(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 977 232 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.02.2000 Bulletin 2000/05

(51) Int. Cl.[7]: **H01H 71/02**, H01H 11/06

(21) Application number: **99114345.4**

(22) Date of filing: **21.07.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **28.07.1998 US 123275**

(71) Applicant: **EATON CORPORATION**
Cleveland, Ohio 44114-2584 (US)

(72) Inventor: **Gula, Lance**
Clinton, Pennsylvania 15026 (US)

(74) Representative:
Wagner, Karl H., Dipl.-Ing. et al
WAGNER & GEYER
Patentanwälte
Gewürzmühlstrasse 5
80538 München (DE)

(54) Conductor subhousing for a circuit breaker

(57) This concerns a molded case circuit breaker 10 including slot motor 54, arc chute A80, operating mechanism, stationary main contact 64 and line terminal arrangement 171. The stationary main terminal 64, line terminal 71 arrangement is assembled in a separate member and inserted into the bottom of the circuit interrupter in one piece with a line terminal portion being fed through a narrow opening 112 in an internal vertical wall 115 of the circuit interrupter. The fixed contact 64 and its u-shaped contact arm 68 and conductor member 128 is snugly dispose within the assembled molded case circuit interrupter with reduced openings between the arc chamber thereof and other portions of the circuit interrupter.

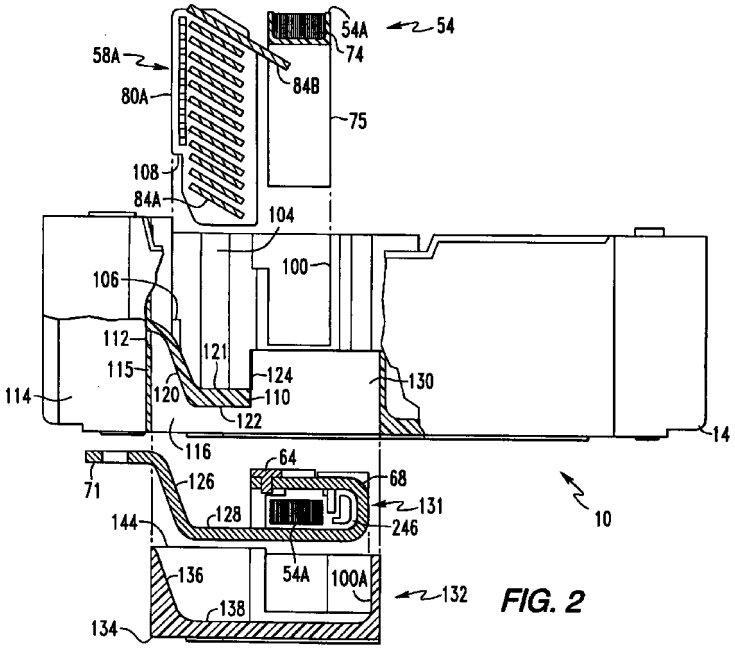

FIG. 2

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Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] Serial No. 08/864104 (96-PDC-547) entitled "Circuit Interrupter With Covered Accessory Case, Adjustable Under Voltage Relay, Self-Retaining Collar And One-Piece Rail Attachment" filed May 27, 1997.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The subject matter of this invention is related to molded case circuit breakers, generally and in particular to plug-in sub housings for the stationary contact and associated terminal thereof.

