Oct. 31, 1944. D. W. JOHNSON 2,361,848

CIRCUIT BREAKER

Filed Jan. 13, 1942 2 Sheets-Sheet 1

Fig. 1.

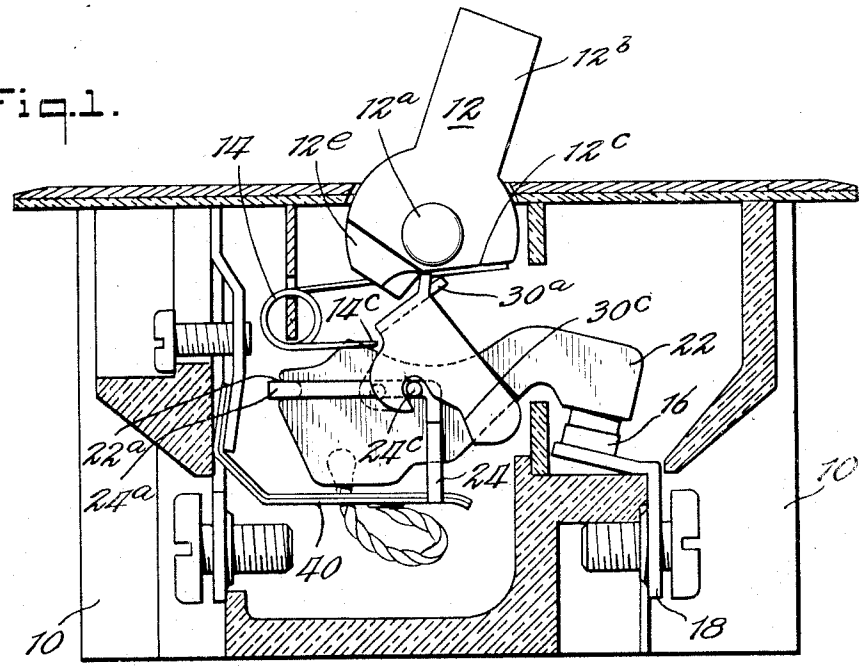
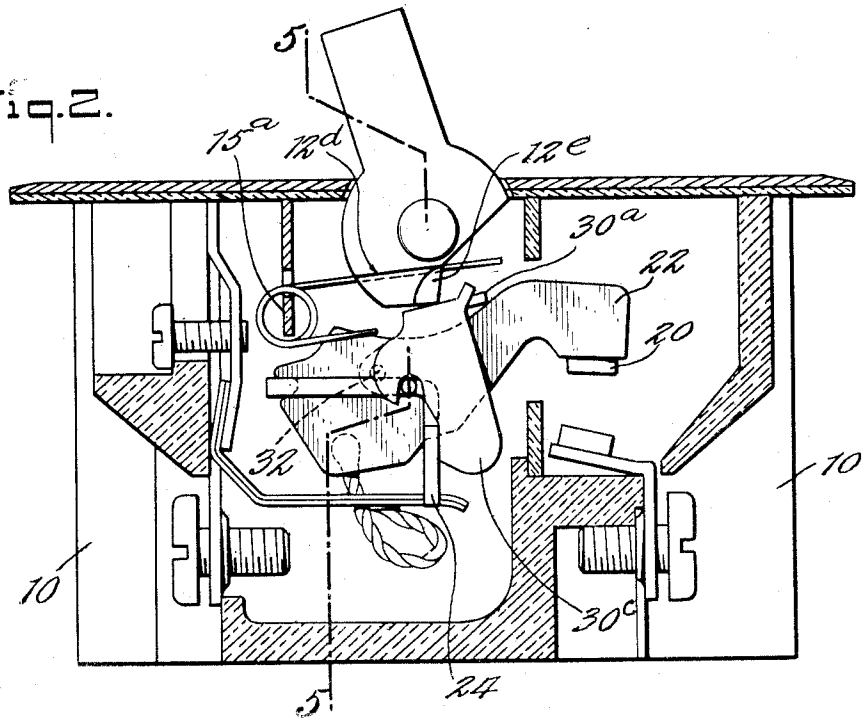


Fig. 2.



