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Gryctko

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[54] **ARC RUNNER BETWEEN STATIONARY CONTACTS**

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[52] **U.S. Cl.** ..... **200/146 R,** 200/147 R

[51] **Int. Cl.** **H01h 33/12**

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

[56] **References Cited**

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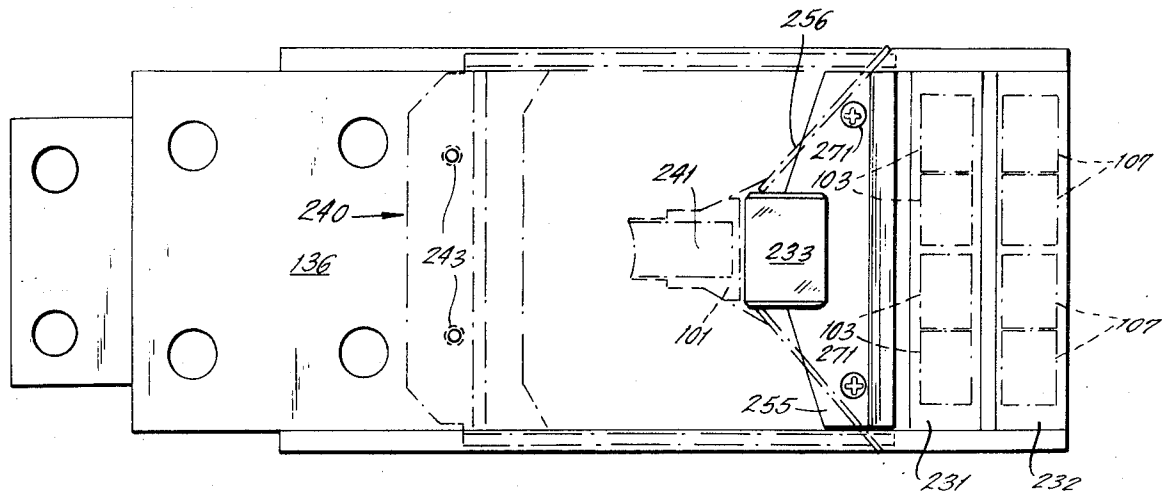
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[57] **ABSTRACT**

A high current capacity molded case circuit breaker having arcing and main contacts and an arc chute to receive and extinguish arcs drawn between the arcing contacts is provided with a magnetic arc runner disposed between the stationary sections of the main and arcing contacts to direct arcs that initiate at the stationary main contact onto the stationary arcing contact.

