Aug. 14, 1945. H. TRENCHAM 2,382,274

GAS BLAST ELECTRIC CIRCUIT BREAKER

Filed July 30, 1942

Fig. 1.

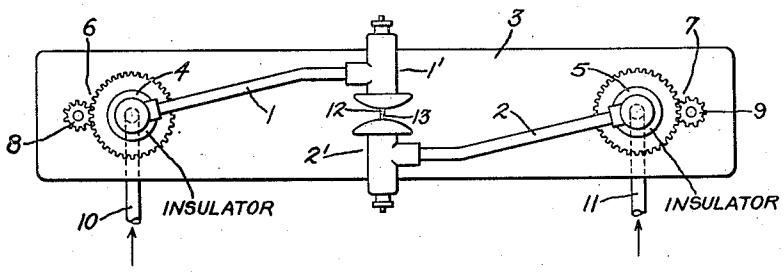


Fig. 2.

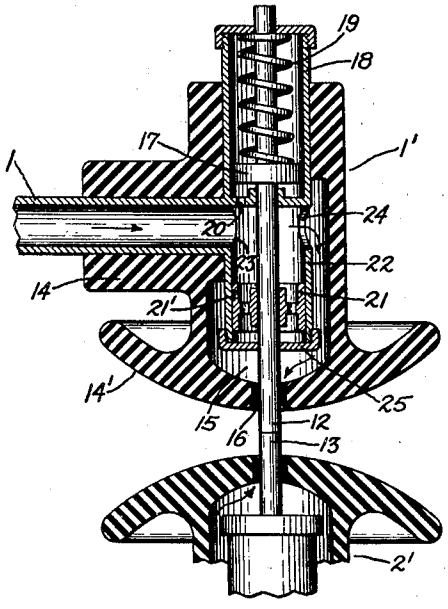
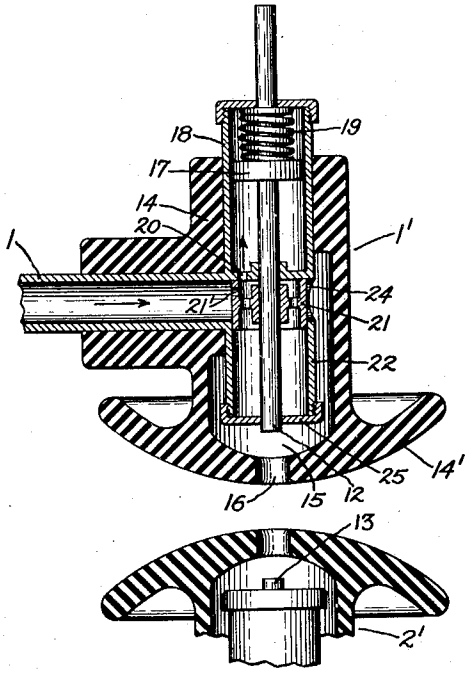


Fig. 3.



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GAS BLAST ELECTRIC CIRCUIT BREAKER

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Application July 30, 1942, Serial No. 452,832
In Great Britain September 29, 1941

4 Claims. (Cl. 200—148)

My invention relates to electric circuit breakers of the gas blast type, particularly for alternating current power circuits, and has for its principal object the provision of an improved gas blast circuit breaker that utilizes the supply of compressed air or other arc extinguishing gas to a minimum practicable extent consistent with positive and efficient circuit interrupting operation.

According to a specific application of my invention, this is accomplished by so constructing the movable element to which one of the circuit controlling contacts is attached or operatively connected that at the extremity of its opening movement it will shut off the supply of compressed air or gas from the main supply line to the arc gap, and that when the blast is so shut off the gas pressure will maintain the aforesaid contact in the open circuit position.

In carrying out the invention, the moving element carrying the contact may be provided with a piston or sleeve type of valve through which the flow of air or gas for arc extinction is controlled. The valve may be arranged so that when the contact is fully retracted, as by application of the gas pressure aaginst the bias of a closing spring of the contact, the gas flow to the arc gap is shut off by the coordinated movement of the valve. The valve, however, is so arranged that sufficient gas is allowed to flow to create a pressure sufficient to maintain the contact in the retracted or open circuit position after the main interrupting blast has been shut off.

