

### [54] CIRCUIT BREAKER CASE

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[51] Int. Cl. .... H01h 33/08

[58] Field of Search .... 200/144 R, 147 R

### [56] References Cited

#### UNITED STATES PATENTS

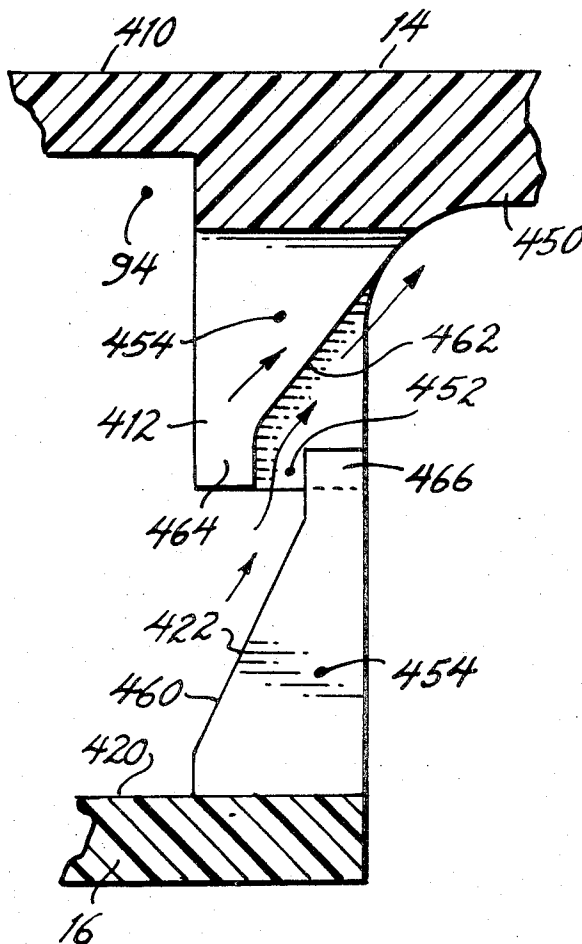
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|-----------|---------|-------------------|-------------|
| 2,436,189 | 2/1948  | Boehne .....      | 200/147 R   |
| 3,290,627 | 12/1966 | Davis et al. .... | 200/144 R X |
| 3,422,235 | 1/1969  | Camp .....        | 200/144 R   |

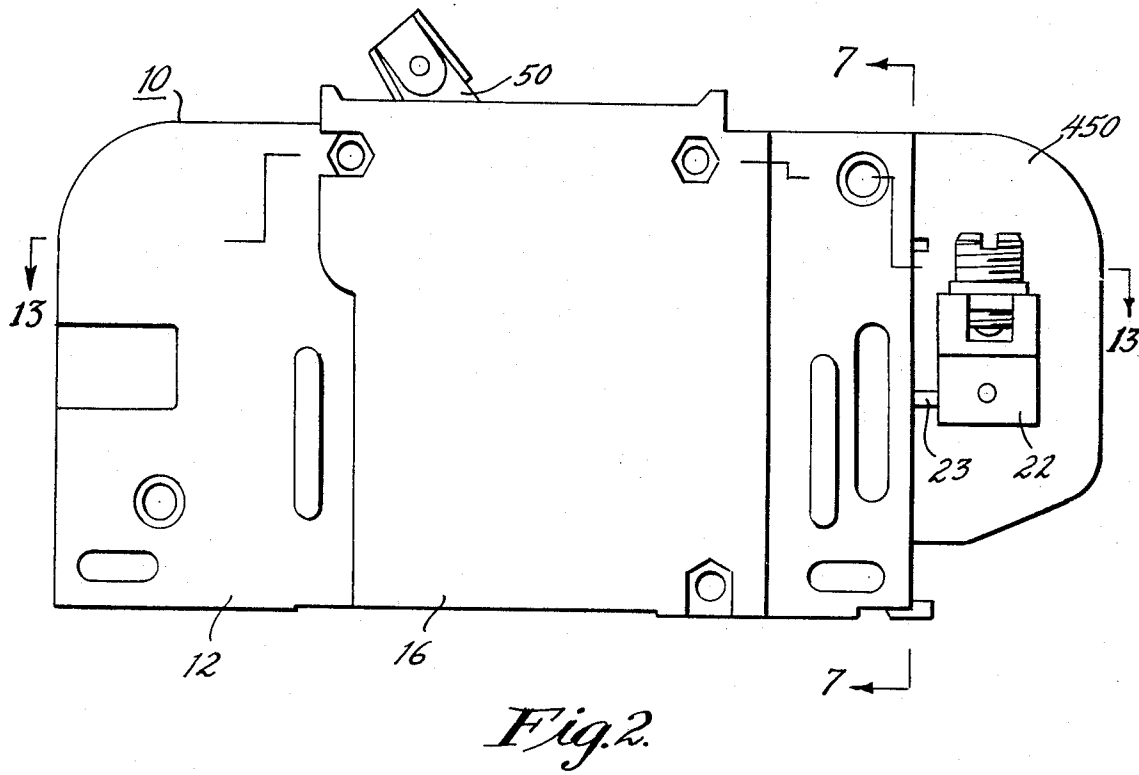
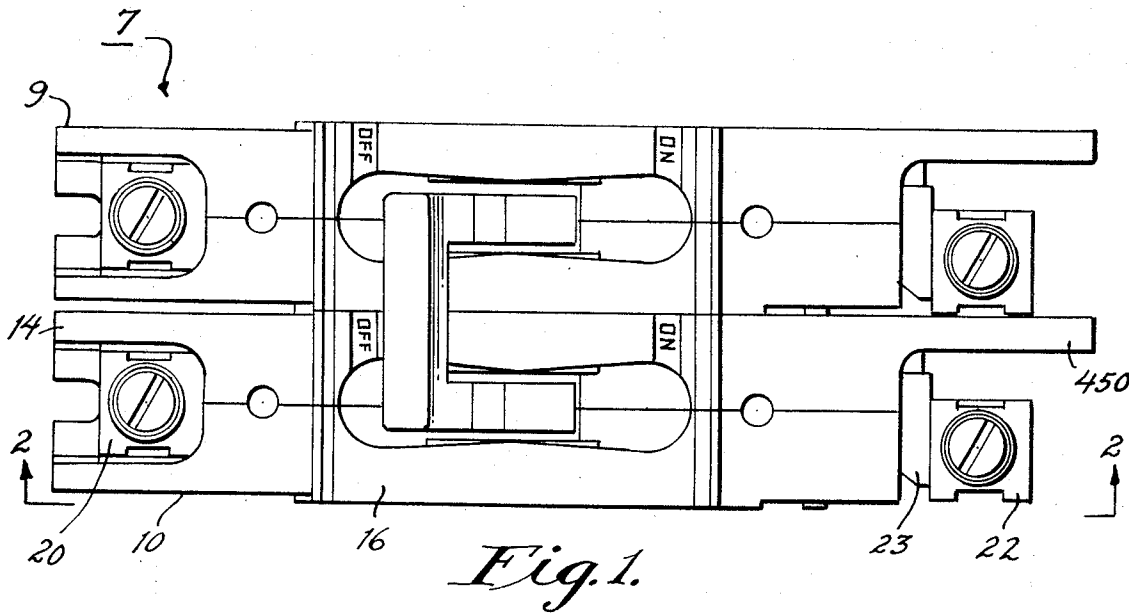
Primary Examiner—Robert S. Macon  
Attorney—Joseph G. Denny, III et al.

