Nov. 7, 1944. T. M. COLE 2,362,051

CIRCUIT BREAKER

Filed Sept. 26, 1941

Fig. 1

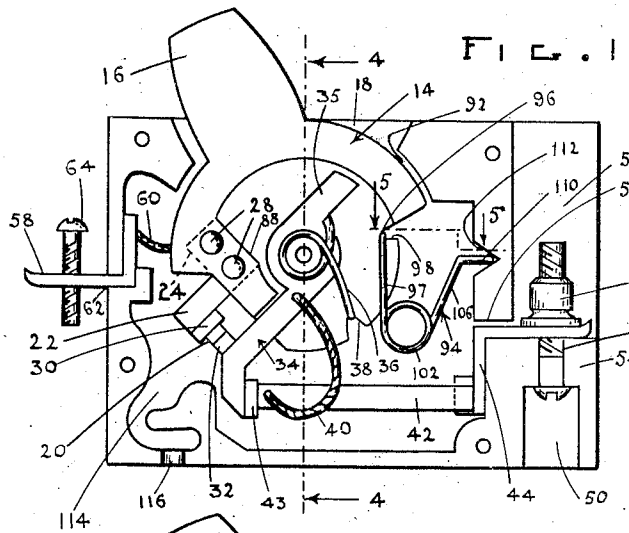


Fig. 4

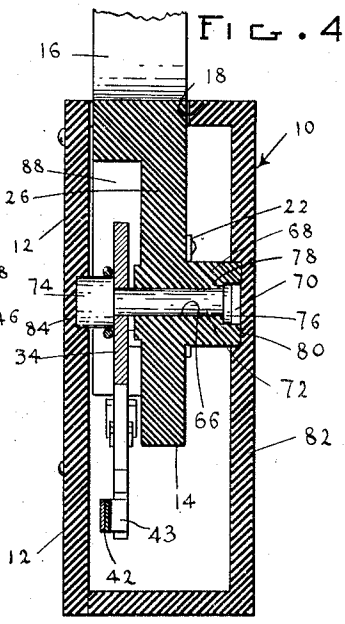


Fig. 2

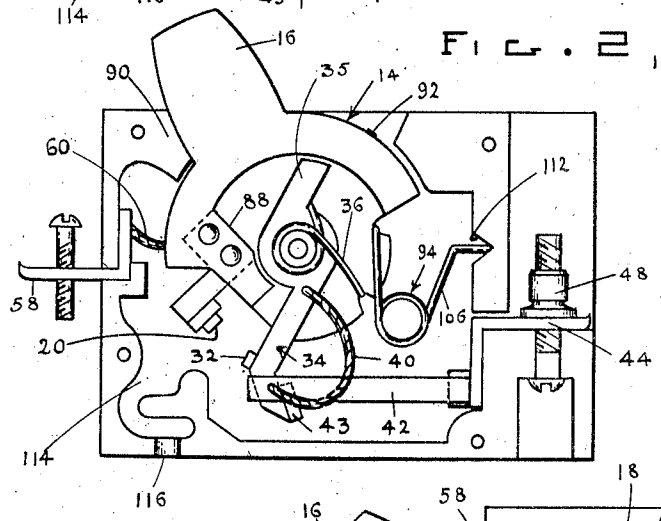


Fig. 5

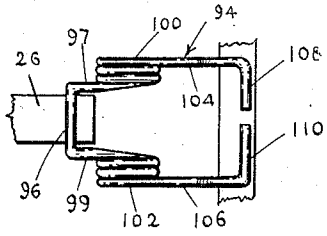


Fig. 6

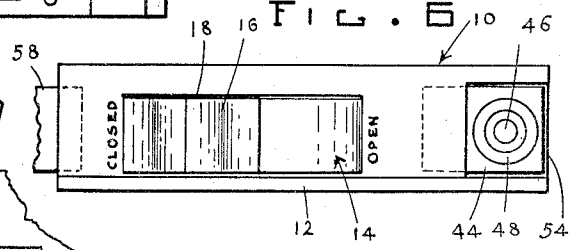
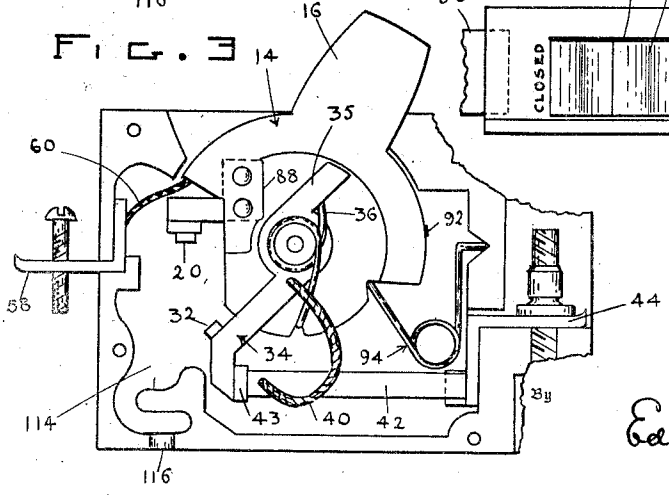


