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Wilson

[11] **3,823,288**

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[54] **VACUUM INTERRUPTER CAPACITANCE DISCHARGE AND CONTACT GROUNDING SYSTEM**

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[73] Assignee: **I-T-E Imperial Corporation,** Spring House, Pa.

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[52] **U.S. Cl.** ..... **200/144 B,** 200/50 AA

[51] **Int. Cl.** **H01h 33/66**

[58] **Field of Search** ..... 200/50 AA, 144 B

[56] **References Cited**

UNITED STATES PATENTS

2,917,677	12/1959	Washil	200/50 AA X
3,603,752	9/1971	Frink	200/50 AA
3,603,753	9/1971	Frink	200/144 B

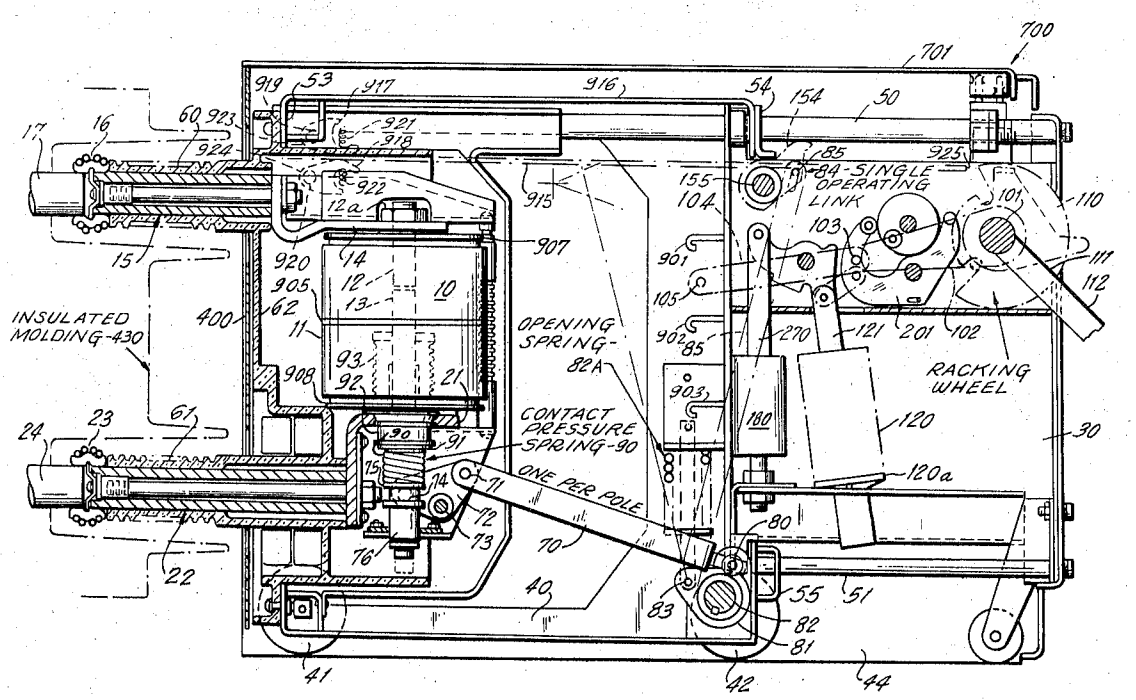
Primary Examiner—Robert S. Macon

Attorney, Agent, or Firm—Ostrolenk, Faber, Gerb & Soffen

[57] **ABSTRACT**

A vacuum interrupter capacitance discharge and contact grounding system for a withdrawal type telescoping circuit breaker mechanism wherein the interrupter is racked toward the frame of the structure to disconnect it and racked away from the frame to connect it in circuit; the frame carrying a plurality of flexible contact probes electrically connected to the frame which, in turn, has contacts engaging a grounding bus in the compartment. The flexible contact probes are individual to and aligned with a ring on the interrupter through which any capacitance may be discharged and with the respective terminals of the interrupter to discharge the capacitance and ground the terminals of the interrupter when the interrupter is racked to disconnect position and toward the frame.