### [57] ABSTRACT

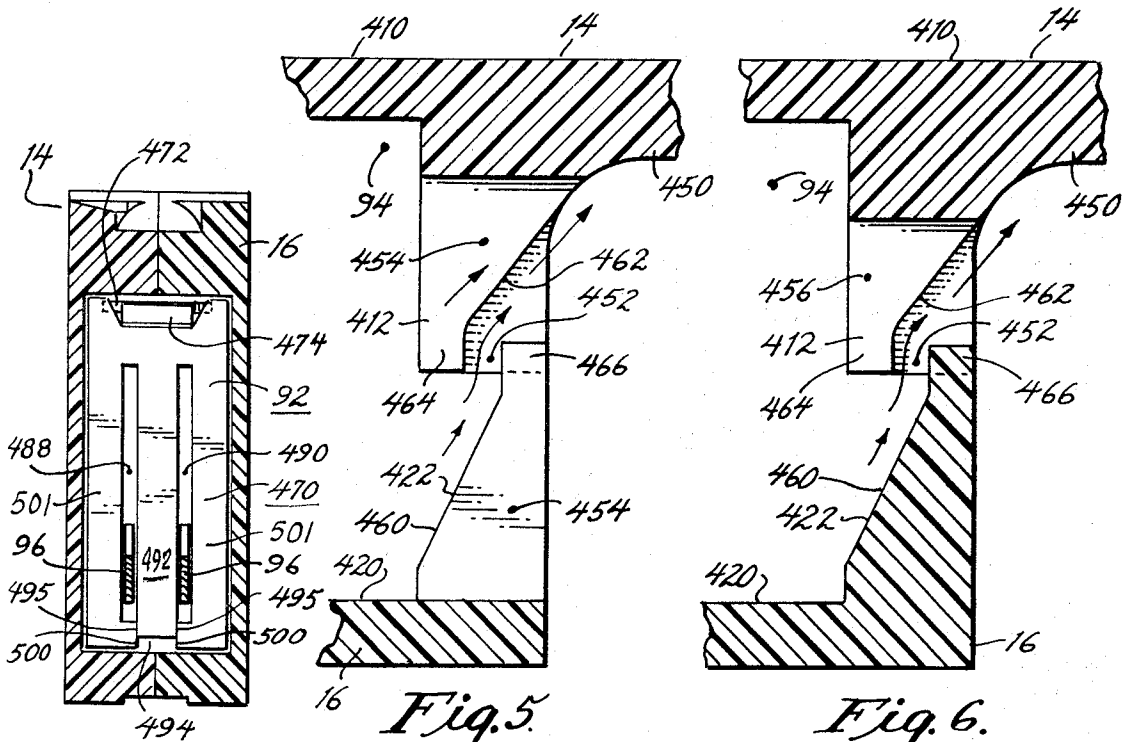
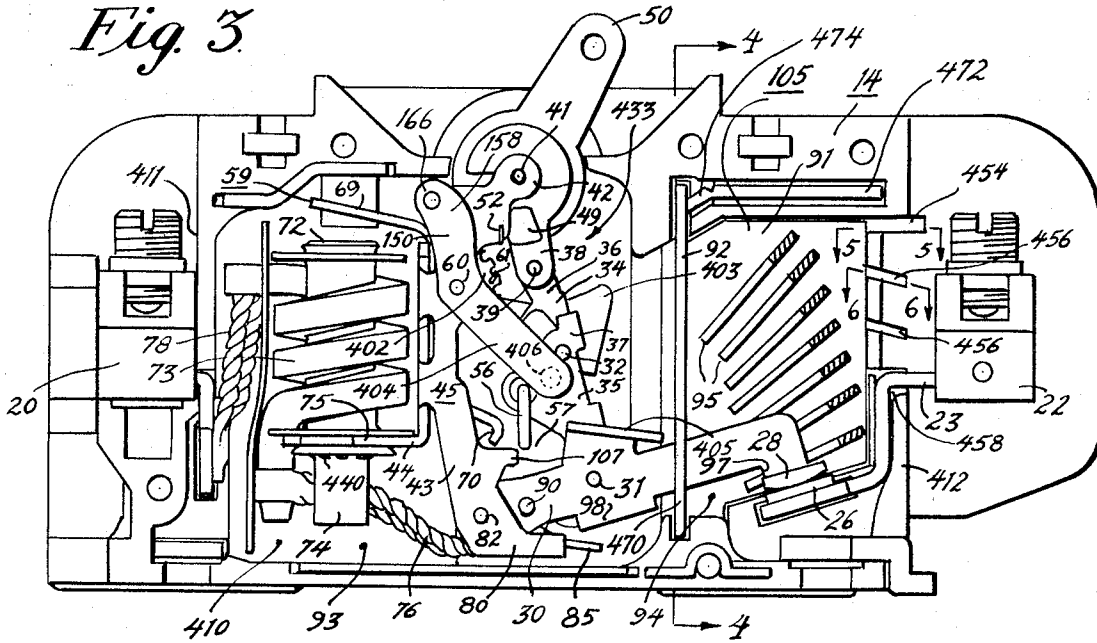
A molded case circuit breaker having an arcing chamber. The case has a recessed end wall forming a passage and also forming a slot intersecting with the passage through which arc gases are vented against a barrier. The arc chamber is defined in part by an insulator plate having a tang between the side plates of the movable arm which is free to expand and contract without binding with the movable arm. The circuit breaker also includes an electromagnetic device having a spool with an integral flange for aligning the time delay tube with the frame to which it is secured.

