

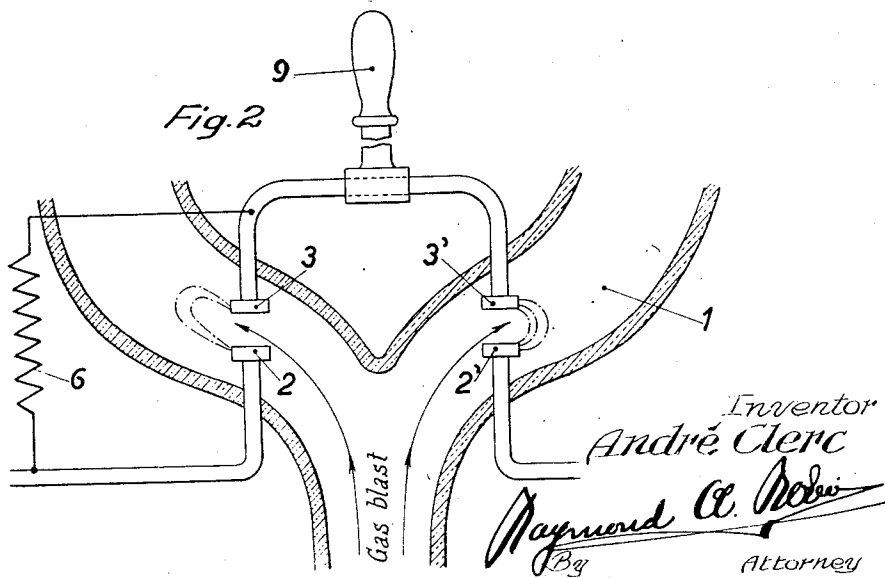
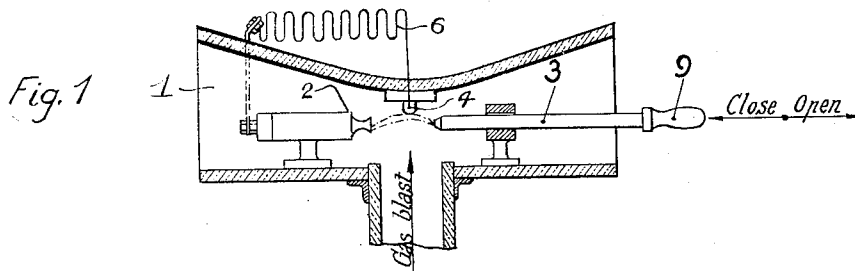
Aug. 4, 1936.

A. CLERC

2,049,996

ELECTRIC CIRCUIT BREAKER WITH COMPRESSED GAS BLOW-OUT

Filed Feb. 13, 1933



UNITED STATES PATENT OFFICE

2,049,996

ELECTRIC CIRCUIT BREAKER WITH
COMPRESSED GAS BLOW-OUTAndré Clerc, Villeurbanne, France, assignor to
Ateliers de Constructions Electriques de Delle,
Paris, FranceApplication February 13, 1933, Serial No. 656,441
In Germany March 13, 1931

1 Claim. (Cl. 200—148)

The present invention relates to electric circuit-breakers with compressed gas blowout.

My prior application Serial No. 503,835 filed December 20, 1930 concerns an electric circuit-breaker in which the arc can be extinguished by a current of slightly compressed gas owing to the use of at least one pair of contacts shunted by a resistance whereby the intensity of the arc is diminished during a half period of the voltage.

In a second application concerning compressed gas circuit-breaker filed July 6, 1931 under Serial No. 549,001 I recommended the shunting of an arc by a plurality of resistance elements.

The object of the present invention constitutes an improvement in the operation of such circuit-breakers.

It is well known that the resistance of an arc drawn out by an external agent is essentially a function of the intensity of the current flowing through same and varies to a very considerable extent with this intensity. In principle the greater this intensity the lower the resistance of the arc; this latter is of the order of a thousandth of an ohm per centimetre for currents of the order of 10⁴ amperes; inversely, for very low intensities (for example 100 amperes) the resistance is of the order of one ohm per centimetre of length of arc. As a consequence, in alternating currents, the intensity varying periodically between two maximum values of opposite signs passes periodically through zero values. It follows that in the vicinity of these zero values and more especially an instant before the falling to zero of the intensity, the resistance of the arc is relatively very high. If under these conditions the arc is shunted by a resistance of low value compared with this relatively high resistance of the shunted fraction of the arc at the moment of extinction of the arc, the proportion of the current shunted through this resistance will become greater and greater and will finally attain a value such that the whole of the current will pass through same. The shunted fraction of the arc is no longer fed with current and extinguishes itself an instant before the passage through zero of the total current. The shunting resistance has thus behaved as a powerful agent of instability for this fraction of the arc. It consequently follows that the period of extinction of a shunted arc is considerably greater, and that the deionizing action of the blowing out agent, the compressed gas blown against the arc in this particular example, will be incomparably more efficient than in the absence of the resistance. As a consequence, at the instant when the voltage

