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C. BRESSON
ELECTRIC CIRCUIT BREAKERS
Filed June 26, 1940

Serial No.
342,569
2 Sheets-Sheet 1

Fig. 1

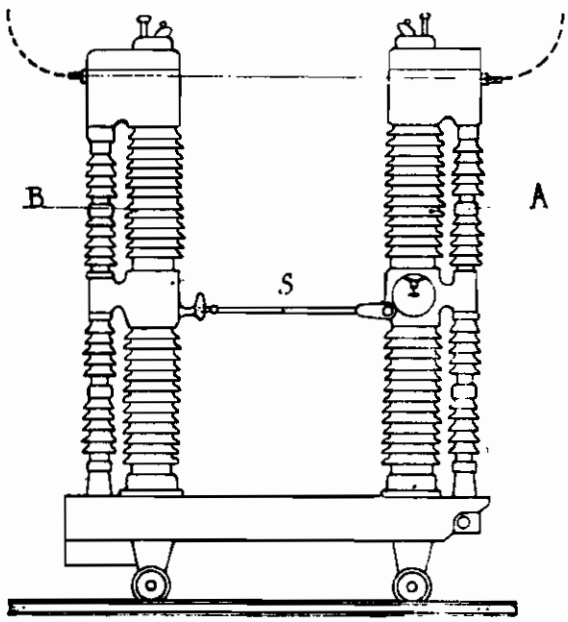


Fig. 3

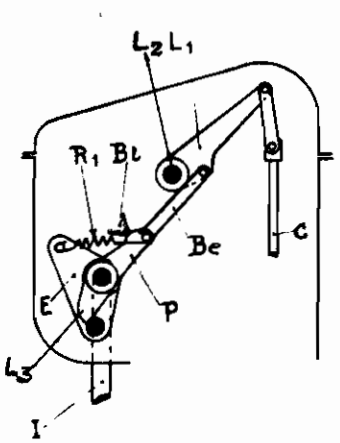
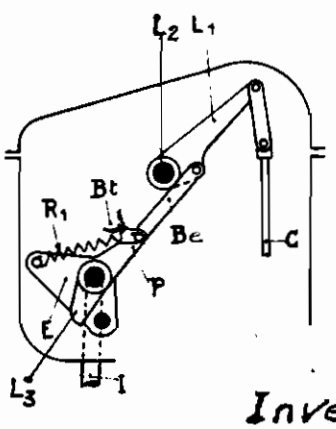


Fig. 4



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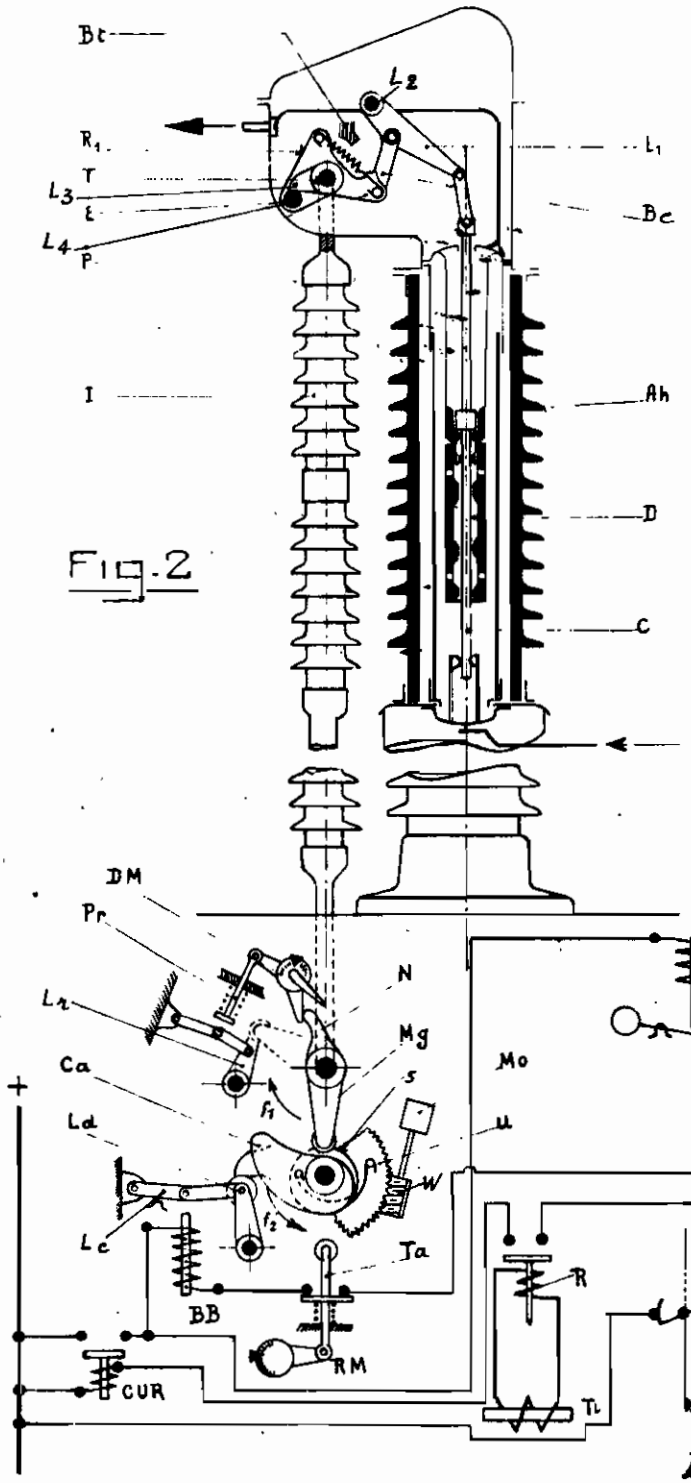