8 Claims, 14 Drawing Figures





*Fig. 3.*

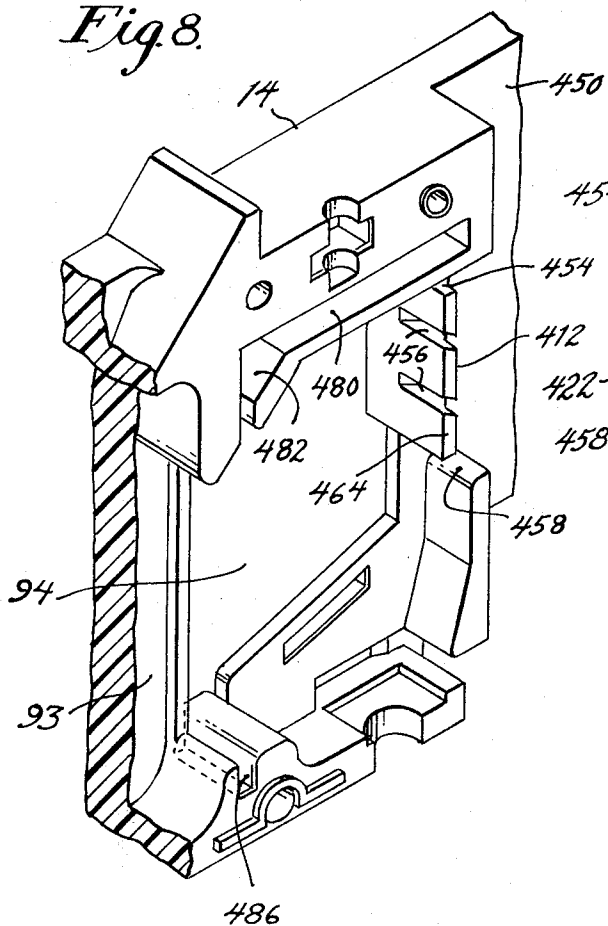


*Fig. 4.*

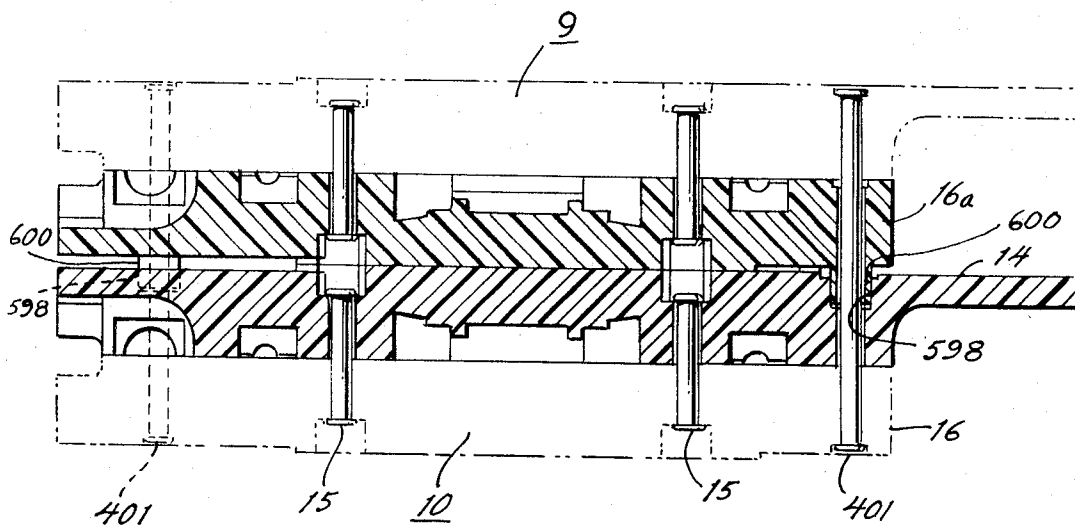
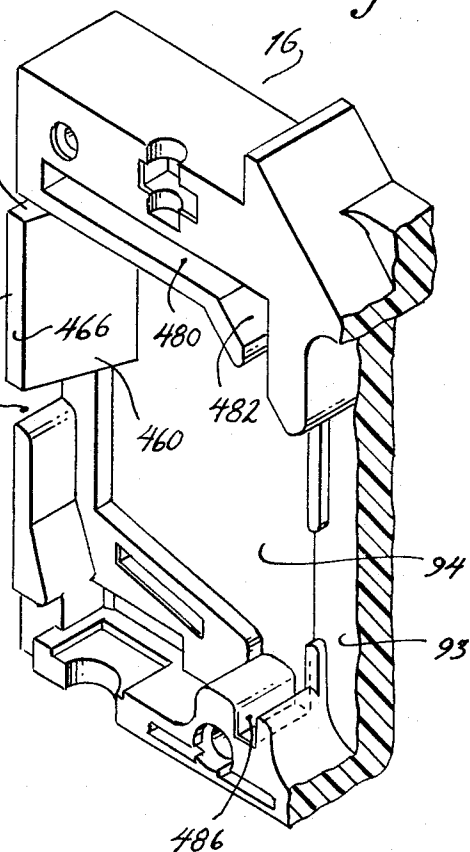
*Fig. 5.*

