United States Patent [19]

Grunert et al.

[11] **3,748,608**

[45] **July 24, 1973**

[54] **ELECTRIC CONTROL DEVICE**

[75] Inventors: **Kurt A. Grunert; John J. Dauer, Jr.,** both of Beaver, Pa.

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

[22] Filed: **Jan. 17, 1972**

[21] Appl. No.: **218,103**

[52] **U.S. Cl.** **335/132,** 200/168

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

[58] **Field of Search** 335/132, 131, 126, 335/202; 200/168; 317/119

[56] **References Cited**

UNITED STATES PATENTS

3,215,800	11/1965	Hurter et al.	200/168 C
3,102,935	9/1963	Christeler	335/202
3,202,785	8/1965	Jelley	335/132
3,564,467	2/1971	Swindler et al.	335/132
3,651,437	3/1972	Kiyoshi	335/131
2,665,353	1/1954	Popp	200/168 C

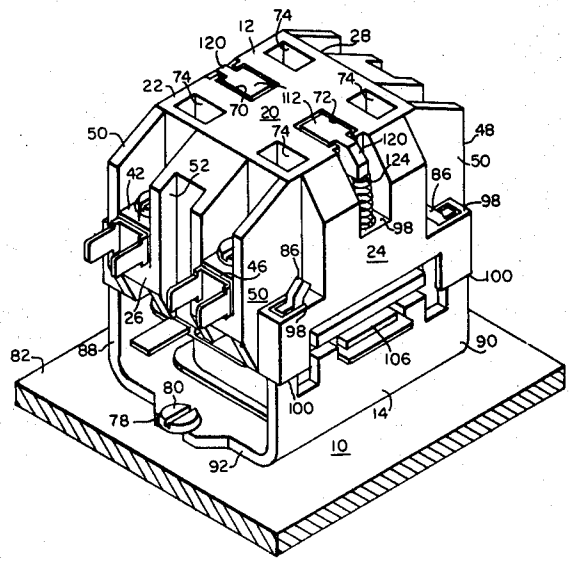
Primary Examiner—Harold Broome

Attorney—A. T. Stratton, Lee P. Johns et al.

[57] **ABSTRACT**

An electric control device for mounting on a control panel which device includes an assembly of an electrically insulating housing and of a mounting bracket in which assembly a contact carrier structure is movable between open and closed positions relative to a stationary contact structure by electromagnetic means against biasing means for holding the contact carrier structure in one of the positions, and the assembly having means for readily detachably mounting the housing on the bracket to facilitate access to the interior of the assembly without removal of the bracket from the mounting panel.

