CIRCUIT BREAKER CASE
William W. Camp, Lawrenceville, N.J., assignor to Home- 
naert Electric Company, Trenton, N.J., a corporation of 
New Jersey
Filed Jan. 28, 1966, Ser. No. 523,772
14 Claims. (Cl. 200—165)

This invention relates to an improved circuit breaker 
and more particularly to an improved case for small, 
molded case circuit breakers and to a mounting plate for 
mounting a circuit breaker to a panel.

It is an object of this invention to combine into one 
piece what has been previously separate mounting inserts 
and case securing rivets and to provide a semi-self align- 
ing insert and a rivet which will correctly position itself 
relative to the centerline of the case upon installation.

Another object of this invention is to provide an insert 
rivet which will advise the intelligent operator, by an 
increase in the torque required to continue insertion of the 
screw, that the screw has travelled far enough and that 
the further travel of the screw may damage the circuit breaker 

A further object of this invention is to provide a case 
construction for a circuit breaker which may be easily 
adapted for use as a series trip circuit breaker, a relay 
trip circuit breaker, a shunt trip or calibrating tap circuit 
breaker, or for the addition of an auxiliary switch.

A still further object is to provide an adapter plate for 
mounting a small, molded case circuit breaker to a panel, 
which may be a metal panel, where the panel has an open- 
ing intended to receive a larger circuit breaker.

The foregoing and other objects of the invention, the 
principles of the invention, and the best mode in which 
I have contemplated applying such principles will more 
fully appear from the following description and accom- 
panying drawings in illustration thereof.

In the drawings,
FIG. 1 is a side view of a circuit breaker incorporating 
my invention, the handle being shown in the closed con- 
tacts position;
FIG. 2 is a front view of the circuit breaker shown in 
FIG. 1, a part of the case being broken away to better 
see the insert rivet for securing together the two half- 
cases;
FIG. 3 is an exploded partial sectional view taken along 
the line 3—3 in FIG. 2 showing the left half of the insert 
rivet in elevation and the right half sectioned, the two half 
cases and the insert rivet being shown prior to assembly of 
the parts together;
FIGS. 4 and 5 are perspective views of the two half- 
cases looking at the inside of the cases and omitting all 
the internal parts;
FIG. 6 is a side view of the circuit breaker shown in 
FIG. 1 but rotating the case so that the handle is at the 

FIG. 7 is a partial view similar to FIG. 6 but showing a 
shunt trip or calibrating tap construction;
FIG. 8 is a partial view similar to FIG. 7 but showing an 
 auxiliary switch construction, the movable arm being 
in the contacts open position, hence the plunger of the 
 auxiliary switch is not depressed;
FIG. 9 is a side view of a dummy block adapted to be 
inserted into the auxiliary cavity;
FIG. 10 is a top view of the dummy block shown in 
FIG. 9;
FIG. 11 is a perspective view illustrating the dummy 
block after its two end nubs have been removed and the 
 auxiliary terminals upon it;
FIGS. 12 and 13 are top views of the two auxiliary 
terminals shown in FIG. 10;
FIG. 14 is a side view of the circuit breaker shown in 
FIG. 1 with parts of the case being broken away to show 
the central portion of the insert rivet, the circuit breaker 
being mounted to a panel by an adapter plate;
FIG. 15 is a front view of the circuit breaker and 
adapter plate shown in FIG. 14; and
FIG. 16 is an exploded, perspective view of the circuit 
breaker, adapter plate and panel shown in FIG. 14.

Referring to the drawings, FIG. 1 illustrates a circuit 
brreaker 10 having a case 12 formed by two half-cases 14 
and 16 of molded insulation material. As illustrated, in 
FIG. 1, the circuit breaker includes terminals 18 and 20 
to connect it to a suitable circuit and a handle 22 for 
manual control.

The two half-cases 14 and 16 are secured together, on 
the right, as viewed in FIG. 1, by two insert rivets 24, 
constructed in accordance with this invention, and, on the 
left, by two conventional rivets 25.

The two insert rivets 24 are substantially identical and 
for brevity the description will be limited to one unless 
otherwise noted.

