Oct. 8, 1957 L. W. DYER ET AL 2,809,255

CIRCUIT BREAKER

Filed April 12, 1955

Fig. 1.

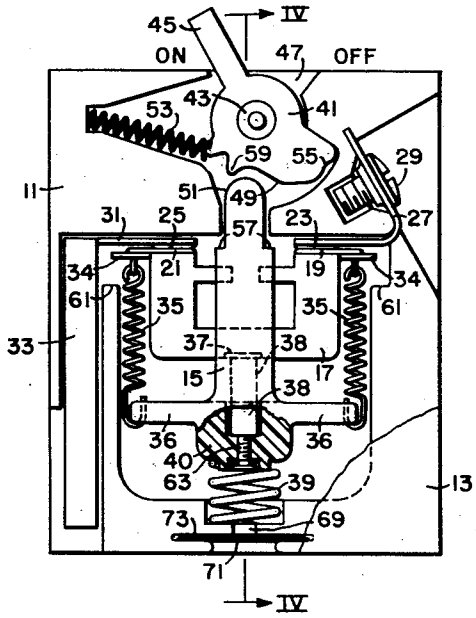
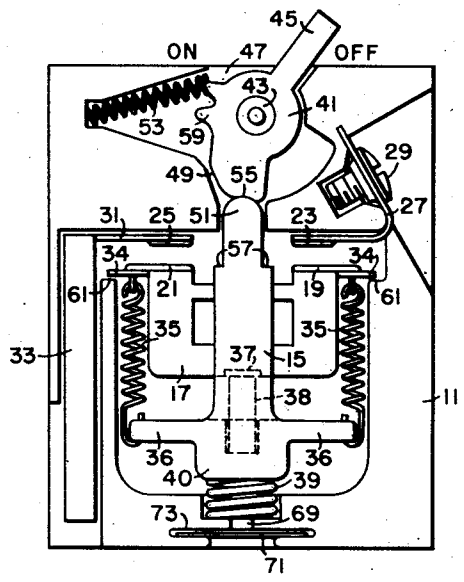


Fig. 2.



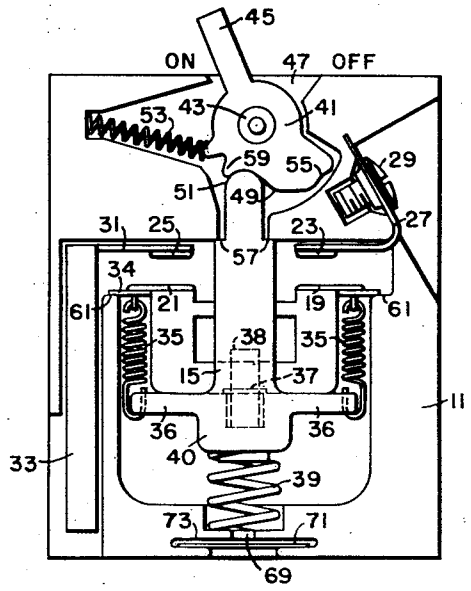


Fig. 3.

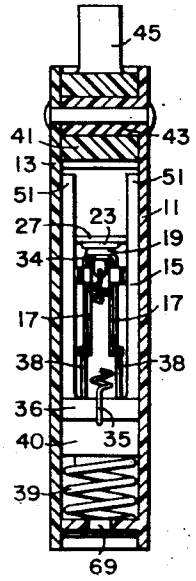


Fig. 4.

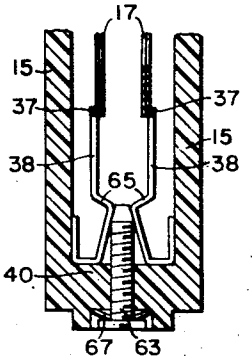


Fig. 5.

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CIRCUIT BREAKER

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Application April 12, 1955, Serial No. 500,766

9 Claims. (Cl. 200—116)

This invention relates to circuit breakers and more particularly to circuit breakers for controlling lighting and moderate power circuits.

An object of the invention is to provide a circuit breaker which is of simple and rugged construction, safe and reliable in operation and which is inexpensive to manufacture.

Another object of the invention is to provide a circuit breaker embodying a thermally responsive element which constitutes both contact carrying means and the trip means is supported on an actuator in a manner to be trip-free of the actuator upon operation of the trip means.

Another object of the invention is to provide a circuit breaker according to the preceding paragraph, in which the contact carrying means and the actuator means move in opposite directions upon operation of the trip means to effect opening movement of the contact carrying means.

The invention both as to structure and operation, together with additional objects and advantages thereof, will be best understood from the following detailed description thereof when read in conjunction with the accompanying drawings.

In said drawings:

Figure 1 is a side elevational view with the cover plate partially broken away of a circuit breaker embodying the principles of the invention, the breaker being shown in the closed position.

