Oct. 26, 1965 B. P. BAKER ETAL 3,214,541

FLUID BLAST CIRCUIT INTERRUPTER WITH STRAIGHT-LINE DRIVING MECHANISM

Filed April 3, 1961 3 Sheets-Sheet 1

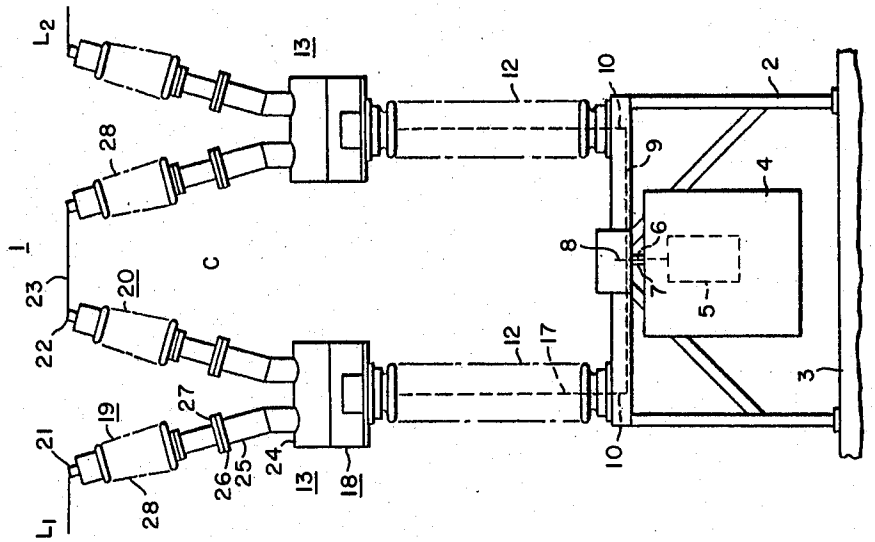


Fig. 2

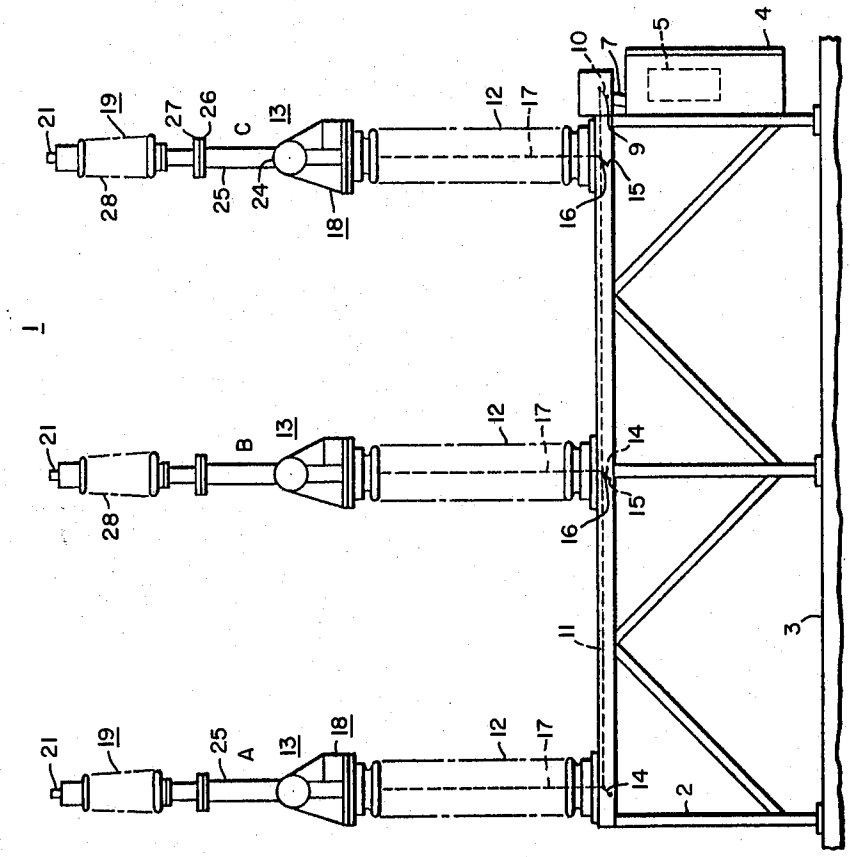


Fig. 1

Oct. 26, 1965 B. P. BAKER ETAL 3,214,541

FLUID BLAST CIRCUIT INTERRUPTER WITH STRAIGHT-LINE DRIVING MECHANISM

Filed April 3, 1961 3 Sheets-Sheet 2

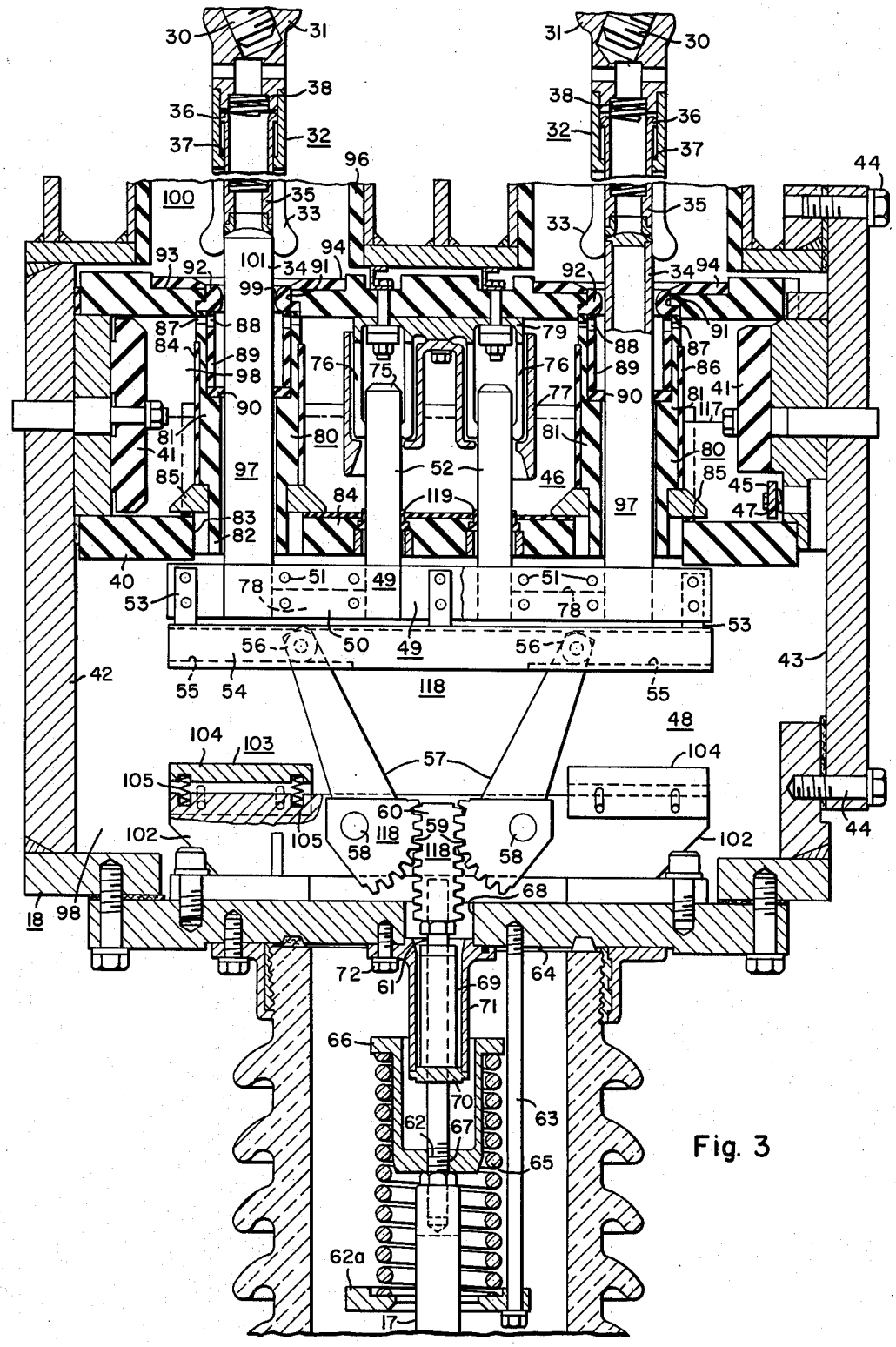


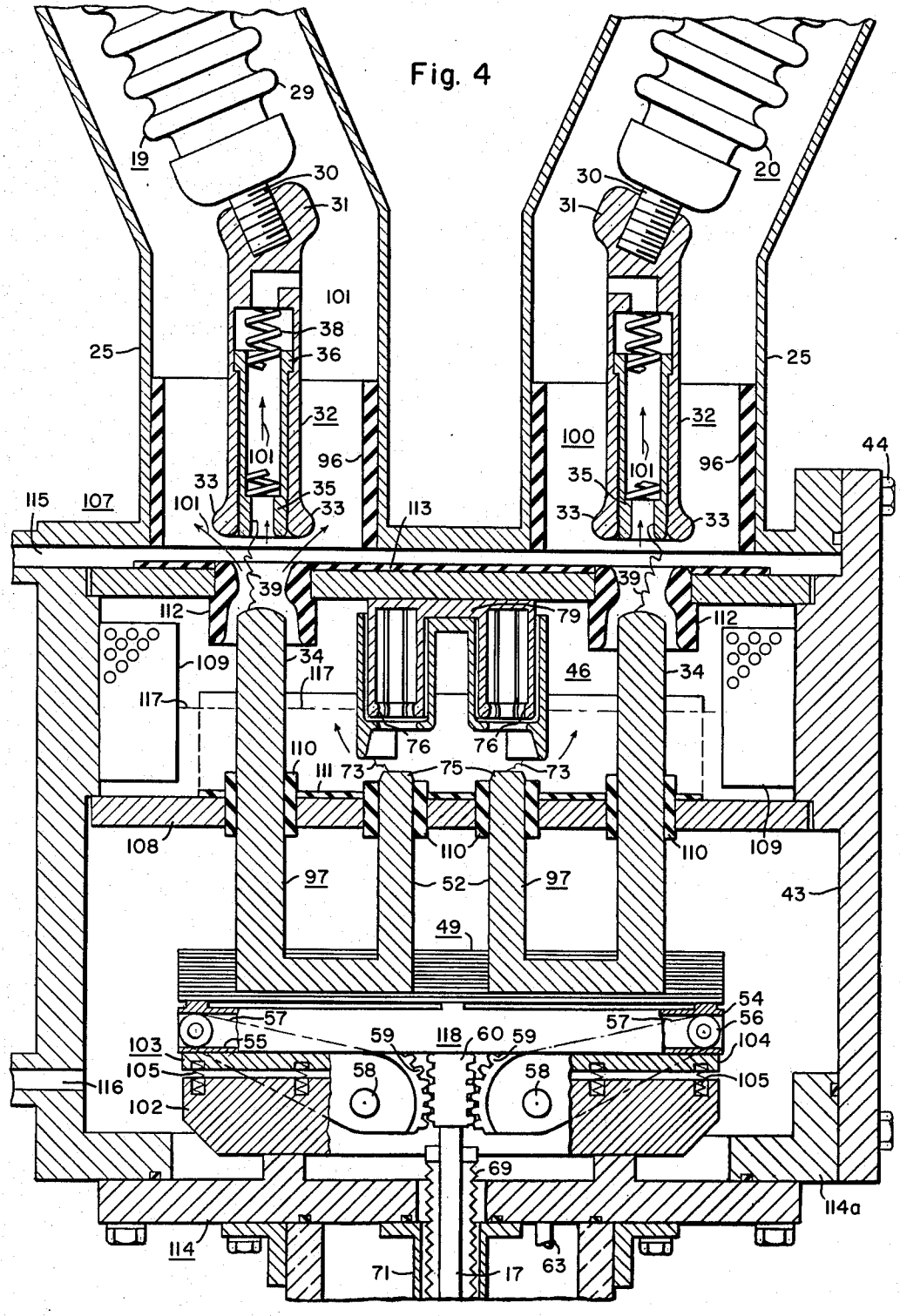
Fig. 3

Oct. 26, 1965 B. P. BAKER ETAL 3,214,541

FLUID BLAST CIRCUIT INTERRUPTER WITH STRAIGHT-LINE DRIVING MECHANISM

Filed April 3, 1961 3 Sheets-Sheet 3

Fig. 4



United States Patent Office 3,214,541 Patented Oct. 26, 1965

3,214,541

FLUID-BLAST CIRCUIT INTERRUPTER WITH STRAIGHT-LINE DRIVING MECHANISM

Benjamin P. Baker, deceased, late of Monroeville, Pa., by Mellon National Bank and Trust Company, executor, and Charles F. Cromer, Penn Township, Westmoreland County, and Wayne S. Aspey, Monroeville, Pa., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Filed Apr. 3, 1961, Ser. No. 101,620
