Jan. 18, 1938. E. LANGE 2,106,032

ARC RUPTURING DEVICE FOR ELECTRIC SWITCHES

Filed March 23, 1937

Fig. 1

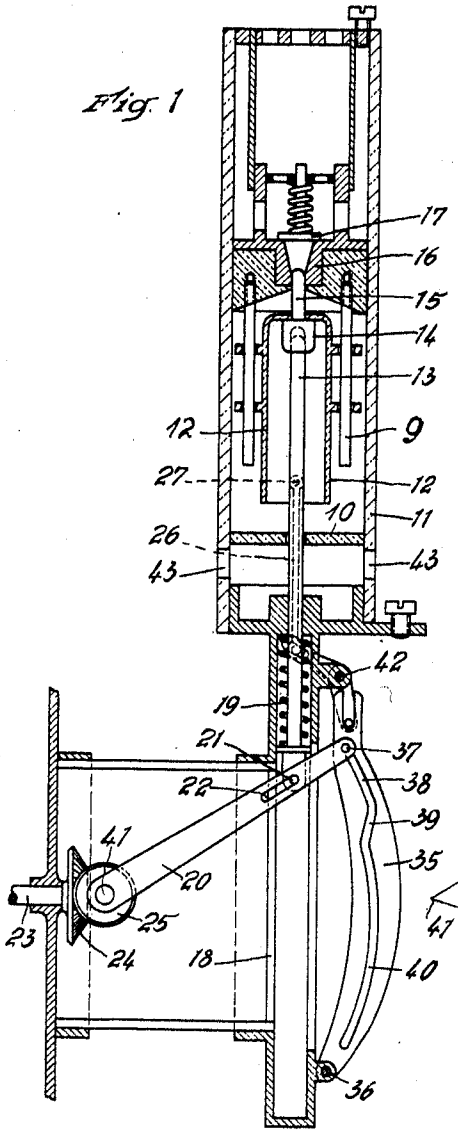
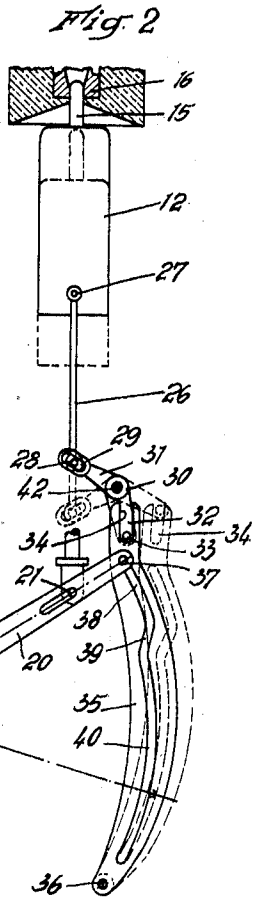


Fig. 2



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Patented Jan. 18, 1938 2,106,032

UNITED STATES PATENT OFFICE

2,106,032

ARC RUPTURING DEVICE FOR ELECTRIC SWITCHES

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Application March 23, 1937, Serial No. 132,584
In Germany April 21, 1936

2 Claims. (Cl. 200—150)

This invention relates to an electric switch of the kind comprising two circuit breakers arranged in a closed, fluid-containing chamber, one at the outlet of said chamber and the other in a confined space, the latter being arranged so that the heating of its fluid by the arc formed therein at the breaking of the circuit, will cause the fluid outside the space to be ejected through the outlet for rupturing the arc formed at the latter.

In switches of this kind it is of importance that the arc at the outlet should not be formed until the pressure of the fluid has risen sufficiently for causing the arc to be ruptured. Otherwise the surrounding fluid will be heated by the arc, and the rupture of the latter will not be effected with the same certainty as when the blast of fluid is cold.

The object of the present invention is to produce a switch operating mechanism whereby a proper control of the circuit breakers will be obtained, and the invention consists essentially in the provision of a switch operating lever which acts directly on the principal circuit breaker disposed in the confined space and which co-operates with means for causing the auxiliary circuit breaker to break the circuit at the outlet after the circuit has been broken by said principal circuit breaker.

The means for operating the auxiliary circuit breaker preferably comprises a pivotally supported arm which is coupled to a bell crank whereby the auxiliary circuit breaker is controlled and which is provided with a cam slot wherein a pin on the switch lever engages for rocking the arm during an appropriate portion of the lever movement.

Fig. 1 of the accompanying drawing represents a sectional view of a switch constructed according to the invention, and

Fig. 2 is a fragmentary view of the operating mechanism.

