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ELECTRIC CIRCUIT BREAKER

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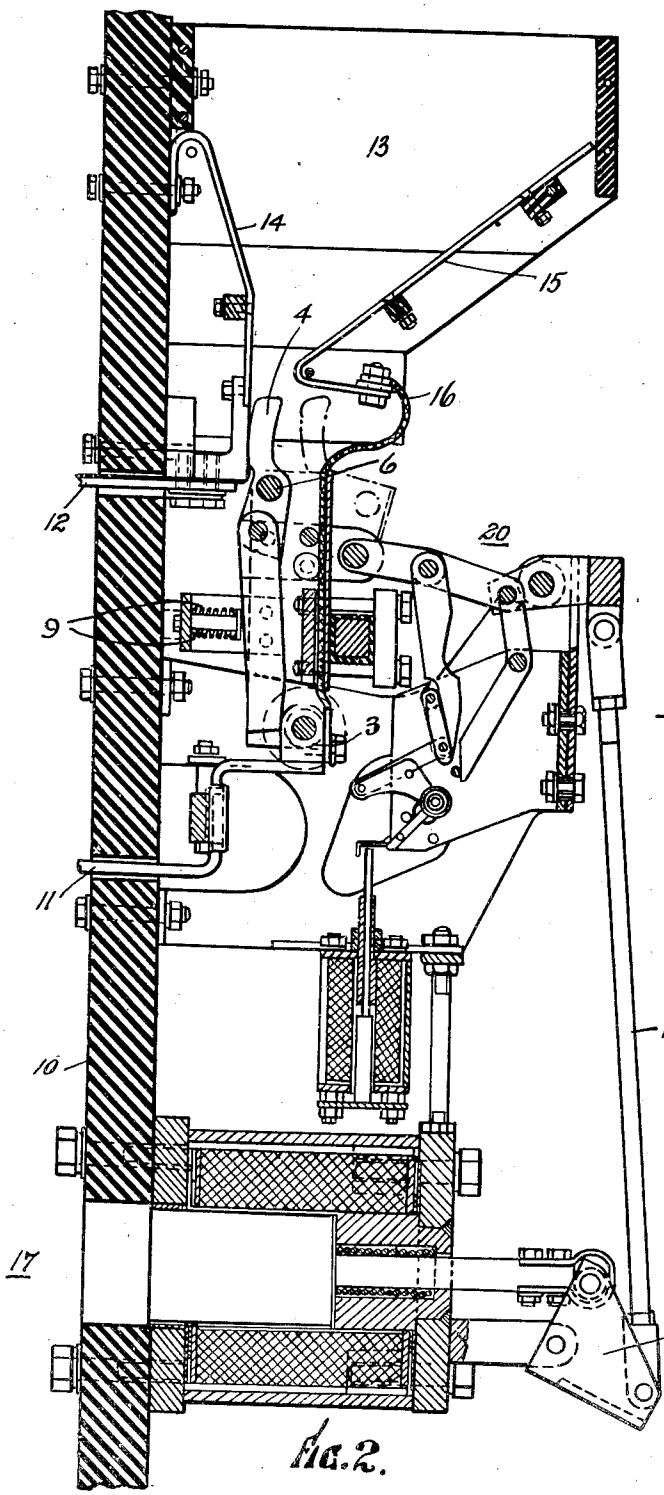

FIG. 2.

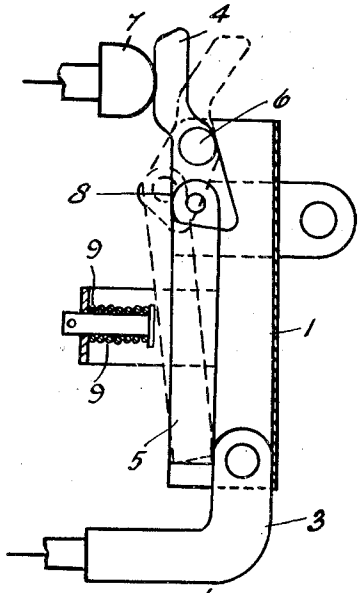

FIG. 1.

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ELECTRIC CIRCUIT BREAKER

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5 Claims. (Cl. 200—87)

This invention relates to electric circuit breakers and is particularly although not exclusively adapted to circuit breakers of the air break type.

A difficulty which is met with in circuit breakers having a hingedly mounted movable contact is that when a heavy current is passing through the breaker the magnetic effect of the current flowing in the movable contact is such that it tends to reduce the contact pressure and even to cause chattering of the contacts. This is due to the well known fact that a loop in a circuit carrying a heavy current tends to expand under the action thereof, the movable contact and the end terminals of the breaker commonly forming a part of a loop.

One object of the invention is to provide an improved construction of electric circuit breaker having a hingedly mounted movable contact member such that the magnetic loop effect is utilised to increase the contact pressure between the contacts.

In the illustrated embodiment of the invention the movable contact member is constructed to provide two levers which are pivotally connected, a preferably relatively short lever including the contact, and a longer lever which extends to the hinge mounting. A fulcrum is so positioned with relation to the lever that when the longer lever of the contact is moved outwardly under the action of a heavy current the short lever is rotated about the fulcrum by its pivotal connection with the longer lever of the contact whereby the contact is moved more closely into engagement with the fixed contact. Spring bias may be applied to the longer lever of the contact in such a direction as to assist the magnetic effect of the current and normally provide a bias for maintaining the contact pressure and also in a direction such that the spring provides an opening bias for the movable contact.