9 Claims, 3 Drawing Figures



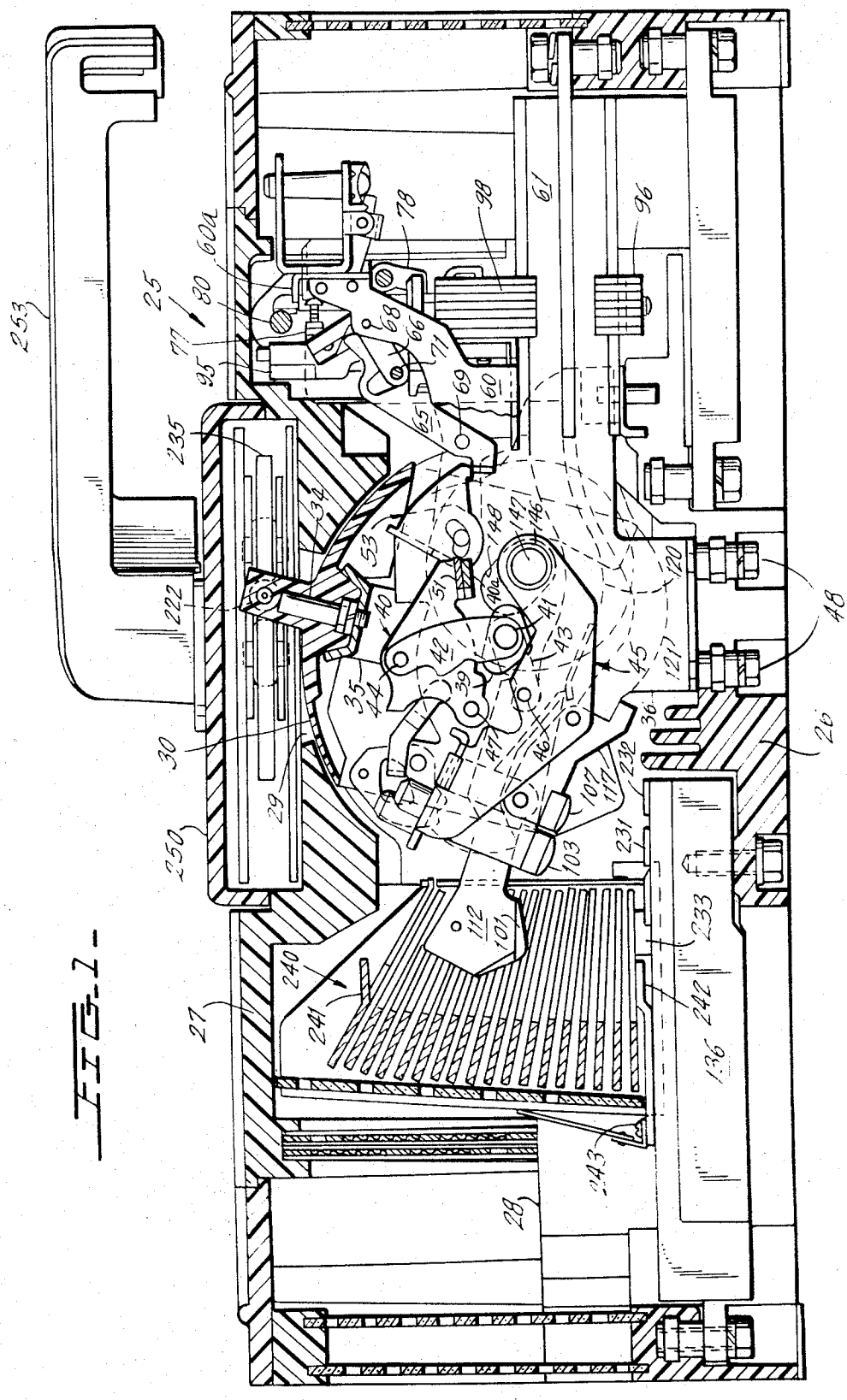

253
25
80
60a
78
98
61
96
77
95
68
66
71
69
60
65
235
34
53
51
40
40a
41
42
43
39
44
35
45
127
120
48
222
30
29
250
47
46
107
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23a
231
103
36
26
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233
242
136
243
28