4 Claims. (Cl. 200—145)

This invention relates to circuit interrupters in general and, more particularly, to circuit interrupters of the fluid-blast type.

A general object of the present invention is to provide an improved fluid-blast circuit interrupter of simplified construction and highly efficient in operation.

A more specific object of the present invention is the provision of an improved circuit-interrupting structure including a confined housing having disposed therewithin a pressure-resistant interrupter tube. Preferably, a pair of simultaneously-movable U-shaped contact structures are moved externally of the interrupter tube and into the interior of the interrupter tube during the opening operation.

A further object of the present invention is the provision of an improved live-tank type of circuit interrupter supported up in the air by suitable insulating means of length commensurate with the voltage rating of the device, and to associate an improved interrupting structure with the live-tank circuit interrupter preferably having in conjunction therewith an improved operating mechanism.

Another object of the present invention is the provision of an improved circuit interrupter of the type having an interrupter tube disposed interiorly within a surrounding pressurized housing, in which the interrupter tube is formed of highly-pressure resistant metallic material for withstanding the high pressure.

Still another object of the present invention is the provision of a circuit interrupter of the type set forth in the immediately preceding paragraph having associated therewith a pair of movable U-shaped contact structures, each contact structure having a movable pressure-generating contact and a movable interrupting contact.

Another object of the invention is to provide an improved operating linkage for simultaneously establishing a pair of pressure-generating arcs and a serially-related pair of interrupting arcs.