The insert rivet 24 comprises a square shaped, as viewed 
in FIG. 3, central body 26 and two integral arms 28 ex- 
tending one each from opposite, generally flat, sides 30 
and 31 of the body 26. The arms 28 each comprise a cylin- 
drical section 32 joined to another longer cylindrical sec- 
tion 34 of smaller diameter by a connecting, conical por-
tion 36. The cylindrical sections 32 and 34, and the conical 
portion 36, are solid, as shown.

The body 26 is of generally rectangular shape length- 
wise, as shown in FIG. 3, but the lower ends of the op- 
posite sides 38 are tapered inwardly, see FIG. 14.

The body 26 has a central bore which is threaded, as 
indicated at 40, and which communicates with, and is 
aligned with, an unthreaded hole 42 formed by an in-
wardly extending annulus 44.

The body 26 is received in a well 46 formed approxi-
ately one half in each of the half-cases 14 and 16, the 
well 46 being deep enough so that the top surface 48 of 
the body 26 is below the surrounding surface 50 of the 
half-cases which abut a panel to which the case 12 may 
be secured.

The well 46 is made slightly wider than the distance 
between opposed surface 30 and 31, but the surface 54 
is accurately positioned relative to the surface 56 of the 
half-case 16 (which defines the middle of the case 12) 
and against which a corresponding surface 58 of the half- 
case 14 abuts.

Also, the length of the body 26 is such relative to the 
depth of the well 46 that the bottom surface 45 is spaced 
above the bottom surface 60 of the well when the arms 28 
are received within holes 62, shaped to mate with the 
arms 28, as shown. Further, the arms 28 are long enough to 
extend through and to the outer surfaces of the cases 14 
and 16.

To assemble the two half-cases, the insert rivets 24 
are placed within the wells 46 and the holes 62. The in-
sert rivets are biased against the case 16 and the end of 
the left arm, as viewed in FIGS. 2 and 3 is upset first 
and peened over, the right hand arm being held against 
the movement and the half-case 16 being held firmly at 
such time. Thereafter, the end of the right hand arm 28 
is upset and peened over, as shown in FIG. 2.

Thus, the insert rivet provides a means for securing to-
gether two half-cases 14 and 16 and a means to secure 
the circuit breaker to a panel by inserting screws into 
the threaded bores 40.

Preferably, the screws which are used have a strength 
such that, if they are too long, upon engagement of the
forward end of the screw with the unthreaded annulus 44 if the torque is increased on the screw, the screw will shear before the front portion of the screw is forced through the case surface 60, i.e., before the case is damaged. Even if the screw does not shear, if the screw is so long that it engages the annulus 42 before the case 44 is made tight against the panel, because the increase in torque required on the screw, to continue insertion into the insert rivet, should indicate to the operator that something is wrong and he may check before continuing to insert the screw to an extent that results in damage to the case.

Since the surface 48 is below the surface 50, this permits the surface 50 to be placed in compression against the panel, insuring a tight assembly. This relationship of the surfaces 48 and 50 also tends to bend the arms 28 which tends to result in a locking action between the screw and bore threads, as the threads of one tend to lie against the threads of the other on one side of the threads because of the bending of the arms 28.

The insert rivet 24 has a semi-self-aligning feature because the body 26 is received loosely in the well 46 as are the arms 28 in their holes 17. The arms 28 are circular as are the mounting holes 62. That is, if the vertical distance, as viewed in FIG. 2, does not exactly match the corresponding vertical distance in the panel, the insert rivets may shift vertically toward or away from each other, as required. Note that if the mounting holes in the panel do not lie along a common vertical plane, the circuit breaker may be twisted bodily to correspond to the inclined plane of the holes in the mounting panel.

One of the tapered sides 38 is made so because one of the walls of one of the wells, see FIGS. 4, 5 and 14 is inclined at its lower end portion, to accommodate an internal circuit breaker. The other sides 38 are made tapered to facilitate the shifting and self-aligning previously described and for uniformity of production parts. Also, the space provided by the tapered sides permits the tapered sides to bulge outwardly somewhat without stress at a location of the case where the case wall is thin, should the screw bottom in the annulus 44.

Preferably the insert rivets 24 are made as zinc die castings.