Fig. 2 is a view similar to Fig. 1 but showing the circuit breaker in the manually open position.

Fig. 3 is a view similar to Fig. 1 but showing the circuit breaker in the tripped open position.

Fig. 4 is a vertical structural view taken on line IV—IV of Fig. 1 and looking in the direction indicated by the arrows.

Fig. 5 is an enlarged sectional view of a portion of the mechanism shown in Fig. 4.

Referring to Fig. 1 of the drawing, the circuit breaker comprises generally an open sided casing or housing **11** and a cover plate **13** of insulating material, the cover **13** being shown broken away in Fig. 1 for clearness. Mounted for sliding movement in the housing is a U-shaped actuator or carrier **15** of insulating material. Disposed between the two legs of the carrier **15** for sliding movement relative thereto is a U-shaped bimetallic switch member **17** having spaced movable contacts **19** and **21** thereon for cooperating with spaced stationary contacts **23** and **25** respectively. The stationary contact **23** is mounted on the inner end of a conducting strip **27** which, at its outer end, has a terminal connector **29** thereon. The stationary contact **25** is mounted on a conducting member **31** which is integral with a plug-in type connector **33**.

The actuator or carrier **15** and the bimetallic movable switch member **17** are biased toward each other by springs **35** tensioned between opposite end pieces **34** of the switch member **17** and the ends of projections **36** on

the actuator **15**. The switch member **17** and the actuator **15** are normally prevented from moving toward each other by the engagement of latch portion **37** on the lower edges of the U-shaped movable switch member **17** (Figs. 4 and 5) with spaced latch members **38** disposed in the lower end of the U-shaped actuator **15**. A coil spring **39** compressed between the bottom of the yoke portion **40** of the actuator **15** and the bottom wall of the housing **11** biases both the actuator **15** and, through the latch mechanism **37—38**, the switch member **17** to the closed contact position.

An insulating manual operating lever **41** is provided for manually opening and closing the breaker contacts. The operating lever **41** is pivotally mounted on a cylindrical projection **43** of the housing and has a finger piece **45** which extends out through an opening **47** in the housing **11**. The operating lever **41** normally does not engage the actuator **15** but has a cam portion **49** integral therewith which is adapted to engage the rounded upper ends **51** of the side members of the actuator **15** upon operation of the lever **41** to operate the actuator **15** and the switch member **17** to open the contacts and permit the spring **39** to close the contacts. The opening lever **41** is normally biased by an overcenter spring **53** to the position shown in Fig. 1.

The circuit breaker is manually operated to the open position by movement of the operating lever **41** clockwise from the "on" position (Fig. 1) to the "off" position (Fig. 2). During this movement of the operating lever **41**, the cam portion **49** engages the upper ends **51** of the actuator **15** and moves the actuator, together with the switch member and movable contacts **19—21** downwardly to the open contact position (Fig. 2) in which a notch **55** in the operating lever engages the ends **51** of the U-shaped actuator **15** and holds the actuator in the open position. Also, during the opening movement of the operating lever **41**, the overcenter spring **53** moves overcenter and biases the operating lever **41** to the "off" position as shown in Fig. 3.

The contacts are closed by reverse movement of the operating lever **41** from the "off" position back to the "on" position causing the operating lever to release the actuator **15**, whereupon the spring **39**, which was further compressed during the opening operation, moves the actuator **15** and the movable contact structure to the closed contact position with a snap action.

The circuit breaker is tripped open automatically in response to a low persistent overload current by the action of the U-shaped bimetallic switch member **17**. When such a low overload current occurs, the two legs of the bimetallic switch member **17** become heated by the current flow therethrough and, when heated a predetermined amount, the lower ends of the bimetallic legs bend inwardly toward each other and disengage the latch portions **37** from the latch members **38**. The springs **35** thereupon snap the movable contact structure downwardly to open the contacts, the downward movement of the movable contact structure relative to the actuator **15** being limited by engagement of the lower edges of the bimetal switch element **17** with the outwardly extending arms or projections **36** of the actuator **15** as shown in Fig. 3. Upon separation of the contacts, the spring **39** moves the actuator **15**, together with the movable contact structure, upwardly until it is stopped by engagement of shoulders **57** on the actuator with the housing **11** as shown in Fig. 3. The upward movement of the actuator **15** causes the upper ends **51** of the legs thereof to engage a projection **59** on the operating lever **41** and move the lever, together with the finger piece **45**, to an indicating position (Fig. 3).