Fig. 3



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UNITED STATES PATENT OFFICE

2,362,051

CIRCUIT BREAKER

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Application September 26, 1941, Serial No. 412,356

3 Claims. (Cl. 200—116)

This invention relates to electric circuit breakers and, more particularly, to circuit breakers of the type set forth in United States Letters Patent No. 2,242,717 granted upon an application filed by me and Christopher I. Smith.

One object of the invention is the provision in a circuit breaker of the above indicated type of an assembly unit comprising a manually actuated operating member and the companion contact members carried by and secured thereto in such manner that these parts can be readily assembled as a unit in the casing of the circuit breaker in association with the other parts thereof.

Another object of this invention is to construct the circuit breaker in such manner that upon disengagement of the companion contact members any arc which may be drawn therebetween extends in a direction away from the part of the casing at which the breaker is manually operated.

The above and other objects, features and advantages of the invention will be more particularly described in the following specification and pointed out in the claims, and for a more complete understanding thereof reference is to be had to the accompanying illustrative drawing.

In the drawing:

Fig. 1 is a side view of the circuit breaker, the cover of the casing being removed, showing the circuit breaker closed;

Fig. 2 is a view similar to Fig. 1 showing the circuit breaker tripped;

Fig. 3 is a view similar to Fig. 1 showing the circuit breaker reset, but still open;

Fig. 4 is a sectional view on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view on the line 5—5 of Fig. 1;

Fig. 6 is a top plan view of the circuit breaker.

Referring now to the drawing in detail the circuit breaker embodying the present invention comprises a casing 10 preferably molded in one part of "Bakelite" or other suitable insulation material. The walls of said casing define a chamber in which the several operating parts of the breaker are positioned and said casing is provided with a removable cover 12 of "Bakelite" or similar material. A switch-operating member 14, molded or otherwise made of insulation material, is pivotally mounted in the casing, preferably in the manner hereinafter to be detailed, and is provided with an operating knob or handle 16 which projects through an opening 18 in the casing. A contact member 20 is mounted in fixed relation to operating member 14, being carried by a metal plate or bracket 22 fixed in a recess 24 provided in one side of the body portion 26 of said operating member. Said bracket 22 is fixed in position in said recess in any suitable way as by rivets 28. Bracket 22 is provided with a lateral part 30 to which contact member 20 is secured for positioning said contact member at the same side of the operating member at which the companion contact member 32 is positioned. Said last mentioned contact member is fixed to a metal arm 34 carried by operating member 14 and pivotally mounted thereon, said arm 34 being mounted at the side of the body portion 26 of said operating member opposite to that at which the carrying bracket 22 of contact member 20 is secured. A spring 36 having one end thereof connected in a notch 38 in the body portion 26 of the operating member and its other end connected to part 35 of arm 34 biases arm 34 for movement to disengage contact member 32 carried by said arm from the companion contact member 20. Thus, both contact members are movable with operating member 14 and said contact members are also relatively movable for engagement with and disengagement from each other.

Contact carrying arm 34 is electrically connected by a flexible conductor or pigtail 40 to an overload tripping device 42 here shown as a thermostatic device constituted by a bi-metallic strip. The free end of strip 42 releasably engages part 43 of arm 34 thus normally holding said arm against movement in a counter-clockwise direction viewing Figs. 1 to 3. Upon the occurrence of an overload strip 42 is flexed out of engagement with said arm and spring 36 moves arm 34 to circuit-opening position. The fixed end of strip 42 is anchored in position in the casing by being fixed to a terminal member 44 held in position in the casing by a screw 46 and a companion knurled nut 48 by which one of the terminal wires (not shown) is connected to the circuit breaker. It will be observed that an end portion of casing 10 is provided with a recess 50 which provides access to the head of screw 46 and with a recess 52 which is open at one side and at an end for providing easy access to the knurled nut 48, a wall portion 54 being formed in the casing for mounting terminal member 44. Terminal member 44 extends from recess 52 into the casing through a slot 56 which is open at the side of the casing at which the cover 12 is secured, whereby to permit the positioning of said terminal member in the casing. The other terminal member 58 is electrically connected to

bracket 22 by a flexible conductor or pigtail 60. Terminal member 58 is preferably L-shaped as shown and is held in a corresponding recess 62 formed in casing 10, said recess being open at the side of the casing at which cover 12 is positioned. Said terminal member is provided with a terminal wire binding screw 64 for the other terminal wire (not shown).

