Nov. 26, 1940. W. K. RANKIN 2,222,722

ELECTRIC CIRCUIT BREAKER

Filed June 22, 1939

Fig. 1.

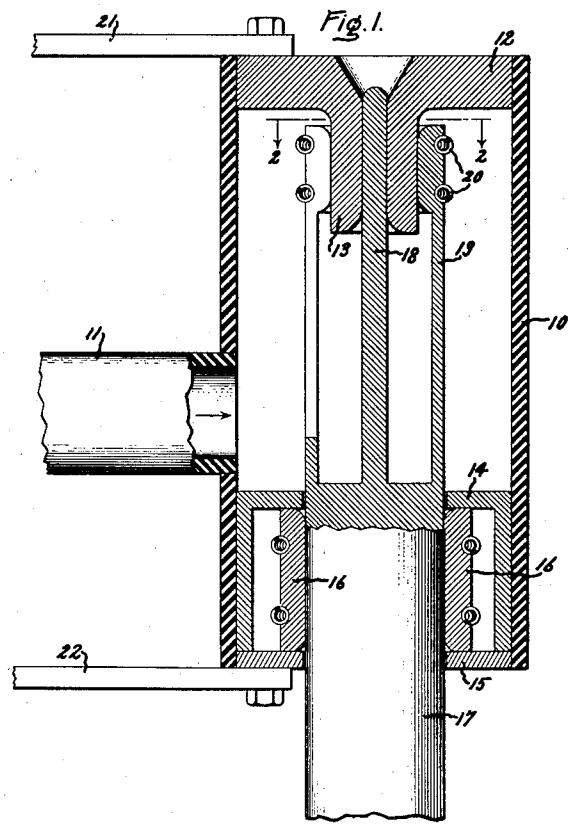
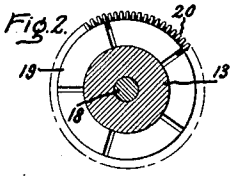


Fig. 2.



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ELECTRIC CIRCUIT BREAKER

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3 Claims. (Cl. 200—148)

The present invention relates to electric circuit breakers, and particularly circuit breakers of the fluid blast type wherein one of the contact members forms a nozzle through which arc-extinguishing fluid is discharged during a circuit-interrupting operation of the switch.

In circuit breakers of the above type the contact area required for carrying the normal load current of the breaker necessitates the use of a contact rod and nozzle of greater size than is necessary or desirable for efficient interruption of the circuit, even under short circuit conditions. For this reason, it is desirable to provide a nozzle of relatively small cross-sectional area so that the arc-extinguishing fluid may be forced through the arc at high velocity without the use of excessive quantities of fluid and, at the same time, to provide a large contact area between the relatively movable contacts. Accordingly, it is a primary object of the invention to provide a novel construction and arrangement in the relatively movable contacts of a fluid blast electric circuit breaker which reduces the fluid requirement for effective operation and provides for a large contact area between the relatively movable contacts of the circuit breaker.

It is another object of the invention to provide an improved circuit breaker construction in which the current-carrying contacts are not subjected to the arc or hot gases and thereby pitted or spattered with the hot metal particles which are carried by the arc stream.

Further objects and advantages of the invention will become apparent as the following description proceeds, reference being had to the accompanying drawing in which Fig. 1 is an elevational view in section of a circuit breaker illustrating an embodiment of the present invention, and Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1.

Referring to the drawing the circuit breaker illustrated comprises a cylindrical housing 10 of suitable insulating material which is closed at its opposite ends to form a pressure chamber. A conduit 11 communicating with the interior of the housing 10 is connected to a suitable supply of arc-extinguishing fluid under pressure which may be, for example, compressed air. Arrangements for supplying air under pressure to switches of this character are well known, and, for purposes of simplifying the drawing, none is shown. The upper end of the housing 10 is closed by a fixed contact member 12 which in the form illustrated comprises a disk of conducting material which is secured within the upper end of the housing in any suitable manner. The stationary contact is provided with a cylindrical depending portion 13 which extends into the arc chamber. An opening of circular cross-section is formed in the fixed contact and extends through both the disk and the depending portions to form a nozzle communicating with the interior of the pressure chamber. Secured in the lower end of the housing 10 is a circular channel member 14 of L-shaped cross-section which is closed at its lower end by an annular plate or washer 15 to form a retainer for a spring pressed segmental contact ring 16 arranged to slidably engage a contact rod 17 which forms a movable contact element of the circuit breaker.