4 Claims, 8 Drawing Figures



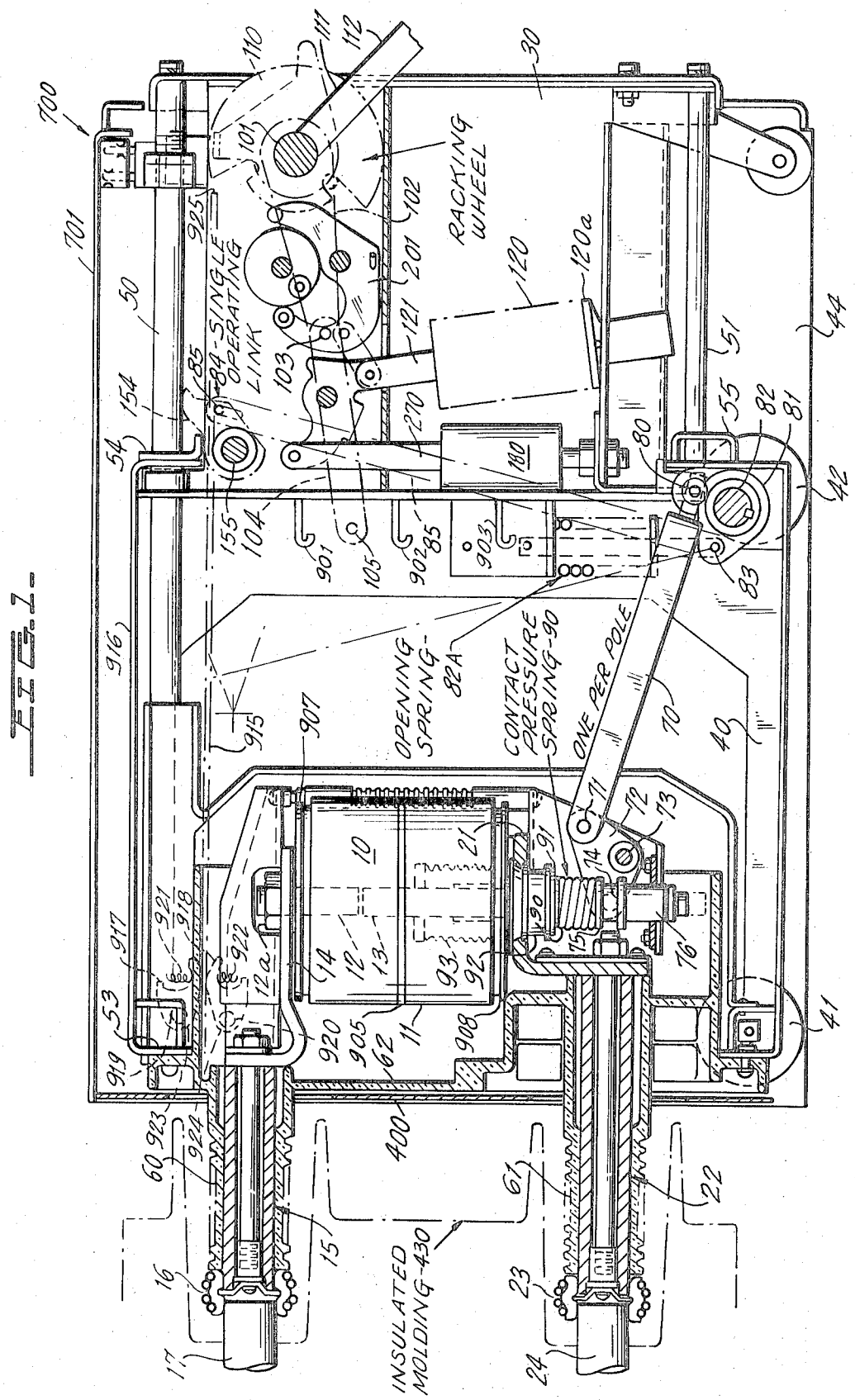
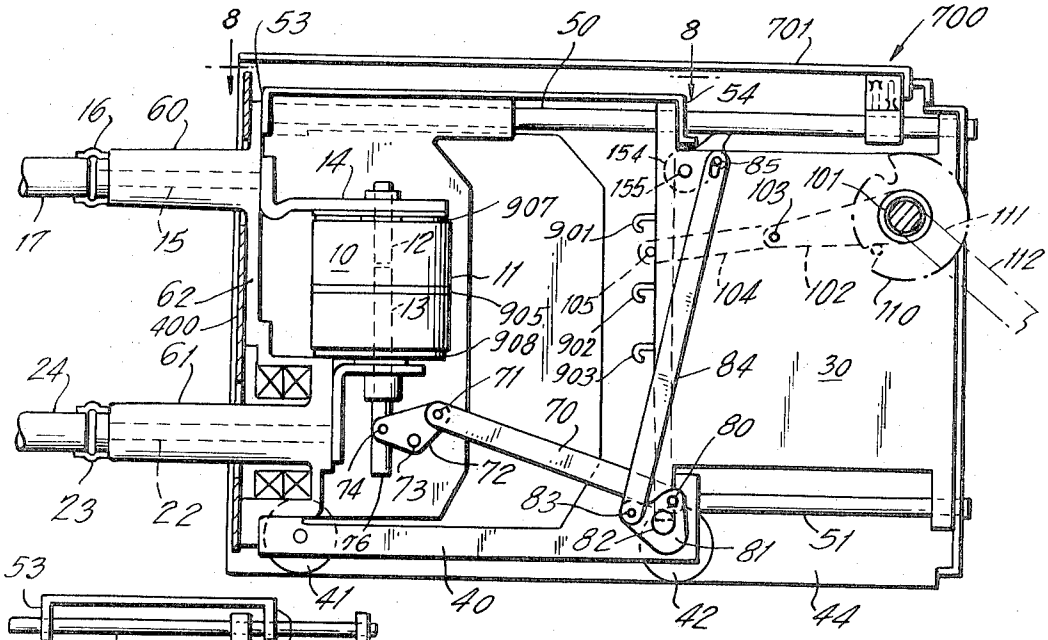

700
701
110
111
112
30
101
102
RACKING WHEEL
201
120
120a
121
925
50
84-SINGLE OPERATING LINK
103
85
154
270
100
80
55
82
81
51
44
42
54
155
104
901
105
902
85
903
83
916
915
907
OPENING SPRING-82A
CONTACT PRESSURE SPRING-90
ONE PER POLE
70
40
11
72
73
74
91
10
21
90
15
76
14
12
13
93
92
12a
922
917
921
918
53
919
920
905
62
11
908
41
60
923
924
400
61
22
16
15
INSULATED MOLDING-430
23
17
24

FIG. 1.

FIG. 2.



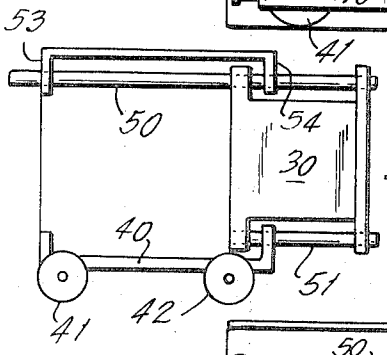


FIG. 3.