Further objects and advantages will readily become apparent upon reading the following specification, taken in conjunction with the drawings, in which:

FIGURE 1 is a side elevational view of a three-phase high-voltage fluid-blast circuit interrupter embodying features of the present invention, with the contact structure being illustrated in the closed-circuit position;

FIG. 2 is an end elevational view of one of the three pole-units of the circuit interrupter of FIG. 1;

FIG. 3 is a longitudinal vertical sectional view taken through one of the live-tank interrupting structures of the circuit interrupter of FIGS. 1 and 2, with the contact structure being illustrated in the closed-circuit position; and,

FIG. 4 is a view somewhat similar to that of FIG. 3, but illustrating a modified type of arc-extinguishing assemblage, with the contact structure being illustrated in the fully open-circuit position.

Referring to the drawings, and more particularly to FIGS. 1 and 2 thereof, there is illustrated a three-phase circuit-interrupting assemblage, generally designated by the reference numeral **1**. The three pole-units are respectively designated by the reference letters A, B and C. As

shown in FIG. 1, the three pole-units A, B, and C are mounted upon an angle-iron framework **2**. The framework **2** is at ground potential and is supported upon a concrete base **3**. Situated at the right-hand end of the framework **2**, as viewed in FIG. 1, is an operating mechanism housing **4**. Any suitable operating mechanism may be employed with the present invention, such as solenoid mechanism, pneumatic mechanism, or a hydraulic mechanism. The particular mechanism device **5**, disposed within the mechanism housing **4**, constitutes no part of the present invention; and any conventional type may readily be employed.

As viewed in FIG. 2, it will be noted that a reciprocally-operable operating rod **6** extends upwardly through a housing tube **7**, and is pivotally connected to one end of a bell-crank lever **8**. The crank-arm **8** is keyed to an operating shaft **9**, extending in opposite direction from the crank-arm **8**, as viewed in FIG. 2 of the drawings.

The rotatable operating shaft **9** is keyed to a pair of crank-arms **10**, which, in turn effect reciprocal horizontal movement of a pair of longitudinally-extending operating rods **11**, which extend below the insulating columns **12** supporting the elemental circuit-interrupting units, or "building-block" units **13**.

The horizontal reciprocally-movable operating rods **11** are pivotally connected to bell-cranks **14**, which are pivotally mounted on shafts **15**. The bell-cranks **14** have arms **16**, which have pivotally connected thereto, at their free ends, insulating operating rods **17**, which extend vertically upwardly interiorly within the porcelain supporting columns **12**.

The upper ends of the insulating operating rods **17** are employed to effect the opening and closing movement of the movable contact structure associated with each of the circuit- interrupting units **13**, as more fully described hereinafter.

With reference to FIG. 2 of the drawings, it will be observed that extending angularly downwardly into each of the pressurized housing structures **18**, associated with each interrupting unit **13**, is a pair of terminal bushings **19**, **20**, having terminals **21**, **22**, respectively, at their outer extremities. Depending upon the voltage requirements, one of the interrupting units **13** may be employed, or, as illustrated in FIG. 2, a plurality of such units **13** may be arranged in series being connected by a conductor **23**. Using only two such units **13**, it will be apparent that the electrical circuit passing through the pole-unit C includes the line connection L_1, outer terminal **21**, through the terminal bushing **19**, into the unit **13**, out of the unit **13** through terminal bushing **20** to external terminal **22** thereof, connector **23**, and in similar fashion through the right-hand arc-extinguishing unit **13** of FIG. 2 to the right-hand line connection L_2.

With reference to FIG. 2, it will be observed that secured, as by welding, to the upper side **24** of the pressurized metallic tank **18** is a cylindrical support member **25**, having an outer support-flange portion **26**, which serves to fixedly support in proper operative position the support flange **27**, associated with each of the terminal bushings **19**, **20**. As well known by those skilled in the art, each terminal bushing **19**, **20** has an externally-located weather-proof casing **28** and an internally-disposed weather-proof casing **29** (FIG. 4). A terminal stud **30** (FIG. 3) extends centrally through each of the terminal bushings **19**, **20**, and has threadedly secured and clamped thereto, adjacent the lower end thereof relatively fixed contact adapters **31**. The contact adapters **31** provide contact housings for relatively stationary contact structures, generally designated by the reference numeral **32**.

With reference to FIG. 3 of the drawings, it will be noted that the relatively stationary contact structure **32**

comprises a plurality of circumferentially positioned contact finger segments **33**, which make contacting engagement with a pair of movable interrupting contacts **34**. Disposed interiorly within each contact finger cluster **32** is a movable tubular arcing contact **35**, which has limited downward following movement with respect to the movable interrupting contact **34**, as limited by a flange portion **36** engaging a shoulder **37** associated with the finger contacts **33**.

During the opening operation, as illustrated more clearly in FIG. 4, the tubular arcing contacts **35** move downwardly into following relation with respect to the movable interrupting contacts **34**, as biased by compression springs **38**, so that interrupting arcs **39** (FIG. 4) are terminated at the arcing contacts **35**, and not at the lower ends of the finger contacts **33**. As a result, the finger contacts **33** are maintained in good condition for good contact-carrying function in the closed-circuit position of the interrupter, as illustrated in FIG. 3 of the drawings.