7 Claims, 4 Drawing Figures



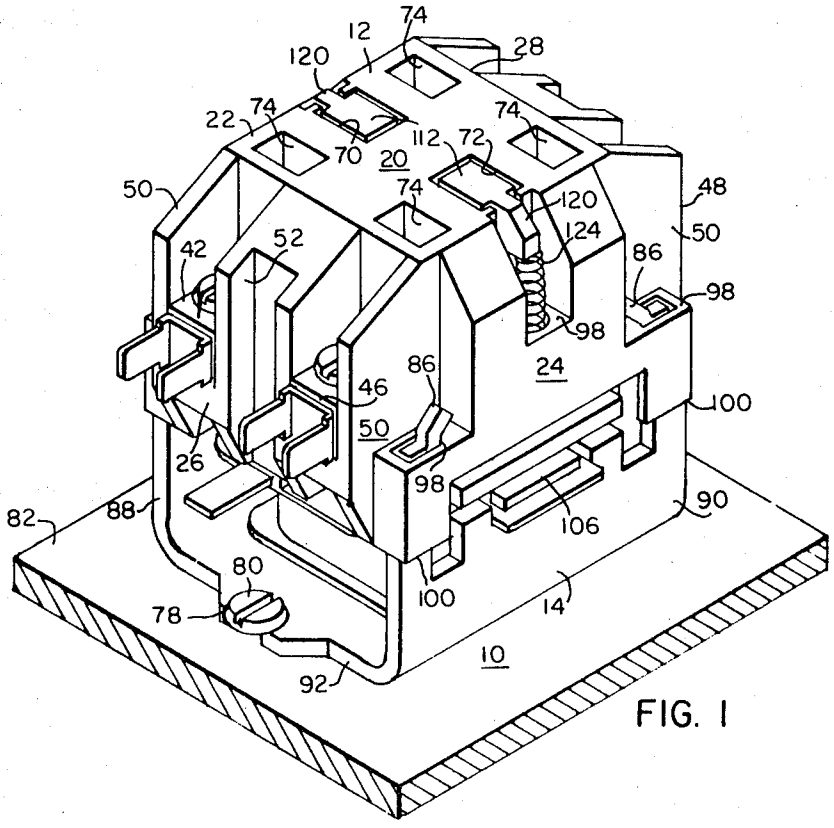

12
74
28
120
22
74
74
70
20
112
72
74
120
48
50
124
50
42
52
86
98
98
24
86
46
100
50
26
98
88
82
106
90
80
78
100
14
10
92

FIG. 1

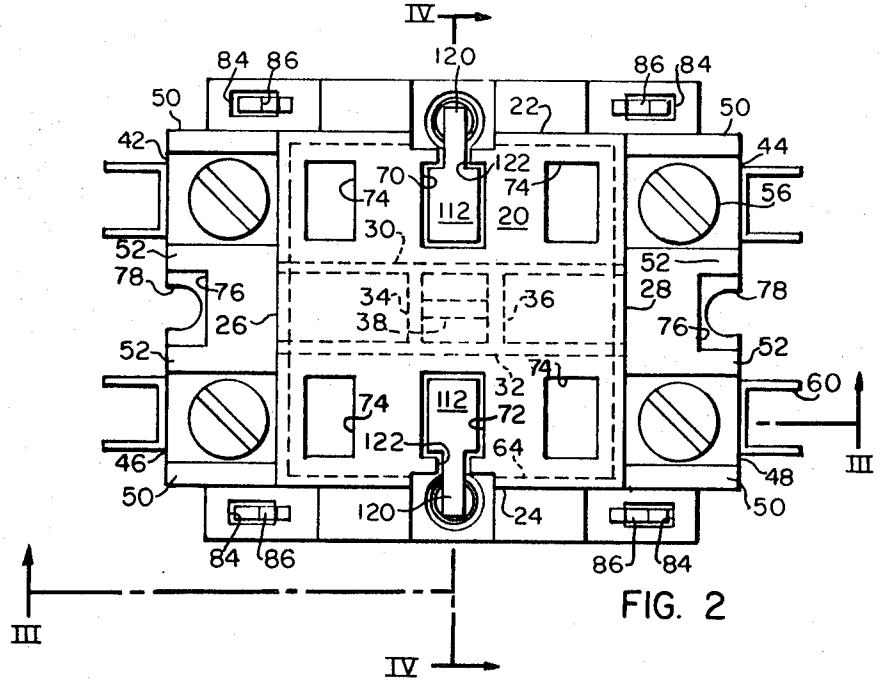

IV
120
84
86
86
84
50
22
50
42
44
70
122
74
74
56
112
20
30
52
52
78
76
34
36
28
78
26
38
76
52
52
74
32
60
74
112
72
122
64
III
46
48
50
50
120
24
84
86
86
84
III
IV

FIG. 2

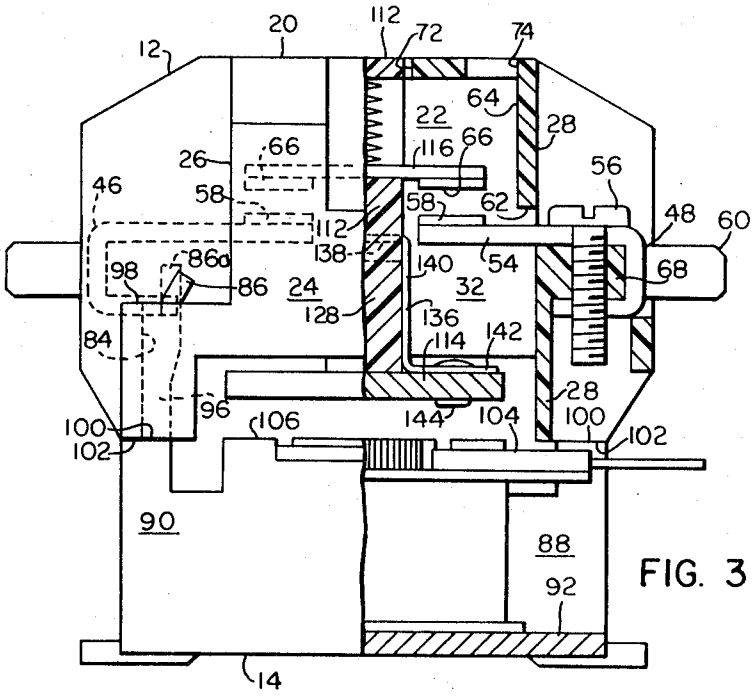

20
112
72
74
12
64
22
28
66
116
66
26
56
46
58
58
62
48
60
112
138
140
54
68
98
86a
86
24
32
128
136
142
84
114
28
96
144
104
100
102
100
102
106
90
88
92
14