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Filed Jan. 13, 1942 2 Sheets-Sheet 2

Fig. 3.

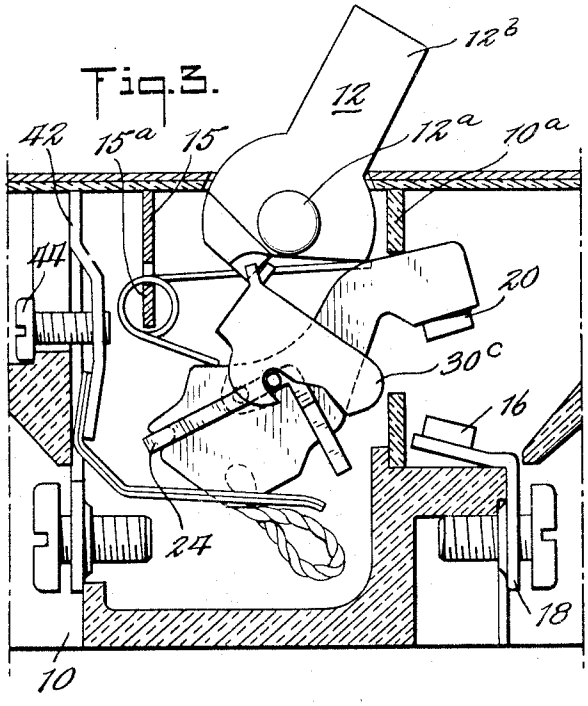
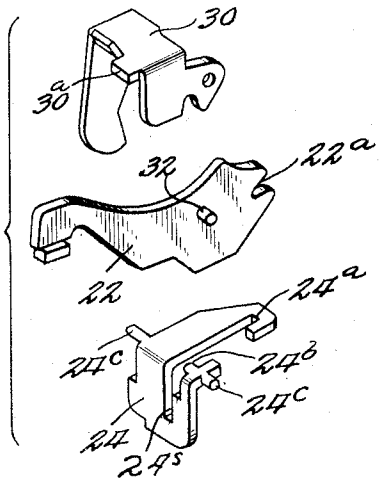


Fig. 6.



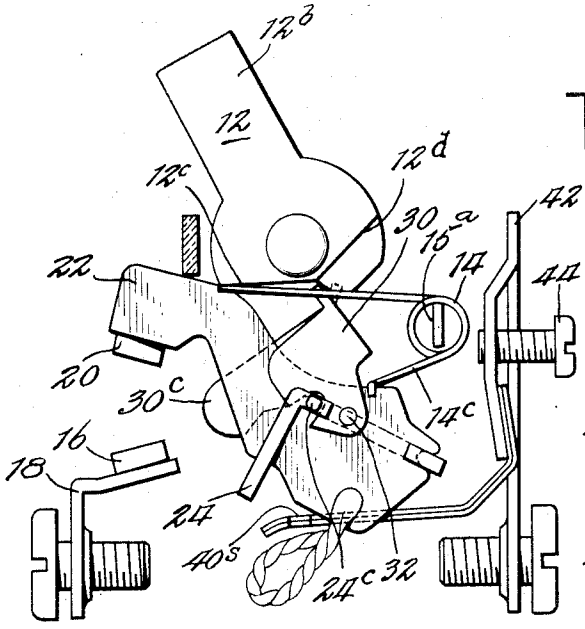
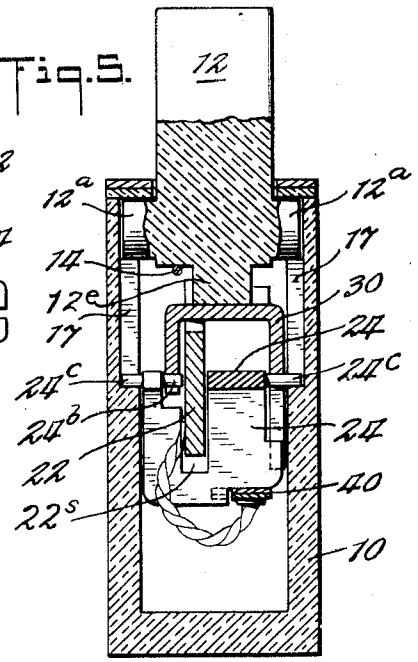


Fig. 4.