After the insert rivet is peened over at the opposite ends of the arms 28, the insert rivet has very little, if any, free play axially, i.e., horizontally in FIGS. 2 and 3. However, because of the circular arms 28, circular mating holes 62, the space between the bottom of the body 26 and the body of the well, the space between the sides 38 and the corresponding sides of the well, and the taper at the lower ends of the sides 38, the insert rivet may pivot about its horizontal axis to align itself, to some extent, with the holes in the panel.

Further, since the case material is a substantially brittle plastic capable of very little flexibility, such as bakel-e, it is seen that if the bottom of the body 26 (FIG. 3) or the lower ends of the sides 30, 31 or 38 should bulge, when the screw engages the annulus 44, that the case might be damaged but for the spaces which tend to accommodate the bulges.

Also, as the screw bottoms on the annulus 44 it tends to start cutting a thread therein, as the screw is of a harder material than the body 26, providing a locking action on the screw.

The unthreaded hole 42 facilitates the cutting of the thread in the bore 40 and also tends to reduce the size of the bulge downwardly when the screw bottoms on the annulus 44.

Referring to FIGS. 4 and 5, the approximate half-case 16 comprises a side wall 70 and integral, peripheral walls on its four margins, i.e., a top or front wall 71, end walls 72 and 73, and a bottom wall 74. Similarly, the approximate half-case 14 comprises a side wall 78 and integral, peripheral walls on its four margins, i.e., a top or front wall 79, end walls 80 and 81, and a bottom wall 82.

The side walls and the peripheral walls jointly define a cavity 85 within which are placed the internal parts of the circuit breaker, some of which are illustrated in FIG. 6.

The bottom walls 74 and 82 are beveled, as shown at 86 and 87, on the inside, and are integral with depending, projecting walls 90 and 91 extending outwardly and together forming an auxiliary cavity 100, the wall 90 defines a space 94 which forms approximately one-half of the cavity 100.

The wall 91 defines a space 95 which forms the other half, approximately, of the cavity 100.

The spaces 94 and 95 are in communication with the cavity 82, as shown, and open at the bottom to the outside of the case. The spaces 94 and 95 are closed on three sides, 110, 111 and 112, and 113, 114, and 115, respectively, as shown, by surfaces of the projecting walls 90 and 91.

Extending from the surface 111 and integral therewith are spaced pins 120 and 121, the length of the pins being shorter than the width of surfaces 110 and 112, as shown. The surface 114 has integral, similar pins 122 and 123, aligned with pins 120 and 121 and of similar extent.

As shown in FIG. 6, the auxiliary cavity 100 is formed between the main terminals 130 and 131 of the circuit breaker, the terminal 130 being carried by the stationary contact 132 and the terminal 131 being connected to the coil 133 of the electromagnetic tripping device of the circuit breaker.

The terminal 130 comprises a vertical part 135 extending through slots in the walls 74 and 82 and having lugs 136 in engagement with the underside of the walls 74 and 82, a part 137 bent at a right angle and overlying the walls 74 and 82, and a part 138 carrying the stationary contact and having lugs 139 carried by the half-cases 14 and 16.

The terminal 131 has a vertical part 140 extending through slots in the walls 74 and 82 and having a lug 141 in engagement with the underside thereof. The part 140 has spaced notches 143 and 144 defining a lug 145 received in suitable depressions in the walls 74 and 82, the part 147 overlying and engageable with the top surface of the walls 74 and 82.

In addition to the electromagnetic tripping device, the circuit breaker comprises a linkage mechanism housed within the cavity 85 except for a part of the handle 22 which extends through an opening, as shown. The linkage mechanism is tripped by the electromagnetic device upon predetermined overload conditions to collapse the linkage mechanism and separate the movable contact 152 from the stationary contact 132.

The movable contact 152 is carried by a movable arm 153 whose rear portion is generally opposite the auxiliary cavity 100.

For a series trip construction, FIG. 1, the auxiliary cavity 100 is filled and closed with a dummy block 200, FIGS. 9 and 10, the dummy block having two holes 202 extending through the block to receive the aligned pins 120, 121, 122, and 123. In this arrangement, the coil is connected at one end to the terminal 131, and at the other end to the movable arm and the only terminals on the circuit breaker are the main terminals 130 and 131.

