

April 4, 1961

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2,978,559

BUSHING MOUNTED INTERRUPTER

Filed Dec. 16, 1957

3 Sheets-Sheet 1

FIG. 1-

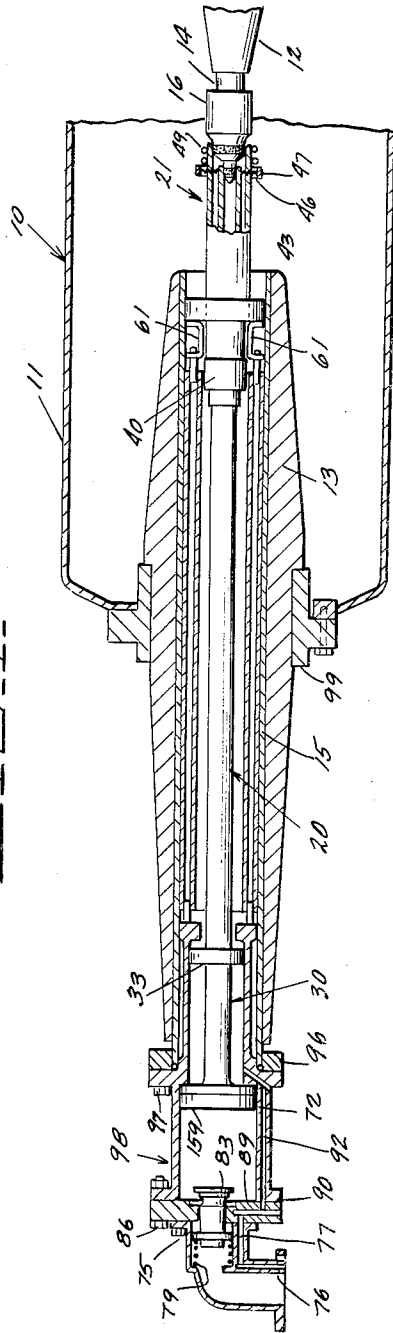
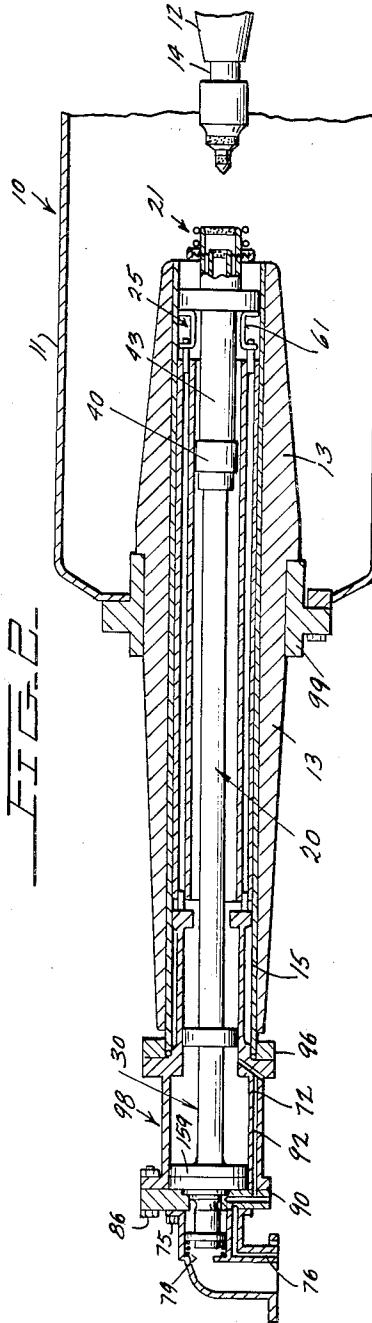