Each pressurized metallic interrupter housing **18** has disposed therein an insulating interrupting tube **40**, maintained in a fixed operative position by means of positioning plugs **41** fixedly secured to the end cover plates **42**, **43** of the tank structure **18**. Suitable bolts **44** are provided to maintain the cover plate **43** in a proper position.

The right-hand positioning plug **41** has associated therewith a check valve **45**, which closes during the existence of high-pressure conditions within the pressure-generating chamber **46** provided interiorly within the interrupting tube **40**. Upon a subsidence of the pressure within the pressure-generating chamber **46**, the check valve **45** will reopen, as biased opened by a spring **47**, to enable fluid to pass into the tube **40** from the region **48** within the outer pressurized metallic casing **18**.

As shown in FIG. 3, the two movable interrupting contacts **34** are secured to a reciprocally-operable cross-head structure, generally designated by the refernce numeral **49**. Generally, the cross-head structure **49** includes an upper spaced pair of insulating bars **50**, secured by bolts **51** to fixedly clamp thereby the lower ends of the two interrupting contacts **34**, and also the lower ends of two movable pressure-generating contacts **52**. The two insulating bars **50** have brackets **53** associated therewith at the outer extremities and centrally thereof, which are secured to a metallic channel-shaped member **54**, providing a pair of race-ways **55**. Disposed within the race-ways **55** are a pair of driving rollers **56**, secured to the outer free ends of a pair of rotatable driving cranks **57**, pivotally secured on fixed pivot shafts **58**, and having gear segment portions **59**. As illustrated in FIG. 3, the gear segments **59** mesh with a double-sided rack **60** having teeth on the oposite faces thereof.

The double-sided rack **60** is disposed at the upper end of a metallic coupling member **61**, having threadedly secured thereto, adjacent the lower end **62** thereof, the insulating operating rod **17**. An annular spring plate **62***a* is fixedly supported by a plurality of tie-rods **63** from the lower side **64** of the pressurized tank **18**. An opening accelerating compression spring **65** has its lower end seated upon the spring plate **62***a*. The upper end of the accelerating spring **65** is seated upon a cup-shaped spring seat **66**, which is threadedly secured, as at **67**, to the lower extremity **62** of the coupling member **61**.

To provide a seal through an opening **68** of the tank **18**, a metallic bellows **69** is provided. The lower end of the metallic bellows **69** is secured, as by suitable metal joining, to a ring **70** secured to the lower end of a tubular guide support **71**, affixed by bolts **72** to the lower side **64** of the metallic housing **18**. The upper end of the metallic bellows is secured, as by soldering, to the coupling member **61**.

From an inspection of FIG. 3 of the drawings, it will be apparent that upward opening motion of the insulating operating rod **17**, as effected by the biasing action exerted by the opening accelerating spring **65**, causes upward movement of the movable spring seat **66**, and consequent upward movement of the coupling **61** and double-sided gear rack **60**. Because of the meshing of the teeth associated with the double-sided rack **60** with the gear segments **59**, the crank-arms **57** will be rotated about their pivot axes **58** in a direction away from each other, causing thereby the driving rollers **56** to move outwardly toward the outer ends of the channel member **54**.

The outward movement of the driving rollers **56** will cause consequent downward opening movement of the cross-head structure **49**, carrying with it the two movable pressure-generating contacts **52** and the two movable interrupting contacts **34**. This will establish two pressure-generating arcs **73** and two interrupting arcs **39**, as more clearly indicated in FIG. 4 of the drawings. It will be observed that the pressure-generating arcs **73** are established between the contact tips **75** and the relatively stationary pressure-generating contact fingers **76**. During the existence of relatively high-amperage currents, the upper ends of the pressure-generating arc **73** may transfer to a surrounding end metallic shell member **77** in a manner more fully brought out and described in United States patent application filed August 27, 1959, Serial No. 836,405, now U.S. Patent 3,110,791, issued November 12, 1963, to Wayne S. Aspey and Benjamin P. Baker, and assigned to the assignee of the instant application.

As illustrated in FIG. 3 of the drawings, the electrical circuit passing through the arc-extinguishing unit **13** generally comprises terminal stud **30**, relatively stationary contact structure **32**, left-hand movable interrupting contact **34**, connecting portion **78**, movable pressure-generating contact **52**, relatively stationary pressure-generating contact **76**, conducting support plate **79**, relatively stationary pressure-generating contact **76**, movable pressure-generating contact **52**, connecting portion **78**, right-hand movable interrupting contact **34**, right-hand relatively stationary contact structure **32** and to the right-hand terminal stud **30**.

During the opening operation the movable interrupting contacts **34** are moved downwardly within guide and fluid directing structures **80**, generally comprising a tubular guide **81** having a lower portion **82**, which extends through an opening **83** provided in the lower wall **84** of the insulating interrupting tube **40**. In addition, an annular split clamping ring **85** encompasses the lower portion **82** of the guide tube **81**. Surrounding the tubular guide **81** is a sleeve **86** of an arc-resistive material, such as polytetrafluoroethylene.