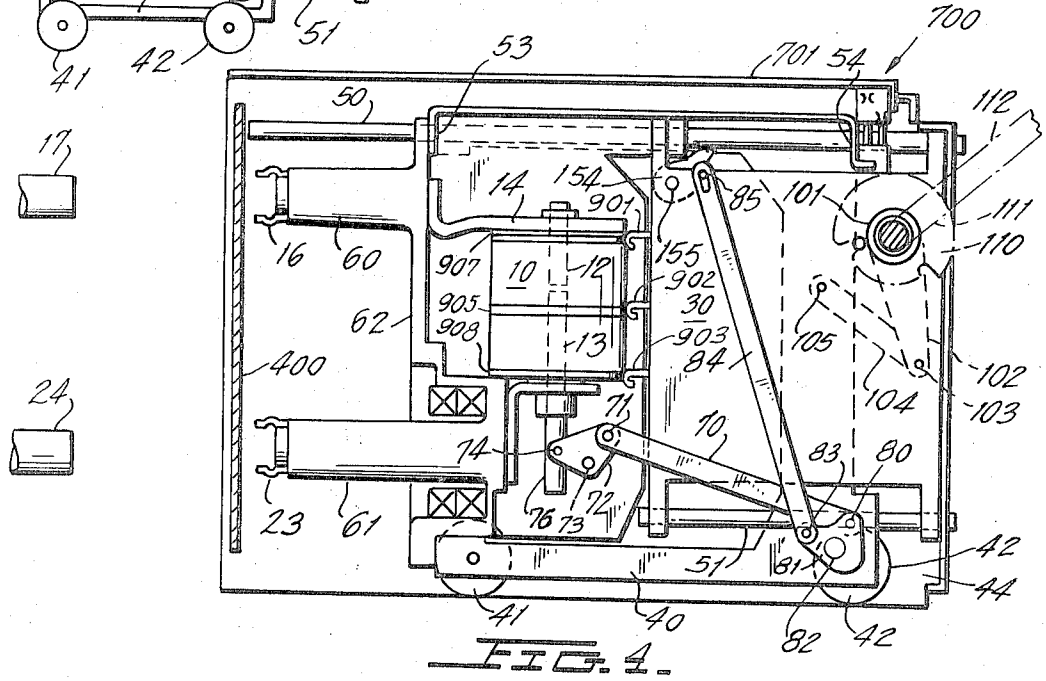


FIG. 4.

