

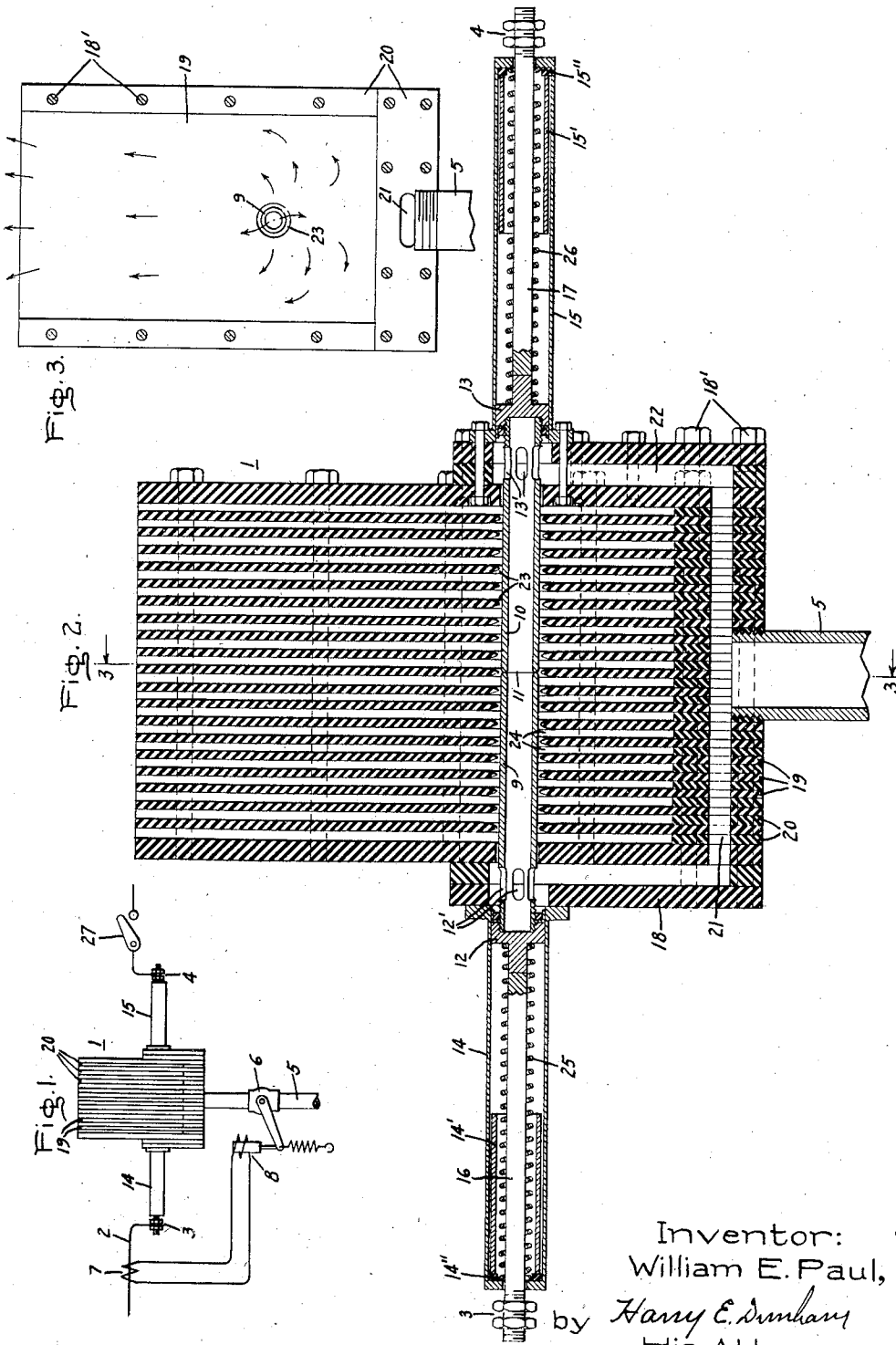
Aug. 19, 1941.

W. E. PAUL

2,253,196

GAS BLAST ELECTRIC CIRCUIT BREAKER

Filed Sept. 28, 1940



Inventor:
William E. Paul,
by *Harry E. Dunham*
His Attorney.

UNITED STATES PATENT OFFICE

2,253,196

GAS BLAST ELECTRIC CIRCUIT BREAKER

William E. Paul, Schenectady, N. Y., assignor to
General Electric Company, a corporation of
New York

Application September 28, 1940, Serial No. 358,847

4 Claims. (Cl. 200—148)

My invention relates to gas blast electric circuit breakers, and has for its principal object the provision of an improved gas blast circuit breaker having a large effective arc cooling area completely surrounding the arc for interrupting large power currents. A further object of my invention is an improved diverging radial blast circuit breaker arranged to force the arc into surrounding arc extinguishing structure.

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 partly diagrammatic illustration of an electric circuit breaker embodying the present invention including control means connected in an electric power circuit, Fig. 2 is an elevational sectional view of the gas blast circuit breaker shown in Fig. 1, and Fig. 3 is an elevational sectional view taken along the line 3—3 of Fig. 2.

Referring generally to Fig. 1, the gas blast circuit breaker indicated at 1 is connected through its contact structure, hereinafter described, in series with an electric power circuit 2, the terminals of the breaker being indicated at 3 and 4. When an overload or short circuit occurs on the power line, the contact structure within the circuit breaker is caused to open under air or gas pressure from a source indicated at 5 in response to operation of the valve 6. The valve control can be accomplished in any suitable manner, such as by a current transformer 7 connected to the valve operating solenoid 8. In addition to opening the contact structure, the gas under pressure creates an arc extinguishing blast.

