March 10, 1931. O. H. ESCHHOLZ 1,795,850

ARC RUPTURING APPARATUS

Filed May 26, 1923

Fig. 1.

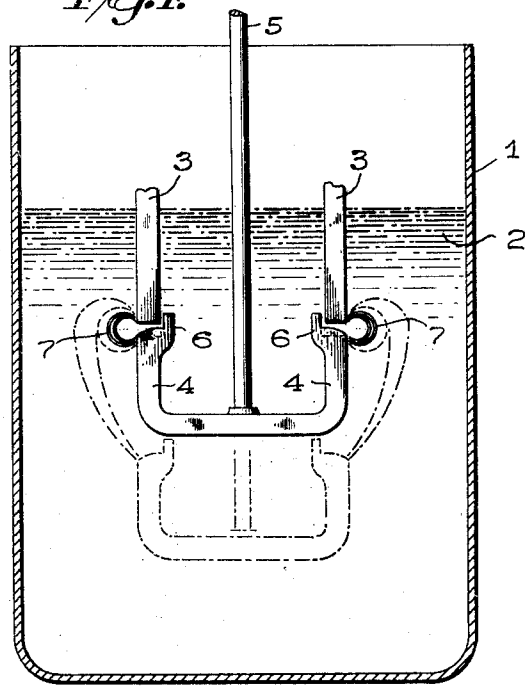


Fig. 2.

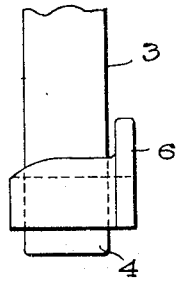


Fig. 3.

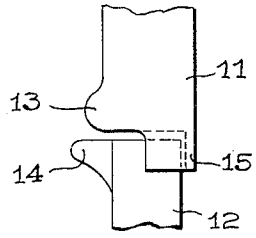
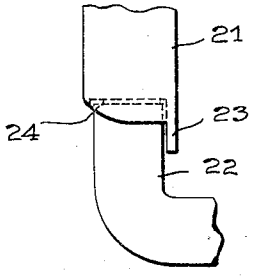


Fig. 4.



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UNITED STATES PATENT OFFICE

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ARC-RUPTURING APPARATUS

Application filed May 26, 1923. Serial No. 641,619.

My invention relates to circuit interrupters and more particularly to the relatively movable contact members embodied therein.

One object of my invention is to provide a circuit interrupter having relatively movable contact members which utilize the gases generated upon the occurrence of an arc for imparting a directional impulse to the resulting arc stream and arc terminals and thereby elongate and extinguish it.

Another object of my invention is to provide a circuit interrupter with contact members which impart a directional impulse to the arc stream developed upon the separation of the contact member.

A further object of my invention is to provide a circuit interrupter with relatively movable contact members which are so constructed that they direct the arc gases against the arc stream.

It has been found that arc rupture in liquid breakers is greatly facilitated by forcing the arc stream from between contact members, thus permitting the influx of the liquid dielectric and the rapid interruption of the arc. Such directional movement has been secured in part either through the use of magnetic blow-out fields or liquid deflectors.

The forces produced by these means, however, may prove inadequate, by such reason as that of a weak field, or a slow separation speed, so that it is proposed to utilize the phenomena of gas generation attending arc formation and maintenance to cause the displacement of the arc stream.

Observation has shown that an arc drawn between vertical contact members and its sustaining envelope of gas tends to stay in alinement with the contact members for a considerable length of time after they have separated. However, if the arc stream and terminals are drawn or propelled to the edges of the contact members, the escape of hot gases along one side of the contact members tends to pull the stream out of alinement therewith and to elongate and destabilize the arc while permitting the flow of the liquid dielectric over and between the contact surfaces to quickly extinguish the arc.

By providing re-entrant contact members designed with an opening in the desired direction of arc travel, the escape of the arc gases in this direction will cause the arc stream to follow and be maintained eccentric to the contact members, thus facilitating arc destabilization and arc interruption.

In the accompanying drawing:

Figure 1 is a fragmentary sectional view of a circuit interrupter equipped with relatively movable contact members embodying my invention.

Fig. 2 is a detail view of the relative movable contact members shown in Fig. 1.

Figs. 3 and 4 are views of modified forms of relatively movable contact members.

In the several figures of the drawing, similar reference characters indicate like parts.

