May 6, 1969 R. W. DUNHAM ETAL 3,443,258

CIRCUIT BREAKER WITH TRIP INDICATOR

Filed Nov. 10, 1966 Sheet 1 of 2

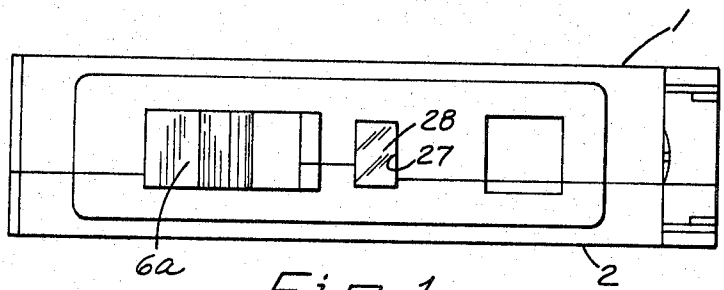


Fig. 1.

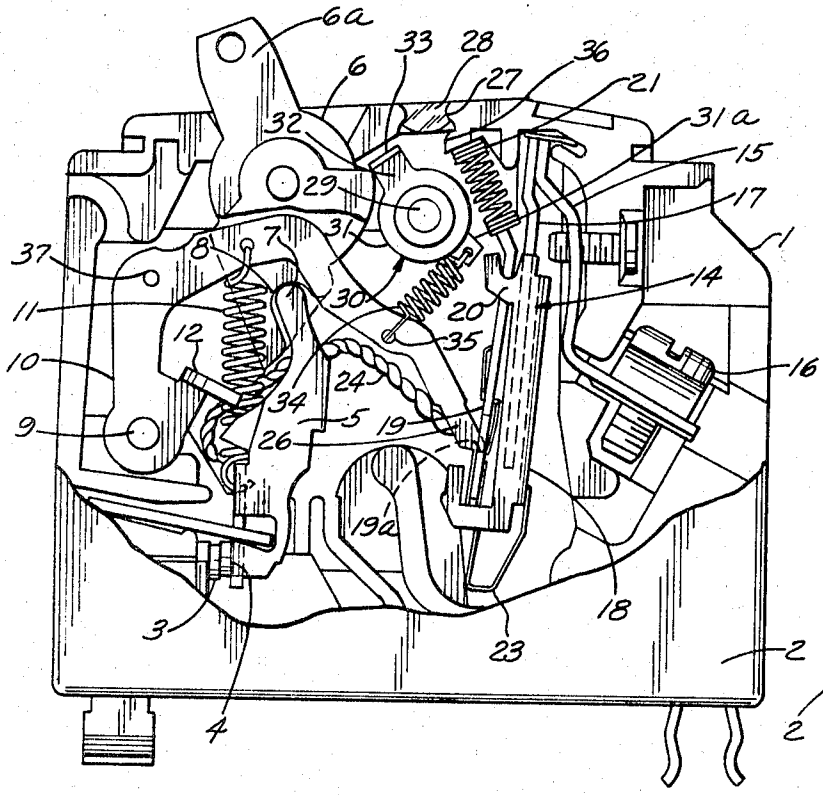


Fig. 2.

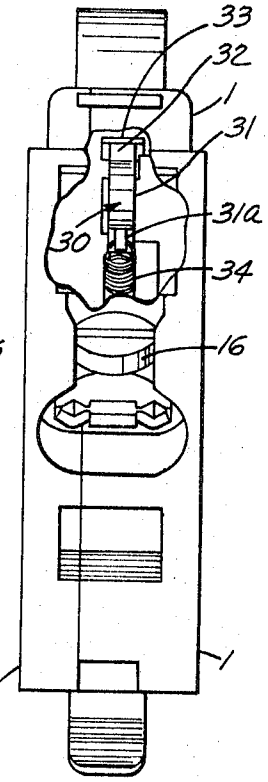


Fig. 3.