Background of the Invention

[0003] Molded case circuit breakers have been know in the art for a long period of time. An example of a molded case circuit breaker may be found in U.S. Patent 4,642,431 entitled "Molded Case Circuit Breaker With A Movable Electrical Contact Positioned by a Camming Spring Loaded Clip" issued February 10, 1987 to Tedesco et al., assigned to the assignee of the present inventions and incorporated by reference herein. Molded case circuit breakers in most instances have stationary contacts and moveable contacts. The moveable contact when actuated by an appropriate operating mechanism or trip mechanism within the circuit breaker housing either closes upon or separates respectively from the stationary or fixed contact. The stationary contact is usually connected by way of a u-shaped contact arm with an electrical terminal to which the load which is protected by the circuit breaker is externally connected. In most molded case circuit breaker arrangements the stationary contact and its associated load terminal and stationary contact arm comprise a one piece member which is inserted into the circuit breaker case during the manufacturing process. An example of such an arrangement may be found in the '431 patent. In most molded case circuit interrupter structures an arc chute is located near the fixed contact so that when the moveable contact is moved away therefrom under a load or overload condition the electrical arc, which is naturally struck therebetween is magnetically or otherwise pushed out into the arc chute for dissipation, cooling, etc., In addition, a contact arm accelerator slot motor arrangement may also be provided which surrounds the region of the fixed and moveable contact arms, such that electromagnetic flux, which is induced into the slot motor, interacts with the metallic moveable contact arm during the circuit interrupter opening operation to accelerate the opening movement of the contact arm. An example is found in incorporated by reference U.S. Patent 3,815,059 entitled "Circuit Interrupter Comprising Electromagnetic Opening Means" issued June 4, 1974 to Spoelman which is also assigned to the assignee of the present invention. Quite often the slot motor, which includes an enclosed magnetic path, is formed from an upper u-shaped member joined or abutted in a face-to-face arrangement with a lower u-shaped member. The lower u-shaped member may be placed in the bite piece or crook of an insulating u-shaped member which surrounds the contact arm for the stationary contact.

[0004] These are problems associated with this arrangement. Placement of the various components in their appropriate locations leads to a complicated manufacturing process. Also openings are required to communicate between the arc generation region and other portions of the circuit interrupter so that the external terminal may be properly joined to the fixed terminal of the circuit interrupter. Lastly, it is necessary to support the previously described arrangement within the molded case circuit breaker.

[0005] It would be advantageous if a way could be found to provide an easier way to manufacture the molded case circuit breaker, particularly with respect to the installation of the fixed contact, external terminal, slot motor arrangement, and arc chute as previously described. It would also be advantageous if the support for these members could be enhanced. Lastly, it would be advantageous if the openings for gas escape during an arc interruption could be minimized to prevent flash over and similar undesirable electrical occurrences in the region of the external terminal.

Brief Description of the Drawings

[0006] In accordance with the invention reference may be had to the preferred embodiment thereof shown in the accompanying drawings in which:

Figure 1 shows a side elevation, partially in section and partially broken away of a portion of a circuit interrupter apparatus employing the teachings of the present invention;

Figure 2 shows an arrangement similar to that shown in Figure 1, but with the various components of the circuit interrupter shown in exploded or separated disposition for convenience of illustration;

Figure 3 shows an arrangement similar to that shown in Figures 1 and 2; but where the components are joined together as in Figure 1 and where the completed side region of the circuit interrupter is depicted; and

Figure 4 shows an orthogonal view of the circuit interrupter of Figures 1, 2 and 3 with the unitary removable plug in sub-housing shown removed from the main circuit breaker case in a disposition for reinsertion into the circuit breaker case.

SUMMARY OF THE INVENTION

[0007] In accordance with the invention, a molded case circuit interrupter is taught which includes a main housing having one portion therein for assisting in capturing a portion of an conductor means. The main housing has also disposed therein a circuit interrupter operating means. Separable contacts, one fixed and one movable, are disposed within the circuit interrupter housing and operated by the circuit interrupter operating device for opening and closing the separable contacts. A terminal is interconnected with the fixed contact by way of a portion of the aforementioned conductor. Lastly, a separate housing sub member, which is insertable into cooperation with the main housing and in cooperation with the conducting member and the housing member is provided for capturing the latter mentioned conductor portion between the sub member and the mentioned portion of the main housing.