*Fig. 6.*

*Fig. 8.*

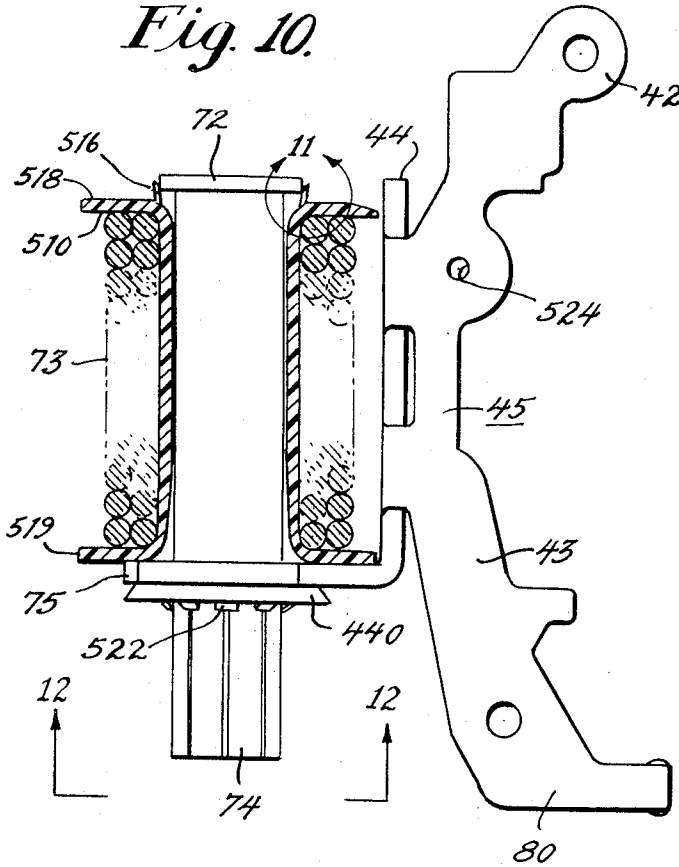


*Fig. 9.*

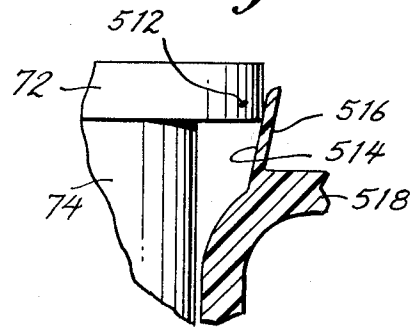


*Fig. 13.*

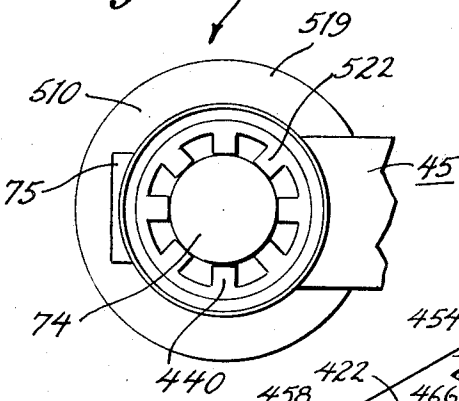
*Fig. 10.*



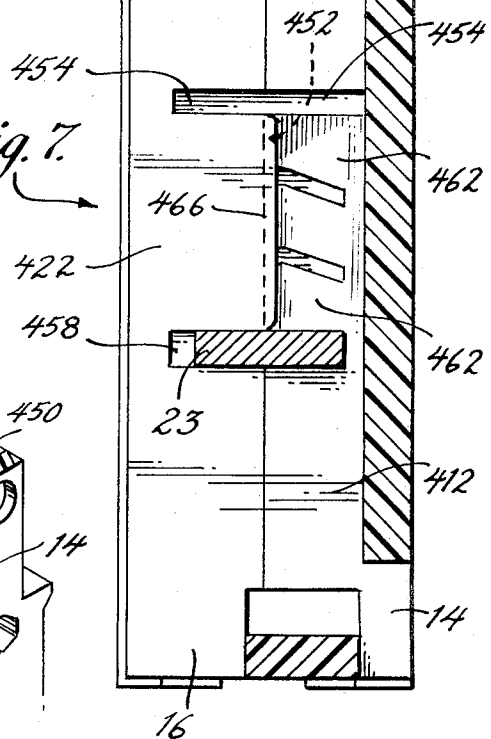
*Fig. 11.*



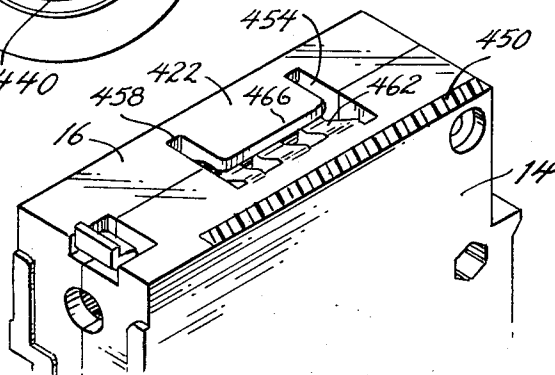
*Fig. 12.*



*Fig. 7.*



*Fig. 14.*



## CIRCUIT BREAKER CASE

## BACKGROUND OF THE INVENTION

This invention relates to circuit breaker units (both single pole and multi-pole) which are described and covered by U.S. Pat. No. 3,290,627 of which I was a co-inventor.

## SUMMARY OF THE INVENTION

The object of this invention is to improve the circuit breaker units shown in U.S. Pat. No. 3,290,627.