FIG. 2-



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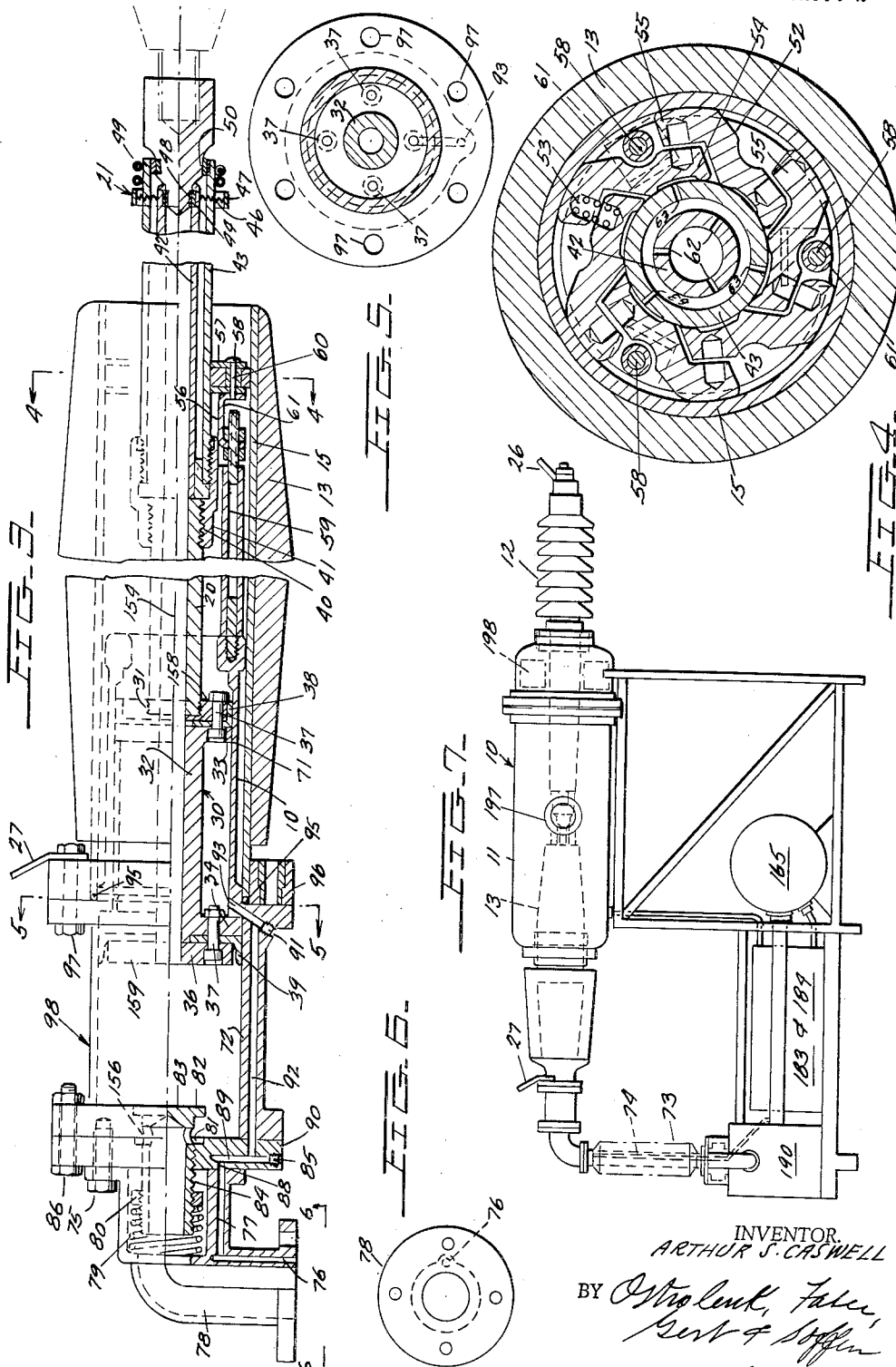
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3 Sheets-Sheet 2



