United States Patent [19]

Grunert et al.

[11] **3,781,728**

[45] **Dec. 25, 1973**

[54] **ELECTRIC CONTACTOR**

[75] Inventors: **Kurt A. Grunert; John J. Dauer, Jr.; Stephen S. Dobrosielski,** all of Beaver, Pa.

[73] Assignee: **Westinghouse Electric Corporation,** Pittsburgh, Pa.

[22] Filed: **Oct. 6, 1972**

[21] Appl. No.: **295,794**

[52] **U.S. Cl.** ..... **335/132,** 200/50 A

[51] **Int. Cl.** **H01h 50/02**

[58] **Field of Search** ..... 335/132, 133, 202, 335/201; 200/50 A

[56] **References Cited**

UNITED STATES PATENTS

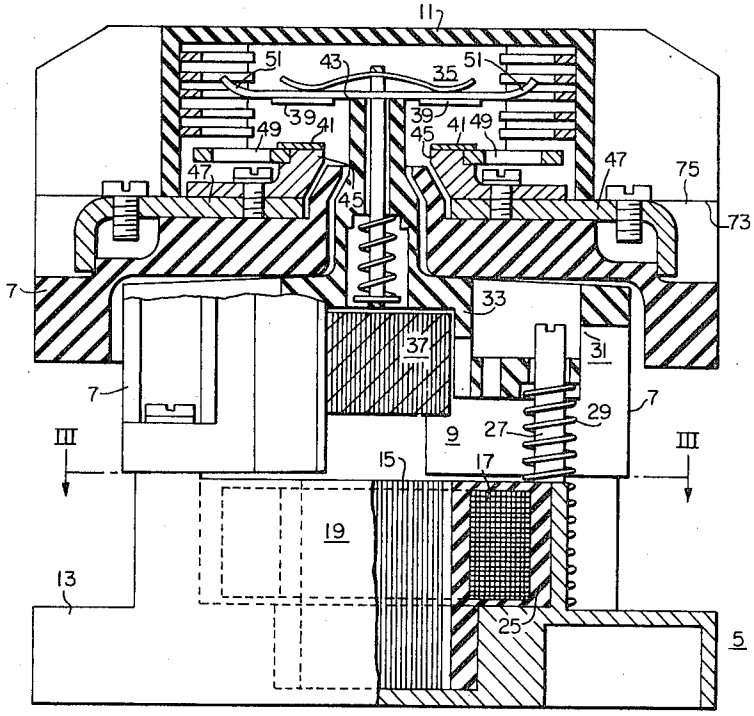
3,602,850	8/1971	Grunert	335/133
3,243,535	3/1966	Platz et al.	200/50 A
3,076,075	1/1963	Colvill	335/202

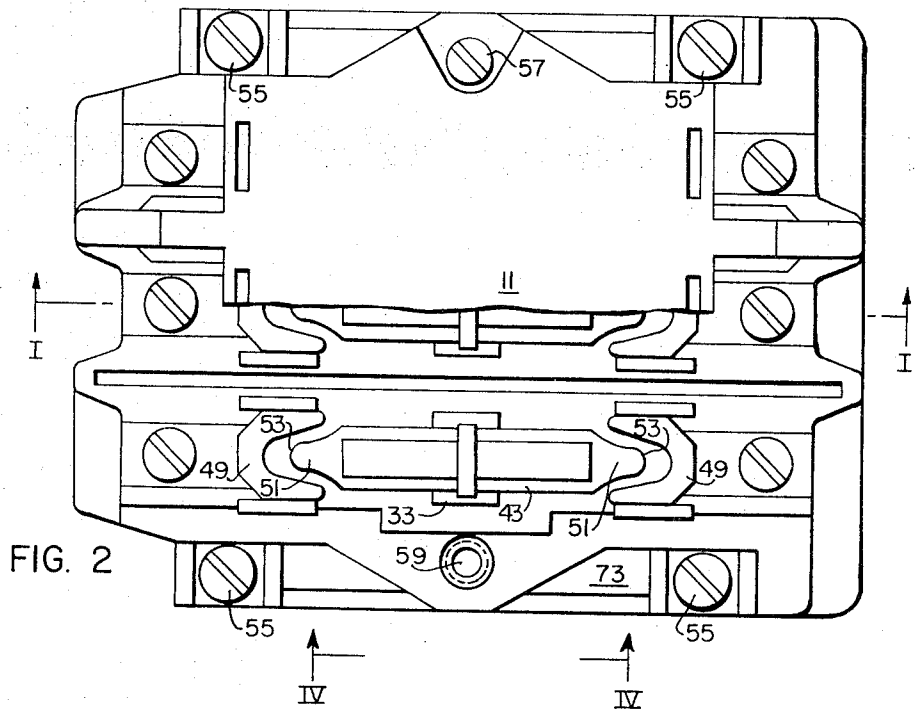
Primary Examiner—Harold Broome
Attorney—A. T. Stratton et al.