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Fig. 4

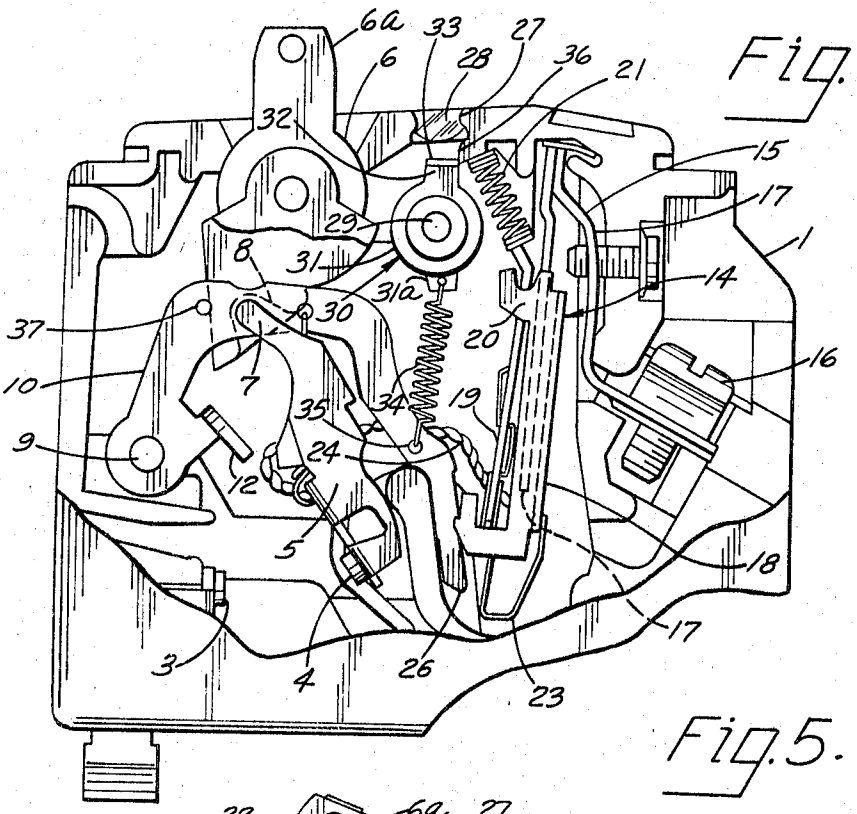
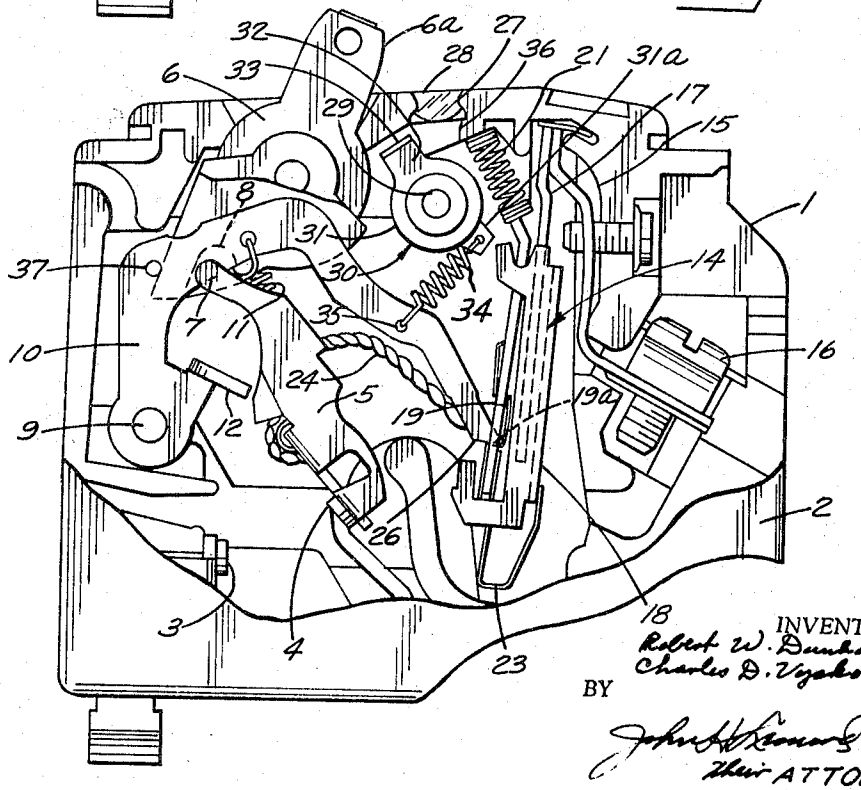


Fig. 5.



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CIRCUIT BREAKER WITH TRIP INDICATOR

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Int. Cl. H01h 71/04, 71/16, 73/12
U.S. Cl. 337—79 1 Claim

ABSTRACT OF THE DISCLOSURE

The circuit breaker has a stationary contact, a movable contact carrier, and a trip member which is normally latched in untripped position by a current responsive trip mechanism and is released thereby under abnormal conditions. In untripped position, the movable contact carrier can be moved to open and closed positions by a manual operator. Upon tripping, the movable contact carrier is moved to open position. An indicator is rockable about a fixed axis from a nonindicating position to a trip indicating position. This indicator is directly connected to the trip member by a coil tension spring which is caused to act in tension upon release of the trip member to rock the indicator to an indicating position and is caused to act in compression upon movement of the trip lever to untripped position by the manual operator to rock the indicator to a nonindicating position.