Description of the Preferred Embodiment

[0008] Figure 1 and Figure 2 depict a molded case circuit breaker 10 embodying the teachings of the present invention. Molded case circuit breaker 10 includes as part thereof a lower base portion 14. There is also an upper base portion (not shown). In some embodiments of the invention a secondary cover (also not shown) may also be utilized on the upper base portion. The upper base portion is shown in the '431 incorporated-by-reference U.S. patent. There is also provided a slot motor assembly 54 and an arc extinguisher assembly 58A. The slot motor assembly 54 may be similar to that shown in the '059 incorporated-by-reference U.S. patent. Basically, the slot motor assembly 54 includes a set of slot motor upper assembly plates 74 disposed upon a mandrel 75. The upper slot motor mandrel 75 with its slot motor upper assembly plates 74 fits snugly into the slot motor groove 100 in base 14 as depicted in Figure 2. The arc extinguisher assembly 58A includes an arc chute 80A having parallel disposed arc chute plates 84A and an upper arc runner 84B. The arc chute-assembly 58A is disposed in the arc chute groove 104 in base 14 as depicted in Figure 2 and is prevented from further downward movement therein by the abutment of a knee 108 therein onto a plateau 106 in the lower base portion 14. There is provided in lower base portion 14 partially angularity oriented upper support member 110 which is disposed between the upper most portion of the lower base portion 14 and the lower most portion of the lower based portion 14. Upper support member 110 includes an upper support member slanted region 120 and an upper support member flat region 122, both of which protrude or reflect towards the bottom portion of the lower base portion 14. A clearance region 124 is also provided. The thusly constructed upper support member 110 forms beneath it a terminal support region 116 adjacent the bottom surface thereof on the left as viewed in the figures and a lower slot motor chamber 130 adjacent the bottom surface thereof on right. Furthermore, there is provided a generally vertical wall 115 between a load terminal chamber 114 and the terminal support region 116. Wall 115 has a small transverse opening 112 therein through which terminal 71 snugly protrudes after assembly of the entire arrangement has been completed. There is also provided a contact support insert member or plug-in sub-housing 132 which comprises a lower support member wall 134, side wall arrangement 144, lower slot motor groove 100A, and flat lower slot motor support surface 138. A slanted lower support member surface 136, which is complimentary to the lower surface of the aforementioned slanted upper slot motor slanted region 120, is provided in the insert member 132. There is also provided a lower slot motor stationary contact line terminal assembly 131 which may nest or rest in the contact support insert member 132 to be lifted into a position of snug fit within the lower base portion 14 of the molded case circuit breaker 10. In particular, when thusly assembled, the slanted lower slot motor surface 136 rest against the bottom of the slanted contact portion 126 which then presses upwardly against the bottom of the upper slot motor slanted region 120. Likewise, the bottom of the flat upward slot motor region 122 cooperates with flat lower slot motor support surface 138 to snugly secure the lower flat contact portion 128 therebetween. The lower slot motor assembly 246 is complimentary with the upper portion of the slot motor assembly 54. The lower slot motor assembly plates 78 cooperate with the upper slot motor assembly plates 74 to form parallel, complete magnetic circuits around the region of the separating main contacts. The lower slot motor assembly 246 is disposed within the bite portion or u-shaped portion of the conductor which includes the lower flat contact portion 128 on the bottom and the stationary contact arm 68 on the top. The stationary contact 64 for the circuit breaker is disposed at the end of the stationary contact arm 68.

[0009] Figure 1 shows all of the aforementioned separate components joined together within the lower base portion 14 to form a completed arrangement. Thus there is a complete electrical circuit between the stationary contact 64, the stationary contact arm 68, the lower flat contact portion 128, the slanted contact portion 126 and the line terminal 71. In addition, the slot motor assembly 54 is made complete by the insertion of the slot motor upper assembly plates 74 onto the mandrel 75 in the groove 100 for mating up with the lower slot motor assembly 246 and the lower slot motor assembly plates 78. It will be noted that the conductor is 131 completely and securely disposed within the circuit interrupter 10 and is bounded on the top by the upper support member 110 and on the bottom by the contact support plug-in insert member 132. There is ample space for the stationary contact 64, stationary contact arm 68, the lower slot motor assembly 246 and the

lower flat contact portion 128 to fit into the lower slot motor chamber 130. Likewise the solid region of the contact support member 132 between the lower support member wall 134 and the slanted lower support member surface 136 fits snugly into the terminal support region 116 to assist in holding the entire arrangement 131 snugly in place.