The end of the contact rod which engages the fixed contact 12 in the closed circuit position of the circuit breaker is specially constructed to cooperate with the fixed contact described above to provide a large contact area and control the flow of arc-extinguishing fluid through the opening in the fixed contact. In accordance with the present invention the end of the movable contact rod is constructed with a centrally located cylindrical contact portion 18 of small diameter in comparison with the size of the rod. This contact portion is received in the opening in the fixed contact in the closed circuit position of the breaker and acts to control the flow of arc-extinguishing fluid therethrough. Surrounding the contact portion 18 and, in the particular construction illustrated, concentrically therewith is an annular contact portion 19 arranged to engage the outer surface of the cylindrical depending portion 13 of the fixed contact. The contact 19 is formed by slotting the outer wall of the rod at spaced intervals to provide segmental contact portions which are spring pressed by a pair of helical springs 20. The fixed and movable contacts of the circuit breaker are connected to the circuit to be controlled by suitable conducting straps 21 and 22 which are electrically connected to the fixed contact 12 and the closure plate 15 of the contact 16 respectively. In the closed circuit position of the breaker illustrated in Fig. 1, it is apparent that a circuit is completed from the strap 21 through fixed contact 12, parallel contact portions 18 and 19 of the movable contact rod, the body of the movable contact rod, the sliding contact 16, and the retainer ports 14 and 15 to the conducting strap 22.

In operation of the breaker described above, the movable contact is moved away from the fixed contact by a suitable operating mechanism

(not shown) in accordance with the circuit condition to be controlled. Simultaneusly, with the opening operation of the movable contact rod or in timed relation thereto arc-extinguishing fluid under pressure is supplied to the pressure chamber through the conduit 11. As the movable contact is withdrawn the contact portion 19 first leaves the outer surface of the depending portion 13 and then the central contact portion 18 is withdrawn from the opening in the fixed contact and an arc is drawn between the walls surrounding the opening and the end of the contact portion 18. At the instant of contact separation a fluid blast is directed through the arc and into the opening in the fixed contact to the surrounding atmosphere. Since the nozzle of the present construction is small compared with the current-carrying capacity of the breaker, the arc-extinguishing fluid may be directed through the nozzle at high velocity without using excessive quantities thereof. Since the supply of arc-extinguishing fluid is an important problem and often a limitation in breaker installations of this type, the conservation of such fluid is a matter of considerable importance. From the preceding description of the operation of the circuit breaker embodying the invention, it is apparent that the arc, which is drawn between the rod 18 and the end of the depending portion 13 of the fixed contact, is blown away from the main current-carrying portion 19 of the movable contact and the cooperating outside surface of the portion 13 of the fixed contact, so that these surfaces are not subjected to the destructive action of the hot gases of the arc stream. This arrangement insures long life of the contacts and lower contact resistance.

While I have shown and described a particular embodiment of my invention, modifications thereof will be apparent to those skilled in the art. I do not, therefore, desire my invention to be limited to the particular construction shown and described, and I intend in the appended claims to cover all modifications within the spirit and scope of my invention.

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

1. In an electric circuit breaker of the fluid blast type comprising a pressure chamber, relatively movable contacts separable in said chamber to form an arc therein, means for supplying an arc-extinguishing fluid under pressure to said chamber, one of said contacts including a cylindrical portion extending into said chamber and having an opening therein, the wall of said opening and the outer wall of said cylindrical portion forming inner and outer contact surfaces, the other of said contacts having concentrically arranged contact portions engaging the inner and outer surfaces of said one contact in the closed circuit position of said breaker, the contact portion of said other contact engaging the inner contact surface of said one contact being constructed and arranged to control the flow of arc-extinguishing fluid through said opening and to engage said inner contact surface until after the other contact portions of said contacts have been separated during opening movement of said breaker so that the arc is drawn between said one contact and the portion of said other contact which controls the flow of arc-extinguishing fluid.

2. An electric circuit breaker of the fluid blast type comprising a pressure chamber, a fixed contact and a movable contact separable in said chamber to form an arc therein, and means for supplying an arc-extinguishing fluid under pressure to said chamber, said fixed contact having a portion thereof extending inwardly into said chamber and provided with an opening forming a blast nozzle, said movable contact having a current-carrying portion received in said opening in the closed circuit position of said breaker and another current-carrying portion engaging an outer surface of said inwardly extending portion, the portion of said movable contact received in said opening being constructed and arranged to control the flow of fluid through said opening and to engage said fixed contact until after the other current-carrying portion of said movable contact has separated from the fixed contact whereby an arc is drawn between the fixed contact and the portion of said movable contact which controls the flow of arc-extinguishing fluid.

3. An electric circuit breaker of the fluid blast type comprising a pressure chamber, a fixed contact and a movable contact separable in said chamber to form an arc therein, and means for supplying an arc-extinguishing fluid under pressure to said chamber, said fixed contact having a cylindrical portion extending inwardly into said chamber and provided with an aperture forming a blast nozzle, said movable contact having an annular contact portion arranged to engage the outer surface of the cylindrical inwardly extending portion of said fixed contact and a centrally located portion of greater length than said annular contact portion extending into said aperture in the closed circuit position of said circuit breaker to control the flow of arc-extinguishing fluid through said aperture.

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