The switch comprises a closed insulating chamber 11 containing a fluid and having a narrow outlet for said fluid formed by a contact member 16. The outlet is normally closed by a spring controlled valve 17. The contact member 16 co-operates with an auxiliary circuit breaker 15 carried in the crown of a bell 12 which is slidably guided on rods 9 within the chamber 11. The circuit breaker 15 is integral with a socket 14 which is situated within the space of the bell 12 and which co-operates with the principal circuit breaker 13. When the circuit breakers are separated from each other and from the contact member 16, arcs will be formed, one within the bell and the other at the outlet. The bell 12 is so arranged that the fluid contents thereof, on being heated and expanded by the arc, will cause the colder fluid outside the space of the bell, to be ejected through the outlet for rupturing the arc at the latter. In order to prevent the arc at the outlet from being formed in advance of the arc within the bell, the following switch operating mechanism is provided:

The principal circuit breaker 13 has the form of a rod which is controlled by a spring 19 and which is guided by means of a head in a channel 18. A pin 21 on the head of the rod engages in an elongated slot 22 made in a switch operating lever 20. While the latter may be operated in any suitable manner, it is shown in the drawing as mounted on a shaft 41 carrying a conical gear 25 which meshes with a conical gear 24 mounted on a driving shaft 23.

The auxiliary circuit breaker 15, which is mounted on the bell 12, is operated by means of the latter. For this purpose two links 26 are pivoted at 27 to the bell 12 and fitted with pins 28 which engage in elongated slots 29 in the forked arm 31 of a bell crank 30 fulcrumed at 42. The other arm 32 of the bell crank carries a pin 33 whereby it engages in the forked free end 34 of a curved arm 35 which is pivoted at 36 to the switch structure. The switch lever 20 carries at its free end a pin 37 which engages in a cam slot made in the arm 35. This cam slot is divided into three distinct portions 38, 39 and 40.

When the switch lever 20 is deflected from the position shown in the drawing, the pin 37 passes through the portion 38 of the cam slot which is substantially concentric with the shaft 20, so that the movement of the lever will have no affect on the arm 35. The principal circuit breaker 13, however, will at once be retracted by the lever from the socket 14 and form an arc between it and the socket. The fluid in the bell 12 will be heated by the arc and set up a pressure which will be transmitted to the colder fluid outside the bell. When the pressure is sufficient to overcome the spring pressure of the valve 17, the pin 37 will be in position to enter the portion 39 of the cam slot, and this portion is made so that the arm will be deflected by the lever for rocking the bell crank 30 and withdrawing the auxiliary circuit breaker 15 from the contact 16. Thus, at the moment when the arc is formed at the outlet of the chamber and before said arc has had time to heat the surrounding fluid, the latter will be

ejected through the outlet and cause the arc to be ruptured.

When the pin 37 of the operating lever reaches the portion 40 of the cam slot, this portion will also be substantially concentric with the shaft 41, and no further deflection of the arm will take place. The rod 13, however, continues to move, and after it has cleared a partition 10 in the chamber, the hot fluid will be free to escape through discharge apertures 43 in the chamber, the discharge of cold fluid through the outlet being checked by the valve 17.

The device has the advantage of being simple and efficient. All the movements of the mechanism are derived from the driving shaft 23. The timing of the circuit breakers relative to each other can be readily determined by means of the cam slot in the arm 35.

The fluid contained in the chamber may consist of air, gas or a liquid. If a gaseous fluid is used, it may be maintained under pressure in the chamber.

I claim:

1. An electric switch of the character described comprising a closed chamber containing a fluid and having an outlet for the latter, a confined space in said chamber, a principal circuit breaker operative to form an arc within said space, an auxiliary contact breaker operative to form an arc at said outlet, said space being arranged so that the heating of its fluid by the arc will cause the fluid outside the space to be ejected through the outlet for rupturing the arc at the latter, a switch operating lever acting direct on the principal circuit breaker, and means co-operating with said lever for causing the auxiliary circuit breaker to break the circuit after the latter has been broken by the principal circuit breaker.

2. An electric switch of the character described comprising a closed chamber containing a fluid and having an outlet for the latter, a confined space in said chamber, a principal circuit breaker operative to form an arc within said space, an auxiliary circuit breaker operative to form an arc at said outlet, said space being arranged so that the heating of its fluid by the arc will cause the fluid outside the space to be ejected through the outlet for rupturing the arc at the latter, a switch operating lever acting directly on the principal circuit breaker, a bell crank controlling the auxiliary circuit breaker, a pivotally supported arm operatively coupled to said bell crank and formed with a cam slot, and a pin on the switch operating lever engaging in said cam slot and co-operating therewith for rocking the arm during an appropriate portion of the lever movement and causing the auxiliary circuit breaker to break the circuit after the latter has been broken by the principal circuit breaker.

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