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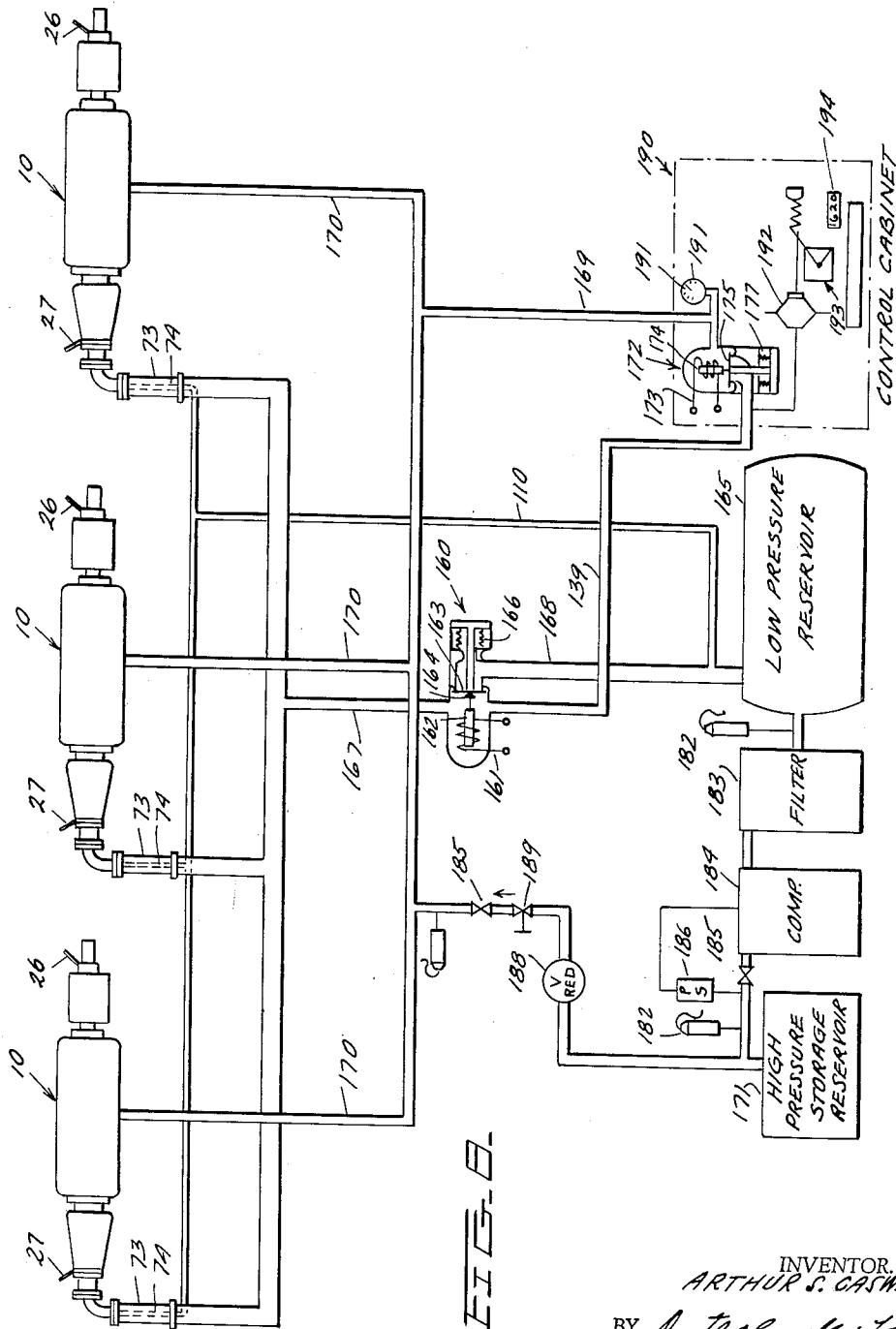
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BUSHING MOUNTED INTERRUPTER

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3 Sheets-Sheet 3



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BUSHING MOUNTED INTERRUPTER

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7 Claims. (Cl. 200—148)

This invention relates to circuit interrupters of the recirculating gas blast type and more particularly to a gas blast circuit interrupter having a bushing mounted interrupter assembly which is readily detachable and removable from the interrupter unit tank for ease of contact inspection and replacement.

When a circuit interrupter protecting a current carrying line is opened, an electric current arc is drawn between the parted contacts. At this time rapid interruption of the arc and the prevention of restrike once interruption has taken place are of prime consideration.

A gas blast directed at the arc hastens the deionization thereof by cooling the arc and exhausting the hot arcing products from the region between the parted cooperating contacts. All other factors being equal, the larger the gap between the parted contacts the lesser the likelihood of arc restrike. But a larger gap necessarily means a greater overall size for the interrupter. However, by raising the pressure of the gas in the gap, the separation distance between the parted contacts may be reduced without danger of restrike at a given voltage. That is, the ability of a dielectric gas to resist breakdown at a given voltage gradient increases as the gas pressure increases except at pressures considerably below atmospheric pressure.

It has been found that the so called electronegative gases, such as sulphur hexafluoride (SF_6) and sulphur monofluoride (SF_2), are superior to air in their deionizing and dielectric properties thereby making them particularly useful in arc interruption. When gases other than air are used a recirculating gas system should be employed because of the high cost of these gases. Further, a recirculating system prevents the external introduction of contaminants into the gas and includes filters to remove arcing products thereby assuring a continuous supply of gas in which the dielectric strength, cooling properties, and interrupting ability is at a maximum.

Gas blast interrupters of the prior art usually stored high pressure gas in a tank forming part of the interrupter structure. At the instant of contact separation, or immediately prior thereto, a valve operatively connected to the contacts was opened to introduce the high pressure gas in the gap between the parted contacts. The introduction of high pressure gas was accompanied by turbulence which decreased the gas flow rate along the arc stream thereby preventing a rapid arc extinction. In interrupters employing a bridging member moving transversely with respect to the stationary contacts, the initial gas blast was required to transfer the arc from the bridging contact to a stationary contact rather than cool the arc, thereby further delaying arc extinction.

Part of the blast gas was often diverted to open an isolating switch when interruption was complete since in open gas systems the gap between the parted contacts is occupied by air and not an electronegative gas. The contacts were reclosed by springs as the blast pressure dropped. Closing the isolating switch once again completed the circuit.

The circuit interrupter of the instant invention includes an individual interrupter unit for each phase of the electrical system being protected. Each interrupter unit comprises an elongated tank having a first stationary contact entered through one end and a bushing mounted interrupter assembly entered through the other end.

