

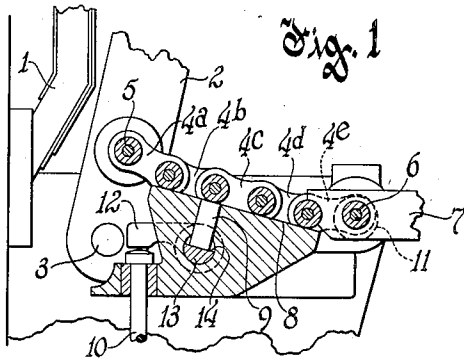
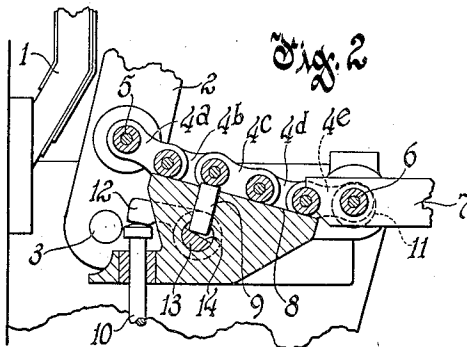
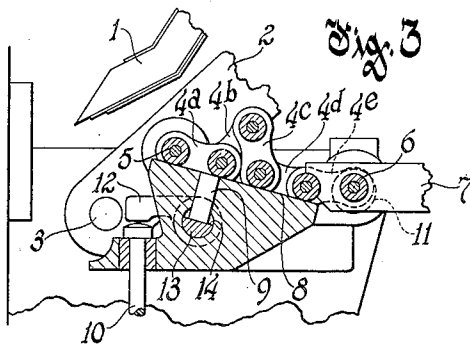
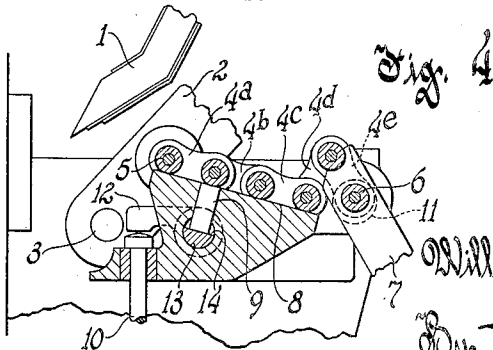
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ELECTRIC CIRCUIT BREAKER

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ELECTRIC CIRCUIT BREAKER

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5 Claims. (Cl. 200—89)

This invention relates to electric circuit breakers and refers more particularly to circuit breakers which comprise an operating handle by which the moving contact is adapted to be moved to the closed and open position at will, and also means whereby, upon the occurrence of overload or some other condition, the transmission between the operating handle and the moving contact is broken so that the latter is automatically thrown to the open position independently of said operating handle.

The object of the invention is the provision of an improved circuit breaker of this kind and the invention consists broadly in the arrangement according to which the transmission between the operating handle and the moving contact comprises a length of chain, preferably of the ordinary roller or bicycle-chain type, which acts as a strut for closing said moving contact and maintaining it closed, said chain being unsupported on one side, and being adapted to be collapsed for permitting the moving contact to return to the open position, by being bent out of the normal thrust transmitting line in the unsupported direction.

In order that the invention may be the more clearly understood a circuit breaker mechanism in accordance therewith will now be described, reference being made to the accompanying drawing ing wherein:—

Fig. 1 is a view of said mechanism in the closed position.

Fig. 2 is a view of the same on the point of being tripped.

Fig. 3 is a view of the same in the tripped position.

Fig. 4 is a view of the same in the re-set position, or the position at which it has been manually opened.

Referring to the drawing the moving contact 1 is mounted at one end of a contact arm 2 whose other end is rotatable about a fixed horizontal axis 3 and is adapted to turn about said axis to and from a contact-closed position, as in Figs. 1 and 2, and a contact-opened position, as in Figs. 3 and 4. The end of the contact arm 2 carrying the contact 1 is above the pivoted end throughout the range of movement as shown, the contact arm when at the contact-closed position approaching the vertical and when at the contact-opened position falling away from the vertical to a position at say 45° thereto.

The transmission by which said contact arm 2 is adapted to be moved to, and held at the contact-closed position consists of five links 4a,

4b, 4c, 4d, 4e of chain of the ordinary roller or bicycle chain type. The extremity of the link 4a at one end (hereinafter termed the end link) is pivoted to said arm 2 at a point 5 usually nearer to the pivoted end than to the contact carrying end thereof, and the extremity of the link 4e at the other end (hereinafter termed the operating link) is pivoted to a fixed pivot point 6. The whole operating link 4e is more or less rigidly connected to the operating handle 7 whereby said operating link 4e is adapted to be turned about the said fixed pivot point 6. The link 4d next to the operating link will be hereinafter termed the connecting link and the remaining two links 4c and 4b the trip links.

A horizontal or inclined surface or track 8 is provided on which certain of the links are adapted to rest by gravity, and the arrangement is such that, with the device at the contact-closed position, both the trip links 4b and 4c and the connecting link 4d will be resting flat on the track 8, as shown in Fig. 1, the end link 4a and the operating link 4e both being tilted upwardly out of the line of the other links. The device is now in a state of stable equilibrium with the whole chain in compression.