reverses itself and even in cases when this voltage regains very rapidly a value approximating to its maximum value, the arc which will have extinguished itself an appreciable moment before this instant will be unable to reestablish itself.

A first object of the invention thus consists in giving a sufficiently low ohmic value to the single arc shunting resistance compared with the resistance of the shunted arc itself so as to provoke the extinction of this shunted fraction of the arc before the passage through zero of the total current.

The ohmic value of the resistance to be inserted in the circuit must be small compared with the ohmic resistance of the shunted fraction of the arc, this latter resistance being taken as that corresponding to the intensities of the current existing in the arc an instant before the passage through zero of the current in the circuit.

The invention also relates to circuit-breakers in which a plurality of resistance elements are inserted. In this case the invention consists in giving to each of these elements an ohmic value determined in the manner indicated above.

Further, on introduction of resistances in the circuit of an arc to be extinguished, the intensity of the current in the said arc is reduced and this facilitates its extinction by a gas blast. In accordance with the invention, the extinction of the arc in series with a resistance is further facilitated by giving to this resistance a total ohmic value R , such that the phase displacement of the current on the voltage will be reduced to a low value. This result is attained by giving to the whole of the inserted resistance a total ohmic value R at least equal to $2.3Z$ and not greater than $20Z$, Z representing the minimum impedance of the electric circuit to be interrupted, corresponding to the maximum power the circuit-breaker will be called upon to interrupt.

The invention is applicable to all electric circuit-breakers provided with a gas blow out device and in which the intensity of the arc is weakened by the use of arc shunting resistances. Several circuit-breakers of this type are shown diagrammatically by way of example in the annexed drawing. They comprise in the interior of a chamber 1 made of insulating material a fixed contact 2 and a movable contact 3. The direction of the displacement of this latter contact for opening and closing is shown on the drawing by double arrows; the handle 9 for the manual operation

ation of these contacts has merely been shown for the sake of simplicity, the opening and closing of such circuit-breaker being generally realized through relays and remote control devices which

5 fall outside the scope of the present invention.

In the drawing:

Fig. 1 shows diagrammatically one illustrative embodiment of the invention;

10 Fig. 2 shows a modification having two pairs of contacts.

The chamber 1 surrounding the contacts is provided with at least two openings for the admission and exit of the gas blast. The direction of displacement of the gases is shown by arrows.

15 The resistances, the values of which form the object of the present invention, are indicated by 6 in Figs. 1 and 2 in which a single resistance shunts the arc.

In all these figures, the arc which is formed on the separation of these contacts is indicated by dash and dot lines. Exposed to the blast of compressed gas the arc is drawn out. In the circuit-breaker shown in Fig. 1 the arc thus comes in contact with the auxiliary electrode 4 connected

25 to the resistance 6 which is consequently rapidly inserted in series with the portion 4—3 of the arc when this resistance is given the values indicated above.

In the circuit-breaker in accordance with Fig. 30 2 two pairs of contacts 2, 3 and 2', 3' are pro-

vided. The two extremities of the resistance 6 are each connected to one of the left hand contacts in such manner that the whole of the arc developed between them is shunted by the resistance 6 and is rapidly extinguished. The resistance consequently finds itself inserted in series with the right hand arc which is easily extinguished by the gas blast.

I am aware that my present invention may be embodied in other specific forms than that herein described without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiments of said invention to be considered in all respects as illustrative and not descriptive, reference being had to the appended claim rather than to the foregoing description to indicate the scope of the invention.

I claim:

In an electric-circuit-breaker for alternating currents, a pair of relatively movable contacts; means for extinguishing the arc struck between said contacts, by a gas blast; means comprising at least one resistance element, for shunting said arc, the total ohmic value (R) of said shunting resistance element or elements being at least equal to $2.3Z$ and not greater than $20Z$, Z representing the minimum impedance of the electric circuit to be interrupted.

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