Referring to FIG. 8, if it is desired to provide the series trip circuit breaker with an auxiliary switch 210, instead of placing the dummy block 200 within the cavity 100, the auxiliary switch 210 is placed therein. The auxiliary switch has a plunger 212 extending into the main cavity 85 and is in the path of movement of the rear portion of the movable arm carrying the movable contact 152. In FIG. 8 the movable arm, partially shown only, is in the contacts open position, and the plunger 212 is not depressed. When the circuit breaker contacts are closed, the rear portion of the movable arm engages the plunger 212 and depresses.
5 the latter, but this is not shown, actuating the contacts of 5 the auxiliary switch. Thus the auxiliary switch can be used 5 to give evidence of the condition of the circuit breaker contacts.

Referring to Fig. 6, a relay trip circuit breaker con- 5 struction is shown wherein the circuit breaker contacts 332 and 352 are in one circuit and the coil 333 is in 5 another circuit to trip the circuit breaker remotely and 5 independently of the current traversing the contacts 332 and 352. For such an arrangement the dummy block 200 5 shown in FIGS. 9 and 10 is used, but the integral side 5 nubs 220 and 221, at the lower left and right, in FIG. 9, 5 are broken off by a suitable tool. The small nubs 220 and 5 221 break off easily as the block 200 is also of molded 5 insulation material, such as bakelite.

By removing the nubs 220 and 221, two spaces are pro- 5 vided, on the left between the end face 224 and the sur- 5 faces 110 and 115 and on the right between the end face 225 and the surfaces 112 and 113 within which auxiliary 5 terminals 230 and 231 may be placed.

The auxiliary terminals 230 and 231 are substantially 5 the same and comprise vertical parts having lugs 234 en- 5 gaging the underside of the walls 90 and 91, FIG. 6, and 5 portions 236 bent at a right angle to the vertical part and 5 overlying and engaging the top surface 238 of the dummy 5 block 200, to thereby restrain vertical movement in either 5 direction. Further, the terminals 230 and 231, each 5 also have an upstanding portion 240 bent at a right angle 5 to each horizontal portion 236. So that identical 5 terminals 230 and 231 may be used, the terminals are 5 placed on the dummy block so that the bent portions 5 face each other, as shown in FIG. 11.

The top surface 238 is interrupted and the block 200 5 has a depression 242, as shown, to receive some of the 5 flexible conductor which in the illustration of FIG. 6 is 5 solder or weld connected at one end to the portion 240 of 5 the right hand terminal 231 and at the other end to the 5 movable arm carrying the movable contact 132. The por- 5 tion 240 of the left terminal 230 in FIG. 6 is solder or 5 weld connected to one end of the coil 133, the other end 5 of the coil in FIG. 6 being connected to the terminal 131.

To insure electrical spacing between the conductors 5 connected to the parts 240 of the terminals 230 and 231, 5 the block 200 has an integral upstanding projection 250 5 curved on one side to receive the terminal 230, as shown. 5 The other side of the projection 250 forms a continuation 5 of the depression 242 and note that this side and the 5 depression 242 extend the full width of the block 200. Also, 5 the horizontal surfaces 238 and the vertical surfaces 224 5 and 225 extend the full width of the block 200.

Referring to FIG. 7, a shunt trip arrangement is illus- 5 trated. In FIG. 7, the dummy block 200 includes the nub 5 221, only the nub 220 having been removed to make room 5 for the terminal 230. In FIG. 7 the terminal 230 is con- 5 nected, as shown, to both the movable arm for the mov- 5 able contact and to one end of the coil 133, the other end 5 of the coil 133 being connected to the terminal 131.

Of course, the blocks 200 in FIGS. 6 and 7, and the 5 auxiliary switch 210 in FIG. 8, all have suitable holes to 5 receive the pins 120, 121, 122 and 123, and they extend in 5 width substantially the distance between opposed sur- 5 faces 111 and 112, so that it interferes with both nubs 220 5 and 221 and with either terminal 230, or terminals 230 5 and 231 or with the terminals 230 and 231, the auxiliary 5 cavity is substantially closed to the outside.

If a tighter closure is desired, a suitable sealing com- 5 pounder may be placed about the auxiliary switch 210, for 5 instance, FIG. 14, so that it interferes with both nubs 220 5 and 221 before the auxiliary switch is added. Such sealing could also be accomplished for the other embodiments.