Fig. 5.



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UNITED STATES PATENT OFFICE

2,361,848

CIRCUIT BREAKER

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Application January 13, 1942, Serial No. 426,626

14 Claims. (Cl. 200—116)

This invention relates to electric circuit breakers. More particularly it relates to an improved form of the type of electric circuit breakers which has provision for automatic tripping upon the occurrence of an overload. In the preferred embodiment hereinafter described, a thermally-responsive or bimetallic means is provided to accomplish the tripping on overload, but it will be obvious that other current-responsive means may be employed.

It is an object of the invention to provide an improved form of manually and automatically operable circuit breaker mechanism having few and easily-fabricated parts, of which most may be manufactured by stamping.

Another object of my invention is to provide a circuit breaker mechanism of the above type which will be more reliable and efficient in operation.

Another object of the invention is to provide a circuit breaker of the above type in which there is provision for firm closing and engagement of the contacts as they wear or burn away.

Other objects and advantages of the invention will become apparent as it is described in connection with the accompanying drawings.

In the drawings:

Fig. 1 is a sectional view through the casing of a switch embodying my invention and illustrating the parts in elevation in closed-circuit position.

Fig. 2 is a view similar to Fig. 1 but with the parts in the position they occupy when the circuit has been manually opened.

Fig. 3 is a view similar to Figs. 1 and 2, but with the parts in the position they occupy when the breaker is operated automatically.

Fig. 4 is a detail view of the operating parts of the invention removed from the casing and viewed from the opposite side from which they are viewed in Figs. 1–3.

Fig. 5 is a transverse section view taken along line 5—5 of Fig. 2.

Fig. 6 is an exploded view of three of the operating parts of the invention.

Referring to the drawings, the circuit breaker mechanism may be mounted in an insulating casing 10 which is suitably recessed and slotted for the accommodation of the various parts. For actuating the mechanism manually, there is an operating member or handle 12 having trunnions 12a pivoted in the casing 10 and having a handle portion 12b extending outside the casing. The portion of the operating member within the casing is provided with two flat surfaces 12c and 12d against which one end of a coiled compression spring 14 may press in the normally open and closed positions of the mechanism, as illustrated in Figs. 1 and 2. The operating member also has a cam portion 12e provided on the inner end thereof for a purpose to be hereinafter more fully described.

Mounted upon a support and terminal member 18 is a fixed contact 16, positioned for engagement by a movable contact 20 on an operating member or carrier 22. The contact carrier 22 may be conveniently stamped from sheet metal into the form best illustrated in Fig. 6. The carrier, at its end opposite the contact 20, has pivotal engagement with a support member 24. For that purpose, the contact carrier may be provided with a bearing recess 22a to engage with a pivot saddle 24a of the support (see Figs. 1 and 6). Under normal conditions, the contact carrier 22 is urged toward closed-circuit position by by an end 14c of a coiled-compression spring pressing upon the top side of the contact carrier 22. The spring 14 may be conveniently coiled about a strut 15a on a stamped sheet metal spring support member 15 mounted in slots in the casing 10.

In order to move the contact carrier 22 positively from the closed position of Fig. 1 to the open position of Fig. 2 by manual means, there is provided an irregular U-shaped intermediate member 30 stamped from sheet metal and mounted pivotally on the contact carrier by means of a pivot pin 32 extending laterally from the side of the carrier 22. In addition to this pivotal connection, the intermediate member 30 also has a pivotal engagement with a pivot portion 24b (see Fig. 6) of the support member 24. The support 24 is an irregularly-shaped part (as best illustrated in Fig. 6) stamped from sheet metal into L-shape, with a pivot portion or bearing finger 24a, and trunnions 24c, and a bearing pin or pivot portion 24b axially common with the trunnions for pivotal connection with the member 30, as shown in Fig. 5. A slot 24s is also provided to receive and permit movement of the carrier 22. (See Figs. 5 and 6.) In order to move the intermediate member 30, it is provided with a lateral extension 30a from the top or transverse portion of said member 30 in position to be engaged by the cam portion 12e of the handle, particularly when the handle moves from the position of Fig. 3 to the position of Fig. 2. During normal manual operation from Fig. 1 to Fig. 2, the cam 12e engages the transverse top portion of the member 30 to compel the intermediate