The accompanying drawing illustrates the manner in which the invention is carried into effect Fig. 1 being a diagrammatic representation of the contact member, and Fig. 2 a sectional elevation of a circuit breaker embodying the improved contact member.

Referring firstly to Fig. 1, we have shown the two portions of the movable contact as mounted in a channel-shaped carrier 1 which is itself hingedly mounted at its lower end on a support 3 serving as one of the terminals of the circuit. The contact member comprises an upper short contact-making lever 4 and a lower longer lever 5 which forms part of a loop carrying the circuit current. The upper lever 4 is pivoted at about its centre to a pivot 6 carried by the flanks of the channel-shaped member 1 and constituting the fulcrum, and above this pivot it is formed as a contact element which engages the fixed contact 7 in the closed position of the circuit. Below the pivot 6, i. e., at the side of the fulcrum remote from the contact making part, the upper lever is provided with a second pivot 8 to which the upper end of the lower lever 5 of the contact member is connected, the lower lever extending down between the flanks of the channel-shaped member and freely abutting against a contact block which constitutes the hinge mounting for the channel-shaped member. With this arrangement it will be apparent that the levers 4 and 5 constitute a toggle which, under current carrying conditions, produces an increase in the contact pressure by reason of the magnetic loop expansion effect.

Intermediate between its upper and lower ends the lower lever is engaged by a spring 9 which acts in a direction such as to tend to cause the contact member to move away from the fixed contact. At the same time this spring pressure acting between the lower fixed pivot of the contact member and the upper movable pivot tends to cause the short upper lever of the movable contact to rotate in a direction such as to engage the fixed contact. The circuit connections are so arranged that when the portion of the current loop including the movable contact is flowed through by current, the current tends to move the lower portion of the contact member against the contact block in a direction which is assisted by the spring. By this means the upper portion tends to be rotated about its fulcrum in a direction to cause an increase in the contact pressure. When the contact is first moved in circuit opening direction, the spring bias causes the upper end of the movable contact to move towards the fixed contact, causing a relative rubbing or rolling motion between the contacts, and further movement effects the separation of the contacts.

For higher current-carrying capacity breakers there may be provided two biassing springs, such as 9, located towards the upper and lower ends of lever 5.

Referring now to Fig. 2, we have shown in this figure a circuit breaker of the air-break type to which the contact arrangements shown in Fig. 1 has been applied. Similar reference numerals in this illustration are applied to corresponding parts of Fig. 1. The circuit breaker is mounted on an insulating panel 10 which supports circuit terminals 3 and 7 constituting the stationary

contacts of the breaker, these contacts being connected to terminal conductors 11 and 12 respectively. Above the stationary contact 7, and the movable contact 4 is arranged an arcing chute 13, into which the arc formed between the contacts 4 and 7 when they separate under load is transferred for the purpose of cooling and deionising the resulting gases. On separation of the contacts, the arc is transferred by the inherent looping effect above referred to, to the arcing horns 14, 15 and as it travels up these horns is lengthened, and the cooling of the arcing chute intensified. The arcing horn 15 is connected by conductor 16 to the lower end of the channel-shaped member 1.

The breaker is solenoid-operated, the operating solenoid 17 being connected through a bell crank lever 18 to an operating rod 19, which operates through the linkage 20 to cause on opening the breaker, clockwise rotation of the channel-shaped member whereby the contacts are separated, separation of the contacts being assisted by the spring 9.

While we have described only one embodiment of the invention, we do not desire to be limited thereto as modifications may be made in the construction which fall within the scope of the invention as set forth in the appended claims.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. An electric circuit breaker comprising two circuit terminals, a contact member for interconnecting said terminals, said contact member comprising a support and two pivotally connected levers thereon forming a toggle and constituting part of a current loop including said terminals whereby under current carrying conditions the loop tends to expand and thereby to produce an increase in the contact pressure between the said contact member and at least one of said circuit terminals, and means for operating said contact member between open and closed circuit positions.

2. An electric circuit breaker comprising two circuit terminals, a movable contact member comprising a support pivotally mounted on one of said terminals and relatively movable pivotally connected levers on said support, one of said levers tending to move outwardly from the current loop formed by said contact member and said circuit terminals under the influence of current flowing in said loop and the other of said levers constituting a contact element which in closed circuit position engages the other of said terminals and means for causing the outward movement of said one lever to increase the pressure between said other lever and said other terminal, and means for operating said contact member between open and closed circuit positions.

3. An electric circuit breaker comprising two circuit terminals, a movable contact member hingedly mounted on one of said terminals and adapted to be moved into and out of engagement with the other of said terminals, said contact member comprising two relatively movable pivotally connected levers and a carrier, one of said levers being fulcrumed on said carrier and constituting a contact co-operating with said other terminal, and the carrier being hingedly mounted on said one terminal, the other of said levers being pivotally connected at one end to said one lever at a point on the side of said fulcrum remote from the contacting point of said one lever with said other terminal, and being in abutting relation at its other end with said one terminal, and means for operating said contact member between open and closed circuit positions.

4. An electric circuit breaker as claimed in claim 3 having spring biassing means co-operating with said other lever at a point intermediate its ends in a direction to cause said carrier to move to open circuit position.

5. An electric circuit breaker comprising two terminals, a contact member comprising a support and two pivotally connected levers thereon forming part of a current carrying loop including said terminals whereby under current carrying conditions the loop tends to expand, said levers constituting toggle means for producing an increase in the contact pressure between said contact member and one of said terminals, and means for actuating said contact member from one circuit controlling position to another.

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