Referring more particularly to Fig. 2, the relatively movable contact structure comprises a pair of tubular contacts 9 and 10 arranged to engage in butt contact at 11. Each contact is connected to an operating piston, the pistons 12 and 13 respectively being guided for longitudinal reciprocal movement in the cylinders 14 and 15. The contacts are also provided with conducting extensions 16 and 17 including the breaker terminals 3 and 4 which are guided in the ends of the cylinders 14 and 15 respectively.

The circuit breaker housing comprises an insulating casing 18 that may be open at both lateral ends and also at the upper end. In the present instance the breaker casing, which is particularly designed for high voltage, is open

only at the top. The casing may conveniently comprise insulating side plates that are suitably interconnected, as by fibre bolts 18'. The arc extinguishing structure comprises a plurality of spaced insulating plates 19 mounted between the insulating side walls of the breaker casing in parallel relation thereto. The plates 19 extend to the lower part of the casing where they are separated by insulating spacers 20. These spacers in the design illustrated may conveniently be formed as U-shape so as to extend also between the plates 19 along the vertical sides. The plates and spacers are provided with aligned apertures at the lower part of the casing to form a lateral passage 21 communicating with the pressure supply conduit 5, the lateral passage 21 in turn communicating with vertical passages 22 formed at opposite ends of the breaker casing leading to the contact operating pistons 12 and 13.

The plates 19 are also provided with aligned apertures 23 through which the contacts 9 and 10 operate. It will therefore be apparent that an arc drawn between the contacts 9 and 10 will be completely surrounded by arc extinguishing baffles or barriers defining radially diverging venting passages 24.

The operation of the circuit breaker is as follows: Let it be assumed that the breaker is in the closed circuit position shown wherein the contacts are biased into engagement by their respective closing springs 25 and 26, and that the control means at 7 and 8 call for a circuit opening operation. Immediately upon opening of the valve 6, gas under pressure enters the passages 21 and 22 in the circuit breaker so as to act directly on the pistons 12 and 13. The pistons are thereupon projected at high speed into their cylinders causing rapid separation of the contacts 9 and 10. At the same time, gas under pressure entering the ports 12' and 13' of the tubular contacts flows through the tubular contacts toward the point of contact separation. The resulting gas blast from both contacts acts from behind the arc and serves to force it radially into the surrounding arc extinguishing structure defined by the plates 19.

In view of the fact that the arc must form along the peripheries of the contacts 9 and 10, it will be apparent that the lateral movement of the arc from the contact arcing surface to the arc extinguishing plates or baffles 19 is very small, and for practical purposes a minimum. The apertures 23 in the insulating plates may have a diameter slightly greater than that of

the contacts 9 and 10 so that the arc is substantially in contact with arc extinguishing structure immediately upon its formation. Also, the blast which mushrooms from the ends of the tubular contacts as illustrated by Fig. 3 necessarily traverses the arc regardless of its position between the contacts forcing it into the radially diverging passages 24. Stop and buffer means for the pistons 12 and 13 respectively are also preferably provided in the cylinders 14 and 15 comprising the spring enclosing sleeves 14' and 15' seated at rubber rings 14'' and 15''.

The contacts are now well separated and the blast continues as long as the valve 6 is held open in response to continuance of the fault. Although I have not in the interest of simplicity disclosed additional means for opening the circuit so that the arcing contacts can return to closed position after interruption of the arc since this forms no part of my present invention, it will be apparent that a disconnecting switch can be connected in series with the power line 2 as indicated at 27 so as to be opened after interruption of arcing.

By reason of the large arc cooling area extending radially from the arc in all directions, the large volume of highly heated arc gases accompanying heavy current interruptions, as well as the arc itself, are effectively cooled by the large passage area of the radially diverging passages between the plates 19. The radially diverging passages extending in all directions laterally of the arc also aid in reducing back pressure to the gas blast by effectively dissipating the arc gases flowing into the extinguishing structure.

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 my invention.

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

1. An electric circuit breaker of the gas blast type comprising relatively movable tubular contacts for directing a gas blast in opposite directions substantially axially of said contacts so as to meet and traverse the arc at the point of contact separation, and arc extinguishing baffle

structure composed of insulating material arranged completely to surround the aforesaid arc and to form radially diverging blast venting passages leading from the exhaust ends of said tubular contacts.

2. An electric circuit breaker of the gas blast type comprising relatively movable tubular contacts for directing a gas blast in opposite directions substantially axially of said contacts so as to mushroom from the coaxing ends of said contacts and traverse the arc at the point of contact separation, and arc extinguishing insulating plates having aligned apertures for said contacts arranged in spaced relation transversely of said arc so as completely to surround the aforesaid arc and to form radially diverging blast venting passages leading from the region of said arc.

3. An electric circuit breaker of the gas blast type comprising relatively movable tubular contacts including means for directing a gas blast in opposite directions substantially axially of said contacts so as to meet and traverse the arc at the point of contact separation, means for causing separation of said contacts by and in accordance with said gas blast, and arc extinguishing structure including spaced insulating plates having aligned apertures for said contacts arranged completely to surround the aforesaid arc and to form radially diverging blast venting passages leading from the region of said arc.

4. An electric circuit breaker of the gas blast type comprising relatively movable tubular contacts for directing a gas blast in opposite directions substantially axially of said contacts so as to mushroom from the contact-making ends of said tubular contacts and traverse the arc at the point of contact separation, arc extinguishing insulating structure through which said tubular contacts operate in close proximity arranged completely to surround the aforesaid arc and to form a plurality of spaced radially diverging blast venting passages leading from the contact passages, means for connecting both said tubular contacts with a source of blast pressure, and piston means for causing separation of said contacts in response to blast pressure.

WILLIAM E. PAUL.