member 30 to pivot about the fixed axis or pivot 24b, thereby carrying the pivotal connection 32 of the intermediate member with the contact carrier in clockwise direction about the fixed axis 24b, and concomitantly moving the contact carrier 22 in counterclockwise direction about pivot 24a into open-circuit position. The open circuit movement of the handle and intermediate member 30 is limited by the engagement of a downward extension 30c on the intermediate member with the support member 24, as clearly shown in Fig. 2. The engagement of the cam 12e with the intermediate member 30 in open-circuit position (Fig. 2) is over the center line of handle trunnions 12a and pivot axis 24b, whereby the handle is held in open-circuit position.

From the foregoing, the normal or manual operation of the breaker may be readily understood. The movement from close to open position has already been described. The movement from open to closed position is accomplished by moving the handle in clockwise direction from the position of Fig. 2 to the position of Fig. 1. During this movement, the cam portion 12e of the handle will move away from the lateral extension 30a of the intermediate member, freeing it and permitting movement of the pivotal connection 32 in a counterclockwise direction about the fixed axis or pivot 24b as the effort of spring 14 moves the contact carrier 22 clockwise into closed circuit position.

One advantage of this mechanism is that when the contact surfaces wear or burn away, the contact carrier 22 may move further, in the circuit-closing direction, without being bound, limited, or restricted by, the other part of the mechanism.

In order that the mechanism may be automatically operated, there is provided a thermally-responsive adjustable bimetallic element 40 which engages with and holds the support member 24 under normal conditions. The bimetallic element may be mounted on a terminal 42 and adjustable by a screw 44. The bimetallic element may be slotted, as at 40s in Fig. 4, near its end to provide a latching surface for the end of the support 24. Thus the bimetal will be in tension. The support 24 is mounted for movement about the axis of its trunnions 24c which seat in the bottoms of bearing slots 17 in the casing 10. This axis 24c is fixed and is the only axis and pivotal connection of the whole operating mechanism that is always fixed and constant at all times. Due to the pressure of the spring 14 being exerted to the left of the axis of the trunnions 24c as the mechanism is viewed in Figs. 1 and 2, the support member 24 is constantly urged in counterclockwise direction but is held by the bimetal under normal conditions. Upon the occurrence of an overload, the bimetal will flex downwardly, disengaging the end of the support 24 and permitting the support to rock about the trunnions 24c in a counterclockwise direction. This rocking action carries the pivotal connection 24a of the contact carrier 22 and support 24 downwardly. This downward movement compels the contact carrier 22 to pivot counterclockwise about its connection 32 with the intermediate member 30, thereby causing the movable contact to separate from the fixed contact, as indicated in Fig. 3. In order to limit this motion, a stop 10a is provided. The movement of the support 24 and carrier 22 is accompanied by a slight downward movement of the pivot 32.

In order to re-set the mechanism after automatic operation, the handle is moved from the position shown in Fig. 3 in a counterclockwise direction, during which the cam surface 12e engages the extension 30a of the intermediate member and rocks it about its trunnions 24c until the downward extension 30c engages the support 24. Thereafter the support and intermediate member move jointly about the fixed axis of the trunnions 24c in a clockwise direction until the end of the support 24 is again latched in engagement with the bimetal 40. Since this movement carries the handle of the breaker into open circuit position, as indicated in Fig. 2, the contacts will be in open-circuit position when the support 24 becomes again latched in engagement with the bimetal 40.