[57] **ABSTRACT**

An electric contactor characterized by improvements including a movable contact carrier structure having a one piece bridge between a pair of movable contacts, the outer ends of which bridge are curved outwardly away from the corresponding stationary contacts, a magnetic coil for actuating the movable contact carrier structure and being embedded in an aluminum die cast base which serves as a better heat sink for the coil, an interlock between the cover and housing of the contactor for preventing operation of the contactor when a cover is removed, and a guide pin for the crossbar of the movable contact carrier structure which guide pin comprises a screw insert for the screw by which the cover is attached to the housing.

1 Claim, 7 Drawing Figures




55
57
55
II
I
I
53
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49
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51
51
33
43
59
73
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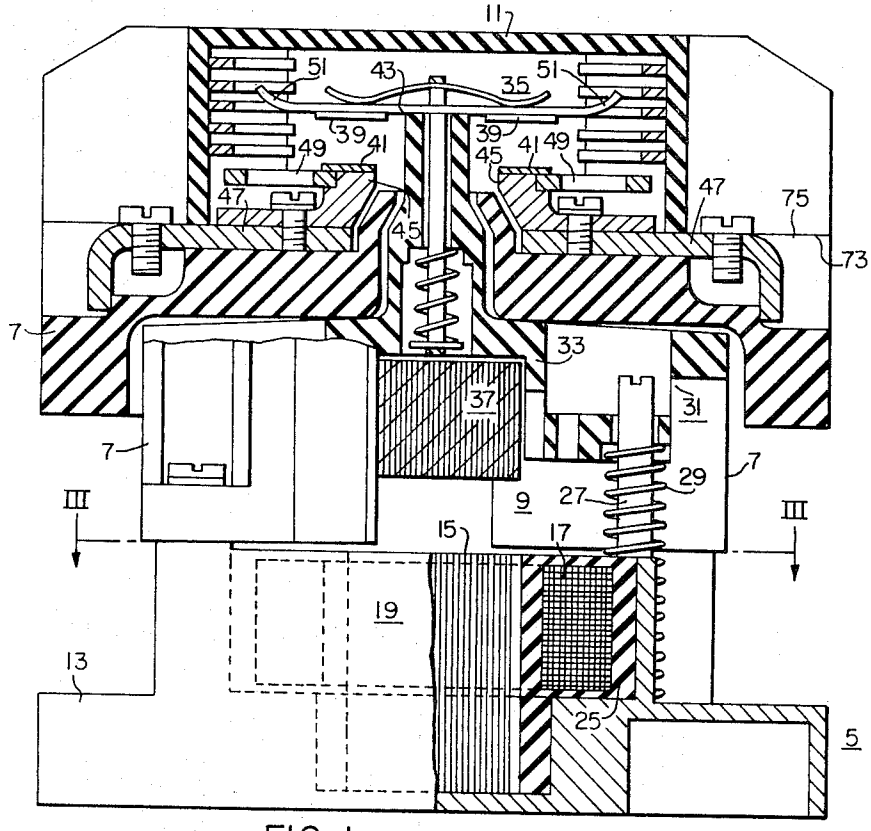
55
IV
IV

FIG. 2


11
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29
III
9
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III
15
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13
25
5