Referring to FIGS. 14 to 16, inclusive, it is sometimes 5 desired to mount the circuit breaker 10 to a panel 300, 5 often a metal panel, having a rectangular hole 301 in- 5 tended to receive a circuit breaker larger than the circuit 5 breaker 10. As seen, the circuit breaker 10 has a boss 302 5 which has an outer, circular surface which is intended to 5 be received in a circular opening in the panel and so that the boss extends slightly beyond the front surface of 5 the panel.

To mount the circuit breaker 10 to the panel 300 an 5 elongated adapter plate 304 is provided having a body 305 5 with a width equal to the rectangular opening 301 in the 5 plate 300 a part of the body 305 being placed in the hole 5 301 and the flat front contacts 312 and 314 mating gen- 5 erally flush with the front, flat surface of the panel.

The body 305 has upper and lower integral extensions 5 308 and 310, thinner than the body, as shown so as to 5 define upper and lower shoulders 312 and 314 mating 5 with the upper and lower surfaces or the hole 301.

The front surfaces of the extensions 308 and 310 abut 5 the rear surface of the panel, as shown.

The body 305 has a circular opening 320 smaller 5 in diameter than the width of the body 305 and, of course, 5 much smaller than the length of the body 305.

The extensions 308 and 310 are provided with vertically 5 aligned holes 322 and 324. Aligned with two holes 322 5 and 324 is a third hole 326 formed between the shoulder 5 312 and the opening 320. The opening 326 is preferably 5 countersunk to receive a suitably flush-headed screw 328 5 and the holes 324 and 326 are not threaded.

The holes 324 and 326 are spaced apart vertically to 5 match thread of bolts 400 in the two insert rivets 24 and axially aligned along the vertical cen- 5 terline, as viewed in FIGS. 15 and 16, of the circuit 5 breaker.

The hole 322 is threaded and the extension 308 in- 5 cludes a bushing 350 which forms most of the threaded 5 hole 322, as shown in FIG. 14, the bushing 350 being 5 closed at its left hand end. Since the part of the circuit 5 breaker adjacent the bushing 350 is the part that has 5 the vents for the arc gases that may form when arcs are 5 formed upon separation of the circuit breaker contacts, 5 the closed bushing 350 prevents these arc gases from 5 passing to the front of the panel 300 through the hole 5 322 and the hole 352 aligned therewith in the panel.

Vertically aligned with the hole 352 is another hole 5 354 in the panel which is also coaxial with the hole 324 5 (in the extension 314) and the threaded bore in the lower 5 insert 24.

Round headed screws 360 and 362 are threaded as 5 shown in FIG. 14. The screws 360 passes through the 5 hole 352 with a sliding fit and is threaded into the hole 5 322. Preferably the thread tapped in the hole 322 but 5 a self-threading screw may be used.

The screw 362 passes through the holes 354 and 324 5 with a sliding fit and is threaded into the threaded bore of 5 the lower insert 24.

What I claim is:

1. A case for a circuit breaker comprising two half- 5 cases, each half-case comprising a side wall and integral 5 peripheral walls on four margins of said side wall, said 5 peripheral and said walls of abutting half-cases defining 5 a main cavity to receive the internal mechanism and as- 5 sociated internal parts of the circuit breaker, one pair 5 of abutting peripheral walls having projecting intergal 5 walls extending outwardly and forming an auxiliary cav- 5 ity having about one-nile of said main cavity. In each half-case, said auxiliary cavity communicating with said main cavity and forming an opening to the outside of the case, termi- 5 nals carried by said case and extending outwardly from said pair of abutting peripheral walls, said project- 5 ing walls disposed intermediate said terminals.

2. The structure recited in claim 1 and further in- 5 cluding an auxiliary switch within said auxiliary cavity, 5 said auxiliary switch extending partially into said main 5 cavity, said auxiliary switch being slidably received in said 5 auxiliary cavity to substantially fill said auxiliary cavity 5 and substantially close the opening to the outside of 5 the case, at least one of said projecting integral walls hav- 5 ing a pin extending part-way toward the other projecting
The structure recited in claim 1 wherein said pair of abutting peripheral walls include slots to slidably receive portions of said terminals, said terminals having lugs and said end portions of said case which limit movement of the terminals relative to the case.