My invention will be more fully set forth in the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Referring to the drawing, Fig. 1 is a plan view of a gas blast circuit breaker embodying the present invention; Fig. 2 is a sectional view, enlarged, of part of the contact and breaker structure shown by Fig. 1 in the closed circuit position thereof; and Fig. 3 is a similar view showing the breaker in the open circuit position thereof.

Fig. 1 illustrates generally the plan view of an air blast circuit breaker of the load-break, disconnecting switch type to which the present invention is particularly applicable. The circuit breaker comprises a pair of conducting switch arms 1 and 2 that are tubular in form and connected to the power line conductors (not shown). Relatively movable contact structures are mounted on the coacting ends of the switch arms at 1' and 2' respectively. The switch arms are in turn mounted on hollow insulators 4 and 5 respectively which can be rotated about vertical axes on a supporting base 3. Accordingly, the relatively movable contact structures at 1' and 2' can be moved into and out of circuit controlling engagement with each other by rotation of the insulator supports.

The actuating means for the insulators 4 and 5 may comprise any suitable arrangement, such as the gearing indicated at 6 and 7. When the circuit breaker is to be opened, the drive gear pinions 8 and 9 are rotated to cause counter-clockwise rotation of the switch arms 1 and 2, thereby causing separation of the contact structures 1' and 2'. At the same time, an arc extinguishing gas under pressure, such as air, is admitted to the contact structures 1' and 2' through the tubular switch arms 1 and 2, the hollow insuators 4 and 5 and the gas supply lines 10 and 11. As the arc forms between the separating contacts, it is subjected in a manner hereinafter described to a blast of the interrupting gas and the circuit is thereby interrupted.

Further opening movement of the arm serves to isolate the breaker contacts in the open circuit position. When the breaker is to be closed the switch arms are rotated simultaneously in clockwise direction until the contact structures engage with each other. A gas blast circuit breaker of this general character is disclosed in Biermanns Patent 2,084,885, granted June 22, 1937, for Electric circuit breaker, and assigned to the same assignee as the present invention.

The contact structures 1' and 2' are provided with coacting rod contacts 12 and 13 respectively and are substantally similar in construction and arrangement so that it will be sufficient to describe in detail the contact structure 1'. The contact 12 and its control means, etc., are mounted within an insulating housing 14 that is carried at the free end of the switch arm 1. The insulating housing may be of a suitable molded material of high mechanical and dielectric strength and has a switching and blast chamber 15 communicating with the exterior by way of a blast exhaust opening 16 through which the movable rod contact 12 also operates. The chamber 15 is arranged to communicate with the gas supply line by way of the tubular switch arm 1. The insulating housings of both contact structures are provided at the arcing ends with convex-shaped shields as indicated at 14'. The operating means for the contact 12 comprises a piston 17 operable within a cylinder 18 also mounted at

least in part at one end of the chamber 15. The piston is spring-biased at 19 so that the contact 12 is normally urged toward circuit-making engagement with the coacting contact 13. The cylinder is provided with an opening 20 for admitting gas pressure to the piston and causing retraction of the contact against the bias to its closing spring.

For the purpose of controlling the application of the gas blast to the arc the movable contact 12 has also operatively connected thereto a valve 21 of the sleeve type that is arranged to shut off the blast when the movable contact has been retracted a predetermined distance to interrupt the circuit. As illustrated in the specific instance, the valve 21 is directly secured to the contact 12. In addition, the valve is arranged in its shut-off position to admit gas pressure to the cylinder through the port 20 for holding the contact in its open circuit retracted position. The specific arrangement comprises a cylindrical valve housing 22 that is conveniently formed as an extension of the cylinder 18. The interior of the housing normally communicates with the gas supply line 1 through a port 23 and with the chamber 15 through a port 24. The opposite end of the valve housing is closed at 25 except for an aligned opening for the movable contact 12.