It will be noted that the upper end of the tubular guide member **81** has a plurality of jet apertures **87** provided therein. These jet apertures **87** register with openings **88** provided in a sleeve **89**, also formed of polytetrafluoroethylene. The lower end of the sleeve **89** abuts a guide and sealing ring **90** also formed of polytetrafluoroethylene. Disposed within an orifice opening **91**, provided at the upper side of the interrupter tube **40**, is an orifice member **92**, also formed of polytetrafluoroethylene. Partially surrounding the external side **93** of the interrupter tube **40** is a shield **94** formed of polytetrafluoroethylene. In addition, disposed within the cylindrical supports **25** (FIG. 4) are shields **96**, formed of polytetrafluoroethylene to protect the metallic supports **25** from the action of the interrupting arc **39**.

During the opening operation, as previously explained, the two movable contact structures **97**, comprising the interrupting contacts **34**, **52** and the interconnecting conducting portions **78**, move downwardly, as a unit, to simultaneously establish a pair of pressure-generating arcs **73** and a pair of interrupting arcs **39**. The two pressure-generating arcs **73** set up an extremely high pressure within the region **46** within the interrupting tube **40**. The fluid, under pressure within the region **46**, is ejected through the registered openings **87**, **88** and through the orifice opening **99** to the region **100** externally of the

tube **40** and adjacent the relatively stationary contact structures **32**, as illustrated by the arrows **101** in FIG. 3. Arc-extinguishing action quickly follows, and the U-shaped movable contact structures **97** move downwardly to an open circuit position, such as illustrated in FIG. 4 of the drawings.

From the foregoing description of the invention it will be apparent that there is illustrated a novel interrupting structure **13** particularly suitable for the use of the liquefied gases, such as set forth in the United States patent application filed September 13, 1957, Serial No. 683,760, now U.S. Patent 3,150,245, issued September 22, 1964, to Winthrop M. Leeds and Benjamin P. Baker, and assigned to the assignee of the instant application.

Although the interrupting structure **13** has particular advantage when used with a liquefied gas, it is to be noted that a certain degree of interrupting effectiveness is also available by using the same interrupting structures with a suitable ordinary arc-extinguishing fluid, such as liquid, for example circuit-breaker oil.

From the foregoing description of the present invention, it will be apparent that there are disclosed novel types of circuit interrupters utilizing liquefied gas or the gas injected into the arcing zone. Although liquefied SF_6 has been used as an example of a possible liquefied gas, in describing the structure, it is to be clearly understood that liquefied selenium hexafluoride, or any one or a mixture of two or more of liquefied gases enumerated below may be employed in substitution of liquid SF_6.

The gases which are suitable for use in interrupters of the type considered, have similar properties and characteristics as set out in the following table.

	Boiling Point, ° C.	Vapor Pressure, #/sq. in. Gauge at 20° C.	Dielectric Strength Compared With Air or N_2
CO_2	−78	830	0.9
SO_2	−10	35	2.0
SF_6	−63.8	300	2.2
SeF_6	−34.5	----------	2.9
SOF_2	−30	160	2.5
CCl_2F_2	−28	68	2.4
ClO_3F	−47.5	139	3.0
C_2F_6	−78	----------	1.8
C_3F_8	−37	----------	2.0
$CClF_3$	−81.5	325	1.4
CF_3Br	−58	195	1.25

Although the foregoing liquefied gases may be used to advantage, exceptional and unusual performance is obtained with liquefied SF_6, and liquefied SeF_6, since the gaseous phases of these two materials are so highly effective in arc interruption and high dielectric insulation.

Disposed at the upper end of the side support plates **102** is a pair of bumpers **103**, provided by an overlying channel member **104**, biased upwardly by compression springs **105**. Thus, upon downward retracting movement of the operating cross-head **49**, the channel member **54** will strike the upper surfaces of the channels **104** and be resiliently brought to a cushioned stop.

FIG. 4 illustrates a modified type of arc-extinguishing unit, generally designated by the reference numeral **107**. Many features of the modified unit **107** are similar to the unit **13** illustrated in FIG. 3 of the drawings; consequently, the same reference characters have been employed, where possible.

In place of using an insulating interrupter tube **40**, as was the case with the unit **13** of FIG. 3, a metallic interrupter tube **108** is employed. Aluminum has proved to be a very desirable metallic material to employ for the interrupter tube **108**. Disposed within the interrupter tube **108**, adjacent opposite ends thereof, are activated alumina filters **109**, which purify the gas following its interrupting function. The U-shaped movable bridging contact structures **97** are substantially the same as before. However, it will be observed that insulating grommet seals **110** formed of polytetrafluoroethylene are employed. The interrupting orifices **112** are of simplified construction, and are also preferably formed of polytetrafluoroethylene. The operating linkage is substantially the same as described heretofore in connection with FIG. 3 of the drawings; consequently, a further description thereof appears unnecessary. By utilizing an aluminum pressure tube **108**, the interrupter **107** is less complicated and less expensive. In addition, the metal is particularly suitable for its pressure-resistant function. As shown, there are provided two polytetrafluoroethylene interrupter orifices **112** and four polytetrafluoroethylene grommet seals **110**. A sheet of polytetrafluoroethylene **111** is provided to protect the lower wall of the aluminum pressure tube **108** from the effects of arcing. In addition, a sheet **113** is provided on top of the aluminum tube **108** to prevent the arcs from striking the top of the aluminum tube.

