PUBLISHED

JUNE 8, 1943.

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CIRCUIT BREAKERS

Filed Sept. 30 1942

Serial No.

460,231

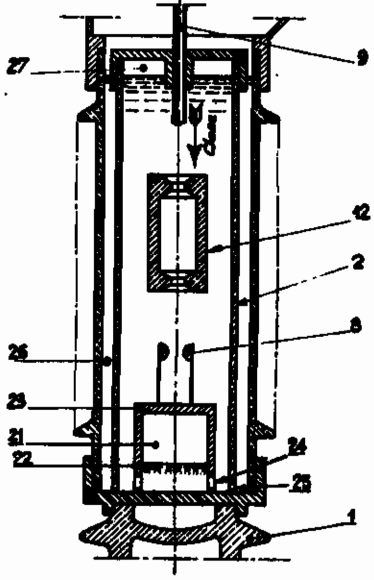

Fig.4

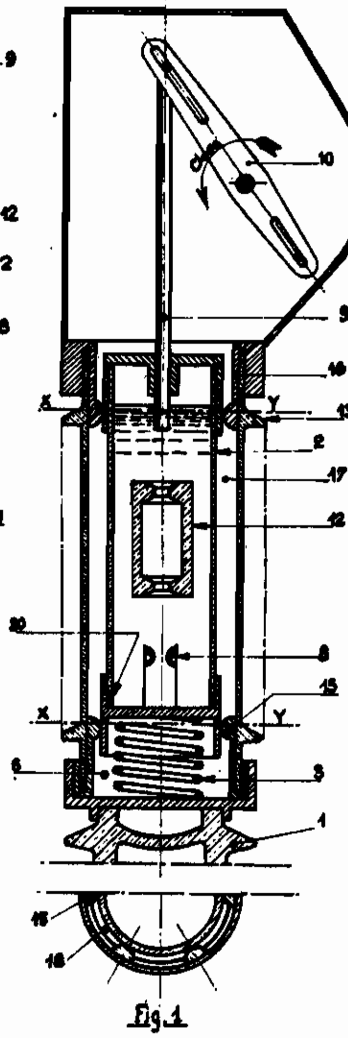

Fig.1

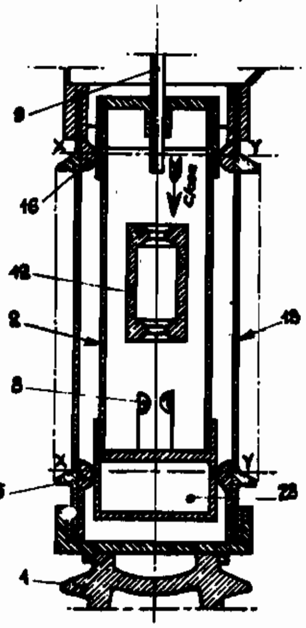

Fig.5

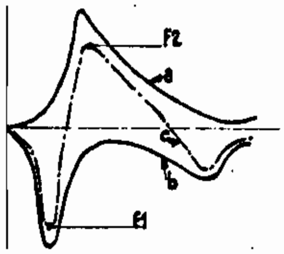

Fig.2

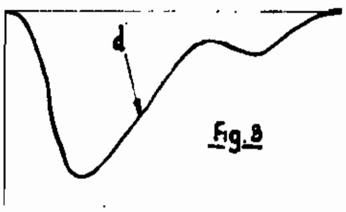

Fig.3

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Published June 8, 1943

Serial No. 460,231

ALIEN PROPERTY CUSTODIAN

CIRCUIT BREAKERS

Aimé Estienne, Lyons, France; vested in the Alien Property Custodian

Application filed September 30, 1942

In circuit-breakers in which the contacts are separated in a liquid such as oil for instance, the extinguishing arc causes the formation of vapors which provoke the displacement of an important mass of liquid. The motion of this mass, called "oil piston," in the extinguishing chamber, produces considerable stresses which are transmitted to the fixing and supporting elements of the extinguishing chamber. In circuit-breakers with a small oil volume, these stresses are most prejudicial because of the fact that the most detrimental stress occurs generally in an upward direction, and in the apparatuses of the type in question, for outside mounting, the extinguishing chamber is usually supported by insulators made of a ceramic matter and having a low rupturing-rate when tensioned.

The purpose of the present invention is to reduce the stresses which the supporting insulators of circuit-breakers with a small oil-volume, are subjected to. Its aim is a circuit-breaker of this type chiefly characterized by devices which allow part of the liquid mass contained in the extinguishing chamber to move towards the chamber supporting insulators, when the breaking occurs and before getting away from it under the action of gases formed by the extinction.