FIG. 1

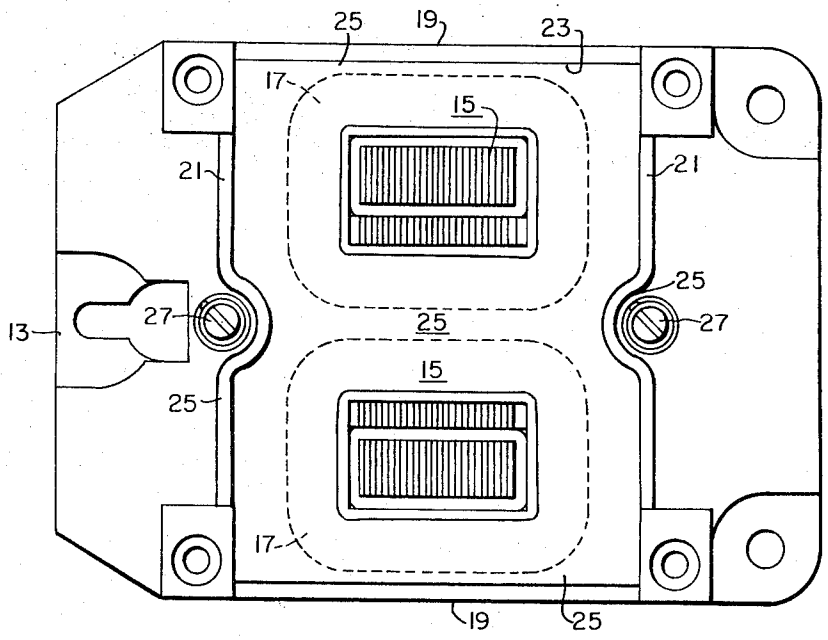

FIG. 3

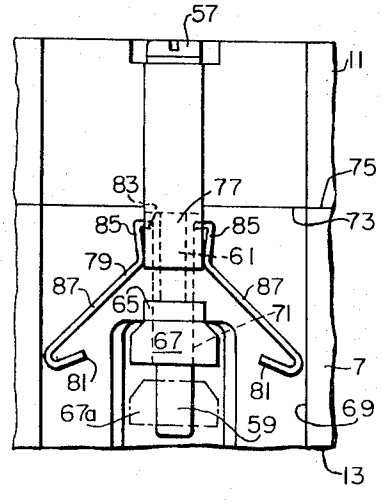

FIG. 4

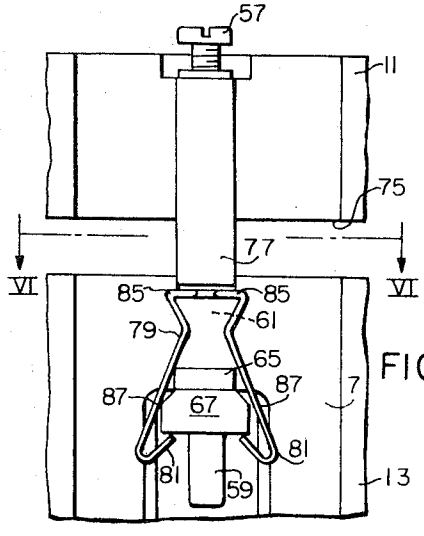

FIG. 5

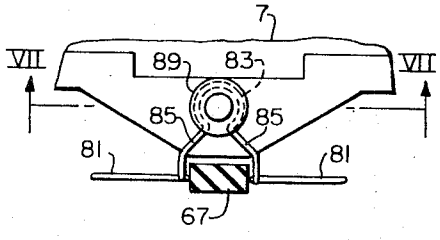

FIG. 6

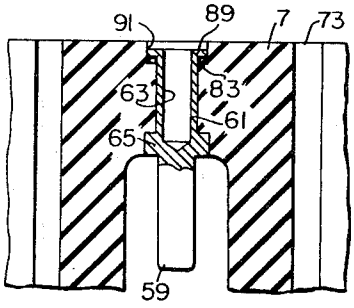

FIG. 7

ELECTRIC CONTACTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an electrical contactor of the type comprising a metallic base, an insulating housing, a bridging contact structure within the housing, and a removable cover on the housing.

2. Description of the Prior Art

Electric contactors of the type comprising an insulating support and a bridging contact structure supported on the insulating support by resilient means that provide contact pressure in the closed position of the contacts are known in the art. For example, U.S. Pat. No. 3,602,850, issued Aug. 31, 1971 to K. A. Grunert, discloses a contactor that functions satisfactorily for

SUMMARY OF THE INVENTION

In accordance with this invention, it has been found that an improved electrical contactor having switching capabilities in a modular arrangement for 1,500V, 60 Hz applications, comprising a metallic base, an insulating housing, a detachable insulating cover, a plurality of conducting paths extending across the conductor, each conducting path comprising a pair of terminals, one terminal at each of the two opposite ends of the conducting path, each of the conducting paths comprising two spaced stationary contacts between the associated pairs of terminals, a bridging contact member for bridging the spaced stationary contacts, a contact carrier member supporting the bridging contact member for movement between open and closed positions relative to the spaced stationary contacts, the contact carrier member extending between the spaced stationary contacts, biasing means for holding the movable briding contact carrier structure in one of the positions, electromagnetic means for actuating the bridging contact carrier structure to the other of the positions, the bridging contact members having opposite end portions extending beyond their respective stationary contacts, and each end portion being turned in a direction away from the corresponding stationary terminal. The contactor also comprises guide pins for the movable contact carrier each pin having a screw insert or threaded opening in which a screw clampingly engages each side of the detachable cover to the corresponding guide pin. The contactor also comprises a safety interlock including a pair of oppositely disposed and oppositely removable flexible members that are movable into and out of a locking position for preventing movement of the movable contact carrier, which flexible members are disposed in the locked position when the detachable cover is removed from the insulating housing and which members are disposed in the unlocked position when the cover is in place.