FIG. 3

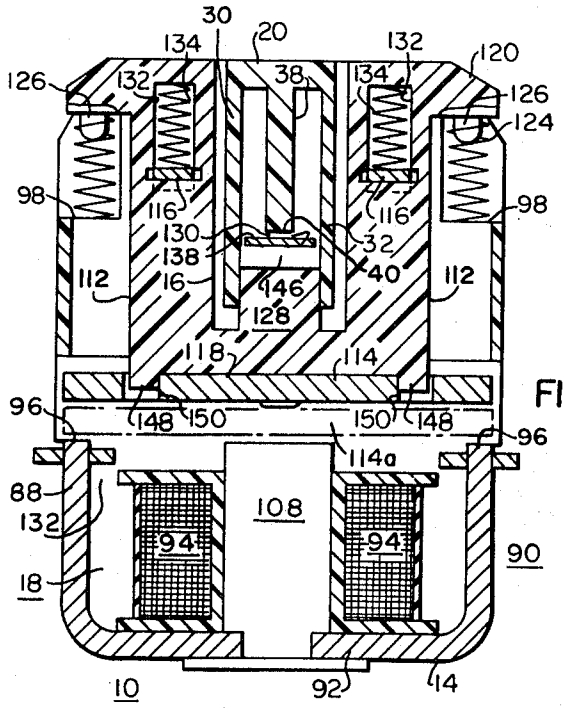

30
134
20
132
120
126
132
38
134
126
124
98
116
116
98
130
32
138
112
16
146
40
112
128
118
114
96
148
150
150
148
96
114a
88
108
132
94
94
90
18
10
92
14

FIG. 4

ELECTRIC CONTROL DEVICE

CROSS REFERENCE TO RELATED APPLICATION

This invention is related to the invention disclosed in the application of Kurt A. Grunert, Thomas Rehm, and Charles R. Paton, Ser. No. 218,104, filed Jan. 17, 1972.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to electric control devices and more particularly to electric control devices such, for example, as contactors or relays that are operated by electromagnetic operating means.

2. Description of the Prior Art

In the electric control art compact control devices adapted for mounting on panel boards and control panels are well known. One type of electric control device is that disclosed in U.S. Pat. No. 3,296,567, issued Jan. 3, 1967, entitled "Electric Control Device" to J. P. Conner and Kurt A. Grunert.

An inherent problem with most electric control devices such as two-pole contactor that are mounted on control panels is the difficulty of changing the device to adapt to varying conditions of electric supply. For example, the coil of a commercially available contactor may be useful only with 24 voltage current where 120 voltage supply is available. Most of the prior known contactors have been so constructed that they must be completely removed from the control panel in order to change a coil to a different voltage requirement. That procedure for changing the coil has been cumbersome and time-consuming and has therefore created a need for a contactor which, after installation on a mounting panel, is readily adapted to a coil change without complete removal from the mounting panel in order to disassemble the entire contactor from the bottom end. It is a salient feature of this invention that the assembly of the insulating housing, the stationary contact structure, the movable contact carrier structure, the biasing means, and the armature comprise a unitary assembly removable as a unit from the mounting bracket.

Associated with the foregoing have been problems of assembly and production costs.

SUMMARY OF THE INVENTION

In accordance with this invention it has been found that the foregoing problems may be overcome by providing an electric control device or contactor for use on a mounting panel which device comprises an assembly of an electrically insulating housing and a mounting bracket for attaching the assembly to a mounting panel. The housing includes a stationary contact structure and a contact carrier structure within housing which is movable between open and closed positions relative to the stationary contact structure. Biasing means are provided for holding the movable contact carrier structure in one of the operating positions, such as the open position. Electromagnetic means are provided for actuating the contact carrier structure to the other operating position, such as the closed position and comprises a magnetic coil, an armature, and the mounting bracket which has a U-shape configuration and is adapted to support the magnetic coil and which serves as a ferromagnetic path for the electromagnetic field generated by the coil when actuated. Finally, the assembly comprises detachable mounting means including an elastically deformable structure for mounting the housing on the bracket for enabling easy access to the interior of the assembly without removal of the bracket from a mounting panel.

