of the thickened portion 32. In addition, the downturned portion 64 of the strap is provided with an opening 76 which is adapted to receive a projection 78 of the thickened portion, which projection includes a lower surface 80 which engages the lower edge of the opening 76 when the strap is seated in place. Thus, the combination of the projection 78 and the ridges 70 and 72 prevent dislodgment of the straps from the position shown in FIG. 3 accidentally. However, inasmuch as straps 52 are composed of metal they include an inherent resilience which permits outward bending of the flanges 64 counterclockwise a sufficient distance to clear the projection 78 and thereby permit removal of the straps when necessary.

The movable contact carrier structure 16 is generally of the type of structure disclosed in U.S. Pat. No. 3,160,730 for which reason only a brief description of the structure is provided herein. Briefly, the structure includes a contact carrier member 82, a magnetic armature 84, and separate bridging contact members 86. The contact carrier member 82 is composed of an electrically insulating material such as phenolic resin. As shown in the drawings, the contact carrier member 82 is movably mounted in the housing 12 with the upper ends of the member extending into openings such as an opening 88 in the top wall 20.

As indicated above, the bridging contact members 86 extend between each pair of corresponding pairs of spaced stationary contacts 58. Movable contacts 90 are secured to opposite ends of the bridging contact members 86 which are preferably composed of metal. Each member 82 extends through a window (not shown) where it is mounted in a manner similar to that set forth in U.S. Pat. No. 3,296,567. The magnetic armature 84 is an E-shaped laminated member which is attached to the lower end of the contact carrier member 82 by a mounting pin 92 which extends through aligned holes in the member and the armature.

The electromagnetic means 18 includes a magnetizing winding, or coil 94, and a magnet 96. The coil 94 is disposed on a suitable spool 98 of insulating material while the coil and spool are positioned over the middle legs of the armature 84 and the magnet 96, which legs are aligned in the center of the spool. Accordingly, when the coil 94 is energized, the armature 84 is pulled downwardly toward the magnet 96 whereby the movable contacts 90 are brought into contact with the contacts 58 of the stationary contact carrier structure 16. Spring means (not shown) are provided for retaining the contact in the open position as shown in FIG. 1.

An alternate embodiment of the assembly of the coil 94, the magnet 96, and the armature 84 is that of mounting the coil on the lower end of the movable contact carrier member 82 and around the center leg of the armature 84, whereby the armature and magnet have reversed functions; the armature 84 becomes a magnet and the magnet 96 becomes an armature. When the coil 94 is actuated the magnetic field generated, flows through the members 84 and 96 in the same manner as described above. Thus, the coil 94 may be mounted either on the housing 12 or the movable contact carrier member 82.

The manner in which the electromagnetic means 18 including the coil 94 and the magnet 96 are retained in place is another feature of this invention. As shown more particularly in FIGS. 2 and 5, a retaining pin 100 extends through an aperture in the magnet 96 and across the chamber 40 between opposite side walls 22 and 24. Each side wall 22 and 24 is provided with a notch such as the notch 102 as shown in FIG. 5 for the wall 22. The end portions of each pin are seated in corresponding notches where the pin is retained by retaining means such as detachable clips 104 and 106 which are secured to the lower end of the side walls 22 and 24 respectively. Generally, each clip 104 and 106 is a C-shaped member composed of metal and therefore having some flexibility for attaching and detaching in place. More particularly, as shown in FIG. 2 for the clip 104, each clip includes an upper intumed flange 108 and an outturned flange 110 which extend into the chamber 40 from the wall 22. When in place, the flange 110 is in contact with the underside of the pin 100. The intumed flange 108 extends across the top of a projection 112 which is an integrally molded part of the side walls 22 and as shown in FIG. 5 is disposed around the notch 102. Accordingly, the intumed flange 108 is retained in place by the projection 112 whereby the pin 100 is prevented from dropping out of position within the notches 102.

Another embodiment of the detachable mounting means is shown in FIGS. 6 and 7. It differs from the embodiment of FIGS. 2 and 5 in that an enlarged outturned projection 114 is provided at the lower end of each side wall, such as the side wall 22, a notch 102 is omitted. However, another projection 116 is provided on the inner surface of the side wall, such as the side wall 22, and the end portion of the retaining pin 100 are seated between the projections 116 and the flange 110.

Another embodiment of the invention is shown in FIG. 8 which differs from the prior embodiments in that the retaining pin 100 is omitted. Instead, a pair of detachable clips 118 and 120 are provided with elongated intumed flanges 122 and 124 which extend sufficiently across the chamber 40 to contact the underside of the magnet 96 substantially as shown in FIG. 8.

Another embodiment of the invention is shown in FIG. 9 which also differs from the embodiments shown in FIGS. 1-7 in that the retaining pin 100 is omitted. In its place, a single detachable clip 126 is provided which has intumed flanges 128 and 130 in a manner similar to the flanges 108 of the clips 104 and 106. In addition, the clips 126 include an intermediate portion or web 132 which extends across the opening of the chamber 40 and between the lower ends of the opposite side walls 22 and 24. Thus, the web 132 retains the magnet 96 in place as shown.

Accordingly, the electric control device or contactor of the present invention satisfies the problems which were extant in prior art devices by providing means for detachably mounting the interior parts of a contactor, such as movable contact carrier structures and electromagnetic means in place within the housing of the contactor without the use of a conventional mounting plate by which prior art devices were mounted on a mounting panel.

What is claimed is:

1. An electric control device for use on a mounting panel comprising an electrically insulating housing, the

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housing comprising a stationary contact structure, a movable contact carrier structure within the housing and movable between open and closed positions relative to the stationary contact structure, biasing means for holding the movable contact carrier structure in one of the positions, electromagnetic means for actuating the contact carrier structure to the other of the positions and comprising a magnetic coil, an armature, and a magnet, the magnetic coil being mounted on one of the movable contact carrier structure and the housing, the armature being mounted on the other of the movable contact carrier structure and the housing, the housing comprising walls forming an access opening through which the movable contact carrier structure, the armature, the coil, and the magnet are inserted into the housing, at least one housing wall comprising an enlarged projection, and means for detachably mounting the assembly of the movable contact carrier structure, the armature, the coil and the magnet intact within the housing and including fastening means comprising at least one detachable clip having a portion engaging a corresponding projection.

2. The electric control device of claim 1 in which each detachable clip comprises a portion extending

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from the surfaces of the wall and into the opening.

3. The electric control device of claim 3 in which the fastening means also comprise a retaining member extending across the access opening and the retaining member having end portions in engagement with the detachable clips.

4. The electric control device of claim 1 in which a detachable clip is mounted on each enlarged projection of two oppositely disposed housing walls, and a retaining pin extending across the opening and between the clips.

5. The electric control device of claim 4 in which two oppositely disposed housing walls comprise projections and in which each clip comprises a flange seated over a corresponding projection.

6. The electric control device of claim 5 in which the magnet includes an aperture through which the pin extends.

7. The electric control device of claim 6 in which two opposite housing walls are each provided with a pin receiving notch and opposite end portions of the pin are seated in the notch.

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