[0010] Referring now to Figure 3 the assembled arrangement depicted in Figure 1 is shown once again, but with the side 15 of the lower base portion 14 completely assembled.

[0011] Referring now to Figure 4 an orthogonal view of the main circuit breaker lower base portion 14 and the separated contact support plug-in, sub-housing member 132 is depicted. In particular, the lower slot motor assembly region 130 and the terminal support region 116 are clearly shown. Also shown is the flat lower surface of the upper support member 122 and the slanted lower surface 120 thereof. The holes or openings 112 for insertion of the terminal portion 71 therethrough from the terminal support region 116 to the terminal chamber 114 through the wall 115 is depicted. In this embodiment of the invention, screws or mounting members 140 are shown for insertion into the openings 142A in the lower base portion 14 to hold the member 132 in place.

[0012] It is to be understood that the previously described arrangement is not limited to use on a stationary load terminal arrangement. It may also, for example, be used with a trip unit.

Claims

1. A circuit interrupter, comprising:

a circuit interrupter housing (14) having one portion thereof (122) for assisting in capturing one portion (128) of a conductor; a circuit interrupter operating disposed within said circuit interrupter housing(14); a separable contact disposed (64) within said circuit interrupter housing and operable by said circuit interrupter operating device for opening and closing said separable contact; a terminal (71) interconnected with said separable contact by way of said portion (132) of said conductor; characterized by a separate housing sub-member (132) insertable into cooperation with said housing means and in cooperation with said portion of said conductor means and said housing means for capturing said conductor means between said sub-member and said portion of said housing means.

2. The combination as claimed in claim 1, wherein said circuit interrupter housing comprises a bottom portion.

3. The combination as claimed in claim 1, wherein said portion of said conductor and said terminal comprise common conductive material.

4. The combination as claimed in claim 3, wherein said common conductive material comprises a relatively solid strip of material.

5. The combination as claimed in claim 3, wherein said sub-member and said portion of said housing when joined form a region between them having generally a dimension of said portion of said conductor.

6. The combination as claimed in claim 4, wherein said sub-member and said portion of said housing when joined form a region between them having generally a dimension of said portion of said conductor.

7. The combination as claimed in claim 6, where in said relatively solid strip of material is ribbon-shaped.

8. The combination as claimed in claim 4, where in said relatively solid strip of material is ribbon-shaped.

9. The combination as claimed in claim 7, where in said ribbon-shaped, relatively solid strip of material has a lateral angular bend therein.

10. The combination as claimed in claim 8, where in said ribbon-shaped, relatively solid strip of material has a lateral angular bend therein.

11. The combination as claimed in claim 1, wherein said terminal and said portion of said conductor are generally in separate compartments 114-116 of said circuit interrupter housing.

12. The combination as claimed in claim 7, wherein said terminal and said portion of said relatively ribbon-shaped, solid strip of material which is captured between said housing portion and said sub-member are generally in separate compartments of said circuit interrupter housing.