The moving contact system, as before, consists of two U-shaped members insulated from each other and mounted upon a race-track device. The contact operating means comprises a pair of levers, each with a gear segment, and both are driven by a common rack **60**, which, in turn, is driven by the upstanding insulating operating rod **17** extending to ground potential. The outer ends of the two levers **57**, as before, are provided with rollers **56**, which engage the race-tracks **55** to drive the movable contacts **34**, **52** in a vertical motion. The tracks **55** thus move up and down but are not restrained in their lateral motion to allow self-alignment with the interrupter and accessibility for maintenance and inspection. By having the interrupter tube **108** formed of metal, there is assurance that the interrupter tube is at the same floating potential as is the casing **18** in the fully open-circuit position of the interrupter **107**.

By the particular mechanism construction illustrated, it will be observed that toward the end of the closing operation, the force exerted upwardly on the race-tracks **55** by the rollers **56** is increased due to the angular position of the operating cranks **57**. In other words, the torque exerted against the driving motion of the double-sided gear rack **60** results due to a shorter lever arm distance in a higher force being imposed upon the cross-head structure **49** at the end of the closing stroke, as illustrated in FIG. 3 of the drawings.

From the foregoing description, it will be apparent that there are provided considerable improvements over the interrupting construction set forth in the aforesaid patent application Serial No. 836,405.

The metallic pressure-resistant interrupter housing **114** of the modified arc-interrupting unit **107** has associated therewith, as shown, a pair of communicating passages **115**, **116**, which lead to a liquid-level measuring device, not shown, such as of the type set forth in United States patent application filed December 7, 1960, Serial No. 74,387 now U.S. Patent 3,099,724, issued July 30, 1963, to Sheldon D. Silliman and Bernard R. Johnson, and assigned to the assignee of the instant application. Briefly, such a liquid-level measuring device indicates the particular location of the liquid level **117** of the liquefied gas disposed within the housing **114**, and is operable to set up an alarm circuit should the level **117** drop too low, due to a tank leak and consequently render the extinguishing unit **107** ineffective to accomplish its desired interrupting task.

A distinct advantage of the crank-arm mechanism **118** of the present invention, together with the lower coupling **56** between the free ends of the crank-arms **57** and the race-ways **55** of the channel-shaped cross-head member **54** is that there is consequently omitted any lateral force exerted upon the movable contact assemblage. This is a distinct advantage since, if there were such lateral biasing force, there might result jamming of the movable contact rods **34**, **52** through the several bushings **80**, **119** and **110**. As a result, the entire movable contact

assemblage is moved to its open and closed-circuit positions by forces having components only in the vertical direction, and not accompanied by laterally-directed forces. Straight-line contact movement is the result with no binding forces being encountered during such movement.

The particular crank-arm mechanism **118** in addition also insures simultaneous movement of the two crank-arms **57** so that they will be operated in unison.

Although there has been illustrated and described specific structures, it is to be clearly understood that the same were merely for the purpose of illustration, and that changes and modifications may readily be made therein by those skilled in the art, without departing from the spirit and scope of the invention.

What is claimed is:

1. The combination in a live-tank fluid-blast type of circuit interrupter including a metallic pressure-resistant arc-extinguishing housing, a hollow insulating column for supporting said metallic pressure-resistant arc-extinguishing housing up in the air and adequate distance above ground potential, a pair of terminal bushings extending into said housing and carrying a pair of relatively stationary contacts at the interior ends thereof, a pressure-resistant metallic interrupting chamber disposed interiorly within said housing and electrically connected to the outer metallic housing, said pair of relatively stationary contacts being situated adjacent one side of said pressure-resistant metallic interrupting chamber, a pair of relatively stationary pressure-generating contacts disposed within said metallic interrupting chamber and electrically connected thereto, a pair of spaced-apart movable U-shaped contact structures, each movable U-shaped contact structure including a movable interrupting contact and a movable pressure-generating contact, the movable interrupting contact being cooperable with one of said first-mentioned relatively stationary contacts and the movable pressure-generating contact being cooperable with one of said relatively stationary pressure-generating contacts, a movable cross-head for carrying the pair of movable U-shaped contact structures, operating mecahnism for driving the cross-head comprising a pair of spaced-apart driving cranks having driving rollers adjacent the free ends thereof, means defining a race-way secured to and movable with said cross-head for accommodating the two driving rollers, a double-sided driving rack movable during the opening and closing operations of the circuit breaker for simultaneously driving said driving cranks in opposite directions of rotation at substantially the same speed, and an insulating operating rod extending upwardly interiorly of said insulating column and having said double-sided driving rack secured thereto adjacent the upper end thereof, whereby the capacitance effects of the terminal bushings and the electrical connection between the inner metallic interrupting chamber and the outer metallic housing will assist in voltage division among the breaks during the opening operation.