FIG. 5

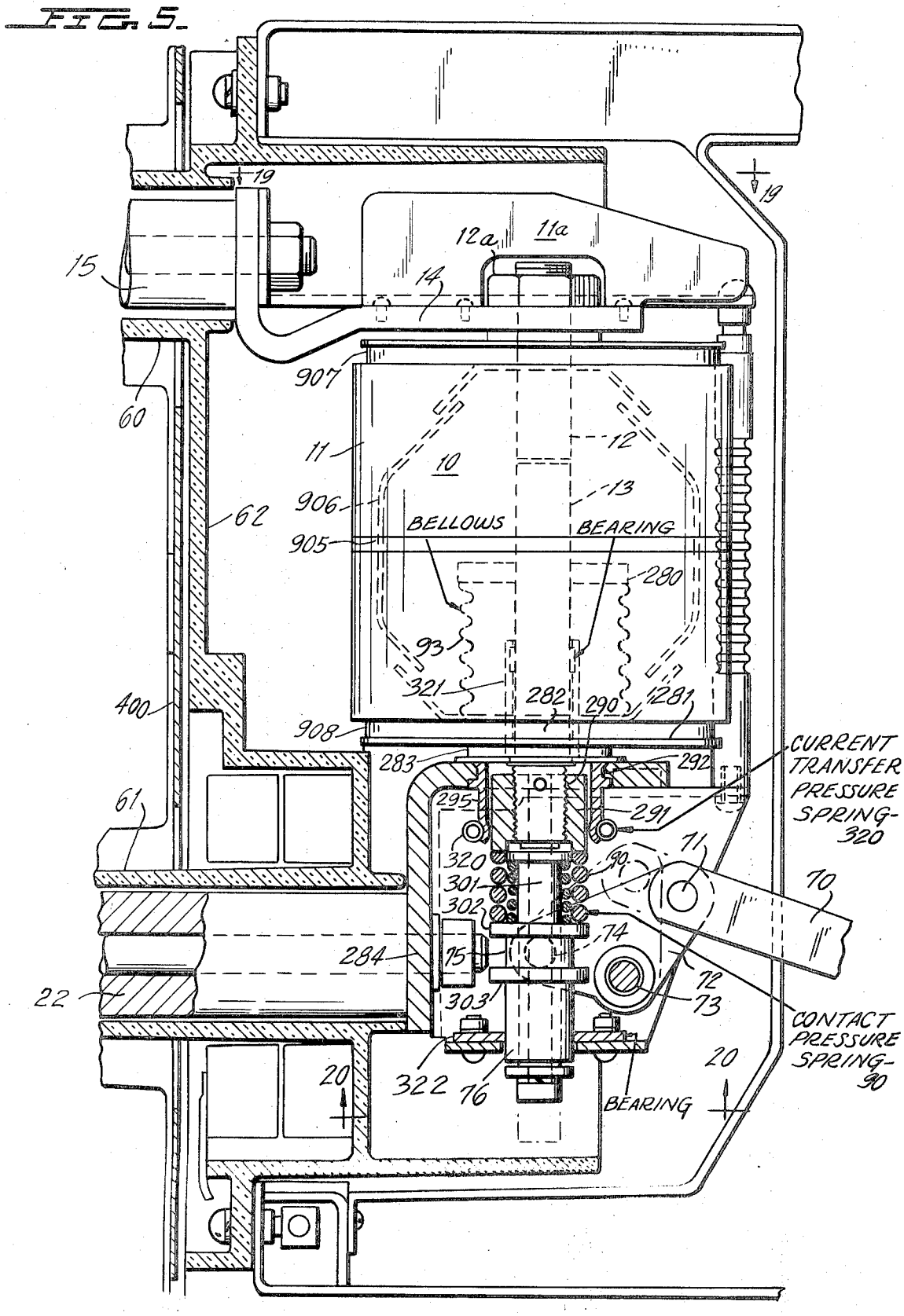

19
19
12a
11a
15
14
907
60
11
10
12
13
906
62
BELLOWS
BEARING
905
280
93
321
282
290
1281
400
908
283
292
CURRENT TRANSFER PRESSURE SPRING-320
295
291
61
320
90
71
70
301
302
74
284
75
72
22
303
73
CONTACT PRESSURE SPRING-90
20
322
76
BEARING
20

FIG. 6.

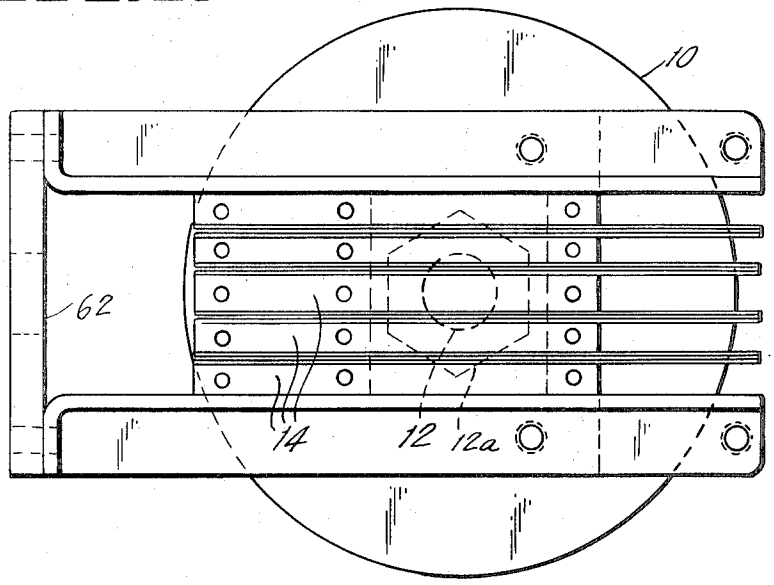
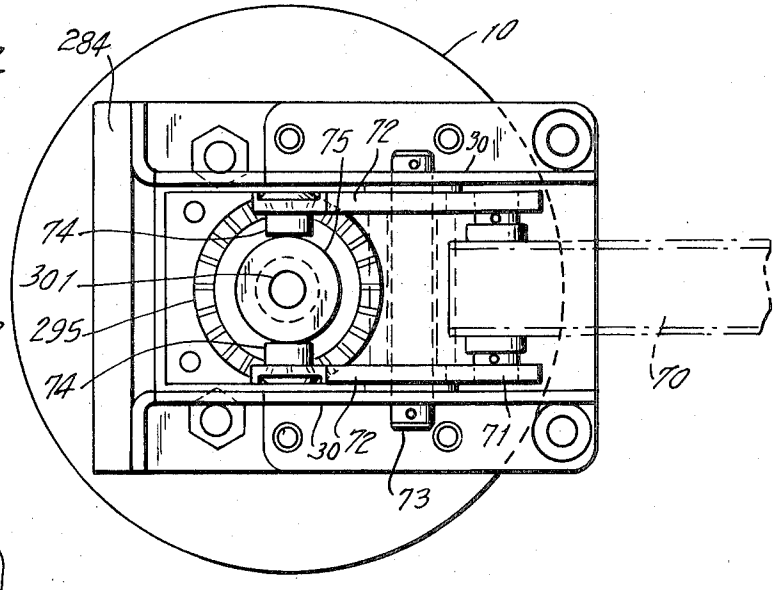


FIG. 7.



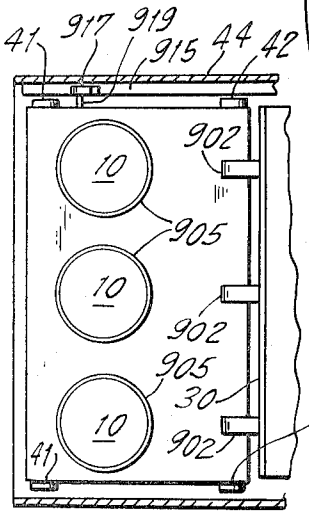


FIG. 8.

VACUUM INTERRUPTER CAPACITANCE DISCHARGE AND CONTACT GROUNDING SYSTEM

The present invention relates to a grounding system including grounding contacts for telescoping withdrawal switchgear and circuit breakers of the type shown and described in applications, Ser. No. 282,319; 282,597; 282,358; 282,325; 282,330 and 282,339, all filed Aug. 21, 1972 by the present applicant and all assigned to the same assignee.