According to a preferred form of the invention, this motion of a part of the liquid mass is performed in opposition to the antagonist stress made upon the extinguishing chamber by either a mechanic or another adequate device.

As non limitary examples, the drawing shows several forms of performing the invention.

In Fig. 1 the upper part shows (raised plan and section) a circuit-breaker, the extinguishing chamber of which is made movable with regard to its insulating support and the lower part of said Fig. 1 shows the circuit-breaker in its half-transversal section according to plan x—y. The supporting insulator, marked out by 1 holds a porcelain cylinder 13 inside which the Bakelite extinguishing chamber 2 is inserted. The latter is filled with oil and contains an extinguishing pot 12 fixed to chamber 2 and traversed by the movable contact. This chamber is supported by a spring 3, resting on the insulator 1 and the force of which has been so chosen that it balances the weight of the chamber and allows the latter, when it undergoes internal pressures produced by the rupturing arc, to move a few centimeters coaxially with the insulator 1 and the external cylinder 13. In order to guide said displacement, guiding fingers 15 and 16 forming two crowns are set inside cylinder 13 on its lower and upper parts.

The space between cylinder 13 and chamber 2 is filled with oil and the very small diameter openings 20 through the lower part of chamber 2 balance the oil level in chamber 2 and in the external cylinder 13 without any quick pressure-waves produced by the electric arc being transmitted to the said cylinder.

The circuit-breaker fixed contact marked 8 placed at the bottom of the extinguishing chamber 2, under the extinguishing chamber 12 and the movable contact is made of a rod 9 driven by a two armed lever 10. The circuit breaker is shown in its open circuit position; in order to close the circuit, lever 10 is turned in the direction of the arrow by any unrepresented mechanical means.

On circuit-breaking, the arc taking place between contacts 8 and 9 vaporizes a part of the oil in the extinguishing chamber 2 and the stresses caused by the displacement of the "oil piston," generally takes the form represented by the curves of Fig. 2. These stresses, shown in ordinates are given with respect to the time represented in absciss. The stresses exerting on the upper bottom of the extinguishing chamber are represented by curve a, those exerting on the lower bottom, by curve b. Their difference, corresponding to resultant stresses applied to the extinguishing chamber is represented by curve c.

On circuit-breaking, chamber 2, under the action of stress F1, makes at first a downward displacent compressing spring 3; the stress transmitted to insulator 1 corresponds only to the spring compressing stress. On account of the inertia of the oil mass set in motion, when the displacement has reached a few centimeters, the applied strain changes of direction, first brakes the downward motion of the chamber, stops it, and after the second peak F_2 (Fig. 2) it brings it back to its state of equilibrium, with a few slight oscillations as shown by curve of Fig. 3, which represents in ordinates the extinguishing chamber motion with respect to the time represented in absciss. The inertia of the extinguishing chamber is used thus to damp the quick variations of stresses produced by the "oil piston."

Fig. 4 represents another mounting in which the elasticity of an air layer 21, provided for at the lower part of the extinguishing chamber, has a similar action as spring 3 in the device represented in Fig. 1. The oil situated in 22, at the lower part of the air chamber 23 communicates with the oil contained in the extinguishing chamber through openings 24 having a large section, much superior to that of the equilibrium apertures 25. The advantage of this device is of maintaining in a fixed position the extinguishing chamber, but the stress transmitted to the supporting insulator is somewhat more important. One can reduce this stress to a minimum in providing air volumes on the upper part in 27, and at the lower part in 21, said air volumes being in inverse ratio to the distance from the ends of the extinguishing arc to the nearest oil level.

Fig. 5 shows another mounting which makes it possible to reduce to the minimum the stress transmitted to the supporting insulator, to maintain the optima conditions of extinction and to do away with spring 3. At its lower part, the extinguishing chamber is provided with a tight float 28 which makes it rise out slightly above the oil level. One could as well place the float at the upper part of the chamber or around it. The guiding is obtained in a proper manner as in device of Fig. 1; but this device requires two oil levels, independent, for the external cylinder 13 and the other for the extinguishing chamber 2.

In any of the above-mentioned devices, the driving-elements of the movable part are fixed at the upper part of the supporting insulator. The motion of the movable rod being determined and the lower contact being connected to extinguishing chamber displacing itself downwards in devices represented by Figs. 1 and 5, the latter ones have the advantage of increasing slightly the relative speed of opening.

AIMÉ ESTIENNE.