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ELECTRIC CIRCUIT BREAKER

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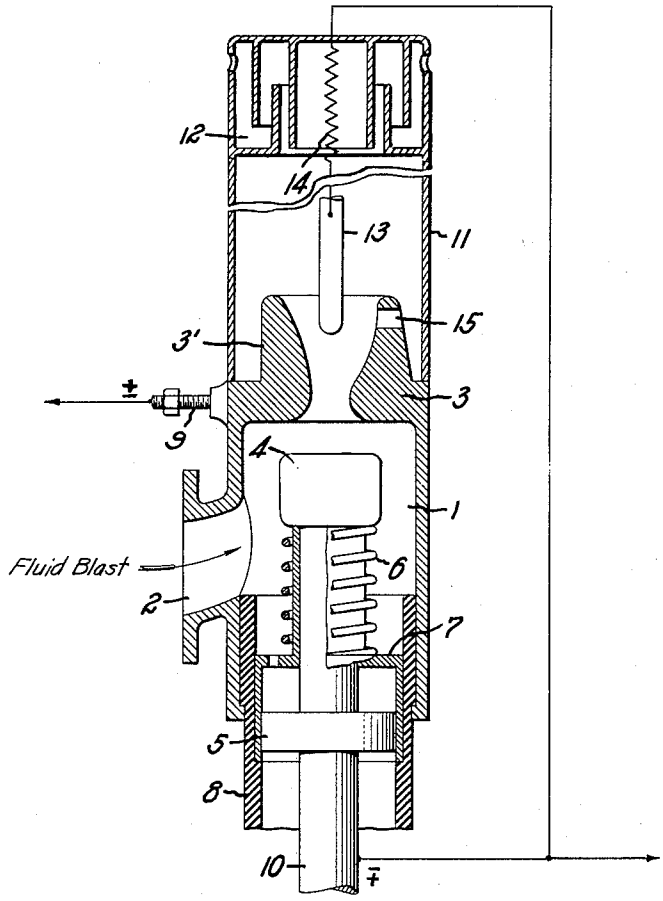

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ELECTRIC CIRCUIT BREAKER

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3 Claims. (Cl. 200—148)

This invention relates to circuit breakers and particularly to fluid blast circuit breakers of the type that includes an auxiliary electrode for inserting a resistance in the arc path established when the main breaker contacts are separated.

Circuit breakers of this general type, including at least one hollow arcing contact and an auxiliary electrode extending coaxially into the hollow contact, are described and claimed in my prior Patent No. 2,117,261, granted May 10, 1938.

An object of the present invention is to provide a circuit breaker of the stated type in which the hollow contact and auxiliary electrode are so designed and relatively arranged as to facilitate the extinction of any arc that is drawn to the auxiliary electrode. An object is to provide a circuit breaker including a hollow arcing contact and a cooperating arcing contact in an arc extinguishing chamber that is normally closed by the engagement of the contacts, an auxiliary electrode extending axially into hollow contact in the path of the arc-extinguishing blast, and a resistance connected between the auxiliary electrode and one of the arcing contacts. More specifically, an object is to provide a fluid blast circuit breaker including a hollow contact located between an arc extinguishing chamber and an exhaust chamber, a cooperating contact normally sealing the bore of the hollow contact, an auxiliary rod electrode extending axially into the hollow contact in line with the arc-extinguishing blast, and a resistance connected between the rod electrode and one of the arcing contacts. A further object is to provide a circuit breaker as stated above in which the hollow contact extends into the exhaust chamber with its outer surface spaced from the wall of the exhaust chamber, and an opening extends laterally through the wall of the hollow contact.

These and other objects and advantages of the invention will be apparent from the following specification when taken with the accompanying drawing in which the single view is a fragmentary and somewhat schematic longitudinal central section through an embodiment of the invention.

In the drawing, the reference numeral 1 identifies the arc extinguishing chamber that may be formed by a hollow casting having a lateral inlet opening 2 for a fluid blast and an apertured upper wall which constitutes a hollow main or arcing contact 3. The cooperating arcing contact 4, that may be solid or hollow, is carried by a piston 5 and normally held in raised or circuit-closing position by a spring 6 which rests upon the upper apertured end of a metal sleeve 7 that is carried by the insulating cylinder 8. One line terminal 9 is carried by or attached to the wall of the arc extinguishing chamber 1, and the other circuit connection is through the rod or sleeve 10 that depends below the piston 5.

A cylinder 11 is arranged above the hollow contact 3 to form a discharge chamber that opens to the atmosphere through a muffler 12 which cools and deionizes the gas blast that is established upon a separation of the contacts 3, 4. The lower end of an auxiliary electrode or contact 13 extends axially into the hollow contact 3, the auxiliary electrode being supported axially of the discharge chamber and connected to one of the main arcing contacts through an arc-suppressing resistor 14.