FIG. 1

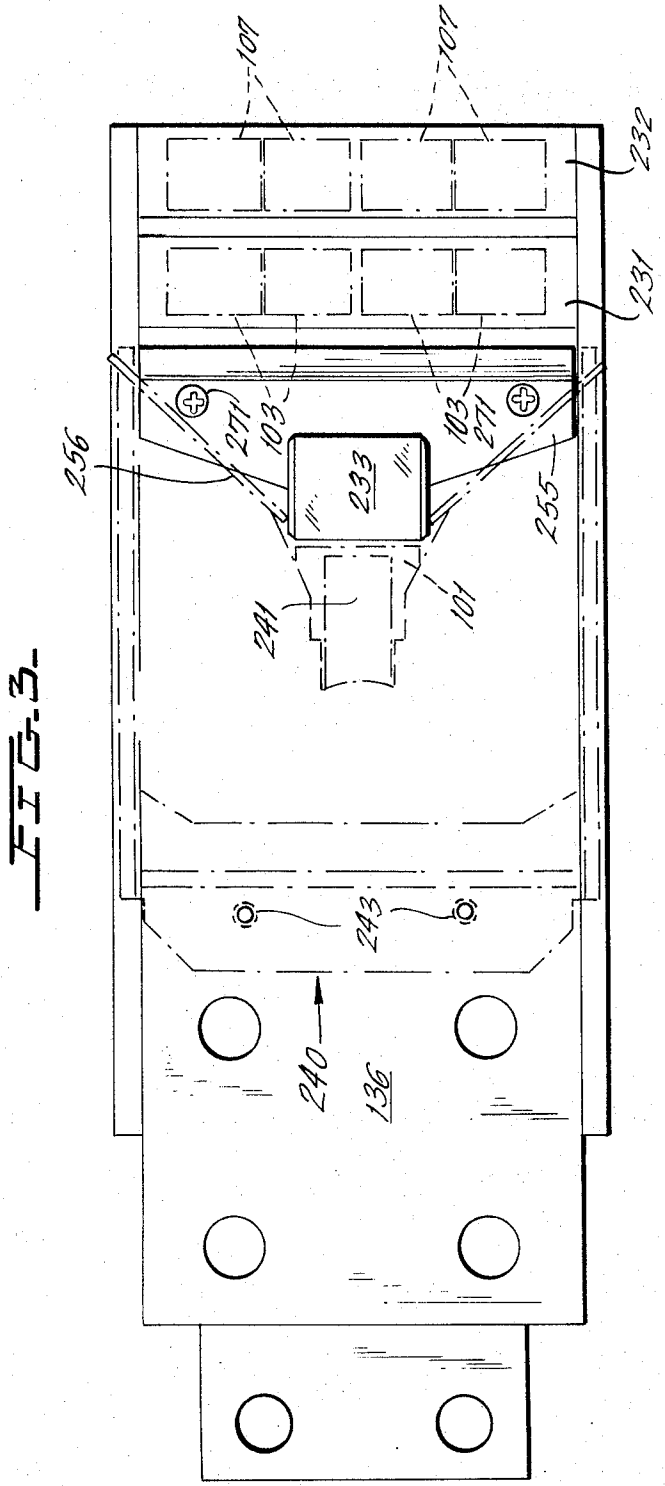

101
107
232
231
256
271
103
233
255
241
243
240
136

FIG. 3.

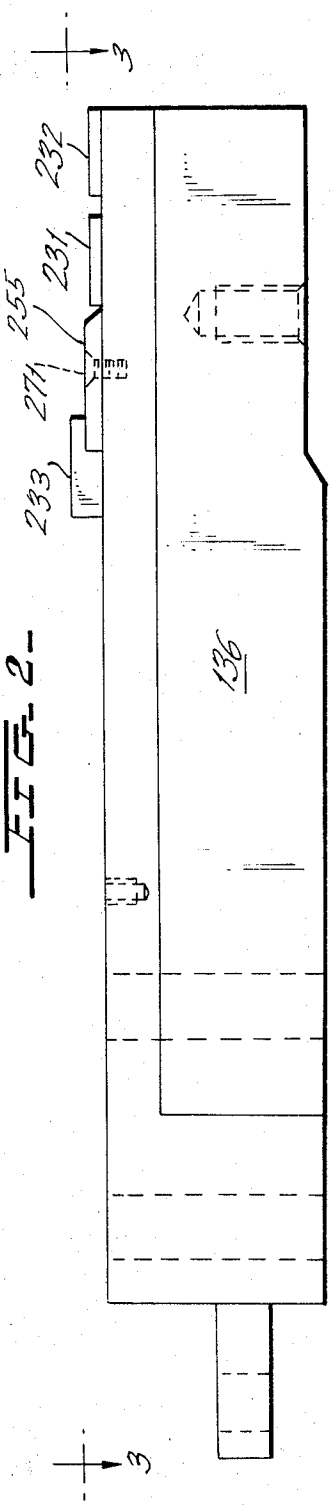

3
232
231
255
271
233
136
3

FIG. 2.

ARC RUNNER BETWEEN STATIONARY CONTACTS

This invention relates to molded case circuit breakers in general and more particularly relates to means for transferring arcs from the stationary main contacts to the stationary arcing contact.

Circuit breakers of high current ratings are provided with separate arcing and main contacts. In moderately high current rated breakers, arcing is confined to the arcing contact and a spaced plate type of chute is provided to receive and extinguish arcs formed on the arcing contact. However, for circuit breakers of very high current ratings, say 2,000 amperes and more, some initial arcing often takes place at one or more of the main stationary contacts. This condition has proven to be very serious in that there is normally no arc extinguishing means in the vicinity of the main contacts, so that arcs formed thereon "hang on" for an excessive period of time causing severe pitting of the main contacts.