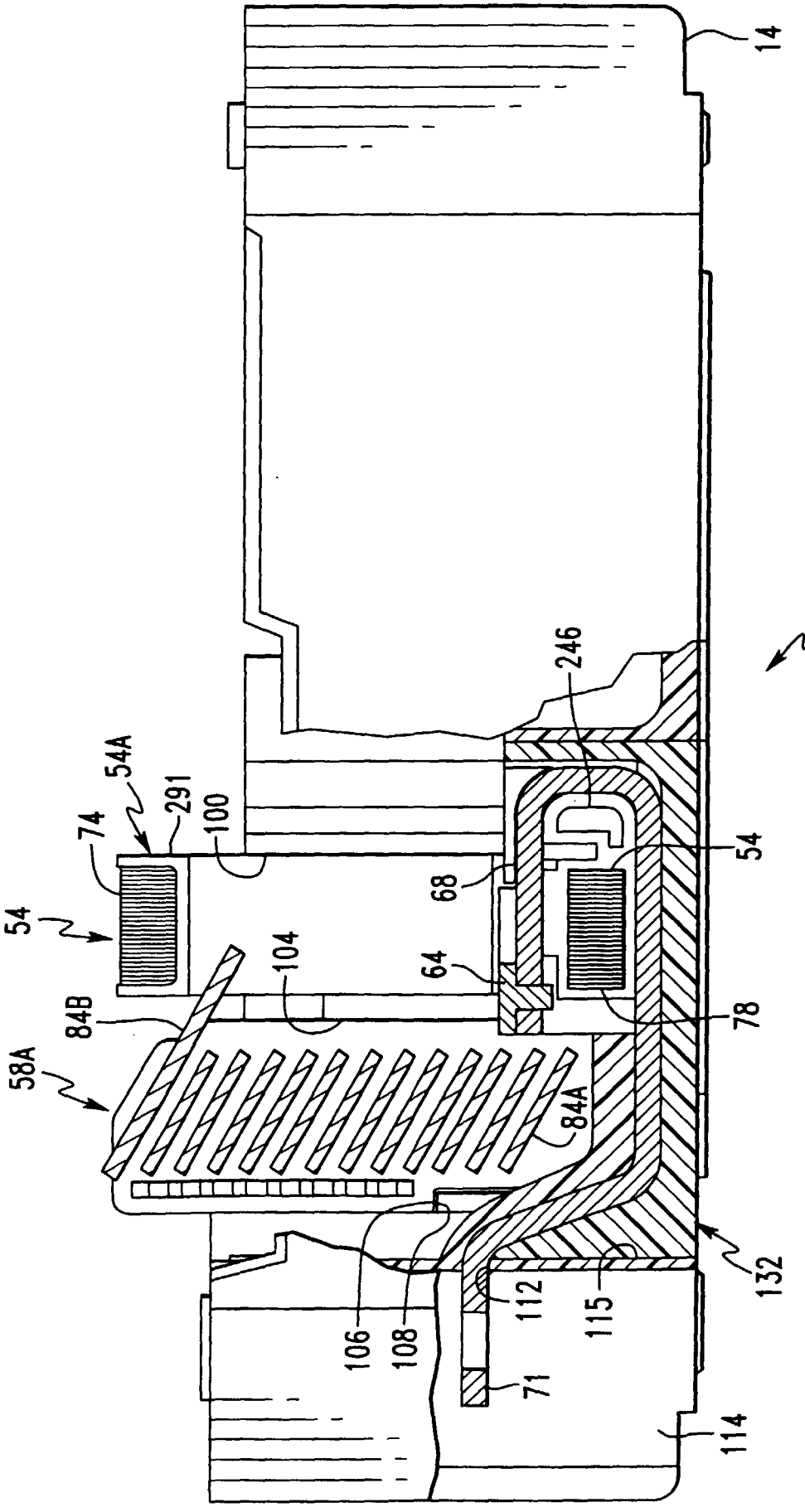
13. The combination as claimed in claim 12 wherein the only means for securing said terminal means and said relatively ribbon-shaped, solid strip of material is the cooperation between said sub-member (132) and said (122) portion of said housing.

14. A circuit interrupter, comprising:

circuit interrupter housing (14) having one portion (122) thereof for assisting in capturing one

portion (128) circuit interrupter subassembly; circuit interrupter operating device disposed within said circuit interrupter housing (14); a separable contact (64) disposed within said circuit interrupter housing and operable by said circuit interrupter operating device for opening and closing said separable contact; characterized by a separate housing sub-member (132) containing a portion of said sub-assembly insertable into cooperation with said housing for capturing said sub-assembly against portion of said housing.