In the preferred form of my invention, a circuit interrupter 1, containing an insulating fluid 2, such as oil, is provided with stationary contact members 3 and movable contact members 4, the latter being supported by suitable operating mechanism 5. The movable contact members 4 are provided with auxiliary arcing contact members 6 which extend beyond, and partially enclose, the stationary contact members 3, as is shown in detail in Fig. 2.

Upon the separation of the contact members 3 and 4, arc streams 7 are set up and a quantity of arc gases are generated. These arc gases comprise certain metallic vapors issuing from the contact members and certain gases evolved by reason of the decomposition of the insulating fluid 2 in the presence of the high temperature arc stream 7.

By reason of the projecting portions of the cup-shape arcing contact members 6, these gases are given an impulse toward the other or unenclosed sides of the contact members and are thus caused to move in a direction at right angles to the direction of travel of the contact members themselves. Since the arc streams 7 require an ionized path for their support and reignition after passing through zero voltage, and since the hot arc gases are readily ionized and thereby supply a path for the arc streams, the outwardly moving gases carry along the arc streams 7 and thereby distort them. The position assumed by the arc

streams 7 in the early stages in the separation of the contact members 3 and 4 is shown in full lines in Fig. 1.

It will be seen that by this design of arcing contact members, the gases generated blow themselves away from the contact members 3 and 4 and, consequently, do not collect between them to facilitate arc re-ignition. As the contact members 3 and 4 move further apart, each arc stream 7 continues to be displaced, assuming the position shown by dotted lines in Fig. 1, until it is destabilized or prevented from re-igniting by the dielectric strength of the fluid 2.

In Fig. 3, is shown a pair of contact members 11 and 12 which are provided with integral arcing tips 13 and 14, respectively. The contact member 11 supports a deflector 15 which extends beyond and encloses a portion of the contact member 12 opposite the arcing tips 13 and 14. Upon the separation of the contact members 11 and 12, deflector 15 imparts a directional impulse to the arc gases which causes them to escape between the arcing contacts 13 and 14 in a manner similar to that described in connection with the modification shown in Figs. 1 and 2.

In Fig. 4, there is shown a pair of relatively movable contact members in which a stationary contact member 21 co-operates with a movable member 22. The stationary contact member 21 is provided with an arcing contact 23 having a cup-shaped depression 24. The construction and operation of this form of my invention is substantially the same as that described in connection with the modification shown in Fig. 2, except that in the form shown in Fig. 4, the arcing contact member 23 is mounted on the stationary contact member 21, while in Fig. 2, the arcing contact member 6 is carried on the movable contact member 4.

It will thus be seen that I have provided contact members for circuit interrupters which utilize the gases generated upon the separation of such contact members for controlling the direction of movement of, and for extinguishing, the resultant arc stream.

Although I have described a specific embodiment of my invention, it will be obvious to those skilled in the art that various modifications may be made in the details of construction and arrangement of parts without departing from the principles herein set forth. I desire, therefore, to be limited only to the spirit and scope of the appended claims.

I claim as my invention:

1. In a circuit-interrupter, a pair of relatively movable contact members, an insulating liquid in which said contact members are immersed and a single barrier projecting from one of said members and extending beyond and around a portion only of the end of the other member in closed position and disposed closely adjacent the arc formed upon operation of said contact members, to impart a directional impulse to gas generated by said arc.

2. In a circuit-interrupter, a pair of relatively movable contact members, an insulating liquid in which said contact members are immersed and an impervious barrier projecting from the end of one of said contacts parallel to the axis thereof and positioned on only three sides of the arc drawn between said contact members, whereby to impart a directional movement of said arc transverse to said axis.

3. In a circuit-interrupter, a pair of relatively movable contact-members, an insulating liquid in which said contact-members are immersed, one of said contact-members being provided with a projection extending beyond and around a portion only of the end of the other member in closed position and adapted to impart a directional impulse to gas generated upon formation of an arc between said contact-members.

4. In a circuit-interrupter, a pair of relatively movable contact members, an insulating liquid in which said contact members are immersed and an impervious barrier projecting from the end of one of said contacts parallel to the axis thereof and positioned on only three sides of the arc drawn between said contact members, whereby to impart a directional movement to the gases formed by said arc transverse to said axis.

In testimony whereof, I have hereunto subscribed my name this 22nd day of May, 1923.

OTTO H. ESCHHOLZ.