Before the contacts can be closed following a tripping

operation, the mechanism must be reset and relatched. This is accomplished by moving the operating lever 41 clockwise as far as it will go. During this movement of the operating lever, the cam surface 49 engages the rounded upper ends 51 of the actuator 15 and forces the actuator downwardly. During the downward movement of the actuator, the end pieces 34 engage and are stopped by shoulders 61 on the housing 11, and continued movement of the operating lever thereafter to a position slightly beyond the "off" position moves the actuator downwardly an additional distance to permit the latch portions 37 (Fig. 5) of the bimetal element to reengage the latch members 38. The contacts are then closed in the previously described manner by movement of the operating lever 41 back to the "on" position.

Adjusting means is provided to vary the tripping time of the circuit breaker. The adjusting means comprises a screw 63 (Fig. 5) threadedly engaging the yoke 40 of the actuator 15. The beveled inner end of the screw 63 engages inwardly formed portions 65 of the latch members 38. Rotation of the screw 63 moves the latch members 38 relative to the latch portions 37 of the bimetallic members 17 thereby varying the tripping point of the breaker. The head of the screw 63 is disposed in a counterbore in the bottom of the yoke 40 of the actuator 15 and a spring washer 67 is provided to hold the screw in place during calibration. Calibration is effected by inserting a proper tool through an access opening 69 in the bottom portion of the housing 11. After the circuit breaker is calibrated, the counterbore is cemented or filled with a suitable sealing compound around the head of the screw 63 to lock it in its adjusted position. To prevent tampering, a piece of insulating material 71 is inserted in a slot 73 in the housing thereby closing the access opening 69.

Having described the invention in accordance with the patent statutes, it is to be understood that various changes and modifications may be made therein without departing from the spirit of the invention.

We claim as our invention:

1. A circuit breaker having spaced stationary contacts, a U-shaped current-carrying bimetallic switch member having spaced movable contacts thereon cooperating with said stationary contacts, the high-expansion side of said bimetallic switch member being disposed on the outside of the U, a U-shaped actuator supporting said bimetallic switch member, spaced latch members mounted in said actuator normally engaged by side portions of said bimetallic switch member releasably holding said switch member and said actuator in predetermined positions relative to each other, spring means biasing said bimetallic switch members to open contact position relative to said actuator, other spring means biasing said actuator and said bimetallic switch member to closed contact position, said bimetallic switch member being heated in response to overload currents and the side portions thereof when heated a predetermined amount bending toward each other to effect release of said switch member from said spaced latch members, said spring means being operative upon release of said switch member to suddenly move said switch member relative to said actuator to open contact position, manual operating means adjacent one end of said actuator movable to "on" and "off" positions, said operating means when moved to said "off" position engaging and moving said actuator to open position and when released in said "off" position holding said actuator and said switch member in open position.

2. A circuit breaker having spaced stationary contacts, a U-shaped current-carrying bimetallic switch member having spaced movable contacts thereon cooperating with said stationary contacts, the high-expansion side of said bimetallic switch member being disposed on the outside of the U, a U-shaped actuator supporting said bimetallic switch member, spaced latch members mounted in said

actuator normally engaged by side portions of said bimetallic switch member releasably holding said switch member and said actuator in predetermined positions relative to each other, spring means biasing said bimetallic switch members to open contact position relative to said actuator, other spring means biasing said actuator and said bimetallic switch member to closed contact position, a pivoted operating lever adjacent one end of said actuator movable to an "on" and an "off" position and disposed to engage and move said actuator and said switch member to open contact position, said operating lever when moved to said "off" position and released positively holding said actuator and said switch member in open contact position, said bimetallic switch member being heated in response to overload currents and the side portions thereof when heated a predetermined amount bending toward each other to effect release of said switch member from said spaced latch members, said spring means being operative upon release of said switch member to suddenly move said switch member relative to said actuator to open contact position.

3. A circuit breaker having spaced stationary contacts, a U-shaped current-carrying bimetallic switch member having spaced movable contacts thereon cooperating with said stationary contacts, the high-expansion side of said bimetallic switch member being disposed on the outside of the U, a U-shaped actuator supporting said bimetallic switch member, spaced latch members mounted in said actuator normally engaged by side portions of said bimetallic switch member releasably holding said switch member and said actuator in predetermined positions relative to each other, spring means biasing said bimetallic switch members to open contact position relative to said actuator, other spring means biasing said actuator and said bimetallic switch member to closed contact position, a pivoted operating lever disposed adjacent one end of said actuator and movable to open and closed positions to effect movement of said actuator and said switch member to open and closed contact positions, said bimetallic switch member being heated in response to overload currents and the side portions thereof when heated a predetermined amount bending toward each other to effect release of said switch member from said spaced latch members, said spring means being operative upon release of said switch member to suddenly move said switch member relative to said actuator to open contact position, said other spring means upon release of said switch member moving said actautor to cause it to engage and move said operating lever to an indicating position.