A salient feature of this invention is the provision of easily detachable mounting means for separating the electrically insulating housing from the mounting bracket with a minimum of effort and without removing the bracket from a mounting panel in order to facilitate quick access to the interior of the assembly for any purpose such as replacement of a coil. The detachable mounting means also thereby facilitates reassembly of the housing and the mounting brackets with a minimum of effort and time.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of an electric control device or contactor in accordance with the principles of this invention;

FIG. 2 is a plan view of the device shown in FIG. 1;

FIG. 3 is a vertical sectional view taken on the line III—III of FIG. 2; and

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

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, an electric control device or contactor is generally indicated at 10 and it comprises a housing 12 and a mounting bracket 14. In addition, as shown in FIG. 4, the device 10 also includes a movable contact carrier structure 16 and electromagnetic means 18 for actuating the contact carrier structure in a manner to be described hereinbelow.

The housing 12 is composed of an electrically insulating or dielectric material such as a phenolic resin. The contactor 10 is a multi-pole type such as a two-pole contactor. The housing 12 is a shell-like member having a top wall 20, opposite side walls 22 and 24, and opposite end walls 26 and 28. In addition, the housing includes a pair of spaced partitions 30 and 32 (FIG. 2) which extend between the end walls 26 and 28. As shown more particularly in FIG. 2, a pair of spaced walls 34 and 36 extend downwardly from the top wall 20 between the partitions 30 and 32. A wall 38 extends downwardly from the top wall 20 between the walls 34 and 36 and parallel to the partitions 30 and 32. The wall 38 has a lower end 40 which serves as a stop member for limiting upward movement of the movable contact carrier structure 16.

As shown in FIGS. 1, 2 and 3, four stationary contact structures 42, 44, 46, and 48 are provided in pairs at opposite end walls 26 and 28. As shown more particularly for the contact structures 42 and 46, said structures are disposed between similar spaced pairs of partitions 50 and 52 extending outwardly from the end walls 26 and 28. Each stationary contact structure 42–48 comprises a U-shaped conducting strap 54 (FIG. 3), a terminal screw 56, stationary contacts 58, and wire connecting terminals 60. The conducting strap 54 has an upper portion extending through an opening 62 on the end wall 28 and is disposed in a chamber 64 between the side wall 24 and the partition 32. A similar chamber 64 is disposed between the side wall 22 and the partition 30. Both chambers 64 extend between the end walls 26 and 28. The stationary contacts 58 are in vertical alignment with and in a path of travel of movable contacts 66. The terminal screw 56 secures the

conducting strap **54** in place on a projecting portion **68** of the wall **28.** The wire-connecting terminals **60** extend outwardly to facilitate connection of a lead wire thereto in a conventional manner.

As shown in the drawings, the top wall **20** is provided with a pair of spaced openings **70** and **72** which communicate separately with the chambers **54.** Likewise, similar openings **74** are provided in the top wall each of which is in substantial alignment with the path of travel of a corresponding movable contact **66.**

As shown in FIGS. **1** and **2,** a vertically extending slot **76** is provided between the partitions **52** which slot is aligned with a screw-receiving notch **78.** One notch **78** is preferably disposed at each end of the mounting bracket **14** whereby the bracket may be attached by screws **80** (one of which is shown in FIG. **1**) to a mounting panel **82.** By aligning the slot **76** with a corresponding notch **78** the shank of a screwdriver may be disposed in the slot for setting screws **80** in place.

Finally, the housing **12** is provided with four prong-receiving openings **84** near opposite corners of the device. The openings **84** cooperate with prongs **86** for securing the housing **20** to the mounting bracket **14** in a manner to be described below.

