Feb. 27, 1934. W. E. PAUL 1,949,258

ELECTRIC CIRCUIT BREAKER

Filed May 20, 1932

Fig. 1.

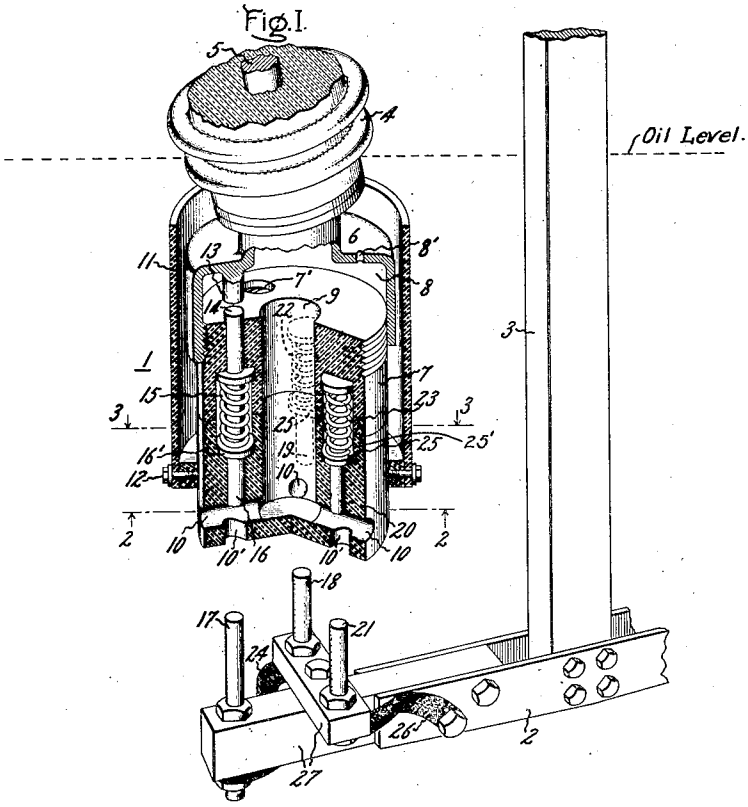


Fig. 2.

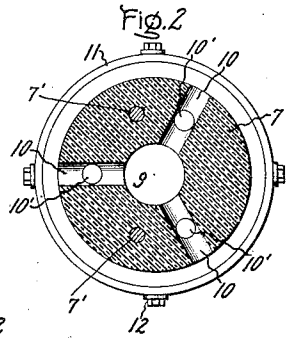
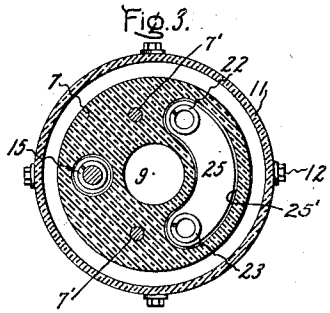


Fig. 3.



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ELECTRIC CIRCUIT BREAKER

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5 Claims. (Cl. 200—150)

My invention relates to electric circuit breakers, more particularly to multiple-break circuit interrupters of the oil blast explosion chamber type.

The principal object of my invention is the provision of an improved circuit breaker of the aforesaid type which shall be efficient and positive in operation and capable of interrupting large amounts of power at high voltages.

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 fragmentary view in perspective, partly in section, of a single pole of a circuit breaker embodying the present invention, Fig. 2 is a sectional plan view taken along the line 2—2 of Fig. 1, and Fig. 3 is a sectional plan view taken along the line 3—3 of Fig. 1.

The circuit breaker illustrated comprises an explosion chamber pot 1 housing the relatively fixed contact structure, and contact actuating means as a conducting bridging member 2 operated in any suitable manner by the lift rod 3. Although the breaker described is of the double pole type wherein the bridging member 2 interconnects two similar explosion pots, illustration and description of the structure and operation of a single pole will be sufficient in understanding the invention. The explosion chamber pots and bridging member are immersed in a well known manner in insulating liquid, as oil, for the purpose of properly insulating the conducting parts and for effecting interruption of arcing by individual blasts of the insulating liquid in a manner presently described.

The explosion chamber pot 1 may be constructed in any suitable manner so as to be mechanically strong and insulated properly for the operating voltage. In the present instance a lead-in bushing 4 for the conductor stud 5 has mounted at the lower end thereof a cup-shaped conducting member 6. Suitably secured to the member 6 is an insulating cylindrical structure 7 formed in two sections for the purpose of assembly and spaced from the upper wall of the member 6 to form a pressure generating chamber 8. The aforesaid sections may be secured together, as by through-bolts 7' which extend longitudinally of the sections from countersunk openings.

The pressure chamber 8 is in communication through a vertical passage 9 with a plurality of radially disposed exhaust passages 10 leading from the central passage 9 to the body of insulating liquid exteriorly of the explosion pot as best shown in Fig. 2. In high voltage operation an insulating shield 11 is commonly used and this shield, which is cylindrical in form, may be suitably supported at its lower edge by the explosion pot as indicated at 12.

The contact structure comprises a plurality of coacting contacts all connected in series and arranged so that opening of one pair of contacts causes an individual blast of insulating liquid across the arc formed at each of the other pairs of contacts. To this end a pair of contacts 13 and 14 are separable in the pressure chamber 8, contact 13 being fixed and forming part of the conducting member 6 and contact 14 comprising a rod guided for vertical movement in the insulating structure 7 and resiliently biased, as by a spring 15, towards open circuit position. A plurality of other pairs of coacting contacts are arranged to separate transversely of the passages 10, said contacts comprising coacting pairs 16—17, 18—19, and 20—21. The contact 16, which is a part of the rod comprising contact 14, is biased by spring 15 into engagement with the contact 17, and the contacts 19 and 20 are biased by springs 22 and 23, respectively, into engagement with contacts 18 and 21 when the switch is in closed position.