4. A circuit breaker comprising a housing, spaced stationary contacts mounted in said housing, a U-shaped actuator movable in said housing to open and closed contact positions, a U-shaped bimetallic current-carrying switch member having spaced movable contacts thereon cooperating with said stationary contacts, said bimetallic switch member being disposed between the sides of said U-shaped actuator for limited movement relative thereto, spaced latch members mounted between the side members of said actuator normally engaged by latch portions on the side members of said U-shaped bimetallic switch member releasably holding said switch member in closed contact position in the closed contact position of said actuator, a compression spring biasing said bimetallic switch member to open contact position relative to said actuator, other spring means biasing said actuator to closed contact position, thermal bending of said bimetallic switch member causing the side portions thereof to move toward each other to effect release of said switch member from said actuator, and said spring means being operative upon release of said switch member to suddenly move said switch member to the open contact position, and an operating lever for moving said actuator and said switch member to open contact position and for engaging and holding said actuator and said switch member in said open contact position when said lever is moved to open said contacts and then released.

5. A circuit breaker comprising a casing, stationary contact means, movable contact means cooperating with said stationary contact means, an actuator slidable within said casing, a bimetallic latch means releasably connecting said movable contact means with said actuator for unitary movement to open and close said contact means, a spring at all times biasing said actuator in contact closing direction, spring means at all times biasing said movable contact means in opening direction relative to said actuator and operable to move said movable contact means to open contact position upon release of said bimetallic latch means, an operating lever pivotally mounted adjacent one end of said actuator movable to "on" and "off" positions but normally disengaged from said actuator in the closed contact position of said actuator, said pivoted operating lever when moved to said "off" position engaging and moving said actuator to the open contact position, and said operating lever when released in said "off" position positively holding said actuator in open contact position.

6. A circuit breaker comprising a casing, stationary contact means, movable contact means cooperating with said stationary contact means, an actuator slidable within said casing, a bimetallic latch means releasably connecting said movable contact means with said actuator or unitary movement to open and close said contact means, a spring at all times biasing said actuator in contact closing direction, spring means at all times biasing said movable contact means in opening direction relative to said actuator and operable to move said movable contact means to open contact position upon release of said bimetallic latch means, an operating lever pivotally mounted adjacent one end of said actuator movable to "on" and "off" positions but normally disengaged from said actuator in the closed contact position of said actuator, said pivoted operating lever when moved to said "off" position engaging and moving said actuator to the open contact position, and said spring upon release of said bimetallic latch means moving said actuator to a position where it engages and moves said operating lever to an indicating position other than said "on" and "off" positions.

7. A circuit breaker comprising stationary contact means, cooperating movable contact means, a U-shaped actuator having spaced side members movable to open and closed positions, a U-shaped bimetallic switch member having spaced side portions and mounting said movable contact means, said U-shaped switch member being disposed between the spaced side members of said U-shaped actuator for movement relative to said actuator to open contact position, spaced latch members mounted between the spaced side members of said U-shaped actuator normally engaged by the spaced side portions of said U-shaped switch member releasably restraining said switch member in closed contact position in the closed position of said actuator, said switch member upon release thereof being movable relative to said actuator to open contact position, and adjusting means for simultaneously adjusting the positions of said spaced latch members relative to the side portions of said switch member.

8. A circuit breaker comprising a casing, stationary contact means, an actuator slidable in said casing and movable to open and closed positions, a movable contact structure having movable contacts thereon cooperating with said stationary contact means, bimetallic latch means on said movable contact structure, latch means on said actuator normally engaged by said bimetallic latch means releasably holding said movable contact structure in closed contact position in the closed position of said actuator, a manual operating lever pivotally mounted on said casing adjacent one end of said actuator and movable to "on" and "off" positions, biasing means biasing said pivoted operating lever to said "on" positions where it is disengaged from said actuator in the closed position of said actuator, and a cam surface on said operating lever engaging and moving said actuator to open contact position when said operating lever is moved to the "off" position.

9. A circuit breaker comprising a casing, stationary contact means, an actuator mounted in said casing and movable to open and closed positions, a movable contact structure having movable contact means thereon cooperating with said stationary contact means, said movable contact structure being movable relative to said actuator to open and closed contact positions, latch means comprising bimetallic latch means on said movable contact structure and latch means on said actuator normally engaged by said bimetallic latch means to releasably maintain said movable contact structure in closed contact position in the closed position of said actuator, said actuator and said movable contact structure moving in opposite directions upon release of said latch means to effect opening of said contact means, a manual operating lever pivotally mounted on said casing and movable to "on" and "off" positions, a projection on said operating lever cooperating with said actuator to effect movement of said actuator to open and closed positions, and another projection on said operating lever cooperating with said actuator when said latch means is released to position said operating lever in an indicating position other than said "on" and "off" positions.

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