This invention relates to a circuit breaker having a trip indicator which by a signal indicates that the circuit breaker has been tripped.

More particularly the invention relates to a visual indicator or flag which, when the circuit breaker is turned ON or OFF, but is in untripped condition, is displaced from a window in the housing of the breaker so as to be in a nonindicating position wherein it is not visible through the window. However, upon tripping of the breaker, whether due to a moderate and long sustained overload or sudden severe overload or fault, or for any reason the indicator is moved by a trip lever of the breaker, when the lever moves after being tripped or released, to an indicating position in which the indicator becomes visible through the window, thereby indicating the tripped condition of the breaker.

The arrangement of the indicator is such that, as in prior breakers, after the trip lever is set the breaker may be turned ON and OFF by a manual operator or handle without movement of the trip lever, and, therefore, without movement of the indicator out of its displaced or nonindicating position.

For the purposes of illustration, the trip indicator is shown as incorporated in a circuit breaker of the type fully described in United States Letters Patent No. 2,902,560 of Stanback et al., issued Sept. 1, 1959, its use with other types of breakers employing trip levers being readily apparent from the illustrative example.

It is well known in the art, as evidenced by Green patent No. 2,222,312, issued Nov. 19, 1940, to provide an indicating flag biased toward an ON indicating position by a torsion spring and the like, and driven against the force of the spring by a contact arm into a tripped indicating position as the circuit breaker trips. In the breaker of this patent, the indicator or flag is not caused to move by manual operation of the circuit breaker.

In Platz Patent No. 2,905,795, issued Sept. 22, 1959, a signal drum or flag is provided which indicates ON, OFF, OVERLOAD, TRIP, or SHORT CIRCUIT, by means of a drum biased by a torsion spring toward the OFF indicating position. Upon manual closure of the circuit breaker the drum is rotated to ON indicating position against the bias of the torsion spring by an extension on the contact arm. Upon tripping, the drum is released and the spring revolves to the appropriate one of the other positions, depending upon whether the magnetic trip responded to a short circuit or a bimetal responded to an overload. The drum, therefore, is operated in direct response to the trip mechanism generally, and not in response to the trip lever, and operates manually in response to movement of the contact arm.

From the above patents it is shown to have been known heretofore (a) to operate an indicator of a circuit breaker by the usual bimetal of the trip mechanism, by magnetic trip, by the manual operator, or by the contact arm, and (b) to spring bias the indicator toward either ON or TRIPPED indicating position. However, it is new to use the trip lever of a breaker in the manner disclosed herein for causing movement of an indicator for indicating the tripped condition of the breaker.

The principal feature of the present invention resides in the fact that the indicator or flag is arranged and connected to the trip lever so as to be moved from a nonindicating position into an indicating position by the trip lever as the lever, upon being tripped, moves into a final tripped position, and so as to be moved into nonindicating position by the trip lever upon movement of the trip lever to its untripped position by the manual operator of the breaker.

More specifically the invention relates to a flag which is pivoted in the housing of the breaker in a position to swing into and out of indicating position with respect to a window in the housing, and which is connected to the trip lever of the breaker by an extensible link which interconnects the flag and trip lever in a manner such that the lever, upon movement to untripped position, causes the link to push the flag out of indicating position, and upon movement of the lever to tripped position, causes the link to pull the flag into indicating position. Preferably, the extensible and retractable link is a coil spring which is normally closed and in closed condition acts in compression as a rigid link to transfer movement of the trip lever to the flag for moving the flag to nonindicating position as the trip lever is moved to untripped position, and which, in stretched or extended condition, acts in yieldable tension to transfer movement of the lever to the flag for moving the flag into tripped indicating position with respect to the window when the lever moves to final tripped position.