In the said switchgear, one of the primary elements is that the interrupters and operating mechanism will completely utilize the available compartment space so that a 15 KV line breaker may be completely housed in a cubicle having dimensions 28 inches high, 37 inches deep and 36 inches wide. For this purpose, the operating mechanism and the current conducting mechanism are so arranged that when it is desired to withdraw the current conducting mechanism from a connected to a test position, the section of the unit which carries the current conducting mechanism will telescope with respect to and around the operating mechanism.

Since the current carrying elements of the circuit breaker structure, on their own truck, are disconnected from the bus in the manner hereinafter described when the truck carrying the same is moved toward the operating section and telescopes therewith, electrical clearance in this disconnected position is not necessary between the circuit breaker current carrying elements and the operating parts.

When the circuit breaker current carrying elements are fully racked into connected position, appropriate electrical clearance is provided between the circuit breaker contacts and current carrying element on the one hand and the operating parts on the other hand, so that no danger to the operator exists.

In the embodiment here described, the circuit breaker interrupter elements are vacuum interrupters.

The primary object of this invention is to provide a means of automatically and simply discharging such capacitance as voltage built up in a vacuum interrupter, when the circuit breaker which includes a plurality of such vacuum interrupters is withdrawn to the test position.

A further object is the provision of similar means for connecting the terminals of each interrupter to ground when the circuit breaker is withdrawn to test position.

The foregoing and other object of this invention will become apparent in the following description and drawings in which:

FIG. 1 is a side view partly in section and partly broken away of the novel miniature high voltage circuit breaker with the contact members and current carrying members fully racked into operative position showing the relative positioning and placement of the various parts of the entire circuit breaker mechanism.

FIG. 2 is a view corresponding to that of FIG. 1 showing the same structure in the same racked in position of FIG. 1 with certain of the details omitted so that the telescoping operation, which may more readily be seen in FIGS. 3 and 4, may be understood.

FIG. 3 is a schematic side view showing the manner in which the circuit breaker contact and current carrying elements of the miniature high voltage circuit breaker mounted on their own truck may be integrated, controlled and positioned with respect to the frame which carries the operating mechanism.

FIG. 4 is a view corresponding to that of FIG. 2 showing the racked out position of the circuit breaker contact and current carrying elements, demonstrating the manner in which the truck carrying these elements may telescope with respect to the frame which carries the operating mechanism.

FIG. 5 is a more detailed view partly in cross-section, partly in phantom, of an interrupter of FIG. 1.

FIG. 6 is a view taken on line 6—6 of FIG. 5 looking in the direction of the arrows.

FIG. 7 is a view taken on line 7—7 of FIG. 6 looking in the direction of the arrows.

FIG. 8 is a schematic top view of the circuit breaker of FIGS. 1 to 4, taken from line 8—8 of FIG. 2 looking in the direction of the arrows.

Referring first to FIGS. 1, 2 and 4, the circuit breaker structure is a vacuum type of circuit breaker, now well known in the art, in which a vacuum-tight housing 11 encloses and supports a stationary contact 12 and a moving contact 13. The connections to the interrupter 10 are specifically described in connection with FIGS. 5, 6 and 7. It is sufficient for the present to note that stationary contact 12 is electrically connected to the rigid connector 14 which, in turn, is connected in any suitable manner as by the nut 12a to upper or load back disconnect contact 15. The upper back disconnect 15 is provided with suitable contact fingers 16 in a manner now well known in the art, when the circuit breaker structure is in the position shown in FIG. 1 to electrically engage the stationary back disconnect contact 17 in the compartment, the said back disconnect contact 17 being connected to a load bus.

The movable contact 13 is a plunger type contact electrically connected by the means described in connection with FIGS. 5, 6 and 7 to the lower disconnect contact 22 which is similar to the upper back disconnect contact 15; the contacts 23 of the lower back disconnect contact 22 are engageable with the lower stationary back disconnect contact 24 which is connected to the line bus. The circuit is then made from back disconnect contact 17 to the circuit breaker upper back disconnect contact 15, stationary contact 12 in the vacuum housing 11, then to the movable contact 13, the lower disconnect contact 22, the contacts 23 and the lower stationary disconnect contact 24. While in the view of FIGS. 2 and 4, a single circuit breaker is shown, it is obvious that the circuit breaker may be set up and in the present embodiment (see FIG. 8) is intended to be set up as a three pole circuit breaker in which the operating mechanism carrying frame 30 will, through the connecting link 84, hereinafter described, and the jack shaft 82, which is common to and runs through all of the three poles of the breaker structure, thereby operate the three poles simultaneously.

Each of the poles is provided with the structure thus far described, including the vacuum interrupter 10 and the back disconnect structures 15 and 22. The three pole circuit breaker arrangement including vacuum interrupters 10 are carried on the frame 40 which is truck mounted on wheels 41, 42 at the front and back of the frame so that they may roll; thus the frame 40, as a whole, may roll with respect to frame 30 which carries the operating mechanism.

The circuit breaker back disconnect contacts of the breakers **10** are racked out with the frame **40** to disconnect the upper and lower back disconnect contacts **15** and **22**, when the frame is moved to the position shown in FIG. **4**.

Telescoping Withdrawal Circuit Breaker

The frame **40**, as may readily be seen from FIG. **4**, telescopes with respect to the frame **30** of the operating mechanism. The frame **30** is releasably fixed in position as described in the aforesaid applications for patent so that during the racking operation from the connected position of FIG. **1** to the disconnect position of FIG. **4**, the operating mechanism on the frame **30** is for all practical purposes to be regarded as integrated with the compartment and switchboard in which the compartment is located.