The mounting bracket **14** is a U-shaped member having upturned legs **88** and **90** and an intermediate base **92.** The bracket is composed of a ferromagnetic material such as low carbon steel, for example, cold rolled steel plate. The mounting bracket **14** serves as a magnetic field path for an electromagnetic field generated by a magnetic coil **94** which is part of the electromagnetic means **18.**

In addition to providing means for mounting the contactor **10** on the mounting panel **82** (FIG. **1**) as well as serving as a magnet member for maintaining the electromagnetic force of the coil **94,** the mounting bracket includes means for attaching the housing on the upper end of the bracket. For that purpose, the bracket has upwardly extending projections **96** disposed in pairs extending from opposite ends of the legs **88** and **90,** one of which is shown in FIG. **3.** Each projection extends through a corresponding prong-receiving opening **84** in the housing **12** and each projection includes one prong **86** at the upper end thereof which extends above a corresponding horizontal surface **98** when lower surfaces **100** are seated in abuttment with support surfaces **102** and upper ends of the legs **88** and **90** of the bracket **14.**

Inasmuch as in the bracket **14** is composed of a low carbon steel, the upper end portions or prongs **86** are elastically deformable and may be bent slightly over the surfaces **98** in a manner shown in FIGS. **1** and **3** and thereby secure the housing **12** in place on the bracket **14.** Conversely, the prongs **86** may be returned to upright positions **86***a*, as shown in FIG. **3,** whereby the prongs are in alignment with the respective openings **84** to enable the removal of the housing from the bracket **14** for any purpose such as maintenance. Inasmuch as the bracket **14** is composed of a low carbon steel, it is readily deformable within broad elastic limits of the material so that the prongs **86** may be repeatedly bent between the upright and angled positions without breaking the prongs from the projections **96.** Thus, the combination of the prongs **86** and the prong-receiving openings **84** comprise means for readily detachably mounting the housing **12** on the bracket **14.**

In addition to the foregoing, the legs **88** and **90** include upper end surfaces **104** and **106,** respectivley, which extend between the pairs of projections **96** on each leg.

Finally, a magnetic core **108** is centrally mounted on the base **92** of the bracket **14.** The core **108** is a laminated assembly of low carbon or ferromagnetic steel sheet-like members and is fixedly attached to the base **92** in a well-known manner such as by staking.

The movable contact carrier structure **16** comprises a generally U-shaped contact carrier member **112,** a magnetic armature **114,** and separate bridging contact members **116.** The contact carrier member **112** is composed of an electrically insulating material such as a phenolic resin. As shown in the drawings, the contact carrier member **112** is movably mounted in the housing **12** with upper ends of the U-legs extending into the openings **70** and **72** of the housing. One U-leg portion of the U-shaped member **112** is disposed in one chamber **64** and the other portion is disposed in the other chamber **64** with an intermediate portion or crossbar **118** (FIG. **4**) extending therebetween and under the partitions **30** and **32.** In addition, each U-leg member **112** is provided with a projection or ear **120** (FIGS. **1, 2** and **4**) which extends outwardly in opposite directions of each other and through vertical slots or openings **122** and of opposite side walls **22** and **24.**

As shown more particularly in FIGS. **1** and **4,** each ear **120** is disposed at the upper end of a coil spring **124,** the lower end of which spring is supported on the surface **98.** The springs **124** hold the contact carrier member **112** in the upper operating position. In FIG. **4,** each ear **120** is provided with a downwardly extending projection or pin-like portion **126** in order to retain each spring **124** in place. The lower end **40** of the wall **38** serves as a stop for the upper limit of travel of the contact carrier member **112** and for that purpose, the member **112** includes an upright portion **128** extending from the crossbar **118** and disposed between the U-legs of the member **112.** It is pointed out, however, that a clearance space **130** exists between the lower end **40** of the wall **38** and the upper end of the upright portion **128** which space varies in accordance with the upper and lower operating positions of the contact carrier member **112.**

As indicated above, the contact carrier member **112** also includes a pair of bridging contact members **116** which extend between corresponding pairs of separated stationary contacts **58.** The movable contacts **66** are secured to opposite ends of the bridging contact members **116.** The bridging contact members **116** are electrical conductors preferably composed of metal and as shown in FIGS. **3** and **4.** One member **116** extends through a window **132,** one window being provided in the upper end of each leg of the contact carrier member **112.** In each of the windows, a separate compression spring **134** holds the associated bridging contact member **116** in place to provide for resilient contact engagement between the corresponding movable contacts **66** and stationary contacts **58** in a manner similar to that set forth in the above mentioned U.S. Pat. No. 3,296,567.