Those circuit breaker units have been improved by providing for better venting of the arc gases, the end wall of the arcing chamber having been modified,

better insuring that the movable arm will move freely in the slots provided in the insulator plate separating the main chamber from the arcing chamber by modifying the insulator plate,

better insuring that the time delay tube and its pole piece will be properly positioned relative to the attractive end of the armature, by modifying the spool about which the coil is wound and the means for securing the tube to the frame, and

better aligning, relative to each other, the poles of a multi-pole circuit breaker, by modifying the stacking arrangement for securing to each other the poles of a multi-pole unit.

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

## BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings,

FIG. 1 is an enlarged, top view of a two pole circuit breaker unit incorporating this invention showing the handle in the contacts open, i.e., "off" position;

FIG. 2 is an enlarged side view of the two pole circuit breaker shown in FIG. 1 viewed along the line 2—2 in FIG. 1;

FIG. 3 is an enlarged, side elevation of the circuit breaker unit shown in FIGS. 1 and 2, but with one of the two case halves of one of the circuit breaker poles removed and showing the handle and the contacts in the closed position;

FIG. 4 is a sectional view taken along the line 4—4 in FIG. 3;

FIGS. 5 and 6 are partial greatly enlarged, sectional views taken along the lines 5—5 and 6—6, respectively, in FIG. 3, but omitting the arcing grids and the terminal strap and the connector;

FIG. 7 is a greatly enlarged end view of one of the two circuit breaker poles and taken along the line 7—7 in FIG. 1, the other pole being omitted for brevity;

FIG. 8 is a partial, greatly enlarged perspective view of the right hand end of the case half shown in FIG. 3;

FIG. 9 is a partial, greatly enlarged perspective view of the case half which mates with the case half shown in FIG. 8;

FIG. 10 is a partial greatly enlarged view, similar to FIG. 3, but at a larger scale, showing the frame, bobbin, coil, tube and fastener;

FIG. 11 is a partial, further enlarged sectional view of the upper portion of the tube and bobbin shown in FIG. 10;

FIG. 12 is a fragmentary enlarged view taken along the line 12—12 in FIG. 10;

FIG. 13 is a partial sectional view taken generally along the line 13—13 in FIG. 2 illustrating the rivet connection between the two poles; and

FIG. 14 is a partial perspective view of a single pole showing the same end as shown in FIG. 7 but omitting the terminal and at a smaller scale than FIG. 7.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, this invention is embodied in a two pole circuit breaker unit 7 comprising similar units or poles 9 and 10. For purposes of brevity only the circuit breaker pole or unit 10 will be described in detail it being understood that the other is similarly constructed.

The two pole circuit breaker unit 7 described herein is a modification of the circuit breaker unit shown in U.S. Pat. No. 3,290,627 of which I was a co-inventor. Hence, for better understanding and for brevity the parts shown and described in this invention which are substantially identical to or which correspond to parts of the circuit breaker unit in U.S. Pat. No. 3,290,627 are identically numbered and reference may be had to said patent for additional details not mentioned herein.

The circuit breaker pole 10 comprises an insulator case 12 divided into two halves 14 and 16 (longitudinally through the width of the circuit breaker unit), as illustrated in FIG. 1, and the two case halves are secured together by suitable rivets 15. The two poles 9 and 10 are, in turn, secured together by suitable rivets 401.

The circuit breaker pole 10 is provided with external terminals 20 and 22 for connecting the unit to a circuit. Referring to FIG. 3, the terminal 22 is connected to a conductor or strap 23 which carries the stationary contact 26. The stationary contact 26 is engaged by a movable contact 28 carried by a movable arm 30.

The movable arm 30 comprises a part of a linkage means or mechanism 433 which includes a toggle 34 comprising lower and upper links 35 and 36. The lower link 35 is pivotally connected to the movable arm 30 by a pin 31 at one end and to the upper link 36 at the other end by another pin 32 to form the knee 37 of the toggle. The upper link 36 is pivotally connected at the other end to a handle link 38 by a pin 39, the handle link 38 oscillating about a pin 41 supported by extending through openings in two spaced extensions 42 of two parallel and flat, side plates 43 which together with an L-shaped plate 44 jointly form a frame 45, the opposed side plates 43 being integral with the L-shaped plate 44 and bent toward each other from the vertical portion of the L-shaped plate 44.

The handle link 38 is integral with a handle 50 extending outside of the case 12 through a suitable opening. The handle 50 and the handle link 38 are biased to the off position of the contacts by a coiled (handle) spring 52 (FIG. 3) wound about the pin 41, the (handle) spring 52 being only partially shown in FIG. 3. The (handle) spring 52 has one end portion restrained by one of the two frame extensions 42 and the other end portion biased against an extension 49 formed integral with the handle link 38 and projecting therefrom, the spring end portion being hidden in FIG. 3 by the frame extension 42.

The upper link 36, FIG. 3, is provided with a tooth portion (not shown) for engaging a half moon (not shown) formed on one leg of a U-shaped latch 56 carried by the lower link 35 for locking the toggle 34 in the overcenter position during automatic resetting, the latch 56 being biased, in the clockwise direction, toward engagement with the tooth portion, by a spring 57 which engages the other leg of the latch 56. The latch 56 is tripped by a pivotal armature 59 having an attracted end 69 and an unlatching end 70 when the end 70 engages the latch.

Referring to FIG. 3, the side plates 43 carry a pin 60 about which the armature 59 pivots, the armature being biased clockwise. The armature 59 further includes integral serrated leg 402 and balance leg 403 (similar to those shown in U.S. Pat. No. 3,329,913 for the armature 50 shown therein in FIG. 18 thereof), the serrated leg 402 engaging the vertical portion of the L-shaped frame to limit clockwise movement of the armature. The armature 59 is biased clockwise by a coil spring (not shown) which is disposed around the pin 60 and has one end portion 61 disposed in a serration of the leg 402 and the other end portion (not shown) engaging a frame plate 43. When the armature end 69 is attracted, upon sufficient overload, sufficiently toward the pole piece 72 of an electromagnet 435 comprising a coil 73 formed about a tube 74, the armature unlatching end 70 engages the latch 56, and turns the latch 56 against the bias of the spring 57 to present the flat portion of the half moon to the tooth portion, whereupon the toggle 34 collapses under the bias of an opening spring 85.