Various other objects and advantages of the present invention will become apparent from the illustrative example wherein reference is made to the drawings, in which:

FIG. 1 is a diagrammatic top plan view of a single pole breaker and flag indicator embodying the principles of the present invention;

FIG. 2 is a front elevation of the breaker illustrated in FIG. 1, with the front cover removed and part of the manual operator being broken away for clearness in illustration, and showing the breaker parts and indicator in their relative positions when the breaker is ON and untripped;

FIG. 3 is a right end elevation of the breaker illustrated in FIGS. 1 and 2;

FIG. 4 is a fragmentary view similar to FIG 2, showing the relation between the indicator and certain parts of the breaker when the breaker is tripped; and

FIG. 5 is a view similar to FIG. 4 showing the relation of the indicator and parts of the breaker when the breaker is OFF and untripped.

Referring to the drawings, as mentioned, the breaker itself is one described in detail in U.S. Patent No. 2,902,560, and therefore is herein described only briefly.

The breaker comprises a body or housing **1**, of molded insulating material, closed at one face by a detachable cover **2**. In the housing **1** are a stationary contact **3** and a movable contact **4** which is mounted on a carrier **5**. Pivotally mounted in the housing **1** is a manual operator **6** having an external operating handle **6***a*. The upper end of the carrier **5** is provided with fingers **7** of which the upper ends engage in slots **8** in the manual operator **6** in rocking relation so that the carrier **5** can be rocked clockwise and counterclockwise about the upper ends.

Also pivotally mounted in the housing **1** for rocking about a pivot **9** parallel to that of the operator **6** is a releasably latchable trip lever **10**. The lever **10** is connected by a spring **11** to carrier **5**. The spring **11** urges the carrier **5** upwardly so as to seat and hold the upper ends of the fingers **7** in rocking contact with the walls of the slots **8**. The spring **11** also acts to rock the trip lever clockwise about its pivot **9** when the trip lever is released by the trip mechanism of the breaker. The trip lever **10** has an actuating portion **12** which, when the trip lever is released and swings clockwise, engages a shoulder on the carrier **5** and rocks the carrier **5** counterclockwise about the upper ends of the fingers **7** to open position.

The spring **11** has a dead center position and is arranged so that it biases the carrier to contact making position when the lever **10** is untripped. When the lever **10** is tripped, it swings clockwise and carries the upper end of the spring **11** past a dead center position, whereupon the spring **11** moves the carrier **5** to fully open position while at the same time still maintaining a downward force on the trip lever **10** urging it to rotate in the clockwise direction.

In order to latch the trip lever in the untripped position, as illustrated in FIG 2, trip mechanism **14** is provided. The trip mechanism **14** comprises a bimetal and blade assembly comprising a conducting strap **15** connected to a terminal **16**, and a bimetal member **17** fixedly connected at its upper end to the strap and extending downwardly therefrom. A magnetic yoke member **18** is connected to the lower end of the bimetal **17**. A movable magnetic armature member **19** is pivotally cradled near its upper end in arms **20** on the yoke member **18** and is held by an armature spring **21** for yieldably resisted swinging movement relative to the yoke member **18**. To the lower end of the magnetic armature is secured a U-shape ambient temperature responsive bimetal member **23**. A conductor **24**, having a loop portion wound about a part of the magnetic yoke, is connected at one of its ends to the bimetal member **17** and at the other of its ends to the movable contact **4** by a flexible conductor.

Thus, upon a moderate sustained overload, the bimetallic member operates to cause the magnetic yoke to swing counterclockwise, swinging with it the magnetic armature **19**. On the other hand, a sudden undue surge in current causes the armature **19** to swing counterclockwise. In either event, the swinging action releases the trip lever **10**.

In order to hold the trip lever in untripped position, it is provided at its outer end with a finger portion **26** which, at its lower edge, engages an upwardly facing latching shoulder **19***a* disposed in a notch in the armature **19** when the trip mechanism is in latching position, thereby preventing swinging of the trip lever **10** clockwise out of its untripped position. Upon movement of either the armature **19** or the yoke **18** counterclockwise, the finger **26** is released and the spring **11** becomes operative to swing the trip lever **10** clockwise.

The structure thus far described is that fully disclosed in the above Stanback Patent No. 2,902,560.

As mentioned, in accordance with the present invention, the tripped condition of the breaker is to be indicated. For this purpose a window **27** is provided in the top wall of the housing **1** adjacent to the manual operator. A suitable viewing lens **28** is mounted within the window. In the housing **1** adjacent to the window is a suitable pivot

29 on which is pivotally mounted an indicator **30**. The indicator **30** comprises a body or rocker **31** which may be of sheet metal or molded composition. The rocker **31** has a finger **32** extending radially therefrom partway of its length with its outer end bent over to extend axially and provide an indicator or flag **33**. The outer face of the flag **33** faces the lens and preferably is coated with red fluorescent paint. At the opposite side of the pivotal axis, rocker **31** is provided with a fin **31***a* having an aperture therein through which one end of a spring **34** is received for connecting the spring to the rocker. The opposite end of the spring **34** is received in a suitable aperture **35** in the trip lever **10** for connecting the spring **34** thereto.