The contact carrier member **112** also includes the magnetic armature **114** which extends between the upper end surfaces **104** and **106** above the mounting brackets **14** for the purpose of completing the loop of the electromagnetic field when the magnetic coil **94** is actuated. The armature **114** is secured to the lower end surface of the contact carrier member **112** by an in-

verted U-shaped clip **136** (FIG. 3) which clip includes an intermediate portion **138**, a pair of downturned similar leg members **140**, and an outturned flange **142** at the lower end of each leg member. Each flange is secured to the magnetic armature **114** by suitable means such as a rivet **144**. The intermediate portion **138** extends across the upper end of the upright portion **128** through the clearance space **130** and the leg members **140** are in snug-fitting surface-to-surface contact with opposite sides of the upright portion **128**, thereby serving as bearings between said portion and the partition **30** and **32** of the housing. Thus, the clip **136** serves a three-fold function of (1) acting as a bearing therebetween the contact carrier member **112** and the housing, (2) tieing the armature **114** to the crossbar **118**, and (3) enabling self-alignment of the armature with the magnetic core and the upper ends of the surfaces **104** and **106** of the mounting bracket.

In addition, the intermediate portion **138** is spaced above the upper end of the upright portion **128** by a slight clearance **146**. A pair of similar projections **148** extend downwardly from the lower surface of the crossbar **118** and into corresponding openings **150** in a loosely fitting manner. Accordingly, the combination of the clearance **146** and the loose fit of the projection **148** in the openings **150** contribute to the self-aligning function of the armature **114** when the magnetic coil **94** is energized or actuated, thereby permitting less precise tolerances between the several associated parts and quieter operation of the armature as it moves into contact with the mounting bracket **14** when the magnetic coil is actuated. The position of the armature **114** is indicated by the broken-line position **114*a*** in FIG. **4**. The advantage of the use of the U-shaped clip **136** for mounting the armature on the crossbar as well as of the loose-fitting connection between the clip, the crossbar, and the armature **114** is the avoidance of potential binding between the cross-bar and the housing. The leg members **140** of the U-shaped clip **136** provides smooth metal surface between the electrically insulating material of the crossbar and the housing which prevents the disadvantage of sluggish movement of the contact in such a degree as to prevent proper switching operation which disadvantage was inherent in prior art constructions.

Accordingly, the electric control device for contactor of the present invention satisfies certain problems which were extant in devices of prior art construction including means for readily detaching the insulating housing from the mounting bracket for facilitating access to the interior valve the device without completely removing the mounting bracket from a mounting panel, and including the incorporation of structural features to avoid potential binding between the crossbar and the housing which in turn resulted in the prevention of proper switching in some prior art devices.

What is claimed is:

1. An electric control device for use on a mounting panel comprising an assembly of an electrically insulating housing and of a mounting bracket for fixedly attaching the assembly to a mounting panel, the 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 and an armature, the magnetic coil being mounted on one of the movable contact carrier structure and the mounting bracket, the armature being mounted on the other of the movable contact carrier structure and the mounting bracket, means for readily detachably mounting the housing on the bracket for enabling easy access to the interior of the assembly without removal of the bracket from a mounting panel, said detachable mounting means comprising an elastically deformable prong on the bracket and a surface on the housing and the prong being bendable between locked and unlocked positions, the prong extending over the surface in the locked position, the detachable mounting means comprising the bracket and the housing having mutually interfitting portions and comprising a prong-receiving aperture in the housing.

2. The device of claim **1** wherein the mounting bracket comprises a U-shaped ferromagnetic member having an intermediate base and two spaced upturned end portions, the electromagnetic means also comprises a magnetic core mounted on the intermediate base, and the magnetic coil is disposed in the bracket and around the core.

3. The device of claim **2** wherein the armature comprises plate-like ferromagnetic member extending between and movable between contacting and non-contacting positions relative to the two spaced upturned end portions.

4. The device of claim **3** wherein the movable contact carrier structure includes a crossbar extending at least a portion of the distance between two spaced upturned end portions, and means for mounting the plate-like ferromagnetic member on the crossbar and between the crossbar and the upturned end portions.

5. The device of claim **3** in which the means for mounting the plate-like member on the crossbar provides for loose mounting therebetween.

6. The device of claim **5** in which the mounting means comprises a clip between the crossbar and the plate-like member.

7. The device of claim **6** in which the clip is a U-shaped member have leg members disposed between the crossbar and adjacent housing surfaces.

* * * * *