Fig. 2

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ALIEN PROPERTY CUSTODIAN

ELECTRIC CIRCUIT BREAKERS

Charles Bresson, Lyon, France; vested in the Alien Property Custodian

Application filed June 26, 1940

This invention relates to electric circuit breakers, and more particularly to apparatus for ultra rapidly reclosing the arc-drawing means following their separation responsive to the occurrence of a fault in the electric system to be protected.

One of the objects of the invention is to reduce the amount of energy required for such reclosing of the arc drawing means.

Another object of the invention is to provide apparatus for reclosing the arc-drawing means in electric circuit breakers, which comprises means for storing up potential energy, for example, by slowing up movable parts of the circuit breaker during the separation of the arc-drawing means, and redelivering the energy thus stored up as additional energy for the reclosing of said arc-drawing means, the energy thus stored up being that resulting from the kinetic energy of said movable parts.

The invention, the aforesaid objects thereof, and such other aims and objects as may hereinafter appear, will be readily understood from the following description, taken in connection with the accompanying drawing of one embodiment of the invention herein given for illustrative purposes, the true scope of the invention being more particularly pointed out in the appended claims.

In the drawing:

Fig. 1 is an elevation of a monophase element of a circuit breaker mounted upon a carriage;

Fig. 2 in its upper portion shows, partly in elevation, partly in section, a circuit breaker B, and in its lower portion a plan view of the controlling or operating mechanism of the arc-drawing means and a diagram of the electric plant for operating the two apparatus A and B:

Figs. 3 and 4 show details.

The invention is herein shown in its application to a polyphase circuit breaker plant, but it will be understood that it is not to be considered as limited to this particular application. Said polyphase circuit breaker plant (see Fig. 1) herein comprises a normal or main circuit breaker A having connected in series therewith an ultra-rapid circuit breaker B, which, upon the occurrence of a fault, acts immediately to break the circuit of the electric system to be protected, but only in that phase affected by said fault, and then recloses said circuit before said normal circuit breaker A of slow or delayed operation has had time to operate, said normal circuit breaker operating definitively to break said circuit only should the fault persist.

Suitable means are provided, such as a swinging member S, to connect or disconnect said two circuit breakers A and B; and each pole of said circuit breaker B is separately controlled or operated. The arc-drawing means comprises a fixed and a movable contact, the latter consisting of a rod C which passes through an arc-drawing chamber D and is actuated by suitable means herein comprising a lever L_1, fulcrumed at L_2 and pivotally connected by a link Be to a member P. The latter is loose upon a shaft T and carries a tooth L_3 adapted to be held forcibly against a pin L_4 upon an actuator E by a spring R_1 which serves to store up potential energy, as will be more fully set forth further on. Said actuator is rigidly connected to a rotary column I provided at its lower end with a crank Mg carrying a roller at its free end.

