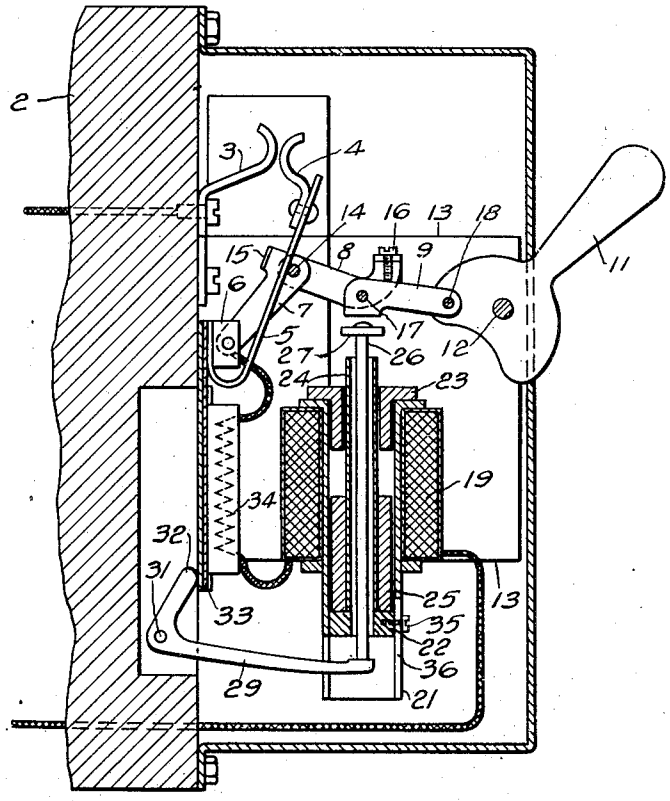
April 28, 1931. G. SPEISER 1,802,679

CIRCUIT BREAKER

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INVENTOR

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BY

ATTORNEY

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UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER

Application filed January 24, 1928, Serial No. 249,109, and in Germany March 11, 1927.

My invention relates to circuit breakers and particularly to circuit breakers for controlling small motors and lighting circuits.

An object of my invention is to provide a circuit breaker wherein the contacts are releasably maintained in closed position and wherein the retaining means is released in response to overload and short-circuit conditions.

A further object of my invention is to provide a circuit breaker having the above-noted characteristics, wherein the circuit breaker is released to open position by a current-responsive thermal element after an overload has endured for a predetermined time, and wherein the circuit breaker is released to open position by an electromagnet trip mechanism in response to a short-circuit.

A further object of my invention is to provide a circuit breaker with an electromagnet trip mechanism that is also actuated by a current-responsive thermal element.

These and other objects that will be made apparent throughout the further description of my invention are attained by means of the apparatus hereinafter described and illustrated in the accompanying drawing, wherein

The figure is a longitudinal section through a circuit breaker embodying features of my invention.

Referring to the drawing, the circuit breaker comprises an insulating base 2 upon which a stationary contact member 3 is mounted and which is adapted to be engaged by a movable contact member 4 that is carried by a yielding contact arm 5 that is secured to a terminal 6 mounted upon the base 2.

The contact arm 5 is actuated by means of a toggle device comprising three links 7, 8 and 9. The link 7 is pivotally connected to the terminal 6 and the link 9 is connected to an operating handle 11 that is mounted for rotation about a shaft 12 carried by a frame member 13 that is attached to the base 2. The contact arm 5 extends between a pivot shaft 14 of the toggle and a stop lug 15 on the link 7, which affords a lost-motion connection between the toggle mechanism and the contact arm. The link 8 is provided with an adjusting screw 16 that engages the link 9 and limits the over-center position of the knee pivot 17 of the toggle.

It will be seen from the foregoing that when the knee pivot 17 is moved past the center line connecting the pivot shafts 14 and 18, the toggle will collapse and the yielding contact arm 5 will immediately snap to open position. Rotation of the operating handle 11 in the clockwise direction will also cause collapse of the toggle and subsequent opening of the circuit breaker. When the operating handle is moved in a counter-clockwise direction, assuming that the circuit breaker is in open position, the toggle links will assume the position shown in the figure and releasably maintain the contact 4 in engagement with the contact 3.