The general structure of the circuit breaker, as so far described, is or may be similar to that of the circuit breaker of Figs. 1 and 2 of my prior patent, and reference is made to that patent for an illustration and description of appropriate physical structure for parts that are not shown in detail in the accompanying drawing. The present invention contemplates a novel structure for the hollow main contact 3 and a new relation ship of the auxiliary electrode 13 and the hollow contact.

The bore or opening through the contact 3 is of Venturi-shape, and the upper portion 3' of the contact is of reduced diameter to provide an annular space between it and the wall 11 of the discharge chamber. The upper end of the sleeve portion 3' of the hollow contact is preferably provided with one or more transverse openings 15 that allow the pressure gas to flow to the space about the sleeve portion, thus subjecting the auxiliary electrode 13 to a flow of pressure gas from all sides.

Upon separation of the main contacts by the manual or automatic opening of a valve, not shown, to admit a pressure fluid to the interior of the arc extinguishing chamber 1, the arc initially drawn between contacts 3 and 4 is quickly transferred to the auxiliary electrode 13 by the blast that flows along and extends the arc. The series damping resistor 14 reduces the current flow and thus reduces the generation of metal vapors, the heat of the arc, and the ionization of the blast gas.

The spacing of the auxiliary electrode 13 from the surrounding portion of the hollow contact is preferably less than the spacing of the main contacts 3, 4 when the movable contact 4 is in fully open position, as illustrated in the drawing so

that the flash-over voltage between that part of the hollow contact which extends into the exhaust chamber and the auxiliary contact is smaller than that between the arcing contacts in the open position of the circuit breaker.

The arc that is blown to the auxiliary electrode 13, or is established between that electrode and the main contact 4, is subjected to an axial blast which elongates the arc path, and cools and deionizes the arc. The axial blast tends to prevent a restriking of the arc after the voltage has passed through zero, and any arc that terminates on the electrode 13 is of course damped by the resistor 14.

There is some latitude in the design and construction of the hollow contact and it is to be understood that changes may be made in the illustrated construction without departure from the spirit of my invention as set forth in the following claims.

I claim:

1. An electric circuit breaker comprising an arc extinguishing chamber having an opening for the introduction of fluid under pressure, a hollow arcing contact at an end of said chamber, an exhaust chamber communicating with said arc extinguishing chamber through the opening of said hollow contact, a cooperating arcing contact within said arc extinguishing chamber and normally engaging said hollow contact to close the opening thereof, pressure-responsive means supporting said cooperating contact for movement away from said hollow contact upon the introduction of a pressure fluid into said arc extinguishing chamber, an auxiliary electrode axially arranged within said exhaust chamber, said hollow contact extending into said exhaust chamber and encircling the tip of said auxiliary electrode, the portion of said hollow contact that extends into the discharge chamber being of substantially less diameter than said exhaust chamber, whereby an annular space is provided between the hollow contact and the wall of the exhaust chamber, and a resistor connected between said auxiliary electrode and one of said arcing contacts.

2. An electric circuit breaker comprising an arc extinguishing chamber having an opening for the introduction of fluid under pressure, a hollow arcing contact at an end of said chamber an exhaust chamber communicating with said arc extinguishing chamber through the opening of said hollow contact, a cooperating arcing contact within said arc extinguishing chamber and normally engaging said hollow contact to close the opening thereof, pressure-responsive means supporting said cooperating contact for movement away from said hollow contact upon the introduction of a pressure fluid into said arc extinguishing chamber, an auxiliary electrode axially arranged within said exhaust chamber, said hollow contact extending into said exhaust chamber and encircling the tip of said auxiliary electrode, the portion of said hollow contact that extends into the discharge chamber being of substantially less diameter than said exhaust chamber, whereby an annular space is provided between the hollow contact and the wall of the exhaust chamber, said hollow contact having at least one transverse opening therethrough adjacent the end portion thereof that extends into the exhaust chamber, and a resistor connected between said auxiliary electrode and one of said arcing contacts.

3. An electric circuit breaker comprising an arc extinguishing chamber having an opening for the introduction of fluid under pressure, a hollow arcing contact at an end of said chamber, an exhaust chamber communicating with said arc extinguishing chamber through the opening of said hollow contact, a cooperating arcing contact within said arc extinguishing chamber and normally engaging said hollow contact to close the opening thereof, pressure-responsive means supporting said cooperating contact for movement away from said hollow contact upon the introduction of a pressure fluid into said arc extinguishing chamber, an auxiliary electrode axially arranged within said exhaust chamber, said hollow contact extending into said exhaust chamber and encircling the tip of said auxiliary electrode, said auxiliary electrode being so positioned with respect to said hollow contact that the flash-over voltage between that part of the hollow contact which extends into the exhaust chamber and the auxiliary electrode is smaller than that between said arcing contacts in the open position of the circuit breaker, and a resistor connected between said auxiliary electrode and one of said arcing contacts.

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