As indicated above an important feature of the present invention is the assembly of the contact members and spring 36 as a unit with the operating member 14. In this respect the construction and arrangement is such that the contact members are both carried by the movable operating member 14 and are secured in assembled relation therewith together with the spring 36 so that these parts can be mounted in assembled relation as a unit in the casing by merely placing the assembly unit in position in the casing. The manner in which this is accomplished will now be described somewhat in detail, although it will be understood that the present specific construction while preferred may be departed from and altered as will readily occur, in view of the present disclosure, to those skilled in the art. By reference to Fig. 4 it will be observed that the body portion 26 of operating member 14 is provided with an axial opening 66 therethrough and with an integral cylindrical axial boss 68 which projects laterally from one side of said operating member. Said axial opening 66 extending through said boss and the latter is provided with a recess 70 which registers with said opening. A cylindrical metal pin 72 extends through opening 66 and has a head or part 74 of enlarged diameter at one end thereof. The other end 76 of pin 72 is located in recess 70 of boss 68 and is upset and thereby enlarged and engaged with the shoulder 78 formed internally of said boss at said recess 70. Pin 72 preferably has a forced fit in opening 66 and is thereby fixed axially of body portion 26 of operating member 14. Boss 68 is received in a bearing opening 80 in the adjacent wall 82 of casing 10 and head 74 is received in a bearing opening 84 in casing cover 12, which constitutes the opposite parallel wall of the casing, whereby operating member 14 is mounted for pivotal movement. The contact carrying arm 34 is pivotally mounted on pin 72 between head 74 of the latter and the adjacent side of the body portion 26 of operating member 14 whereby said contact carrying arm 34 is carried by said operating member and is also pivotally mounted thereon. Arm 34 is thus held against movement axially of member 14 and the contact member 32 carried by said arm is maintained in registry with companion contact member 20. As stated above, spring 36 is connected to part 35 of arm 34 and to the body portion 26 of operating member 16, one end of said spring being engaged in notch 38 in said operating member.

It will be understood that when bi-metallic strip 42 engages the adjacent end of contact carrying arm 34, the circuit breaker can be manually opened and closed by turning operating member 14 from the closed position shown in Fig. 1 in which the companion contact members 20 and 32 are engaged with each other to the open position shown in Fig. 3 in which said companion contact members are disengaged from each other. It will be understood also that, as described above, when the switch is closed and an overload occurs the bi-metallic strip 42 is deflected so that the end thereof which normally engages the adjacent end of contact carrying arm 34 is flexed out of said engagement thus releasing said arm for movement to disengage the contact member 32 carried thereby from the companion contact member 20, said movement being effected by spring 36. Strip 42 flexes, upon an overload, in a direction transversely of the plane of movement of contact carrying arm 34 and, more specifically, toward cover 12 of the casing. The circuit breaker in the tripped condition thereof is illustrated in Fig. 2. The movement of arm 34 in switch-opening direction by spring 36 is limited by the engagement of part 35 of said arm with a shoulder 88 formed on the body portion 26 of operating member 14. It will be noted that when the switch is tripped knob 16 moves from the position illustrated in Fig. 1 to the position illustrated in Fig. 2, in which position said knob engages a stop 90 formed in casing 10. An edge portion of operating member 14 is provided with a red or other mark or trip indicator 92 which is exposed to view through opening 18 in the casing when the switch is tripped, thus to indicate the tripped condition of the switch, said indicator being concealed in the normal open or normal closed condition of the breaker. Also, as here shown, the casing is preferably provided with legends "closed" and "open" at opposite ends, respectively, of opening 18 to indicate the corresponding condition of the switch by reason of the position of the handle 16 adjacent said ends, respectively, of opening 18, except that when indicator 92 is exposed to view the tripped condition is indicated as stated.

The circuit breaker is preferably provided with means for the manual operation of the switch with a snap action. For this purpose an overcentering spring 94 is provided. Said spring comprises, as here shown, a part 96 which engages the body portion of operating member 14 in a notch 98. Said part 96 is integral with arms 97 and 99 provided with coils 100 and 102, the ends of said coils being integral with arms 104 and 106, respectively, terminating in inturned confronting end portions 108 and 110 which engage an adjacent wall portion of casing 10 in a notch 112 formed therein. It will be noted that spring 94 is V-shaped, coils 100 and 102 being located at the apex of the V and parts 96 and 108, 110 being located at the free ends of the V. By reference to Figs. 1, 2 and 3 of the drawing it will be clearly understood that upon the manual operation of operating member 14 overcentering spring 94 is effective to impart to said operating member a snap action in the opening and closing movements of the circuit breaker in the manual operation thereof. Also, it will be observed that spring 94 assists in tripping the breaker as it moves operating member 14 from the position shown in Fig. 1 to the position shown in Fig. 2, when strip 42 disengages arm 34.