The contactor also comprises a coil for the electromagnetic means which coil is embedded in the metallic base, which base provides an improved heat sink for the coil.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side sectional view, partly in elevation, of a three-pole contactor constructed in accordance with the principles of this invention and taken generally along the line I—I of FIG. 2;

FIG. 2 is a plan view with one half of the top cover broken away;

FIG. 3 is a horizontal sectional view taken on the line III—III of FIG. 1;

FIG. 4 is a fragmentary elevational view showing the interlock in the unlocked position, taken on the line IV—IV of FIG. 1;

FIG. 5 is a fragmentary elevational view showing the interlock in the locked position when the cover is removed from its operating position;

FIG. 6 is a horizontal sectional view taken on the line VI—VI of FIG. 5; and

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

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A three pole contactor is generally indicated at 5 in FIG. 1 and it comprises an insulating housing structure 7, a contactor structure 9, an insulating cover 11, and a die cast aluminum base 13. In construction and operation the contactor 5 is generally similar to that disclosed in K. A. Grunert U.S. Pat. No. 3,602,850, issued Aug. 31, 1971, for which reason an abbreviated description of the contactor is set forth herein.

The contactor-structure 9 comprises a U-shaped stationary magnetic member 15 and a conducting coil 17 supported on the base 9. The contactor 5 of this invention differs from that of the above-mentioned patent in that the base 13 includes pairs of opposite side walls 19 and 21 (FIG. 3) which form a central compartment 23. The magnetic member 15 and the coil 17 are encapsulated in a shell 25 of insulating material such as an epoxy resin. Thus, the magnetic member is fixedly mounted on the base 13 where it energizes the contactor. More particularly, the base having the integral die cast side walls 19 and 21 serves as a heat sink for heat generated by the coils during operation of the contactor. A pair of guide pins 27 (FIGS. 1 and 3) extend upwardly from the base 13 and separate kick-out coil springs 29 are mounted on each guide pin to bias a movable contact carrier structure 31 upwardly to a contact open position (FIG. 1) when the coil 17 is deenergized.

The movable contact carrier structure 31 comprises an insulating carrier 33, three bridging contact structures 35 at the upper end of the carrier, and an inverted U-shaped magnetic armature 37 at the lower end of the carrier. Thus, when the coil 17 is energized the armature 37, being attracted to the magnetic member 15, pulls the insulating carrier 33 downwardly, whereupon movable contacts 39 on the bridging contact carriers 35 are brought into a closed circuit position with the stationary contacts 41.

As shown in FIG. 1, the bridging contact carrier 35 includes an elongated conductor 43 to which the contacts 39 are attached. The stationary contacts 41, disposed on opposite sides of the carrier 33 are separately mounted on support members 45 which, in turn, are mounted on elongated terminals 47. Associated with each stationary contact 41 is an arc diverter 49.

The elongated conductor 43 comprises similar opposite end portions or horns 51 which are turned upwardly and outwardly from the movable contact 39 and from the arc diverters 49. As shown more particularly in FIG. 2, each horn 51 is preferably tapered to a rounded end surface 53, whereby it is devoid of all corners such as present in rectangular or square end portions of prior construction. When the contacts are

opened to break the current, an arc is "blown" or magnetically forced off of the contacts by self-generated magnetic fields. As the arcs move outwardly extending between the corresponding arc diverters **49** and the end portions or horns **51,** the arcs become less stable due to the divergence of the diverters and the horns. Moreover, the rounded end portions of the horns prevent the arcs from terminating at any sharp corners and thereby prevent undue burning of the diverters or horns.

The assembly of the contactor **5** is best understood with reference to FIGS. **1** and **2.** The insulating housing structure **7** is secured to the base **13** by screws **55** at four corners thereof. The insulating cover **11** is mounted on the insulating housing structure **7** by a pair of oppositely disposed screws **57,** one of which is shown in FIG. **2.** The manner in which the screws **57** are secured to the housing structure **7** is described hereinbelow.