The movement to separate the movable contact from the fixed contact is in the direction indicated by the arrow f_1 and is effected by a cam Ca which is swung in the direction indicated by an arrow f_2 by a spiral spring s. This spring is secured at one end to said cam and is tensioned by a worm W driven by a motor Mo and meshing with a gear u to which the other end of said spring is secured. The system is arrested with the arc-drawing contacts in closed position by a lever Ld which controls the separation of said contacts. A hiatus occurs in the operation between the separation of said contacts and their reclosure to permit de-ionisation of the air at the place where the fault which caused the separation of said contacts occurred. The duration of said hiatus is variable and is determined by a mechanical time lag relay DM which acts upon lever Lr that controls the closing movement of said movable contact C.

The parts of the apparatus being in the position shown in Fig. 2, with the arc-drawing contacts closed, the operation is as follows:

Upon the occurrence of a fault on the system to be protected, a relay R, which is supplied with energy from a transformer Ti, operates immediately to close the circuit of the coil of an ultra-rapid acting two point contact CUR. A coil BB is thus energized and its core, acting upon toggle Lc, actuates lever Ld to release cam Ca, which starts to rotate and turn crank Mg. When said cam has completed one revolution, the rotary column I and said movable contact C being still mechanically connected, continue their movement. When the parts are nearing the positions shown in Fig. 3, movement of the system comprising lever L_1 and said movable contact C slows up, while movement of said rotary column I is accelerated. When the member P, in this op-

eration, meets the stop Bt, operation of the system comprising parts P, Be, L_1 and C is arrested; movement of said actuator E and said column I continuing, spring R_1 will be strongly tensioned, thus storing up potential energy derived from the kinetic energy of said column I. When the maximum elongation of said spring R_1 is attained, crank Mg is locked with lever Lr, as shown in Fig. 2.

In the course of the above described operation, cam Ca, acting in its rotation at the proper time upon a two point break Ta, breaks the circuit of said coil BB. Said two point break Ta is connected to a mechanical relay RM, which is so constructed and arranged that it will not reclose said circuit until a certain time has elapsed after the extinction of the drawn arc, in practice about fifteen seconds, in order to prevent the circuit from being broken twice in rapid succession in the same chamber.

At the start of the circuit breaking movement of said movable contact a nose N sets the above-mentioned time lag relay DM in operation. When the period of time for which said time lag relay is adjusted has elapsed, said relay actuates a striker Pr to break a toggle pivoted at one end to a fixed point and at the other to said lever Lr, which controls the reclosing movement of said arc-drawing contact C. This causes said lever Lr to release crank Mg and said spring R_1, which latter thus delivers the energy it previously stored up during the circuit breaking movement of said movable contact C. This vigorously draws back said actuator E, integral with said column I, toward said member P, which latter is still pressed against the stop Bt. When these two parts meet the movement of said contact C is accelerated, the speed of said column I diminishes, and said movable contact closes the circuit, inclosing movement being damped by a conventional hydraulic damper Ah.

If, when the closing movement of said movable contact is completed, the fault has disappeared, the circuit BD will remain broken by the relay RR, the action of which is sufficiently retarded and which no longer is supplied with current through the ultra-rapid two point contact CUR, and the main circuit breaker A will not operate to break the current. On the other hand, should the fault still persist, relay R and consequently said two point contact CUR will operate automatically to cause relay RR to close circuit BD, thus operating main circuit breaker A definitely to break the circuit.

It will be seen that the present invention enables practically all the energy used for operating the circuit breaker B to break the circuit, to be recuperated on conclusion of said operation, and to utilize the energy thus recuperated to insure the rapid reclosure of said circuit by said circuit breaker B. It is thus possible to use a much less powerful motor, motor Mo for example, than has heretofore been required, and still obtain the same rapidity of reclosure. Thus, by diminishing by one half, for example, the energy to be stored up in spring s, the power of motor Mo can be reduced by this same amount while still obtaining a speed of operation comparable to that heretofore obtained with circuit breakers using the more powerful motor without the energy recuperating feature of the present invention.

I am aware that the present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desire that the present embodiment of the invention be considered in all respects as illustrative and not restrictive.

CHARLES BRESSON.