If it is desired to move the device to the contact-open position voluntarily, the operating link 4e is turned by the operating handle 7 about the fixed pivot point 6 in such a direction as to raise the pivotal connection between said operating link 4e and the connecting link 4d. This will require force until said operating link 4e and connecting link 4d have moved into and passed the straight line position after which further movement will enable the contact lever 2 to move to the contact-open position with the connecting link 4d and operating link 4e buckling upwardly as in Fig. 4.

If now the operating link 4e is returned, said operating link and connecting link will be again straightened and the contact lever 2 moved to the contact-closed position. After re-passing the straight line position the pivotal connection between said two links 4e and 4d will be pressed against the track 8 and the position of stable equilibrium will again obtain so that the handle 7 can be released.

At a position immediately underneath the pivotal connection of the two trip links 4b and 4c when the device is at the contact-closed position is a reciprocating pin 9 operated by the plunger 10 of an overload winding not shown, and the arrangement is such that, upon the occurrence of overload, said plunger 10 moves upwards and

said reciprocating pin 9 passes through the surface of said track 8 and engages the chain at said point of pivotal connection between the trip links 4b and 4c thereby moving said point upwards out of the straight or dead centre position whereupon said trip links collapse upwardly (as shown in Fig. 3) permitting the contact 1 to move to the open position under the influence of a spring bias. It will be seen that, said trip links 4b and 4c having once been collapsed even should the plunger 10 and pin 9 return to the down position the contact lever 2 cannot be again moved to the contact-closed position until the operating link 4e has been returned to the position for raising the connection between it and the connecting link 4d thereby permitting the trip links 4b and 4c again to straighten on the track as shown in Fig. 4.

The arrangement is such that the plunger 10 will operate to trip the trip links just before the full contact-closed position is attained and when auxiliary contacts, whose closure precedes that of the main brush 1, first close.

In order that the device shall be rendered adjustable to compensate for wear at the contacting surfaces, and thereby to ensure that the contacts shall always close fully, the position of the axis 6 is made adjustable by virtue of said axis being mounted eccentrically in a rotatable bearing element 11. As said bearing element 11 is rotated, said axis 6 will move on the arc of a small circle and its location is in a sense longitudinally of the track 8 and can accordingly be adjusted within fine limits.

It will be observed that the movement of the pin 9 by means of the plunger 10 is effected through the medium of a lever 12 which is provided with trunnions 13 one of which is cut away to provide a surface 14. The pin 9 rests on this surface 14 and as will be seen from Fig. 2 is lifted by the cam action of said surface when the lever 12 is turned by the plunger 10. The movement of the pin 9 is small compared to that of the plunger 10 so that a high mechanical advantage is obtained.

What I claim and desire to secure by Letters Patent is:—

1. The combination with a switch including a movable switch member and an operating member therefor, of a chain connecting said members and having one side unsupported, a stationary guide for the opposite side of said chain, said chain tending to buckle toward said guide upon movement of said operating member in a direction to close said switch member and being held against buckling by said guide and tripping means operable to move said chain away from said guide member to cause buckling thereof for release of said switch member from said operating member.

2. The combination with a switch including a movable switch member and an operating member therefor, of a horizontally arranged chain connecting said members and having its upper side unsupported, and a stationary guide for the underside of said chain, said chain being arranged

whereby the same tends to buckle in a downward direction upon movement of said operating member in a direction to close said switch member and being held against downward buckling by said guide, and tripping means for moving said chain away from said guide to cause buckling thereof in an upward direction for release of said switch member from said operating member.

3. The combination with a switch including a movable switch member biased toward open position, a pivoted operating member therefor, a horizontally arranged chain connecting said members and having its upper side unsupported, and a stationary guide for the underside of said chain, said chain tending to buckle in a downward direction upon movement of said operating member in a direction to close said switch member, and being held against downward buckling by said guide, and certain of the links of said chain being associated with said operating member to cause the same to act as a toggle joint during movement of said operating member in a direction to close said switch member.

4. The combination with a switch including a movable switch member biased toward open position, a pivoted operating member therefor, a horizontally arranged chain connecting said members and having its upper side unsupported, said chain tending to buckle in a downward direction upon movement of said operating member in a direction to close said switch member and a stationary guide member engaging the under side of said chain to hold the same against buckling in a downward direction, said guide member and said operating member cooperating with certain of the links of said chain to cause the same to act as a toggle joint during movement of said operating member in a direction to close said switch member and said chain acting upon movement of said operating member into circuit closing position to releasably hold the same in such position.

5. The combination with a switch including a movable switch member biased toward open position, a pivoted operating member therefor, a horizontally arranged chain connecting said members and having its upper side unsupported, said chain tending to buckle in a downward direction upon movement of said operating member in a direction to close said switch member, a stationary guide member engaging the under side of said chain to hold the same against buckling in a downward direction, said guide member and said operating member cooperating with certain of the links of said chain to cause the same to act as a toggle joint during movement of said operating member in a direction to close said switch member and said chain acting upon movement of said operating member into circuit closing position to releasably hold the same in such position, and tripping means for moving said chain away from said guide member to cause buckling thereof in an upward direction for release of said switch member from said operating member.

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