In accordance with the prior art, arc runners have usually been associated with the arcing contacts, usually positioned more deeply in the arc chute than the arcing contacts. For those structures in which arcing occurred at the main contacts, methods other than arc runners were employed to prevent arcs at the main contacts from being made interrupting points of the circuit. To accomplish this, the prior art has utilized insulating shields positioned between the main contacts and the plates of the arc chute. With such a construction, if arcing occurred at the main contacts, this arcing was blocked from proceeding into the arc chute, but was expected to extinguish if and when arcing was transferred to the arcing contact and its associated runner.

For very high current rated breakers, it has been found that arcing on the main contact does not always transfer to the stationary arcing contact, and if the main contacts are insulated from the arc chute, excessive damage will occur as a result of the arc "hanging on" to the main contacts. The instant invention solves this problem by providing a magnetic arc runner between the main contacts and the arcing contact, so that arcs established at the main contacts are attracted to the magnetic arc runner which directs these arcs to the arcing contact where the arcs enter the arc chute associated with the arcing contact and are extinguished.

Accordingly, a primary object of the instant invention is to provide novel means for minimizing arcing time at the main contacts of a circuit breaker.

Another object is to provide means of this type for directing arcs from the main to the arcing contacts.

Still another object is to provide a magnetic arc runner positioned between the stationary main and arcing contacts to facilitate transfer of arcs, established on the main contacts, to the arcing contact.

These objects as well as other objects of this invention will become readily apparent after reading the following description of the accompanying drawings in which:

FIG. 1 is a longitudinal cross-section of a multipole circuit breaker, showing the elements of one pole thereof, including the arc runner of the instant invention.

FIG. 2 is an enlarged side elevation of the line terminal strap of FIG. 1, together with the stationary contacts and arc runner mounted thereon.

FIG. 3 is a plan view of the terminal strap of FIG. 2, looking in the direction of arrows 3—3 of FIG. 2.

Now referring to the figures. Multipole circuit breaker **25** includes a molded housing constructed of base **26** and removable cover **27** abutting at interface **28.** The main current path through each pole of circuit breaker **25** is identical and consists of load terminal strap **61** connected by a plurality of flexible conductors **120, 121** to the groups of movable main contacts **103, 107** engaged with stationary main contacts **231, 232,** respectively, extending across line terminal strap **136** and brazed or otherwise secured to the upper surface thereof.

Movable arcing contact **101,** mounted at the forward end of arm **112,** is engageable with stationary arcing contact **233,** mounted on the upper surface of terminal strap **136** and positioned forward of stationary main contact strips **231, 232.** All of the movable contacts **101, 103, 107** are mounted to contact carrier **45** that is pivotally mounted to mechanism frame **36,** secured to base **26** by bolts **48.** Contact carrier **45** is connected at pivot **46** at one end of lower toggle link **43** whose other end is connected to toggle knee **41.** Upper toggle link **42** extends between knee **41** and pivot **44** on cradle **40,** with the latter being pivotally mounted at **47** to frame **36.**

Transverse cradle portion **40***a* mounts latch plate **51,** engageable by secondary latch **53,** which is connected to primary latch **65,** pivoted on trip unit frame **60** at stub shaft **69.** Primary latch **65** is in turn engageable by the latch plate portion of carrier **66,** to maintain cradle **40** in the latched position shown in FIG. **1,** wherein circuit breaker **25** may be operated from its open position of FIG. **1** to its closed position. When carrier **66** releases latch train **53, 65,** the movement of cradle **40** is transmitted back through latch train **53, 65,** whereby transverse pin **71** is moved by primary latch **65** to pivot carrier **66** about shaft **68,** thereby moving transverse common trip bar **80** to release the latch systems of all other poles.