The tube 74 (FIGS. 3 and 10) projects through the horizontal leg 75 of the L-shaped frame plate 44 and houses a movable core (not illustrated) of magnetizable material biased toward the lower end of the tube 74 to provide a time delay below certain overload currents before the mechanism is tripped. The tube 74 is secured to the frame leg 75 by a fastener 440, as hereinafter further described, and the coil 73 has one end connected to the movable arm 30 by a length of flexible conductor 76 and the other end connected by a conductor 78 to the terminal 20.

The two side frame plates 43 have lower extensions 80 with two pairs of aligned holes. The movable arm 30 pivots about a pin 82 which extends through one of the pairs of holes in the extensions 80 and an elongated slot (not shown) in the arm 30, the opening spring 85 being coiled about the pin 82, the yoke-like portion (not shown) of the spring 85 bearing against a pin 90 carried by the movable arm 30, the end portions of the pin 90 engaging ears 107 of the side plates 43 to limit the opening movement of the movable arm 30.

The pin 39 has end portions extending beyond the handle link 38 which abut against the side plate extensions 42 to limit overcenter movement of the links 36 and 38, FIG. 3.

Referring to FIGS. 3 and 4, the movable arm 30 has a generally channel or U-shape in cross section. The movable arm 30 comprises two side plates 96 (FIG. 4) bridged by integral upper and lower plates 97 and 98 (FIG. 3) to define a space 99 (FIG. 3) therebetween. The movable contact 28, mentioned previously, is suitably secured to the upper plate 97.

An insulator plate 92, received in suitable grooves in the case halves 14 and 16, separates the main interior portion 93 from the right hand or arcing chamber por-

tion 94. The insulator plate 92 is provided with two elongated openings to receive the side plates 96 of the movable arm 30. Within the arcing chamber 94 is placed an arc grid assembly 105 comprising a suitable number of magnetizable grids 95 disposed at an angle, as shown, and supported by insulator plates 91 for facilitating extinction of any arc that may form between the contacts 26 and 28 as they separate.

When the contacts are manually opened, that is, when the movable handle 50 is manually turned from the position of FIG. 3 to that of FIG. 2, the toggle 34 is generally raised and rotated to the right, which simultaneously pivots the movable arm 30 counterclockwise until the end portions of the pin 90 abut the frame ear stop portions 107 to limit rotation of the mechanism. During such movement from the contacts closed to the contacts open positions, portions of the toggle lower link 35 and a part of the toggle upper link 36 are received between the two side plates 96 of the movable arm 30, but this is not illustrated.

When the circuit breaker pole 10 is in the position illustrated in FIG. 3, and an overload energizes the coil 73 sufficiently to attract the armature end 69 sufficiently toward the pole piece 72 so as to pivot the unlatching end 70 and turn the latch 56 for collapsing the toggle 34, the mechanism collapses to the contacts open position (not illustrated).

The case half 14 comprises a side wall 410 and end walls 411 and 412. Similarly, the case half 16 comprises a side wall 420 and end walls 421 and 422.

While not illustrated, the pins 41 and 82 have end portions which extend beyond the frame side plates 43. The case halves 14 and 16 are provided with opposed upper bosses (not illustrated but projecting from and integral with the case side walls 410 and 420) into which the end portions of the pin 41 are received.

Similarly, the case halves 14 and 16, are provided with lower opposed bosses (not illustrated but projecting from the case side walls 410 and 420) into which the end portions of the pin 82 are received.

Thus, the flat side frame plate 43 abut the boss faces to space the frame 45 and the linkage mechanism from the walls of the case halves and to properly position the frame 45, and the linkage mechanism which it carries, within the case.

The circuit breaker pole 10 includes a common trip cam 150 which comprises two spaced arms 158 (only one of which is shown in FIG. 3), cam arm 404 having a pin 406 engageable with the drive plate 405 (formed on one of the two side plates 96 of the movable arm 30) and a hollow tube 166 extending between the arms 158, the arms 158 and 404 and the tube 166 being integral. Preferably, the common trip cam 150 is formed of plastic, electrical insulating material. The arms 158 are provided with suitable aligned holes to receive the end portions of the armature pin 60, so that the common trip cam 150 is pivotal about the pin 60.

The attractable end 69 of the armature 59 engages the tube 166 so that when the contacts 26 and 28 are closed, the end 69 (under the pressure of the armature spring) rotates the common trip cam 150 clockwise to the position shown in FIG. 3 so that it is in position to be engaged (during opening of the contacts) by the left hand portion of the drive plate 405 (as the movable arm 30 rotates counterclockwise), the pin 406 being cammed upwardly by the drive plate 405 as the movable arm 30 opens.

An insulator rod 154 extends between the two poles to interconnect the common trip cam 150 of the pole 10 with the common trip cam (not shown) of the pole 12, the rod 154 being inserted in the tube 166. The abutting side walls (FIGS. 1 and 13) of the poles 10 and 12 are provided with suitable arcuate openings (not shown) through which extends the rod 154.

Upon an overload in one of the tow poles 9 or 10, sufficient to trip the pole, the associated armature is rotated about its pin into engagement with and rotates its latch against the bias of the latch spring sufficiently for the tooth to clear the half moon. The overcenter toggle immediately collapses under pressure from the opening spring and the movable arm starts to separate from the stationary contact. Continued movement of the movable arm causes the drive plate to impinge upon the common trip pin and to rotate the common trip cam counterclockwise. Since the common trip cams of the two poles are interconnected by the rod 154, both common trip cams pivot simultaneously.

Since the associated pole is not overloaded, the armature thereof has not been pivoted toward its pole piece. But because of the aforementioned simultaneous movement of the common trip cams, the tube in the nonoverloaded pole forces the associated armature to turn in the direction to unlatch its associated latch, whereby both poles are opened substantially simultaneously.

Referring to FIGS. 5 through 8, the end wall 412 of the half case 14 projects outwardly to form a barrier 450 aligned with the side wall 410.

