April 11, 1939. W. H. FRANK 2,154,237

SEPARABLE CONTACT STRUCTURE

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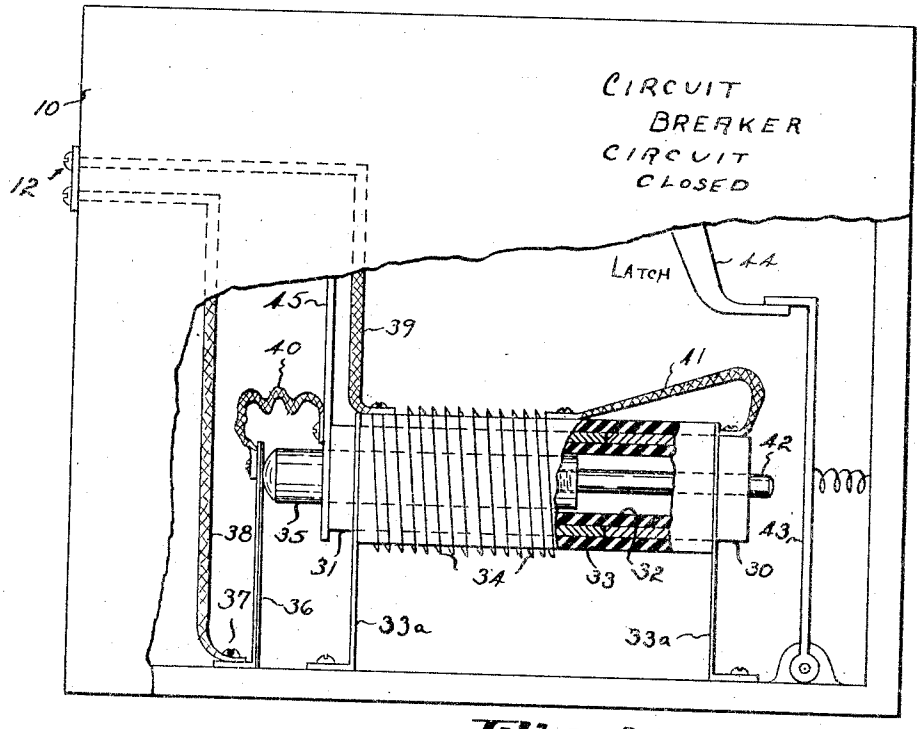


Fig. 1

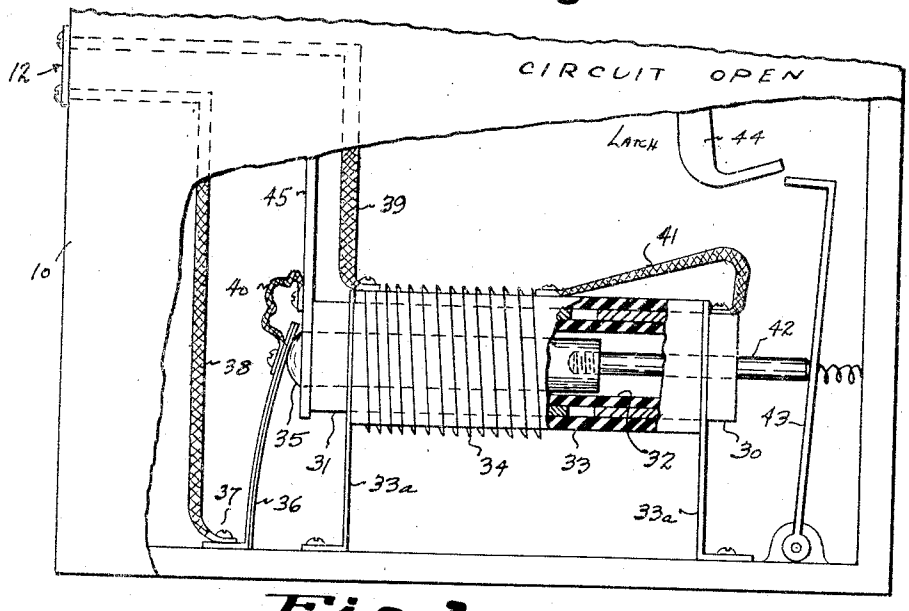


Fig. 2

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SEPARABLE CONTACT STRUCTURE

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6 Claims. (Cl. 200—88)

This application relates to circuit breakers.

The appended drawing shows a circuit breaker having as part thereof a novel contact structure and latch control arrangement; for an understanding of the same reference should be had to the following specification.

In this drawing,

Figs. 1 and 2 show the circuit breaker partly cut away to expose particularly the contact structure and latch control arrangement; the parts are shown in the circuit closed and circuit open positions respectively.

It will be understood that the contact structure and latch control arrangement hereof may be formed as part of any conventional circuit breaker of the character having a circuit current responsive element, such as a bimetal element, arranged to control a trip or release latch of the breaker operating mechanism which when released causes contact separation. Inasmuch as the invention hereof relates particularly to the separable contact structure and latch control arrangement, no attempt will here be made to disclose or describe the circuit breaker except as is necessary to aid in an understanding of the contact structure and the latch control arrangement.