Instantaneous trip means in the form of stationary magnetic frame members **96, 98** and movable armature **78** is provided. Also provided is a delay trip means in the form of bimetal strip **77** mounted to insulating member **95** on trip unit frame **60.**

Transverse insulation bar **147** extends through tubular members **146** at the rear of each contact carrier **45** to mechanically connect the contact carrier **45** of all poles. Aligned apertures **148** in the sides of frame **36** provide clearance for movement of bar **147.** Toggle **42, 43** is operated by spring means (not shown) connected between plate **39,** on toggle knee **41,** and the upper end of operating member **35** pivoted at its lower end to frame **36.** Member **36** is connected by studs **34** to circuit breaker operating handle **30,** which is provided with stubby bifurcated extension **33** extending through aperture **29** in housing cover **27.** Handle extension **33** mounts roller **222** that is engaged by the operating elements **235** of auxiliary handle operating mechanism **250,** having main operating handle **253** for moving elements **235.**

During normal operation, as movable contacts **101, 103, 107** separate from stationary contacts **233, 231, 232** respectively, arcing will be confined to arcing contacts **101, 233.** The arc formed between arcing contacts **101, 233** is drawn deeply into spaced plate type arc chute **240,** having upper and lower magnetic arc runners **241, 242,** with the latter being secured to the upper surface of terminal strap **136** by screws **243.**

In accordance with the insant invention, magnetic steel arc runner **255,** secured to the upper surface of terminal strap **136** by screws **271,** is disposed immediately in front of the forward stationary main contact **231** and extends into the mouth region **256** at the rear of arc chute **240,** where stationary arcing contact **233** is disposed. The front edge of arc runner **255** tapers downward from rear to front and terminates along the sides of stationary arcing contact **233.**

The presence of magnetic arc runner **255** causes arcs established at stationary main contacts **231, 232** to move forward and transfer to stationary arcing contact **233** with sufficient rapidity to prevent excessive pitting of main contacts **231, 232.** Once the arc transfers to stationary arcing contact **233,** arc chute **240** causes the arc to be elongated and extenguished rapidly.

For those features of construction in circuit breaker **25** that have not been described in detail herein, reference is made to one or more of the copending applications Ser. Nos. 275,568, 275,577, 275,446, 275,578, 275,507, 275,454, 275,508, 275,621, 275,623, 275,624, 275,569, 275,522, 275,521, and 275,622, all filed of even date herewith, and all assigned to the assignee of the instant invention.

Although there has been described a preferred embodiment of this novel invention, many variations and modifications will now become apparent to those skilled in the art. Therefore, this invention is to be limited not by the specific disclosure herein but only by the appending claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows.

1. A circuit breaker comprising stationary contact means including stationary arcing and main contact sections; movable contact means including movable arcing and main contact sections operable into and out of engagement with said stationary arcing and main contact sections, respectively; arc chute means to receive and extinguish electric current arcs drawn between said movable and stationary contact means upon separation thereof; said stationary main contact means being disposed outside of said arc chute; said arc chute having an entrance region; said stationary arcing contact means being positioned at said entrance region; and magnetic arc runner means positioned at said entrance region and interposed between said stationary arcing and main contact sections to transfer arcs from said stationary main contact section to said stationary arcing contact section and into said arc chute means where these arcs are extinguished.

2. A circuit breaker as set forth in claim **1** also comprising an elongated terminal strap supporting on its upper surface said stationary arcing and stationary main contact sections, with the latter being behind the arc chute means and the stationary arcing contact section; said arc chute means extending above said terminal strap.

3. A circuit breaker as set forth in claim **2** in which the arc runner means is tapered downward from rear to front.

4. A circuit breaker as set forth in claim **3** in which the arc runner means at the rear end thereof extends across substantially the entire width of the terminal strap.

5. A circuit breaker as set forth in claim **4** in which the stationary main contact section extends across substantially the entire width of the terminal strap.

6. A circuit breaker as set forth in claim **5** in which the stationary main contact section includes first and second elongated portions extending substantially across the terminal strap.

7. A circuit breaker as set forth in claim **5** in which the stationary arcing contact section is substantially narrower than said stationary main contact section, and the arcing runner is constructed of steel.

8. A circuit breaker as set forth in claim **2** also including additional magnetic arc runner means extending forward of said arcing contact means and operatively positioned to draw arcs formed beteween separable sections of said arcing contact means deeply into said arc chute.

9. A circuit breaker as set forth in claim **2** in which said magnetic arc runner means covers a substantial portion of sait terminal strap upper surface in the region thereof between said stationary arcing and stationary main contact sections.

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