The pairs of contacts above described are suitably connected in series, the circuit being completed from the lead-in conductor 5 to the bridging member 2 through the conducting member 6, contacts 13—14, 16—17, conducting strip 24, contacts 18—19, conducting strip 25, (Fig. 3) contacts 20—21, and conducting strip 26. The movable contacts 17, 18, and 21 are suitably mounted at the end of the bridging member 2, as on the insulating blocks 27.

When the switch is in closed circuit position the bridging member 2 is positioned so that the movable contacts 17, 18, and 21 are within and extend through the corresponding alined apertures 10' communicating with passages 10 and the above described contacts engage within the radially disposed passages. The contact 17 in closing likewise biases the contact 14 upwardly into engagement with its coacting contact 13 so that the circuit is complete through all the contacts. The conducting strip 25 is connected to and moves with the contacts 19 and 20 within an arcuate slot 25' formed in the insulating structure 7, as illustrated in Figs. 1 and 3.

When the circuit is to be opened as by lowering the bridging member 2, the initial opening causes immediate separation of the contacts 13, 14 in the pressure chamber. The remaining contacts, however, are still in engagement due to the following action of the biasing springs. After a short travel the contacts 16, 19, and 20 are checked by the stop collar 16' and the conducting strip 25, respectively, so that simultaneous operation of the contacts occurs transversely of the passages 10.

During the initial opening movement the pressure generated by the arc between contacts 13 and 14 in the pressure chamber drives insulating liquid at high velocity downwardly through the passage 9 and outwardly through the radial passages 10 transversely of the arcs formed therein. The interrupting action of simultaneous blasts of insulating liquid on individual arcs in series is effective at high voltages. The movable contacts 17, 18, and 21 move through the apertures 10' to open circuit position within the main body of insulating liquid so that the contacts are insulated and separated a suitable distance. After a circuit opening operation the insulating liquid refills the explosion pot, a vent 8' in the upper part of chamber 8 insuring refilling by preventing the formation of a gas pocket.

The radial arrangement of the oil blast passages enables the normal magnetic forces of the circuit to be interrupted to assist the action of the blast. It is well known that the magnetic forces of a loop tend to expand the loop so that in a circuit breaker of the type in question the magnetic forces tend to blow the arc outwardly and away from the loop. The arcs in the radial passages 10 are, therefore, urged generally in the same direction by both the magnetic forces and the oil blast, this arrangement aiding the circuit interrupting action.

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. A circuit breaker comprising an explosion chamber pot immersed in an insulating liquid, means forming in said pot a pressure generating chamber and a plurality of passages including a centrally disposed passage communicating with said chamber and with the exterior of said pot, respectively, a pair of coacting contacts separable in said pressure generating chamber, a plurality of pairs of arc interrupting contacts separable transversely of said passages, and an actuating member common to the aforesaid pairs of contacts arranged to lower the movable arc interrupting contacts into said insulating liquid, the aforesaid contacts connected in series so that arcing pressure generated in said chamber is effective to produce an individual blast of insulating liquid from said central passage across the arc in each of said passages upon opening of the circuit.

2. A circuit breaker comprising an explosion chamber pot forming a pressure generating chamber and a plurality of radially disposed exhaust passages communicating with said chamber, an insulating liquid in which said explosion pot is immersed, a pair of coacting contacts separable within said pressure chamber, and a plurality of pairs of coacting contacts, each pair disposed transversely of one of said passages, said contacts connected in series arranged so that arcing pressure generated within said chamber is effective to cause a blast of insulating liquid through each of said passages and across the contacts therein upon opening of the circuit.

3. A circuit breaker of the oil blast type comprising an explosion chamber pot forming an upper pressure generating chamber and a plurality of radially disposed exhaust passages beneath and communicating with said chamber, an insulating liquid in which said explosion pot is immersed, a pair of coacting contacts separable within said pressure chamber, a plurality of pairs of coacting contacts, each pair separable in one of said passages and including a contact movable transversely of said passage, and actuating means arranged to lower said movable contacts into said insulating liquid.

4. A circuit breaker comprising an explosion chamber pot forming a pressure generating chamber and a plurality of radially disposed exhaust passages, said passages having a common central passage communicating with said chamber, a pair of contacts separable in said pressure chamber, a plurality of pairs of contacts each separable in and transversely of one of said radial passages, a bridging member carrying the movable contacts of said last-named pairs of contacts, and springs mounted in said pot biasing the contacts coacting with said movable contacts into limited following engagement with said movable contacts, one of said movable contacts controlling engagement and disengagement of said first-named pair of contacts.

5. A circuit breaker of the oil blast type comprising a conducting bridging member for connecting a pair of contact structures, each structure comprising an explosion chamber pot forming a pressure generating chamber and a plurality of exhaust passages leading therefrom, an insulating liquid in which said structure is immersed, a plurality of pairs of contacts connected in series including contacts separable in said pressure chamber and contacts separable in each of said passages arranged so that pressure generated in said chamber on opening of the circuit causes individual blasts of insulating liquid through said passages and the arcs formed therein, said passages being arranged with respect to the magnetic forces of the circuit to be interrupted so that the normal magnetic blowout effect is in the direction of said blasts.

WILLIAM E. PAUL.