Referring to the drawing and particularly to Fig. 1 it will be observed that this drawing shows a circuit breaker comprising a casing 10 on which are line and load binding posts indicated generally at 12. Within the casing is an operating mechanism, and also the separable contact structure and latch control arrangement of this application. This structure comprises relatively separable and engageable tubular contacts 30—31, which surround a hollow insulating core 32 and are themselves surrounded by an insulating tube 33 supported on supports 33a around an end portion only of which is closely wound a coil 34. Within the core 32 is a magnetic element 35 whose exposed end is adapted to be engaged by a circuit current responsive bimetal warping element 36 anchored at 37. A circuit is established between conductors 38 and 39 by the bimetal part 36, a flexible connection 40, contacts 31 and 30, a connection 41, and coil 34.

On the end of the element 35 opposite the end engaged by the warping element is an elongated non-magnetic pin 42 adapted to engage a spring held trigger 43 which in turn is hooked over the end of a latch 44, it being understood that release of latch 44 constitutes a release of the breaker mechanism (not shown) which mechanism in turn is operatively connected to the contact 30 by a strap 45 so that when the breaker mechanism is tripped contact 31 is pulled away from contact 30.

The operation of the construction herein shown is as follows: Assume the parts to be in the circuit closed position. If a moderate overload arises nothing happens until after a prolonged interval, whereupon the bimetal element 36 warps to the left and moves the magnetic element 35 into operative association with the coil 34. This coil though inadequately energized by the overload, which is merely moderate, to draw the element 35 to it, in the event the element 35 is remote from it, is nevertheless sufficiently well energized to draw the element 35 to the tripping position in the event the element 35 has been partially moved by the warping of the bimetal element, as happens on the prolongation of the moderate overload. Under such circumstances the pin 42 connected to the element 35 will strike the trigger and release the latch 44 thus releasing the breaker mechanism and causing contact 31 to be pulled away from contact 30.

If the overload were intense instead of moderate the element 35 would be sufficiently energized to draw the core to it instantaneously and without waiting for the warping of the element 36 and consequently instantaneous tripping of the breaker and instantaneous separation of the contacts would be effected.

It will be observed that when the contacts 30—31 are engaged the circuit between the line and load binding posts 12 is closed. When these contacts are separated, however, any arc arising incident to contact separation is confined in the annular space between the engaging contact ends and between insulation tubes 32—33 and because of the arrangement of the parts and particularly because of the provision of the coil 34, the arc is caused to rotate rapidly and while in and around such space to the end that burning and pitting of the contacts at their engaging faces is eliminated.

It will also be observed that the coil 34 provides an inductive impedance which limits the amount of current flow in the event of a short circuit or the like.

It will also be observed that the coil 34 acts as a mechanical reinforcement for the insulation tube 33 and particularly prevents such tube from being shattered in the event of an explosion.

I claim:

1. A circuit breaker having a separable contact structure comprising two separable and engageable hollow relatively sliding contacts, an insulation tube closely surrounding the contacts,

a fine wire coil connected in series with the contacts and wound closely and tightly around the tube to reinforce it mechanically, and an insulating core within the contacts and closely surrounded thereby.

2. A circuit breaker having a separable contact structure comprising two separable and engageable hollow relatively sliding contacts, an insulation tube closely surrounding the contacts, a fine wire coil connected in series with the contacts and wound closely and tightly around the tube to reinforce in mechanically, and an insulating core within the contacts and closely surrounded thereby, the core and sleeve cooperating to provide an annular space within which slide the contacts, the annular space between the end edges of the contacts, when these are separated, receiving and confining any arc formed on contact separation, with such arc whirled and rotated in such space by the current flow through the coil.

3. A circuit breaker having a separable contact structure comprising two separable and engageable hollow relatively sliding contacts, an insulation tube closely surrounding the contacts, a coil connected in series with the contacts and wound closely around the tube to reinforce it mechanically, and an insulating core within the contacts and closely surrounded thereby, the core being hollow, and a magnetic element within the core arranged to be moved by the current flow in the coil, and a latch outside the contact structure arranged to be actuated by movement of the element, and a contact separating mechanism controlled by the latch.

4. A circuit breaker having a separable contact structure comprising two separable and engageable hollow relatively sliding contacts, an insulation tube closely surrounding the contacts, a coil connected in series with the contacts and wound closely around the tube to reinforce it mechanically, and an insulating core within the contacts and closely surrounded thereby, the core being hollow, and a magnetic element within the core arranged to be moved by the current flow in the coil, and a latch outside the contact structure arranged to be actuated by movement of the element, and a contact separating mechanism controlled by the latch, and a circuit current responsive element for moving said magnetic element to release the latch and cause contact separation.

5. A separable contact structure comprising two separable and engageable hollow contacts, an insulation tube closely surrounding the contacts, a coil connected in series with the contacts and closely surrounding the tube, a hollow insulating core within the contacts and which cooperates with the tube to provide an annular space between the ends of the contacts when these are separated, the annular space receiving and confining any arc formed on contact separation, a magnetic core within the insulating core adapted to be moved by the current flow in the coil and connected to one of the contacts whereby it will cause contact separation on movement of the magnetic core responsive to the flow of excessive current through the coil.

6. A separable contact structure comprising two separable and engageable hollow contacts, an insulation tube closely surrounding the contacts, a coil connected in series with the contacts and closely surrounding the tube, a hollow insulating core within the contacts and which cooperates with the tube to provide an annular space between the ends of the contacts when these are separated, the annular space receiving and confining any arc formed on contact separation, a magnetic core within the insulating core adapted to be moved by the current flow in the coil and connected to one of the contacts whereby it will cause contact separation on movement of the magnetic core responsive to the flow of excessive current through the coil, the coil being of fine wire wound closely and tightly around the tube to reinforce it mechanically.

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