2. A fluid-blast type of circuit interrupter including a metallic arc-extinguishing housing having a pair of terminal bushings extending therewithin, a metallic pressure-resistant interrupting chamber disposed within said housing and electrically connected thereto, a pair of spaced-apart relatively stationary contact structures supported by said pair of terminal bushings and situated adjacent one side of said metallic pressure-resistant interrupter chamber, a pair of relatively stationary pressure-generating contacts disposed within said metallic interrupting chamber and secured adjacent one interior wall thereof and electrically connected thereto, a pair of spaced-apart movable U-shaped contact structures, each movable U-shaped contact structure including a movable interrupting contact and a movable pressure-generating contact, the movable interrupting contact being cooperable with one of said first-mentioned relatively stationary contact structures and the movable pressure-generating contact being cooperable with one of said relatively stationary pressure-generating contacts, an insulating orifice structure to shield the passage of each movable interrupting contact from the metallic interrupting chamber from said one side thereof, whereby the establishment of two serially related pressure-generating arcs interiorly of said metallic pressure-resistant interrupting chamber generates pressure therein to effect the extinction of the two serially related interrupting arcs drawn between the relatively stationary and the movable interrupting contacts, and whereby the capacitance effects of the terminal bushings and the electrical connection between the inner metallic interrupting chamber and the outer metallic housing will assist in voltage division among the breaks during the opening operation.

3. The combination in a live-tank fluid-blast type of circuit interrupter including a metallic pressure-resistant outer arc-extinguishing housing, a pair of terminal bushings extending into said metallic pressure-resistant housing and carrying a pair of relatively stationary contacts at the interior ends thereof, a metallic pressure-resistant internally-located interrupting chamber disposed within said outer housing and spaced from said relatively stationary contacts, said metallic interrupting chamber being electrically connected to the outer metallic housing, a pair of relatively stationary pressure-generating contacts secured adjacent an inner wall of said metallic inner interrupting chamber and electrically connected thereto, a pair of spaced-apart U-shaped movable contact structures movable through four insulated openings along the opposite side wall of said inner metallic interrupting chamber for establishing a pair of interiorly-disposed pressure-generating arcs and a pair of serially-related interrupting arcs, and a stationary insulating orifice structure for each movable contact structure secured adjacent the pair of pressure-generating contacts, whereby the capacitance effects of the terminal bushings and the electrical connection between the inner metallic interrupting chamber and the outer metallic housing will assist in voltage division among the breaks during the opening operation.

4. A fluid-blast type of circuit interrupter including a metallic arc-extinguishing housing having a pair of terminal bushings extending therewithin, a pressure-resistant metallic interrupting chamber disposed within said housing and electrically connected thereto, a pair of spaced-apart relatively stationary contact structures supported by said pair of terminal bushings and situated adjacent one side of said pressure-resistant metallic interrupting chamber, a pair of insulating orifice openings provided in said one side of said metallic pressure-resistant interrupting chamber, a pair of relatively stationary pressure-generating contacts disposed interiorly of said metallic interrupting chamber and secured to an inner wall thereof and electrically connected thereto, a pair of spaced-apart movable U-shaped contact structures movable into the opposite side of said metallic interrupting chamber through insulated openings, each movable U-shaped contact structure including a movable interrupting contact and a movable pressure-generating contact, the movable interrupting contact of each movable U-shaped contact structure being movable through the insulating orifice opening and into engagement with one of said relatively stationary contact structures, and the associated movable pressure-generating contact of each U-shaped movable contact structure being cooperable with one of said interiorly-located relatively stationary pressure-generating contacts for generating pressure within the metallic pressure-resistant interrupting chamber to create an arc-extinguishing flow through the orifice openings, whereby the capacitance effects of the terminal bushings and the electrical connection between the inner metallic interrupting chamber and the outer metallic

housing will assist in voltage division among the breaks during the opening operation.

References Cited by the Examiner

UNITED STATES PATENTS

1,824,903	9/31	Kuhn	200—150
2,138,191	11/38	Noyes	200—151
2,252,983	8/41	Rossman	200—150
2,292,547	8/42	Sadler	200—150
2,843,706	7/58	Oppel	200—148
2,933,576	4/60	Friedrich et al.	200—150
3,052,783	9/62	Buron	200—148

3,110,791	11/63	Aspey et al.	200—145

FOREIGN PATENTS

444,824	8/12	France.
661,181	6/38	Germany.
5,400	1826	Great Britain.
394,741	7/33	Great Britain.

KATHLEEN H. CLAFFY, *Primary Examiner.*

MAX L. LEVY, ROBERT K. SCHAEFER, BERNARD A. GILHEANY, *Examiners.*