It may be noted, by observing the position of the handle in Figs. 1 and 3, that when the breaker operates automatically on occurrence of an overload, the parts—particularly extension 30a—carry the handle past the normal closed-circuit position, so that an indication is given when the breaker is operated automatically. This additional movement becomes clearly apparent when several breakers are mounted alongside one another, whereby it may be easily determined which of the several breakers is automatically tripped. If desired, additional indicating means, such as a mark of color upon the enlarged portion of the handle, may be provided in such a position as to appear only when the breaker handle moves into the position of Fig. 3. This color mark would be covered by the casing during normal operation of the breaker.

Many modifications within the scope of my invention will became apparent to those skilled in the art. Therefore I do not limit the invention to the specific form herein illustrated and described.

I claim:

1. In a circuit breaker, manual actuating means, relatively movable contacts, means for operating at least one of said contacts, supporting means having pivotal engagement with said contact operating means, means resiliently urging said contact operating means toward closed circuit position under normal conditions, intermediate means having pivotal connection with said contact operating means and pivotally mounted about a fixed axis and engageable by said manual actuating means to positively move said contact operating means to open-circuit position, means normally holding said supporting means but responsive to abnormal current conditions to release said supporting means and automatically cause said contacts to separate.

2. In a circuit breaker, manual actuating means, relatively movable contacts, means for operating at least one of said contacts, supporting means having pivotal engagement with said contact operating means, means resiliently urging said contact operating means toward closed circuit position under normal conditions, intermediate means having pivotal connection with said contact operating means and pivotally mounted about a fixed axis and engageable by said manual actuating means to positively move said contact operating means to open-circuit position, means normally holding said supporting means but responsive to abnormal current conditions to release said supporting means and automatically cause said contacts to separate, said resilient means engaging with said manual actuating means to hold it in "closed" position but permit-

ting movement beyond closed position on overload operation.

3. In a circuit breaker, manual actuating means, relatively movable contacts, means for operating at least one of said contacts, supporting means having pivotal engagement with said contact operating means, means resiliently urging said contact operating means toward closed circuit position under normal conditions, intermediate means having pivotal connection with said contact operating means and pivotally mounted about a fixed axis and engageable by said manual actuating means to positively move said contact operating means to open-circuit position, means normally holding said supporting means but responsive to abnormal current conditions to release said supporting means and automatically cause said contacts to separate, and means on said intermediate means to engage said supporting means for moving both means jointly for resetting after overload operation.

4. A circuit breaker mounted in an insulating casing, manual actuating means pivotally mounted in said casing, relatively movable contacts, means for operating at least one of said contacts, supporting means having pivoted engagement with said contact operating means and having a fixed pivotal mounting in said casing, means resiliently urging said contact operating means toward closed circuit position under normal conditions, intermediate means having pivotal connection with said contact operating means and having pivotal mounting for movement about the fixed axis of said supporting means, and engageable by said manual actuating means to positively move said contact operating means to open-circuit position, means normally holding said supporting means but responsive to abnormal current conditions to release said supporting means and automatically cause said contacts to separate.

5. In a circuit breaker, manual actuating means, means providing a fixed bearing for pivotally mounting said manual actuating means, relatively movable contacts, means for moving at least one of said contacts, supporting means having pivoted engagement with said contact-moving means, means providing a fixed bearing for pivotally mounting said supporting means about a fixed axis, means resiliently urging said contact-moving means toward closed-circuit position under normal conditions, intermediate means having a pivotal connection with said contact-moving means and having a pivotal connection with said supporting means for operation about the fixed axis of said supporting means, said intermediate means being positively movable by said manual actuating means to move said contact-moving means to open-circuit position, and means normally holding said supporting means but responsive to abnormal electrical conditions to release said supporting means and automatically cause said contacts to separate.

6. In a circuit breaker, manual actuating means, relatively movable contacts, means for moving at least one of said contacts, supporting means having pivotal engagement with said contact-moving means, intermediate means having pivotal connection with said contact-moving means and being movable by said manual means to positively move said contact-moving means to open-circuit position, said intermediate means also having pivotal mounting about a fixed axis, and means normally holding said supporting means but responsive to abnormal electrical conditions to release said supporting means and automatically cause said contacts to separate.