The end walls 412 and 422 are formed with a horizontal, upper slot 454 formed partly in the end wall 12 and partly in the end wall 422, and a lower, horizontal slot 458 likewise formed partly in the end wall 422 and partly in the end wall 412, the strap 23 extending through the slot 458. Between the horizontal slots 454 and 458 is disposed a vertical passage 452.

The vertical passage 452 is defined by overlapping wall portions 464 and 466, the sloped (or recessed) inner surface 460 (of the end wall 422) and the sloped outer surface 462 (of the end wall 412), the sloped outer surface 462 defining a sloped exit opening, as shown in FIG. 4. The passage 452 thus created directs the venting arc gases toward and against the barrier 450. This is an important feature as it tends to direct the arc gases away from the terminal of the adjacent pole and away from any metal that may be at a lower electrical potential.

Further, between the horizontal slots 454 and 458 are disposed two slots 456 (FIGS. 3, 7 and 8) inclined at an acute angle with the angle at which the adjacent grids 95 are disposed, the grids 95 being disposed generally at the angle which corresponds to the movable arm 30 as it moves from the closed to the open contacts position, so as to vent the arc gases downwardly, as viewed in FIG. 3. If any elongated foreign object is attempted to be inserted into the circuit breaker through the slots 454 and 456, because of the intersecting angle of the grids and the slots, the foreign object will engage the grids which will obstruct and prevent further insertion. (In certain installations the terminal strap 23 extends through the bottom walls of the breaker instead of through the end walls 412 and 422 and the associated terminal connector is located below the case, so that in such installations the temptation to insert an object into the venting slots is even greater.)

It should also be noted that the inclined slots 456 discharge arc gases across the vertical passage 452 and the mingling of the gases from these two intersecting streams helps to expend the energy of the gases.

As viewed in FIGS. 2 and 7 particularly, the three sections of the outer vertical surface of the end wall 422, i.e., the section above the slot 454, the section between the slots 454 and 458, and the section below the slot 458 all lie in the same vertical plane. In contrast, the outer vertical surface of the end wall 412 has the recessed surface 462 which is disposed inwardly of the outer vertical surfaces of the sections of the wall above the slots 454 and below the slot 458, all of the outer surfaces of the end wall 412 and 422, except the recessed surface 462, being co-planar.

Referring to FIGS. 3, 4, 8 and 9, the main compartment 93 is separated from the arcing chamber 94 by the insulator plate 92. As seen in FIG. 3, the insulator plate 92 has three sections, a vertical section 470, a horizontal section 472 and a sloping, bridging section 474, the vertical section 470 being the portion which separates the arcing chamber 94 from the main compartment 93.

The horizontal and sloping sections 472 and 474, respectively, are received in mating horizontal and sloping slots 480 and 482 respectively, formed in the top walls of the two half cases, as best shown in FIGS. 8 and 9, the sloping slots 482 also having vertical entry portions to receive parts of the vertical section 470. Further, the half cases 14 and 16 are provided with aligned, slots 486 (vertically extending) to receive the lower part of the vertical section 472.

The vertical section 470 is provided with two vertical slots 488 and 490, as shown in FIG. 4, each slot freely receiving one of the two side plates 96 of the movable arm 30 and permitting the latter to move freely from the contacts closed to the contacts open positions and vice versa. The inner edges of the slots 488 and 490 are continued downwardly, i. e., the lower part of the section 470 is cut along the two parallel lines 495, to thus create a central tang 492 abutting surfaces 500 of margins 501 on either side of the tang 492 at its lower end portion. Further, the lower end portion of the tang 492 is cut short of the remainder of the vertical section 470 (between the surfaces 500), as shown, to create a space 494 directly below the tang 492 and in the slots 486 into which the tang 492 may expand or contract.

The insulator plate 92 is preferably formed from a three ply laminate having a central ply of phenolic plastic and outer layers of vulcanized fiber bonded thereto. It has been found that with insulator plates 92 of this and similar material, i. e., formed of a single ply of vulcanized fiber, that expansion and contraction thereof took place when the circuit breaker unit was placed in a high humidity environment or upon arcing of the contacts and the consequent heat generation. It has been found that the moisture or heat tends to expand the vertical section 470 and may cause the side plates 96 to jam in the section 470 unless some provision is made therefor.

In assembling the circuit breaker, since the insulator plate 92 is relatively flexible, the tang 492 may be easily flexed and inserted between the side plates 96 of the movable arm 30. In effect, the tang 492 hangs down as a cantilever from its upper, integral connection with the remainder of the plate 92, the tang 492 being free to move vertically up and down (as it expands and con-

tracts) yet being guided in this movement by the opposed vertical surfaces 500 on either side of the tang 492 at its lower end, and the lower end of the tang 492 is restrained from moving to the left or right (as viewed in FIG. 3) by the walls defining the slots 486.

Preferably, the vertical, horizontal and sloping sections 470, 472 and 474, respectively, are integral and self-hinged to each other by scoring and bending the sections from an integral piece of suitable material. Thus, as the vertical section 470 tends to expand and contract more than the other sections, the flexible hinges permit this relative movement.

Referring to FIGS. 10, 11 and 12, the spool 510 of electrical insulating material, preferably a plastic material, for the coil 73, has a flange 519 seated upon the horizontal leg 75 of the frame 45. The time delay tube 74 extends through the center of the spool 510, as shown, and through a suitable hole in the horizontal leg 75.

The pole piece 72 has a larger diameter than the tube 74, as shown, and overhangs the tube 74. As best shown in FIG. 11, the lower, circumferential edge portion, formed by the outer cylindrical surface of the pole piece 72 and its lower annular surface, engages the inner tapered, annular surface 514 of an upstanding flange 516 formed integral with the upper flange 518 of the spool 510.

The annular surface 514 is tapered to diverge outwardly, as best shown in FIG. 11, the upper portion thereof having an inner diameter slightly greater than the diameter of the edge portion 512 and the lower portion having an inner diameter slightly smaller than the diameter of the edge portion 512 so as to form a "V" shaped seat for the edge portion 512.