The operation of the circuit breaker is as follows: When the circuit breaker is to be opened, the mechanical operation is initiated as described in connection with Fig. 1. At substantially the same time, a means such as a blast control valve or valves (not shown) is operable by being opened to admit the interrupting gas under pressure to the switch chambers though the tubular arms 1 and 2 prior to any relative separation of contacts 12 and 13. As the gas flows through the port 20 into the cylinder 18, it retracts the piston 17 against the bias of its spring to cause opening movement of contact 12. The contact 13 is similarly actuated. Meanwhile, the chamber 15 is filled with gas under pressure as indicated by the flow direction arrows in Fig. 2 so that as the blast opening 16 is cleared by the contact the arc gap between the contacts 12 and 13 is subjected to a high velocity blast. The arc is generally interrupted after comparatively short contact travel, even less than that indicated by Fig. 3.

Referring now specifically to Fig. 3 which shows the contacts 12 and 13 in the retracted position, it will be noted that the sleeve valve 21 has now closed off the port 24 communicating with the chamber 15. The gas blast is now completely shut off from the arc gap. However, the valve is provided with an aperture 21' that admits gas into the cylinder 18 for holding the contact in its open circuit retracted position where it is held until the main blast control valve is closed. The main blast valve is generally closed when the switch arms 1 and 2 have been swung to their isolating positions. The contacts 12 and 13 are now returned by their biasing springs to the original positions in readiness for the next operation.

It will therefore be seen that I have provided simple and effective means for utilizing to the practicable minimum extent the interrupting gas supply without impairing the interrupting performance or efficiency of the circuit breaker.

It should be understood that my invention is not limited to specific details of construction and arrangement thereof herein illustrated, and that changes and modifications may occur to one skilled in the art without departing from the spirit of the invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A gas blast electric circuit breaker comprising relatively movable contacts separable to form an arc gap, means operable prior to any relative separation of said contacts for providing an arc extinguishing gas under pressure adjacent said contacts to interrupt the circuit by a gas blast upon relative separation of said contacts, and valve means directly mounted on the conducting portion of one of said contacts and movable therewith for shutting off the blast adjacent said contacts regardless of the condition of said first mentioned means, whereby assurance is had that the contacts are in normal open circuit position prior to shutting off said blast.

2. A gas blast electric circuit breaker comprising relatively movable contacts separable to form an arc gap, means for supplying gas under pressure to cause both relative separation of said contacts and to provide an arc extinguishing gas under pressure adjacent said arc gap to interrupt the circuit by a gas blast, and means mounted directly on the conducting portion of one of said contacts and movable therewith for shutting off the blast to said arc gap when a predetermined relative separation of said contacts is obtained, whereby said contacts are in the open circuit position before said blast is shut off.

3. A fluid blast electric circuit breaker comprising relatively movable contacts separable to form an arc gap, means normally biasing one of said contacts to the closed circuit position, fluid operated means for causing relative separaiton of said contacts, means for directing an arc extinguishing fluid under pressure both to said fluid operated means to cause relative separation of said contacts and to said gap to interrupt the circuit by a fluid blast, and means mounted on said one contact for shutting off the blast to said arc gap while still supplying fluid to said fluid operated means so that the movement of said valve means is coordinated with the circuit opening movement of said contacts and the contacts are in normal open circuit position prior to closing of said valve.

4. A fluid blast electric circuit breaker comprising relatively movable contacts separable to form an arc gap, means for biasing said contacts toward the closed circuit position, fluid operated means for causing relative separation of said contacts, means for supplying fluid to said fluid operated means and for directing a blast of arc extinguishing fluid under pressure to said gap to interrupt the circuit by a fluid blast, valve means for shutting off the blast of fluid to said arc gap, the movement of said valve means being coordinated with the circuit opening movement of said contacts so that the contacts are in normal open circuit position prior to closing of said valve, said valve means having an opening to admit said gas under pressure to said contacts for holding said contacts in separated position after said blast has been shut off.

HENRY TRENCHAM.