7. In a circuit breaker, manual actuating means, relatively movable contacts, means for moving at least one of said contacts, supporting means having pivotal engagement with said contact-moving means, intermediate means having pivotal connection with said contact-moving means and being movable by said manual means to positively move said contact-moving means to open-circuit position, said intermediate means also having pivotal mounting about a fixed axis, a fixed pivotal mounting for said supporting means, and means normally holding said supporting means against movement about its fixed pivotal mounting but responsive to abnormal electrical conditions to release said supporting means to automatiaclly cause said contacts to separate.

8. In a circuit breaker, manual actuating means, relatively movable contacts, means for moving at least one of said contacts, supporting means having pivotal engagement with said contact-moving means for manual operation of the contact-moving means, rigid intermediate means movable by said manual means for moving said contact-moving means to open-circuit position, said intermediate means being free to move independently of said manual means past normal closed-circuit position in case of wearing away of the contacts, whereby there is a firm engagement of said contacts regardless of wear, and means normally holding said supporting means but responsive to abnormal electrical conditions to release said supporting means and automatically cause said contacts to separate.

9. In a circuit breaker, manual actuating means, relatively movable contacts, means for moving at least one of said contacts, supporting means having pivotal engagement with said contact-moving means for manual operation of the contact-moving means, intermediate means movable by said manual means for moving said contact-moving means to open-circuit position, said intermediate means being free to move independently of said manual means past normal closed-circuit position in case of wearing away of the contacts, whereby there is a firm engagement of said contacts regardless of wear, resilient means urging said contact-moving means to closed-circuit position under normal conditions, and means normally holding said supporting means but responsive to abnormal electrical conditions to release said supporting means and permit said resilient means to move the breaker into open-circuit position.

10. In a circuit breaker, manual actuating means, relatively movable contacts, means for moving at least one of said contacts, supporting means having pivotal engagement with said contact-moving means for manual operation of said contact-moving means, rigid means intermediate said contact-moving means and said manual actuating means for moving said contact-moving means to open-circuit position, and means normally holding said supporting means but responsive to abnormal electrical conditions to release said supporting means and automatically cause said contacts to separate.

11. In a circuit breaker, manual actuating means, relatively movable contacts, means for moving at least one of said contacts, supporting

means having pivotal engagement with said contact-moving means for manual operation of said contact-moving means, rigid means intermediate said contact-moving means and said manual actuating means and having a non-permanent connection with said manual actuating means for moving said contact-moving means to open-circuit position, and means normally holding said supporting means but responsive to abnormal electrical conditions to release said supporting means and automatically cause said contacts to separate.

12. In a circuit breaker, manual actuating means, relatively movable contacts, means for moving at least one of said contacts, supporting means having pivotal engagement with said contact-moving means for manual operation of said contact-moving means, rigid means intermediate said contact-moving means and said manual actuating means for moving said contact-moving means to open-circuit position, resilient means for moving said movable contacts into engagement, and means normally holding said supporting means but responsive to abnormal electrical conditions to release said supporting means and automatically cause said contacts to separate, said manual actuating means and said intermediate means having a toggle relationship whereby said manual actuating means when moved to open-circuit position holds the contacts apart against the action of said resilient means.

13. In a circuit breaker, manual actuating means, relatively movable contacts, means for moving at least one of said contacts from the other with a slow-break action, supporting means having pivotal engagement with said contact-moving means for manual operation of said contact-moving means, rigid means intermediate said contact-moving means and said manual actuating means for moving said contact-moving means to open-circuit position, and means normally holding said supporting means but responsive to abnormal electrical conditions to release said supporting means and automatically cause said contacts to separate with a quick break.

14. In a circuit breaker, manual actuating means, relatively movable contacts, means for moving at least one of said contacts, supporting means, a fixed pivotal mounting for said supporting means, said contact-moving means having pivotal engagement with said supporting means for manual operation of said contact-moving means, rigid means intermediate said contact-moving means and said manual actuating means for moving said contact-moving means to open-circuit position, resilient means tending to move said supporting means about said fixed pivotal mounting, means normally holding said supporting means but responsive to abnormal electrical conditions to release said supporting means and automatically cause said contacts to separate.

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