The bushing mounted interrupter assembly comprises a conducting sleeve, which serves as a second stationary contact, a movable contact and a bridging contact finger assembly to electrically connect the second stationary contact to the movable contact. Operation of the circuit interrupter is achieved by utilizing the differential piston principle fully described in copending application Ser. No. 667,204 filed June 21, 1957 now Patent No. 2,905,793, issued September 22, 1959 and assigned to the assignee of the instant invention, thereby eliminating closing springs which would close the interrupter upon a loss of gas pressure unless the interrupter also included costly latch means to maintain the interrupter latched open.

The device of previously mentioned application Ser. No. 667,204 includes an assembly which serves substantially the same function as the bridging contact finger assembly. However, this assembly of application Ser. No. 667,204 is secured to the movable contact and movable therewith. In the device of the instant invention the bridging contact finger assembly is held stationary during interrupter operation to minimize the number and mass of moving parts thereby increasing the speed of the movable contact.

A garter spring or similar resilient means acting transverse to the path of the movable contact, is provided to assure high pressure contact between the movable contact and the first stationary contact. This same resilient means also serves to compress the movable contact once it is free of the first stationary contact thereby reducing the frictional forces acting between the second stationary contact and the movable contact finger assembly to further contribute to speed of operation.

Construction of my novel interrupter unit is such that the mere removal of several cap screws will enable the entire bushing mounted interrupter assembly to slide free of the bushing to which it is mounted. After the interrupter assembly has been withdrawn from its bushing a tool may be inserted through this bushing for removal of the first stationary contact. Thus, both the movable and stationary contacts, as well as the operating mechanism of the interrupter assembly, are conveniently and quickly removable from the interrupter unit tank for the purposes of inspection, replacement, and repair.

Further my novel recirculating gas blast circuit interrupter includes a dead tank construction. That is, the interrupter housing or tank may be grounded thereby reducing the number of porcelain insulators to a minimum and conveniently enabling an inexpensive current transformer to be disposed within the tank.

The interrupter unit tank is directly connected to a source of high pressure dielectric gas so that the contacts are immersed in the high pressure gas at all times. Thus, when the circuit interrupter is open the space between the parted contacts is occupied by a gas having insulating qualities superior to air at atmospheric pressure. Since high pressure gas surrounds the contacts when the circuit interrupter is closed, a smooth gas flow will act on the arc from the moment of its inception. Smooth gas flow assures maximum interrupting and dielectric properties since arcing products are rapidly carried away from the arcing gap. Suitable filters are provided to remove the products of arcing and thereby assuring that a continuous supply of uncontaminated gas will be continuously introduced into the arcing gap.

Accordingly, a primary object of the instant invention is to provide a circuit interrupter of the recirculating gas

blast type wherein the cooperating contacts are always immersed in a high pressure dielectric gas thereby permitting smaller creepage distances, better heat transfer, and faster arc interruption.

Another object is to provide a construction for a recirculating gas blast breaker in which the cooperating contacts may readily be removed from the tank for purposes of inspection, repair, and replacement.

Still another object is to provide a construction for a recirculating gas blast breaker in which the speed of the movable contact is exceptionally rapid.

A further object is to provide a construction for a recirculating gas blast breaker in which the arc drawn between the cooperating contacts is subjected to a smoothly flowing gas blast from the moment of arc inception thereby achieving rapid arc interruption and also preventing restriking of the arc.

A still further object is to provide a novel recirculating gas blast type circuit interrupter including a bushing mounted interrupter unit tank.

Yet another object is to provide an interrupter unit including a stationary bridging contact finger assembly which is in wiping contact with the movable contact and a single spring means which biases the cooperating contacts into good electrical contact and also acts to reduce the frictional engagement between the bridging contact finger assembly and the movable contact for substantially the entire movement thereof.

Still another object is to provide a recirculating gas blast interrupter in which the only insulators extending into the tank are the two bushings through which the current bearing members enter the tank.

These as well as other objects of the instant invention shall become apparent after reading the following description of the accompanying drawings in which:

Figures 1 and 2 are fragmentary views of my novel interrupter unit in the closed and open positions respectively.

Figure 3 is an enlarged view showing selected portions of Figure 1 in greater detail.

Figures 4 and 5 are cross sections taken through lines 4—4 and 5—5, respectively, of Figure 3 looking in the direction of arrows 4—4 and 5—5, respectively.

Figure 6 is an end view of the elbow of Figure 3 looking in the directions of arrows 6—6.

Figure 7 is a side elevation of my novel circuit interrupter.

Figure 8 is a schematic representation of a three conductor system protected by the circuit interrupter of the instant invention.