A pair of guide pins **59,** one of which is shown more particularly in FIGS. **4–7,** are provided for the dual purpose of guiding the vertical movement of the contactor structure **9** and/or attaching the cover **11** to the insulating housing structure **7.** For that purpose, each guide pin **59** includes an upper insert portion **61** which is embedded in the housing structure **7.** The pin guides are disposed on two opposite sides of the housing structure **7** and include threaded openings or screw inserts **63** in which the screws **57** are seated. To prevent rotation of the guide pins **59** the insert portions **61** thereof are provided with non-circular or rectangular flanges **65** which are likewise embedded in the housing structure **7.** The contactor structure **9** comprises a pair of oppositely disposed lugs **67** which extend outwardly through opening **69** in the housing structure **7** and in which a corresponding guide pin **59** is disposed. Each lug **67** has an opening **71** in which the corresponding guide pin **59** is mounted. Thus, as shown in FIG. **4,** the lugs **67** move vertically on the pin **59** within the openings **69** and between the upper, solid line position and the lower, broken line position **67***a* thereof as the contactor structure **9** moves between the open and closed positions of the contacts **39** and **41.**

For safety, the contactor **5** is provided with interlock means for preventing closing of the contacts **39** and **41** when the cover **11** is removed. As shown in FIGS. **1, 4** and **5** the housing structure **7** has an upper surface **73** and the cover **11** has a lower surface **75.** When the cover **11** is intact (FIGS. **1** and **4**), the surfaces **73** and **75** are in contact where they are held in place by the screws **57.** The interlock means includes a projection member **77** and a flexible member **79** which cooperate to lock and unlock the contactor structure **9** when the cover **11** is displaced or mounted in position. The flexible member **79** is a wire-like structure having similar hooked end portions **81,** and a central necked portion **83.** In addition, the flexible member **79** includes similar intermediate portions comprising inturned segments **85** and outturned segments **87.** All of the portions **81, 83** and the segments **85** and **87** constitute an integral wire-like member having a non-flexed configuration, as shown in the locked position of FIG. **5,** whereby the inturned hooked end portions **81** extend under the lug **67** to prevent its downward motion in the event that the contact structure **9** is actuated when the cover **11** is removed. The flexed or unlocked position of the flexible member **79** is that shown in FIG. **4** in which the inturned hooked end portions **81** are removed from any interference with the downward movement of the lug **67.**

More particularly, the neck portion **83** of the flexible member **79** is a circular segment of the member and is clamped in place (FIG. **7**) between the surface of the housing structure **7** and a radially spun flange **89** at the upper end of the guide pin **59.** It is preferred that the necked portion **83** and the spun flange **89** be seated within a recess **91** within the upper surface **73** of the housing, whereby the upper side of the flange **89** is in planar alignment with said upper surface.

When the cover **11** is intact with its lower surface **75** in surface-to-surface contact with the upper surface **73** of the housing **7** (FIG. **4**), the projection member **77** is disposed between the inturned segments **85** so that the outturned segments **87** and the hooked end portions **81** are cammed outwardly in opposite directions from each other so that the lug **67** is free to move vertically on the guide pin **59,** such as to the lower, broken line position **67***a.* Conversely, when the cover **11** is removed from the seated position on the surface **73** (FIG. **5**), the projection member **77** moves out of the position between the opposing inturned segments **85,** whereupon the hooked end portions **81** move (due to the resilient property of the flexible member **79**) into the locked position below the lug **67.** Accordingly, the pair of interlocks on opposite sides of the contactor **5** serve as safety lock mechanisms for stopping movement of the crossbar of the contactor structure **9** when the cover is removed.

We claim:

1. A contactor comprising an insulating housing, a cover detachably mounted on the housing, a stationary contact structure within the housing, 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 armature, a magnetic core, and a coil, means for detachably mounting the cover on the housing, interlock means for preventing movement of the movable carrier structure when the cover is removed from the housing, the interlock means comprising a flexible member movable into and out of a locking position in the path of travel of the movable contact carrier structure, the flexible member being mounted on the housing and being biased in the locked position, the cover having a projecting portion for holding the flexible member in the unlocked position when the cover is mounted on the housing, the electromagnetic means actuates the movable contact carrier structure to the closed position, the flexible member comprising one portion attached to the housing, another portion in the path of movement of the movable contact carrier structure and an intermediate portion inclined at an angle across the position otherwise occupied by the projecting portion when the cover is mounted on the housing, the flexible member comprises a pair of oppositely disposed and oppositely movable end portions movable into and out of the locking position of the movable contact carrier structure, the movable contact carrier structure comprises an apertured guide member, a guide pin on the housing and disposed in the apertured guide member, the guide pin having an end portion embedded in the insulating housing and having a threaded aperture in said end portion, a screw clampingly engaging the cover and seated in threaded aperture, and the flexible member being attached on periphery of the end portion of the guide pin.

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