A fastener 440 having spaced, spring fingers 522 is slipped up over the lower end of the tube as the pole piece 72 pressed against the flange 516.

As shown in FIG. 10, the spring fingers 522 engages the outer surface of the tube 74 so tightly as to score the outer surface (as shown by the vertical lines) as they slide up the tube. The pole piece 72 is urged downwardly as the spring fastener 440 is pushed up against the leg 75. The tapered surface 514 tends to seat the pole piece 72 coaxially with the spool 510 and by controlling the relative diameters of the parts involved and of the hole in the leg 75, the longitudinal axis through the tube 74 is aligned parallel to a vertical axis through the center of the hole 524 for the armature pin 60. The upper surface of the pole piece 72 will then be at 90° thereto and at a predetermined location. Thus, referring to FIG. 3, when the armature 59 is in the unattracted position, better control is attained of the gap between the pole piece 72 and the attracted end 69 of the armature 59. When the armature 59 is attracted to the pole piece 72, having previously established a correct gap, the unlatching end 70 of the armature 59 moves toward and engages the latch 56 sufficiently to trip the toggle.

It should also be noted that the tapered flange 516 is deformable and deflectable so that the pole piece 72 tends to compress it. Since the flange 519 is seated on the leg 75, the spool 510 is held in compression against the leg 75 by the pole piece 72.

Previously, the tube 74 was soldered to the frame leg 75, but use of the spring fastener 440 in place of the soldered connection is more economical. However, when the spring fastener 440 is used, because of the

lack of a rigid connection to the frame leg 75, the pole piece 72, i.e., the top of the tube 74 as shown in FIG. 10, would tend to move laterally. The interaction between the tapered surface 514 and the edge portion 512 places radially inwardly directed forces upon the periphery of the edge portion 512 which tend to centrally align the tube 74 relative to the hole in the leg 75.

Referring to FIG. 13, the two poles 9 and 10 are shown connected together by the rivets 401. The rivets 401 pass through suitable holes formed in the half cases of the two poles, the holes being preferably slightly larger than the outside diameter of the rivets. To better align the two poles relative to each other, the inner half case 14 of pole 10 is formed with two circular recesses 598 coaxial with the holes through which the rivets 401 extend. The inner half case 16a of pole 9 is formed with projecting circular bosses 600 mating with, and slidably received entirely within, the recesses 598. The adjacent sides of the half cases 14 and 16a abut, as shown in FIG. 13, but the recesses 598 are slightly deeper than the length of the bosses 600 to insure that the adjacent sides are brought into abutment. Referring to FIG. 2, the rivets 401 are disposed at diagonally opposite portions.

Preferably, the recesses 598 and the bosses 600 are closely interfitting so that a large number of poles may be stacked in side-by-side relation with a satisfactorily functioning common trip interconnection and with substantially no relative movement of the case of one pole to the case of the other pole.

Having described this invention, what I claim is:

1. In a molded case circuit breaker, a case of electrical insulating material divided longitudinally into two approximate half cases, said case enclosing a movable contact and a stationary contact, said movable contact being carried by a pivotal movable arm into and out of engagement with said stationary contact, said case also enclosing an arcing chamber, each half case having a side wall and an end wall together defining three sides of said arcing chamber, said end walls having inner and outer recessed portions together forming a passage extending generally in the direction of travel of the movable contact and for venting said arc gases to one side, one of said end walls including an integral barrier extending therefrom and projecting from said end wall in alignment with the associated side wall, and said passage is inclined transverse to the length of said case and in the direction to vent the arc gases against said barrier.

2. The circuit breaker recited in claim 1 wherein said end walls also include overlapping portions forming a part of said passage.

3. The circuit breaker recited in claim 1 and further including grids of magnetizable material inclined at angles generally similar to the angle traversed by the movable contact arm in moving from the contacts closed to the contacts open positions, and said end walls including at least one slot inclined at an angle which intersects the angles of the grids for obstructing entry of a foreign object into the arcing chamber.

4. In a molded case circuit breaker, a case of electrical insulating material divided longitudinally through its width into two approximate

half cases, said case enclosing a movable contact and a stationary contact,  
said movable contact being carried by a pivotal movable arm into and out of engagement with said stationary contact,  
said case also enclosing an arcing chamber and a main chamber,  
each half case having a side wall, a top wall, a bottom wall and an end wall together defining five sides of said arcing chamber when said half cases are assembled together,  
an insulator plate defining the sixth side of said arcing chamber,  
said insulator plate having two margins and a tang therebetween,  
said insulator plate also having two slots one on each side of said tang and between said tang and one of said margins,  
said insulator plate also having a space below said tang and intermediate said margins into which said tang may expand when heated,  
said movable arm having spaced side plates movable through said slots,  
said half cases including wall means for supporting said insulator plate, and  
at least one of said margins having a surface in abutment with a portion of said tang for guiding the expansion and contraction of said tang.  
5. The circuit breaker recited in claim 4 wherein said wall means includes a slot to receive a portion of said

insulator plate, said tang being free to move within said slot as it expands and contracts.

6. The circuit breaker recited in claim 4 wherein said insulator plate includes a vertical portion having said tang and an upper portion overlying the arcing chamber and hinged to said vertical portion.

7. In a molded case circuit breaker,  
a case of electrical insulating material divided longitudinally into two approximate half cases,  
said case enclosing a movable contact and a stationary contact,  
said movable contact being carried by a pivotal movable arm into and out of engagement with said stationary contact,

said case also enclosing an arcing chamber,  
each half case having a side wall and an end wall together defining three sides of said arcing chamber,  
said end walls having inner and outer overlapping recessed portions together forming a vertical passage which, when viewed in cross section, is sloped transverse to said side walls throughout its length and has a sloped exit opening, defined by a sloped wall,

whereby said arc gases are vented, at least in part, across the plane of the nearest side wall.

8. The structure recited in claim 7 wherein the inner wall forming said vertical passage has at least one downwardly sloped slot.

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