Referring to the figures, each interrupter unit 10 comprises an elongated tank 11 having insulating bushings 12 and 13, entered through appropriate seals 99, at the ends thereof. Tank 11 may be constructed of insulating or conducting materials as design considerations may dictate. Bushing 12 is of the conventional type having conducting stud 14 passing therethrough and current transformer 198 mounted thereon. Stationary contact 16 is secured to the end of stud 14 which is entered into tank 11. Bushing 13 is formed over a current carrying tube 15 through which a bushing mounted interrupter assembly 20 is inserted, operated, and withdrawn for maintenance and inspection. Glass covered porthole 197 is provided in the side of tank 11 opposite contact 16.

Bushing mounted interrupter assembly 20 includes moveable contact assembly 21 which is engageable at end 22 thereof with stationary contact 16. A stationary bridging contact assembly 25 is also included as a contact means between tube 15 and moveable contact assembly 21 when moveable contact 22 is in engagement with stationary contact 16. With the interrupter unit 10 closed, Figure 1, the current path through interrupter unit 10 comprises connection clip 26, stud 14, stationary contact 16, movable contact assembly 21, bridging contact assembly 25, tube 15 and connection clip 27.

Moveable contact assembly 21 comprises a hollow tubular member carrying a differential piston 30 at one end by means of threaded section 31. Differential piston 30 comprises a central hollow cylindrical portion 32 having a small diameter flange 33 at the right end and a large diameter flange 34 at the left end.

Rings 35, 36 secured to flanges 33, 34 respectively by means of fasteners 37 retain small piston ring 38 and large piston ring 39 to flanges 33, 34 respectively. The purpose of differential piston 30 shall be hereinafter explained.

Movable contact 21 is secured to the other end of member 29 at element 40 thereof which engages threads 41. Element 40 carries inner 42 and outer 43 hollow cylindrical members which carry the movable arcing 44 and main 45 contacts respectively. A plurality of compression springs 46 extend radially inward from circumferentially spaced depressions in outer cylinder 43 thereby urging movable arcing contact 44 into good electrical engagement with stationary arcing contact 48 while garter spring 49 positioned on the outside of cylinder 43, and of greater strength than springs 46, urges movable main contact 45 into good electrical engagement with stationary main contact 50.

Bridging contact assembly 25 comprises a plurality of stepped contact members 52 and a plurality of compression springs 53. Contact members 52 are arranged in a circle with the upper step 54 of one contact 52 being in radial alignment with the step 55 of the adjacent contact 52 located counterclockwise thereof. Contact members 52 are journaled by spaced ring guides 56, 57 which are secured to three rods 59 by means of rivets 58, sleeves 60 and brackets 61. Rods 59 extend longitudinally from the reduced section 71 of differential cylinder 70 and are circumferentially spaced thereabout.

Thus, a movable contact assembly 21 is moved between the contact engaged and contact disengaged positions of Figures 1 and 2, contact members 52 remain in a longitudinally fixed position. During this time contact members 52 are biased by springs 53 into contact with the inside surface of bushing tube 15 and the outside surface of outer cylinder 43. Note that cylinders 42, 43 are both longitudinally slit at 62, 63 respectively for a substantial portion of their lengths so as to enable springs 46 and 49 to act effectively in maintaining good electrical contact between movable contact assembly 21 and stationary contact 16. The presence of slits 63 in outer cylinder 43 acts to reduce the contact pressure between contact members 52 and outer cylinder 43 as contact assembly 21 is moving between the contact engaged and disengaged positions thereby reducing operating force requirements and achieving fast contact movement. In the contact engaged position stationary contact 16 will force the split segments of outer cylinder 43 outwardly into good electrical contact with contact members 52.

Differential cylinder 70 is formed in casting 98 which is secured by means of fasteners 97 to collar 96, welded or otherwise secured to the end of conducting tube 15, with O-ring gasket 95 providing a gas tight seal. The bore of small cylinder 71 is of substantially the same diameter as large piston ring 39. Since the central portion 32 of differential piston 30 is of a smaller diameter than the bore of small cylinder 71, a bleed chamber 94 is formed between central portion 32 and differential piston 30. Communicating, small diameter, bleed passages 92 and 93 are bored through casting 98 with one end of passage 92 being plugged by screw 91 and the other end of passage 92 communicating with bleed chamber 94.

Valve casting 90, having communicating, small diameter, bleed passages 87—89, is secured by means of fasteners 86 to casting 98 and positioned so that bleed passage 87 communicates with bleed passage 92. Screw 85 plugs the end of bleed passage 89 extending to the outside of valve casting 90.

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Valve sleeve 84 is inserted in a central opening through valve casting 90 and acts as a guide for valve 83 which is moveable longitudinally. Flange 82 at one end of valve 83 cooperates with countersunk area 81 of casting 90 to provide a gas seal when interrupter unit 10 is being opened. Collar 80, secured to valve 83, limits valve travel in the open valve direction or the direction in which compression spring 79 is urging valve 83.