The current-responsive trip mechanism for the circuit breaker comprises a solenoid coil 19 that is mounted on the frame 13. The coil is provided with a centrally-disposed guide tube 21 that is provided near its lower end with an armature supporting collar 22 and at its upper end with a guide bushing 23 which serves as a guide for an armature sleeve 24 that is attached to an armature 25 that is mounted for reciprocation within the guide sleeve 21.

The trip plunger extends through the armature sleeve 24 and is provided at its upper end with a disc 27 that is adapted to be engaged by the armature sleeve 24 and move into engagement with the knee joint of the toggle links 8 and 9 when the armature 25 is forced upwardly by a sudden current surge in the coil 19 as the result of a short-circuit condition. The plunger 26 is forced upwardly with sufficient force to break the toggle and cause opening movement of the circuit breaker.

The plunger 26 is supported upon a bell crank lever 29 that is pivoted upon the base 2 by means of a shaft 31. The short arm 32 of the bell crank lever engages the free end of a bi-metal thermal element 33 that is secured at its upper end to the base 2 and the terminal 6. The bi-metal element 33 is provided with a heating element 34 that is connected in series with the circuit breaker con-

tacts and the solenoid coil 19. The position of the armature 25 within the coil 19 may be varied by adjusting the position of the armature supporting disc 22 within the sleeve 21. The disc 22 is maintained in adjusted position by the screw 35 that extends through a slot 36 in the lower end of the sleeve 21. By varying the positions of the armature stop disc 22, the amount of current required to cause operation of the solenoid and subsequent opening of the circuit breaker may be varied and so adjusted that the normal starting current of the motor controlled by the circuit breaker will not cause the circuit breaker to trip open.

The current-responsive thermal element is provided to cause the circuit breaker to be opened under short-circuit conditions after they have persisted for a predetermined time. Thus, the circuit breaker may be opened by a current less than the starting current of the motor, in the event that it endures for sufficient time, the thermal element being proportioned to open the circuit before injury is done to the apparatus controlled thereby.

It is apparent from the foregoing that the current-responsive thermal element may actuate the circuit breaker independently of the solenoid or electromagnet and that the electromagnet may operate the circuit breaker independently of the operation of the thermal element and that the adjustment of the solenoid armature within the solenoid in no way affects the adjustment of operation of the thermal element.

While I have illustrated but one embodiment of my invention, it will be apparent to those skilled in the art that various changes, modifications, substitutions, additions and omissions may be made in the apparatus illustrated without departing from the spirit and scope of my invention, as set forth in the appended claims.

I claim as my invention:

1. A circuit breaker comprising a contact member, a movable switch member normally biased to open position, releasable means for retaining the switch member in closed position, a current-responsive, thermally actuated means for actuating the said means to release the switch members and an electromagnet surrounding the thermally actuated means having a movable armature for actuating the last said means.

2. A circuit breaker comprising a movable contact member, releasable means for retaining the switch member in closed position, an electromagnet having a hollow armature, a trip member extending through the armature and operable thereby for actuating the said means and a current-responsive thermal element for actuating the trip member.

3. A circuit breaker comprising a movable member normally biased to open position, releasable means for retaining the switch member in closed position, an electromagnet having a movable armature, a trip member operable by the armature for actuating the said means and a current-responsive thermal element for actuating the trip member independently of the said armature.

4. A circuit breaker comprising a movable contact member, releasable means for retaining the switch member in closed position, an electromagnet having a movable armature, a trip member operable by the armature for actuating the said means, a current-responsive thermal element and a lever connecting the said element and the trip member, the said trip member being movable independently of the said lever.

5. A circuit breaker comprising a contact member, a movable switch member normally biased to open position, a solenoid coil responsive to current in the circuit controlled by the switch member, a thermal element responsive to current in the circuit controlled by the switch member, releasable means for retaining the switch member in closed position, and trip means therefor extending through the opening in the solenoid coil and movable therein into tripping engagement with the releasable means by the magnetic flux of the said coil and the said thermal element.

6. A circuit breaker comprising a contact member, a movable switch member normally biased to open position, a solenoid coil responsive to current in the circuit controlled by the switch member, and having an opening extending therethrough, a thermal element responsive to current in the circuit controlled by the switch member, releasable means for retaining the switch member in closed position, and trip means extending through the opening in the said coil for actuating the said releasable means and operable by the magnetic flux of the said coil and the thermal element.

In testimony whereof, I have hereunto subscribed my name this 19th day of December, 1927.

GOTTLIEB SPEISER.