4. The structure recited in claim 1 and further including a dummy block to substantially fill said auxiliary cavity and to substantially close the opening to the outside of the case, at least one of said projecting integral walls having a pin extending part-way toward the other projecting integral wall, said dummy block having a hole receiving said pin to restrain movement of said auxiliary switch out of said auxiliary cavity.

5. The structure recited in claim 4 wherein said dummy block is spaced at its opposite ends from opposite surfaces of said abutting walls to provide therewith two auxiliary slots.

6. The structure recited in claim 5 and further including auxiliary terminals slidably received in said auxiliary slots, said auxiliary terminals having portions bent to overlie parts of said dummy block facing the main cavity and having lugs outside of said case which engage said projecting integral walls to limit movement of the terminals back and forth relative to said case.

7. The structure recited in claim 2 and further including a sealer between the opposed surfaces of said auxiliary switch and said case projecting walls.

8. The structure recited in claim 4 wherein said dummy block has removable nubs and a depression on the side thereof facing the main circuit breaker cavity, said depression being intermediate said nubs.

9. The structure recited in claim 4 and further including a sealer between the opposed surfaces of said dummy block and said case projecting walls.

10. A case for a circuit breaker comprising two half-cases, each half-case comprising a side wall and integral peripheral walls on four margins of said side wall, said peripheral walls of abutting half-cases defining a main cavity to receive the internal mechanism and associated internal parts of the circuit breaker, one pair of abutting peripheral walls forming an insert cavity at opposite end portions of said pair of abutting peripheral walls, each insert cavity having about one-half of its depth in each half-case, each insert cavity comprising a wall opening to the front of the circuit breaker and longitudinal openings on opposite sides of said well, communicating therewith and opening to the sides of the circuit breaker through juxtaposed portions of said pair of abutting peripheral walls, and an insert within each insert cavity, each insert having a body and a pair of arms extending in opposite directions, said body being received in said well with said arms received in said longitudinal openings, each pair of arms having end portions extending beyond said longitudinal openings at opposite ends, each body having an opening threaded to receive a screw for mounting said circuit breaker to a panel, and the opposite end portions of said pair of arms upset to secure said half-cases to each other.

11. The structure recited in claim 11 wherein each opening in each body extends throughout said body, the front and major portion of each opening threaded but the minor and rear portion being of smaller diameter and unthreaded, so that when the screw engages the unthreaded portion, the torque required to continue insertion of the screw must be increased beyond the strength of the screw, shearing the screw and preventing damage to said case.

12. The structure recited in claim 11 wherein said case includes a front surface, and each well is sufficiently deep so that the insert is disposed below the front surface of the case surrounding the insert, whereby when the circuit breaker is mounted on a panel, and the screws are threaded into the inserts and drawn tight, the portions of the case surrounding the inserts tend to be placed in compression and the screw threads tend to bear on one side of the threads of the insert to provide a locking action.

13. The structure recited in claim 10 wherein said body and arms are received loosely in said well and in the mating openings for the arms, one surface of said well positions said body with respect to the centerline of the case, said body having an annular projection restricting and locking the advance of the screw to be threaded into the body, said insert rivet being disposed below the surface of the circuit breaker case abutting the panel to thereby cause said arms to bend and place a second lock on said screw threads.

14. A case for a circuit breaker comprising two abutting parts, each case part comprising a side wall and integral peripheral walls on four margins of said side wall, said peripheral and side walls of abutting case parts defining a main cavity to receive the internal mechanism and associated internal parts of the circuit breaker, one pair of abutting peripheral walls having projecting integral walls extending outwardly and forming an auxiliary cavity, said auxiliary cavity communicating with said main cavity and forming an opening to the outside of said case, terminals carried by said case and extending outwardly from said pair of abutting peripheral walls, said projecting walls disposed intermediate said terminals.

References Cited

UNITED STATES PATENTS

2,647,191 7/1953 Huffman --------- 200—168
2,661,614 12/1953 Case ----------- 200—116
2,912,548 11/1959 Wodal --------- 200—168

ROBERT K. SCHAEFFER, Primary Examiner.
H. O. JONES, Assistant Examiner.