Elbow casting 78, having bleed passages 76, 77 is secured by means of fasteners 75 to valve casting 90 and positioned with bleed passage 77 in communication with bleed passage 88 of valve casting 90. Thus a complete bleed passage extends from bleed chamber 94 into insulating blast tube 73 which is suitably fastened to elbow casting 78. This complete bleed passage comprises, in order, bleed passages 93, 92, 87, 89, 88, 77 and 76. Insulating bleed tube 74 passes through blast tube 73 and serves to connect bleed passage 76 with low pressure reservoir 165 for a reason to be hereinafter explained.

Bleed passage 93 is so positioned that it is in communication with bleed chamber 94 for all positions of differential piston 30. It is neither practical nor economical to maintain a perfect seal between piston rings 38, 39 and the small 71 and large 72 portions of cylinder 70 so that the gas that does leak past must be bled off to low pressure reservoir 165. If the pressure in chamber 94 is permitted to build up, differential action of piston 30 would be impossible.

With the interrupter unit 10 in the closed position of Figure 1, high pressure gas is present on both the front 158 and back 159 faces of differential piston 30. To open interrupter unit 10 blast valve 160 is opened by applying power to coil 161 which attracts plunger 162 to the left with respect to Figure 8 and thereby moves the pilot valve disc 164 off seat 163 against the force of spring 66. Blast tube 73 communicates with low pressure reservoir 165 through gas line 167, and gas line 168, connected between blast valve 60 and low pressure reservoir 165.

Now the pressure on front face 158 is high and the pressure on back face 159 is low so that differential piston 30 will be driven to the left, engaging valve 83 and driving flange 82 into depression 81 thereby closing off the passage through sleeve 84. As soon as an arc is drawn between moveable contact 21 and stationary contact 16 the arc will be subjected to a smooth flowing gas blast, flowing from tank 11 to low pressure reservoir 165, which cools and deionizes the arc bringing about its rapid extinction. The arcing products are rapidly removed from the arcing gap by the gas blast and carried through the moveable contact passage 154, casting 98, side opening 156 in valve 83, elbow casting 78, blast tube 73 and gas lines 167, 168 to low pressure reservoir 165. Slits 63 permit the gas blast to be initiated at the moment blast valve 160 is opened.

By the time differential piston assembly 30 forces valve 83 into depression 81 the arc is extinguished and the gas blast is shut off by valve 83 which seals off the central chamber of casting 98 from the central passage of elbow casting 78. Valve 83 also serves as a gas trap and provides an air check at the end of the opening stroke. Spring 79 serves as a reset means for valve 83. Piston rings 38, 39 serve as a substantially gas tight seal between piston 30 and the inside walls of cylinder 70. High pressure gas is present in the gap between cooperating contacts 21, 16 since tank 11 is connected through gas line 169 to high pressure reservoir 171 thereby preventing arc restrike.

When blast valve 160 is closed by deenergizing coil 61, interrupter unit 10 will not close immediately since chamber blast tube 73 is not as yet filled with high pressure gas. Closing valve 172 must first be opened by energizing coil 173 which attracts plunger 174 and moves valve disc 175 upward off seat 176 against the force of biasing spring 177. At this time high pressure gas line 169 is

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connected to gas line 139 which in turn is operatively connected to blast tube 73. Valve 83 is constructed to leak sufficiently so that when closing valve 172 is energized the whole left face 159 of piston 30 is at high pressure. Now both faces 158, 159 of differential piston 30 are now at the same pressure level. However, the force on back face 159 exceeds that on front face 158 since 159 has a larger area than face 158. Thus differential piston 30 will be forced forward until cooperating contacts 21, 16 are in the engaged position of Figure 1.

The net force acting on piston 30 through the walls of bleed chamber 94 is negligible since it is due to low pressure gas. It is essential that bleed chamber 94 be maintained at low pressure or else any leakage of high pressure gas from tank 11 passed ring 38 into chamber 94 will soon equalize the forces acting on the differential piston 30 and prevent operation of the interrupter from the open position of Figure 2 to the closed position of Figure 1.

Filter unit 183 is interposed between the input of compressor 184 and low pressure reservoir 165 to remove arcing products from the gas after it has interrupted a first arc and before it will be played on a second arc. The output of compressor 184 is connected to both high pressure storage reservoir 171 and high pressure gas line 169 to assure a continuous supply of high pressure gas within tank 11. Safety valves 182 are strategically placed throughout the system to bleed excess pressures back to low pressure reservoir 165 and prevent damage because of excessive gas pressures.

High pressure gas line 169 also has located therein check valves 185, a shut off valve 189, reducing valve 188, and pressure switch 186. Reducing valve 188 controls the pressure level within tanks 11 even though the pressure in high pressure reservoir 171 or compressor 184 responsive to the pressure in high pressure reservoir 171. Check valves 185 prevent a loss of pressure in tanks 11 even though the pressure in high pressure reservoir 171 or compressor 184 should drop below that of tank 11.