The spring **34** is so chosen that it is normally in unstressed condition and sufficiently stiff to act as a compression link. For example, it may be a normally closed coil. On the other hand, it can be resiliently extended endwise and act under tension. Thus the spring **34** operates as an extensible and contractible link pivotally connected at its opposite ends to the indicator rocker **31** and trip lever **10**, respectively.

When the breaker is ON and the trip lever is in untripped condition, the flag **33** is held in a position out of alignment with the window **27** and lens **28** by the trip lever acting through the spring **34**.

Assuming the breaker has been tripped, for resetting it the lever **10** is swung counterclockwise to latched position by moving the manual operator **6** from an intermediate TRIPPED position, as shown in FIG 4, to OFF position, as shown in FIG. 5. As the lever **10** is thus swung counterclockwise, the spring **34** acts as a compression link and rotates or rocks the rocker **31** counterclockwise to dispose the flag **33** in nonindicating position out of alignment with the window **27**, as illustrated in FIG. 5. This relation continues whether the manual operator **6** is left in OFF position or is moved to and from OFF and ON positions.

On the other hand, when the breaker is ON, as shown in FIG. 2, and the trip lever **10** is released, it is rocked in a clockwise direction by the spring **11** to the position shown in FIG. 4. The spring **34** then operates as a resiliently extensible link, and becomes operative to transmit the movement of the lever **10** to the rocker **31** so as to rock the rocker **31** about its axis in a clockwise direction to a position wherein the flag is beneath and visible through the window **27** and lens **28**. The finger **32** of the rocker **31**, when the flag is in this position, engages a suitable shoulder **36** in the housing so as to stop the flag precisely in the desired position when moving in a clockwise direction. Thereupon, the spring **34** can elongate sufficiently to hold the flag **33** visibly in the indicating position while permitting the lever **10** to continue on, under the influence of the spring **11**, to final tripped position.

The trip lever carries a reset pin **37** which, when the trip lever is in tripped condition and the manual operator **6** is rocked in a clockwise direction from an intermediate TRIPPED position (FIG. 4) to the OFF position (FIG. 5), is engaged and moved by a portion of the manual operator **6** and thereby swings the trip lever **10** counterclockwise to the latching position. While in this latched, untripped position, with the latching lever **10** holding the flag **33** out of alignment with the window, the manual operator **6** is then rocked counterclockwise to ON position (FIG. 2) and thereby swings the fingers **8** beyond the dead center position of the spring **11**, thus causing the spring **11** to move the carrier **5** to contact making or ON position.

During this operation of the manual operator **6** to ON position, the trip lever **10** remains fixed in its untripped position, wherein the flag **33** is not visible through the window **27**, so that the breaker can be turned OFF and ON by the manual operator **6** without causing the flag to become visible through the window.

Having thus described our invention, we claim:

1. An electric circuit breaker comprising:

a housing;

a stationary contact in said housing;

a movable contact carrier in said housing;

a movable contact mounted on said carrier and movable thereby into and out of engagement with said stationary contact;

a releasably latchable trip lever pivotally mounted in said housing and releasable from a latched position for movement to a tripped position to effect separation of said contacts;

a window in said housing;

an indicating member pivotally mounted in said housing and having an indicating portion movable into alignment with said window upon movement of said trip lever to said tripped position and movable out of alignment with said window upon movement of said trip lever to said latched position;

an extensible-contractible link connecting said indicating member and trip lever and acting as a solid member in compression while pivoting said indicating member to move said indicating portion out of alignment with said window as said trip lever moves from said tripped position toward and to said latched position and acting as an extensible member and extending as said trip lever moves fully to tripped position to move said indicating portion into alignment with said window and to hold the indicating portion in alignment with said window so long as the trip lever remains in fully tripped position; and

the distance between the points of connection of said link with the trip lever and the indicating member, respectively, being equal to the length of the unextended link when the trip lever is in said latched position and the indicating member is positioned with its indicating portion out of alignment with said window.

References Cited

UNITED STATES PATENTS

2,367,382	1/1945	Taylor.
2,685,011	7/1954	Boller et al.
2,055,183	9/1936	Sperry.

FOREIGN PATENTS

657,744	2/1963	Canada.

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