15. The combination as claimed in claim 14, wherein said sub-assembly means compress a circuit interrupter trip unit.


14
10
246
54A
291
100
74
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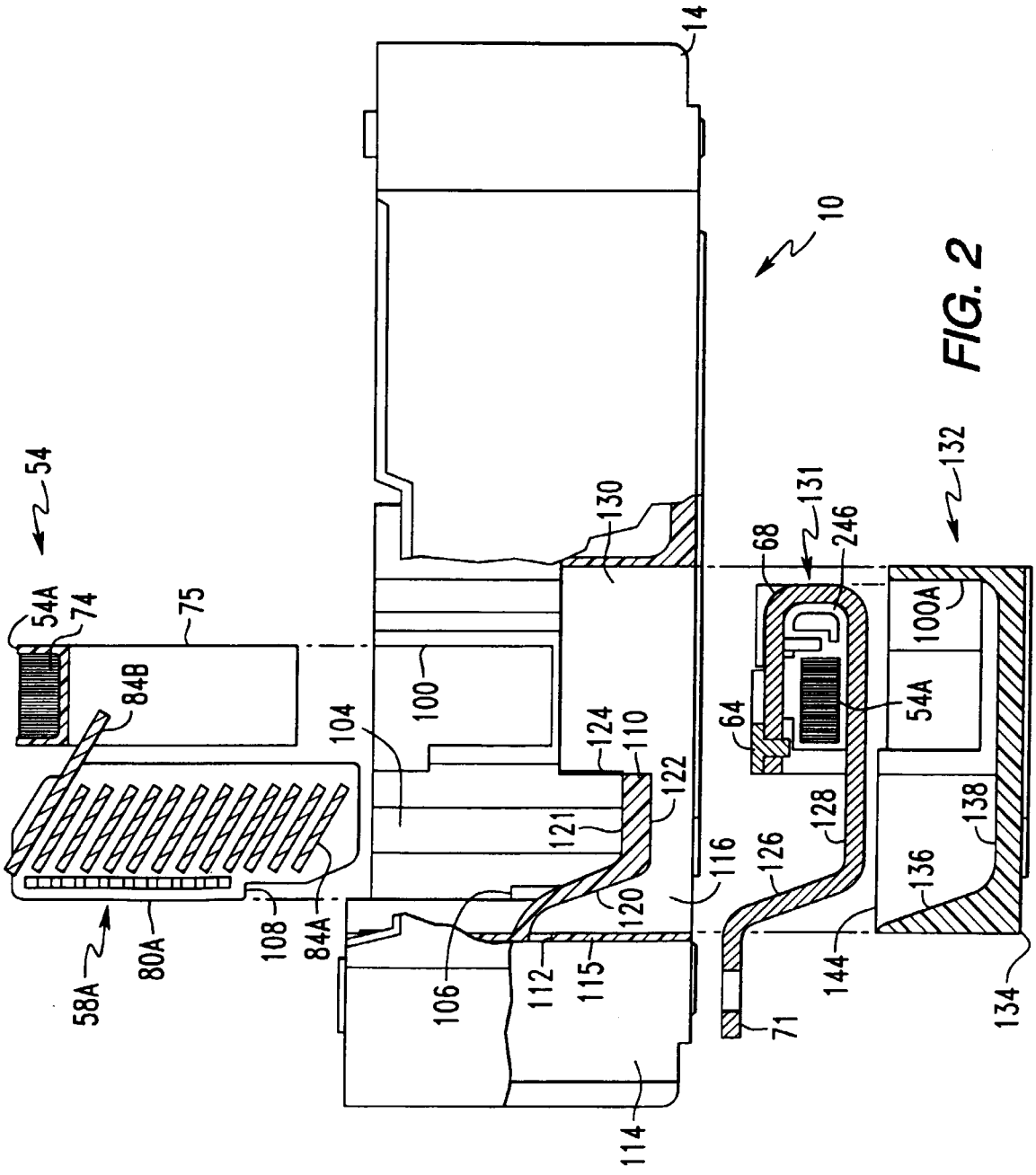
104
64
84B
78
58A
84A
132
112
115
106
108
71
114