Control cabinet 190 houses pressure gauge 191 and operation counter 194 which is operated by means of auxiliary switch 193 and air valve 192 connected to gas line 139.

The three interrupter units 10 of Figure 8 may each be connected in series with an individual current carrying line of a multi-phase system to provide a break in each line. However, for severe interrupting conditions two or more interrupter units 10 may be serially connected to produce one, two, three, etc. breaks in a single power line.

The recirculating gas system also contributes in part to a compact construction by supplying non-contaminated gas to the interrupter. Because of this, the safety factor used in calculating creepage distances within the tank 11 of the interrupter unit 10, may be kept to a minimum since dirt and arcing products are not likely to build up on the insulating surfaces to impair their effectiveness as insulators.

Servicing of my novel interrupter unit 10 is especially simple since by merely removing fasteners 97, after elbow casting 73 is removed, bushing mounted interrupter assembly 20 may be parted from the remainder of interrupter unit 10 along line 5—5 of Figure 3, and pulled outward to the left. Thereafter, a tool may be inserted through conducting tube 15, which acts as one stationary contact, to remove the stationary contact 16 mounted to the end of stud 14. Thus, a gas blast circuit interrupter of especially compact and simplified construction has been provided. The construction is such that accidental or unscheduled operation of the interrupter is prevented. That is, the cooperating contacts are operated both into and out of engagement by means of gas pressure acting without the aid of springs. High pressure gas must be available for interrupter opera-

tion. Furthermore, a loss of control circuit power cannot result in interrupter operation since a positive energization of the gas valves is required to affect movement of the cooperating contacts.

In the foregoing, this invention has been described only in connection with preferred embodiments thereof. Many variations and modifications of the principles of this invention within the scope of the description herein are obvious.

Accordingly, I prefer to be bound not by the specific disclosure herein, but only by the appending claims.

I claim:

1. A circuit interrupter comprising an elongated tank, a first and a second insulating bushing entered through opposite ends of said tank, a stud entered into said tank through said first bushing, an interrupter assembly mounted to said second bushing; a stationary contact secured to the end of said stud entered into said tank; said second bushing being formed upon a conducting tube; said interrupter assembly including a movable contact assembly movable along its own axis, which coincides with the longitudinal axis of said tube, between a first and a second position wherein said movable contact assembly is in and out of engagement respectively with said stationary contact; means electrically connecting said movable contact assembly and said tube; said interrupter assembly including a differential piston; said tank being connected to a source of high pressure gas whereby a first end of said differential piston is always acted upon by said high pressure gas; means selectively connecting a second end of said differential piston to a source of low pressure gas and said source of high pressure gas whereby said movable contact assembly is operated in both directions between its said first and said second positions by gas pressure; means interconnecting said sources of gas to form a recirculating system.

2. A circuit interrupter comprising an elongated tank, a first and a second insulating bushing entered through opposite ends of said tank and secured thereto, a stud entered into said tank through said first bushing, an interrupter assembly mounted to said second bushing; a stationary contact secured to the end of said stud entered into said tank; said second bushing being formed upon a conducting tube; said interrupter assembly including a movable contact assembly movable along its own axis, which coincides with the longitudinal axis of said tube, between a first and a second position wherein said movable contact assembly is in and out of engagement respectively with said stationary contact; means electrically connecting said movable contact assembly and said tube; said interrupted assembly being detachable from said second bushing by withdrawal through said tube while said second bushing remains secured to said tank.

3. A circuit interrupter comprising an elongated tank, a first and a second insulating bushing entered through opposite ends of said tank and secured thereto, a stud entered into said tank through said first bushing, an interrupter assembly mounted to said second bushing; a stationary contact secured to the end of said stud entered into said tank; said second bushing being formed upon a conducting tube; said interrupter assembly including a movable contact assembly movable along its own axis, which coincides with the longitudinal axis of said tube, between a first and a second position wherein said movable contact assembly is in and out of engagement respectively with said stationary contact; means electrically connecting said movable contact assembly and said tube; said interrupter assembly being detachable from said second bushing by withdrawal through said tube while said second bushing remains secured to said tanks; said stationary contact also being removable from said tank through said tube.