Since the frame **30** is thus fixed, the circuit breaker structure on the moving frame **40** moves with respect to the frame **30** and hence with respect to the compartment wall **44**. It is guided in its movement by the slide arrangement which is more clearly seen in FIG. **3**, but appears in FIGS. **1** to **4**; that is, the frame **30** carries the upper slide **50** and the lower slide rod **51**. The frame **40** carrying the circuit breaker is provided with the slide member **53** at the upper rear portion of the frame and the slide member **54** at the upper front of the frame **40** which slides on the upper slide bar **50** carried by the operating mechanism frame **30**. The lower portion of the circuit breaker frame **40** is provided with a slide **55** which slides on the lower guide bar **51** on the frame **30**.

It may thus be seen that when the racking mechanism is operated the circuit breaker structure on frame **40** may be moved from the position of FIG. **1** to the position of FIG. **4**, telescoping with respect to the operating mechanism of frame **30**.

Since, in the telescoped position of FIG. **4**, the circuit breaker back disconnect contacts **15** and **22** are fully disconnected, there is no need at this position of the circuit breaker mechanism to isolate the operating mechanism, there being no danger of any flashover to the operating mechanism. This is especially so since the stationary back conductors **17** and **24** remain in their original position within the stationary insulated bushings **60** and **61** on the back wall **62** of the compartment and covered by the shutter **400**.

The mechanical connection for the operating mechanism on frame **30** to the truck mounted interrupter elements on frame **40** in order to operate the circuit interrupter **10** is made through the insulated operating link **70** which engages pin **71** on the bell crank lever **72** on pivot **73**. The bell crank lever **72** at the end opposite the pin **71** is provided with the pins **74** which engage the clevis **75** of the extension **76** of the moving contact **13** of the interrupter **10**. The specific operation of the interrupter **10** by bell crank lever **72** is described in connection with FIGS. **5**, **6** and **7**.

Consequently the movement of the link **70** to the right with respect to FIG. **1** will rotate the bell crank lever **72** to raise the moving contact **13** into engagement with stationary contact **12** and the movement of the link **70** to the left will operate the bell crank lever **72** to open the contacts **13**. The operating link **70** may be centrally located to operate the center pole or may be provided in duplicate on each side to be operated by bell crank levers **81** (hereinafter described) keyed to a single jack shaft **82** which is common to all the poles of the circuit breaker.

The end of the operating link **70** opposite its connection to the bell crank lever **72** is connected at pin **80** to bell crank lever **81** which is keyed to jack shaft **82** on frame **40**. The opposite end of the bell crank lever is connected by pin **83** to the link **84** which is the driving link in the operating mechanism for operating the circuit breaker. The driving link **84** in the operating mechanism frame is connected at its upper end **85** so that it may react appropriately to the closing spring **120** (FIG. **1**) and respond to the latch system.

The moving contact plunger **13–76** is biased toward the stationary contact **12** in the closed position by the compression spring **90** captured between the upper portion of the clevis **75** on the external portion of the moving contact plunger **76** and the base **91** of the moving contact plunger **13**. Vacuum interrupter **10** contains a bellows **93** which is connected to the plunger **13** within the interrupter housing **11** in order to maintain the vacuum despite the fact that the plunger **13–76** must slide in and out of the housing. This is more specifically described in connection with FIGS. **5**, **6** and **7**.

When, therefore, the link **84** is permitted to rise, it rotates the bell crank lever **81** thereby pulling the link **70** to the right, rotating the bell crank lever **72** clockwise and moving the contact plunger **13** up to the closed position where it engages the stationary interrupter contact **12**. When the link **84** is released so that it no longer retains the contact in the closed position, when the compressant spring or opening compression spring **82***a* drives the bell crank **81** down to open the contacts, rotating the bell crank lever **72** counterclockwise, pushing the link **70** to the left, rotating the bell crank lever **81** counterclockwise and pulling down the operating link **84**.

Racking Into and Out of Telescoping Position to Disconnect and Connect the Back Contacts

The racking shaft **101** is a through shaft in the operating mechanism frame **30**. The racking shaft **101** is provided on each side thereof with a crank **102** keyed to shaft **101** and connected by the pin **103** to the link **104** which is connected to the pin **105** of the interrupter frame **40**. The crank **102** and link **104** are in toggle relationship.

The two racking positions of the swinging link **84**, FIG. **1**, are symmetrically arranged so that the closing mechanism will operate the interrupter contacts equally when the circuit breaker is in the connected position or in the test position. This is necessary so that the operation of the circuit breaker while in the test position may be checked with appropriate assurance that its subsequent operation when racked in will be the same.

When the racking shaft is rotated counterclockwise from the position of FIG. **2** to the position of FIG. **4**, the crank **102** and link **104** on each side move to the closed toggle position shown in FIG. **4** thereby resulting in the racking out of the interrupter carrying frame **40**. When the racking shaft **101** is rotated clockwise from the position of FIG. **4** to the connected position of FIG. **2** then the interrupter carrying frame **40** is moved also from the position of FIG. **4** to the position of FIGS. **1** and **2** into the fully connected position. The racking shaft is provided with a handle receiving member **110** keyed

thereto, having an opening 111 therein to receive a removable handle 112. Therefore the racking shaft 101 may be rotated to move the interrupters from the position of FIGS. 1 and 2 to the position of FIG. 4 by inserting the handle 112 in the opening 111 of the handle member 110 and lifting the handle as shown by comparison of FIGS. 2 and 4. Similarly the circuit breaker interrupter elements may be racked into connected position by a reverse operation in which the handle 112 is inserted in the opening 111 of the handle member 110 and the handle 112 lowered from the position of FIG. 4 to the position of FIGS. 1 and 2.