FIG. 1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84B
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54A
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110
122
121
128
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120
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84A
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58A
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112
115
114
144
71
134

FIG. 2

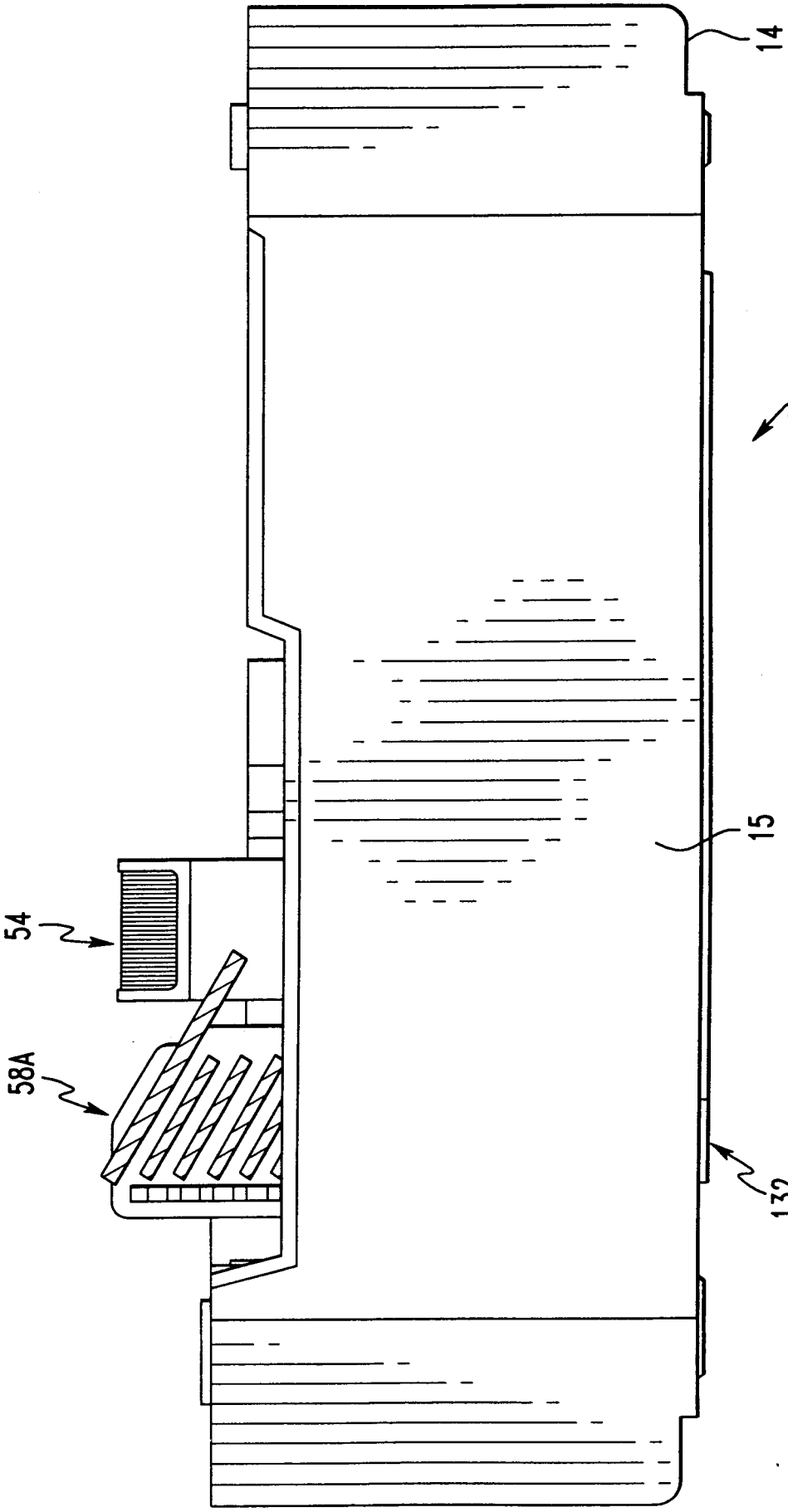

FIG. 3

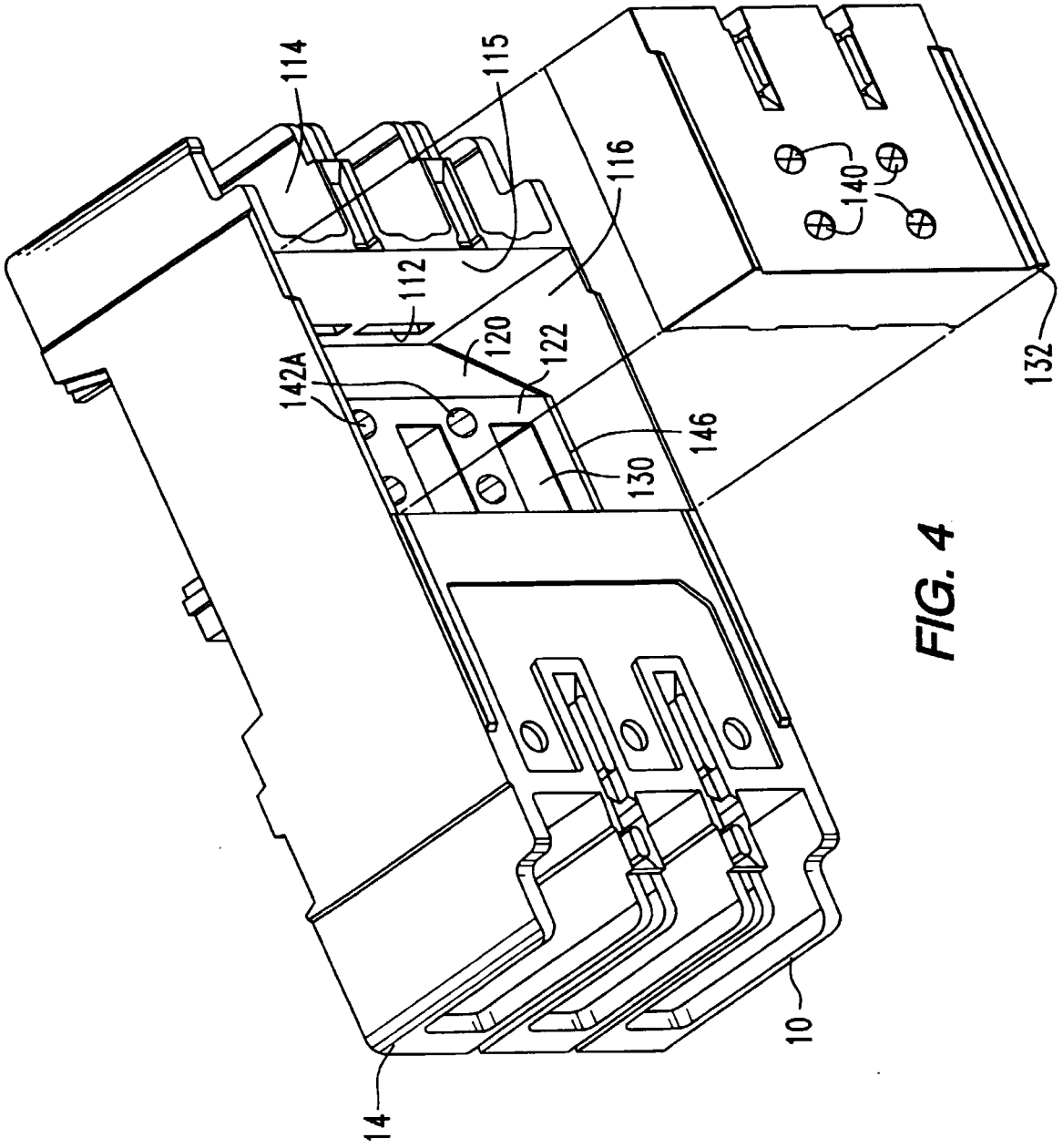

FIG. 4