4. A circuit interrupter comprising an elongated tank, a first and a second insulating bushing entered through opposite ends of said tank and secured thereto, a stud

entered into said tank through said first bushing, an interrupter assembly mounted to said second bushing; a stationary contact secured to the end of said stud entered into said tank; said second bushing being formed upon a conducting tube; said interrupter assembly including a movable contact assembly movable along its own axis, which coincides with the longitudinal axis of said tube, between a first and a second position wherein said movable contact assembly is in and out of engagement respectively with said stationary contact; means electrically connecting said movable contact assembly and said tube; said means being part of said interrupter assembly and comprising a plurality of contacts and a biasing means urging a first end of each of said contacts into engagement with the inner surface of said tube and urging a second end of each of said contacts into engagement with an outer surface of said contact assembly; said contacts remaining in a longitudinal fixed position with respect to said tube as said movable contact assembly is operated into and out of engagement with said stationary contact; said interrupter assembly being detachable from said second bushing by withdrawal through said tube while said second bushing remains secured to said tank.

5. A circuit interrupter comprising an elongated tank, a first and a second insulating bushing entered through opposite ends of said tank, a stud entered into said tank through said first bushing, an interrupter assembly mounted to said second bushing; a stationary contact secured to the end of said stud entered into said tank; said second bushing being formed upon a conducting tube; said interrupter assembly including a movable contact assembly movable along its own axis, which coincides with the longitudinal axis of said tube, between a first and a second position wherein said movable contact assembly is in and out of engagement respectively with said stationary contact; means electrically connecting said movable contact assembly and said tube; said interrupter assembly including a two width cylinder and a differential piston; said cylinder including a first section of a first diameter and a second section of a second diameter smaller than said first diameter; said piston having a first end of substantially said first diameter and a second end of substantially said second diameter; said piston also having a central section of a third diameter less than said second diameter between its said first and said second ends; said piston being secured at its second end to said movable contact assembly; said tank being operatively connected to a high pressure source of dielectric gas; a first valve means selectively connecting said piston first end to a low pressure source of dielectric gas and said high pressure source; said movable contact assembly being operated to said first position by gas pressure when said piston first end is connected to said high pressure source and being operated to said second position by gas pressure when said piston first end is connected to said low pressure source.

6. A circuit interrupter comprising an elongated tank, a first and a second insulating bushing entered through opposite ends of said tank, a stud entered into said tank through said first bushing, an interrupter assembly mounted to said second bushing; a stationary contact secured to the end of said stud entered into said tank; said second bushing being formed upon a conducting tube; said interrupter assembly including a movable contact assembly movable along its own axis, which coincides with the longitudinal axis of said tube, between a first and a second position wherein said movable contact assembly is in and out of engagement respectively with said stationary contact; means electrically connecting said movable contact assembly and said tube; said interrupter assembly including a two width cylinder and a differential piston; said cylinder including a first section of a first diameter and a second section of a second diameter smaller than said first diameter; said piston having a first end of substantially said first diameter and a second end of sub-

stantially said second diameter; said piston also having a central section of a third diameter less than said second diameter between its said first and said second ends; said piston being secured at its second end to said moveable contact assembly; said tank being operatively connected to a high pressure source of dielectric gas; a first valve means selectively connecting said piston first end to a low pressure source of dielectric gas and said high pressure source; said moveable contact assembly being operated to said first position by gas pressure when said piston first end is connected to said high pressure source and being operated to said second position by gas pressure when said piston first end is connected to said low pressure source; a second valve means operatively positioned between said piston first end and said first valve means; said second valve means being biased open; said second valve means being engaged by said differential piston when said piston first end is connected to said low pressure source and when so engaged being operated closed.

7. A circuit interrupter comprising an elongated tank, a first and a second insulating bushing entered through opposite ends of said tank, a stud entered into said tank through said first bushing, an interrupter assembly mounted to said second bushing; a stationary contact secured to the end of said stud entered into said tank; said second bushing being formed upon a conducting tube; said interrupter assembly including a moveable contact assembly moveable along its own axis, which coincides with the longitudinal axis of said tube, between a first and a second position wherein said moveable contact assembly is in and out of engagement respectively with said stationary contact; means electrically connecting said moveable contact assembly and said tube; said interrupter assembly including a two width cylinder and a differential piston; said cylinder including a first section of a first diameter and a second section of a second diameter smaller than said first diameter; said piston having a first end of substantially said first diameter and a second end of substantially said second diameter; said piston also having a central section of a third diameter less than said second

diameter between its said first and said second ends; said piston being secured at its second end to said moveable contact assembly; said tank being operatively connected to a high pressure source of dielectric gas; a first valve means selectively connecting said piston first end to a low pressure source of dielectric gas and said high pressure source; said moveable contact assembly being operated to said first position by gas pressure when said piston first end is connected to said high pressure source and being operated to said second position by gas pressure when said piston first end is connected to said low pressure source; a second valve means operatively positioned between said piston first end and said first valve means; said second valve means being biased open; said second valve means being engaged by said differential piston when said piston first end is connected to said low pressure source and when so engaged being operated closed; a bleed chamber formed between said central section and said cylinder; said bleed chamber being operatively connected to said low pressure source for all positions of said differential piston.

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