By this means therefore a full telescoping arrangement is provided for the truck elements of the circuit interrupter and back disconnect contacts mounted on the truck 40 so that they may approach the operating mechanism and overlap and surround elements of the frame 30.

The only operative connection between the operating mechanism on frame 30 and the interrupter elements on frame 40 is the link 84 which operates the interrupter elements. The link 84 in turn operates as previously described on the three links 70 which are housed in the interrupter mechanism frame 40.

As will be seen from a comparison of FIGS. 1 and 2 on one hand and FIG. 4 on the other hand, the link 84 is free to swing alongside the operating mechanism. Thus, the interrupter on frame 40 may cooperate with any type of operating mechanism on frame 30 and vice versa in accordance with the modular concept above disclosed.

Telescoping Arrangement and Modular Concept

It should be borne in mind that, for this purpose, the ability of the driving link 84 on the operating mechanism to swing as shown from the position of FIGS. 1 and 2 to the position of FIG. 4 permits the telescoping arrangement to occur. By isolating this link 84, any interrupter device on frame 40 which will respond to the movement of the driving link to close may be substituted for the interrupter on frame 40, and any operating mechanism utilizing a swinging link (or a link which may shift its position) while still being operatively connected through bell crank lever 81 to an interrupter contact drive link, such as link 70, may be substituted for the operating mechanism shown. This makes possible the modular arrangement in which various types of interrupters may be used in connection with various types of operating mechanisms.

The opening spring is part of and associated directly with the frame; the closing operation as well as the latch arrangement which resists the opening spring and the controls for the latch are in the operating mechanism on the telescoping frame. Hence, the telescoping and modular arrangements are both made possible.

The specific operating system which achieves all of the foregoing functions is described in the aforesaid applications for patent.

Interrupter Structure and Current Transfer

FIGS. 5, 6 and 7 show the novel portions of the miniature high voltage circuit breaker as it relates to the interrupter 10 itself which includes the stationary contact 12, the moving contact 13. As previously pointed out, the moving contact has a bellows 93 connected to a sealing sleeve 280 carried thereby. The bellows 93 is connected at the bottom wall 281 of the vacuum interrupter housing by a vacuum type seal therewith so that the movement of the movable contact plunger 13 through the opening 282 in the bottom wall will not result in contamination of the vacuum condition within the housing 11 of the vacuum interrupter 10. The vacuum interrupter 10 is supported by an annular insulator 283 and is secured to the rigid connector strap 284 which, in turn, is connected to the lower back disconnect contact 22. The moving contact plunger 13 is secured in any suitable manner as by, for instance, screw threads 290 to an exterior plunger 291. The strap 284 is provided with an opening 292 through which the exterior plunger 291 may pass and the periphery of this opening is provided with spring contact elements 295 arranged annularly of the contact plunger extension 291, so that effective contact can at all times be made between the moving contact plunger 13 and the connecting strap 284. An extension 301 of the plunger is provided with a ring 302 secured thereto and another ring 303 which together form the clevis 75 previously referred to which is slidably mounted on plunger extension 291. Plunger 13 and extensions 291 and 301 move as a unit. Clevis 75 slides along this unit to compress spring 90. Only contacts 295 transfer current to the moving plunger extension 291; extension 291 is threaded into and hence a part of moving contact plunger 13.

The operating pin previously described in connection with FIG. 1 engages the clevis on both sides; the operating bell crank lever is basically a two piece member with the pin 74 projecting from each side thereof so that when the circuit breaker is to be closed upward movement of the pin 74 will operate the clevis 75. Raising the clevis 75 will compress the spring 90. As previously described the arm 70 which operates the bell crank lever 72, which in turn operates the pins 74 which engage the clevis, is latched in position through its connection bell through crank lever 81 to operating link 84 which in turn is connected to elements which engage the latch (see also FIG. 7).

Consequently when the plunger 13 is raised to the position shown in FIG. 5, the circuit breaker is closed. On release of the holding force which is transmitted to the link 70 and bell crank lever 72, the opening spring 82A (FIG. 1) will now drive the plunger 13 down to the open position. The stationary contact 12 is supported in the upper wall 11*a* of the housing 11 of the interrupter and there connected to the rigid connection strap 14 which is, in turn, connected to the movable back disconnect contact 15. The garter spring 291 maintains contact pressure between contacts 295 and the plunger assembly 13-291-301. Spring 90 maintains contact pressure between contacts 12 and 13 when the circuit breaker is closed.

By the means herein described, the minimum number of current transfer joints are used to minimize heating. The straight line guiding of the moving contact 13 prevents damage to the bellows 93 and insures full seating of the internal contact surface in the vacuum interrupter. The contact pressure spring 90 is placed as close as possible to the gap between contacts 12 and 13 with a minimum amount of added material between the springs and the contact gap. This spares the stationary housing 11 for the vacuum interrupter and especially the stationary contact extra abuse from the inertia of material of any kind added between the contact pressure springs and the contact gap. Such material would

otherwise be brought to an abrupt halt by the stationary vacuum interrupter contact on closing. The rigidity of the mounting and actuating assembly minimizes contact bounce on closing and rebound on opening.