It will be noted that, as indicated above, contact members 20 and 32 are so positioned in the casing in respect to each other and have such relative movement that upon the tripping of the circuit breaker any arc which might be formed is directed away from the opening 18 through which the manually operated part of the breaker extends, thus to prevent arcing near knob 16 on the passage of an arc through said opening. It will be noted that contact members 20 and 32 disengage at a point remote from the opening 18 at which knob 16 is positioned. Also, as here shown, an arc chute 114 is provided in casing 10 in the region of separation of contact members 20 and 32. Said arc chute being provided with

an opening 116 for the passage of gases out of the casing. As shown, said arc chute 114 is constructed to provide a tortuous passage for cooling the arc whereby to more rapidly extinguish the same. It will be understood that said arc chute is effective to extinguish the arc formed not only when the switch is tripped under the control of the overload device but also when the switch is manually operated to open the same. Further, it will be observed that when the switch is tripped operating member 14 moves a short distance in a direction such that the contact member 20 moves toward contact member 32 thus slowing down the break between said companion contact members which is advantageous especially when the circuit breaker is used as an alternating current circuit breaker.

It will be understood that after the circuit breaker trips open, it is reset by moving knob 16 of operating member 14 from the position shown in Fig. 2 to the position shown in Fig. 3, thus to permit strip 42 to engage arm 34, provided of course that strip has in the meantime cooled sufficiently, and then the breaker is closed by moving knob 16 from the position shown in Fig. 3 to the position shown in Fig. 1. In this movement of the operating member 14 to close the breaker, arm 34 is held against movement by strip 42 and spring 36 is stressed and thereby conditioned to open the breaker when strip 42 is flexed by an overload and releases said arm.

The manner of assembling the parts of the circuit breaker in casing 10 is considered more or less obvious in view of the above description. It will be understood that the assembly unit consisting of the member 14, contact members 20 and 32, and spring 36 is made before it is placed in casing 10, the parts being secured in position on member 14 by pin 72. Also, the pigtails which connect terminal members, strip 42 and terminal member 58 to arm 34 and plate 22 are secured, preferably by welding, before placing the unit in position in the casing. Said unit spring 94, terminal members 44 and 58, and strip 42 are all placed in position in the casing through the open side thereof, cover 12 being removed, and finally said cover is secured in position.

While I have shown and described the preferred embodiment of my invention, it will be understood that the latter may be embodied otherwise than as herein specifically shown or described, and further it will be understood that in the illustrated embodiment certain changes in the details of construction and in the arrangement of parts may be made and that certain parts may be omitted. Accordingly, I do not wish to be limited to the specific construction herein shown or described except to the extent which may be required by the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In an electric circuit breaker, a casing, relatively movable contact members positioned in said casing and engageable with and disengageable from each other within said casing, an operating member for engaging and disengaging said contact members, said operating member being mounted for movement in said casing, an arm carried by said operating member, one of said contact members being fixed to said operating member for movement therewith and the other of said contact members being carried by said arm, said arm being mounted on said operating member for movement therewith under one condition and for movement in relation thereto under another condition, current responsive means for holding said contact members releasably in engagement with each other, means operable under the control of said current responsive means for effecting said relative movement of said other contact member for disengaging the same from said one of the contact members, and means carried by said operating member engageable with said casing for mounting said operating member for said movement thereof, said last means comprising a recessed cylindrical axial projection in fixed relation to said operating member at one side thereof and a pin passing through said member axially of said projection and having one end secured in the recess of said projection, the other end of said pin having a cylindrical part disposed at the other side of said operating member, said casing having bearing recesses in which said cylindrical projection and said cylindrical part are movably supported.

2. In an electric circuit breaker, the sub-combination comprising an operating member adapted to be mounted for pivotal movement, a contact member carried by said operating member in fixed relation thereto, said operating member having an axial opening, a pin passing through said opening axially of said operating member, an arm pivotally mounted on said pin at one side of said operating member and held against axial movement by a part of said pin and the adjacent side of said operating member, the other side of said operating member engaging an adjacent part of said pin for preventing axial movement of the latter, and a contact member carried by said arm and movable by the latter into and out of engagement with said first mentioned contact member.

3. In an electric circuit breaker, the sub-combination comprising an operating member adapted to be mounted for pivotal movement, a contact member carried by said operating member in fixed relation thereto, said operating member having an axial opening, a pin passing through said opening axially of said operating member, an arm pivotally mounted on said pin at one side of said operating member and held against axial movement by a part of said pin and the adjacent side of said operating member, the other side of said operating member having a cylindrical part projecting therefrom axially thereof and provided with a recess in registry with said opening, said pin having a part thereof secured in said recess for preventing axial movement of said pin, and a contact member carried by said arm and movable by the latter into and out of engagement with said first mentioned contact member.

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