The vacuum housing **11** is mounted to the copper conductor **284** which, in turn, is bolted to the incoming lower disconnect **22.** The stationary contact **12** is bolted to the outgoing copper conductor **14** which is connected to the upper disconnect **15.** The moving contact plunger **13** has a threaded external end on which is mounted the copper bushing **291** which is then clamped by the washer, the long bushing, and the long bolt which enters a tapped hole in the external end of the moving plunger **13.** The floating bushing with the actuation groove or clevis **75** forces the copper bushing and the moving contact **13** upward through the captive contact pressure spring **90.** The floating bushing is held assembled by a limit washer. The moving contact and spring assembly are guided by the widely spaced bearings **321** inside the housing **11** and the lower stationary bearing **322** which is secured to the frame.

The vacuum interrupter **10** may be a vacuum bottle type of interrupter such as that shown in U.S. Pat. No. 2,892,911 and be provided with a shield **906** of the general type therein shown for the purposes there shown.

The shield **906** is connected electrically to the external ring **905** on the exterior of the interrupter **10,** approximately mid-way between the terminals of the interrupter.

Grounding Contacts

The grounding contact arrangement is shown in FIGS. **1, 2, 4** and **8.**

A means must be provided for automatically and simply discharging the capacitance voltage built up in a vacuum interrupter when the circuit breaker is withdrawn to the test position of FIG. **4.** This capacitance voltage may exist between the shield **906** and the contacts and their supports or with other parts of the interrupter. This residual charge may surprise the operator and possibly lead to injury, if it were not discharged to ground.

The circuit breaker frame **30** carries at its forward surface a set of flexible metallic contact probes **901, 902, 903,** -- one set for each of the vacuum interrupters **10;** these contact probes are all electrically connected to the frame **30.**

Contact probe **902** is aligned with the external ring **905** related to shield **906** of the vacuum interrupter **10.**

Flexible contact probe **901** is aligned with the upper terminal wall **907** of the interrupter **10.** Flexible contact probe **903** is aligned with the lower terminal wall **908** of the interrupter **10.**

When, therefore, the interrupter carrying frame is racked from the fully operative position of FIGS. **1** and **2** to the test position of FIG. **4,** the contacts **902, 901** and **903** engage, respectively, the external ring **905** and the terminal walls **907** and **908** of the interrupter **10.**

Thus, in the test position, any capacitance voltage which may appear at ring **905** and both terminals of the interrupter are grounded to frame **30.** This supplies to each of the interrupters **10** (see FIG. **8**).

Since the frame **30** is a removable truck operable on wheels **42** into and out of the compartment, the frame **30** must be grounded to the compartment, which itself is fully grounded.

The compartment is provided with a grounding bus **915** (FIGS. **1** and **8**) extending the length of the compartment. The frame **30** carries at its inner end a pair of contacts **917, 918** pivotally mounted on pins **919, 920** and urged toward each other by biasing springs **921, 922.** The inner surface of each contact **917, 918** is cammed at **923, 924** so that they may slide readily over the end **925** of the grounding bus **915** when the frame **30** is inserted in the compartment, receiving the grounding bus **915** between them and making a good sliding contact with the grounding bus **915.**

Thus, when the circuit breaker is racked to the test position of FIG. **4,** the flexible grounding probes **901, 902, 903** engage the interrupter elements **905, 907, 908** connecting them to ground through frame **30,** grounding contacts **917, 918** and grounding bus **915.** In this manner, any capacitance voltage built up in the interrupter is discharged to ground and the circuit breaker contacts are grounded for safety.

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

The embodiment of the invention in which an exclusive priviledge or property is claimed are defined as follows:

1. In a withdrawal type of interrupter having a main frame and an interrupter carrying frame with the main frame mountable in a compartment, the interrupter carrying frame being movable with respect to the main frame from a connected position of the interrupter remote from the main frame to the disconnected position of the interrupter adjacent the main frame;

said interrupter having a pair of spaced terminal elements,

a contact member on said main frame individual to each of said terminal elements,

said terminal elements of said interrupter engaging their respective contact members when the interrupter carrying frame is moved to disconnect position with respect to said main frame,

an electrical grounding connection between said contact members and said main frame;

an additional grounding contact means carried by said main frame and a grounding bus in said compartment; said additional grounding contact means engaging said grounding bus when the main frame is in said compartment;

said interrupter being capable of developing a capacitance charge,

electrically conductive means external of the interrupter and participating in said capacitance charge;

an additional contact member on said main frame substantially aligned with said first mentioned contact members and electrically connected to said main frame,

said last mentioned electrically conductive means external of said interrupter being aligned with said additional contact member,

and engaging said additional contact member when the interrupter carrying frame is moved to disconnect position with respect to said main frame.

2. The withdrawal type of interrupter of claim 1 in which said contact members and said additional contact member are flexible resilient members projecting from the main frame toward the interrupter carrying frame.

3. The withdrawal type of interrupter of claim 2 in which said additional grounding contact means on said main frame includes a pair of grounding contacts biased toward each other; said grounding contacts being located at and engaging opposite surfaces of the grounding bus.

4. The withdrawal type of interrupter of claim 3 in which the main frame supports the interrupter carrying frame;

the main frame being movable into and out of said compartment,

the compartment having a wall parallel to the path of movement of the main frame into and out of said compartment,

said grounding bus being supported on said last mentioned wall,

said grounding contacts being located on a portion of the main frame which initially enters said compartment when the withdrawal type of interrupter is inserted therein;

said grounding contacts having cammed surfaces to receive the end of the grounding bus between them as the withdrawal type of interrupter is inserted therein;

said grounding contacts maintaining a sliding electrical connection with said grounding bus as said withdrawal type of interrupter including its main frame is moved in the compartment.

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