May 16, 1944. M. K. PARKHURST ET AL. 2,348,996

CIRCUIT BREAKER

Filed March 5, 1942 2 Sheets-Sheet 1

Fig. 1.

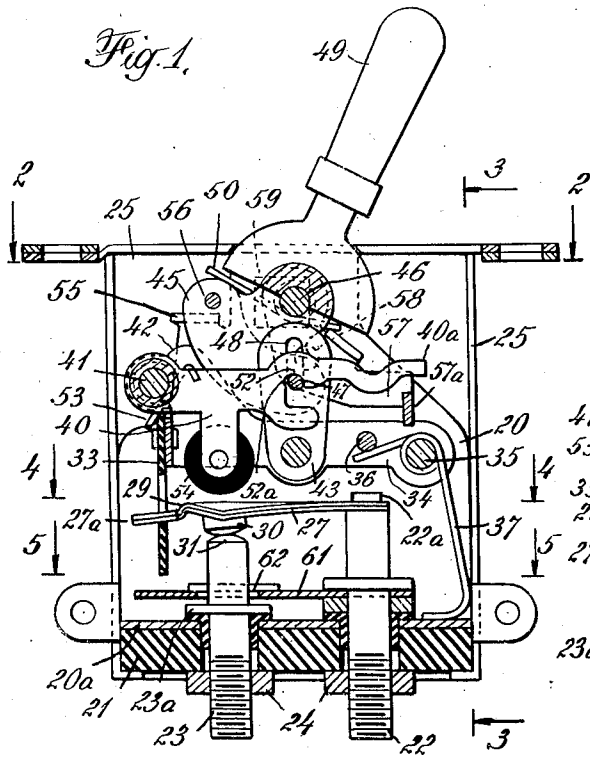


Fig. 7.

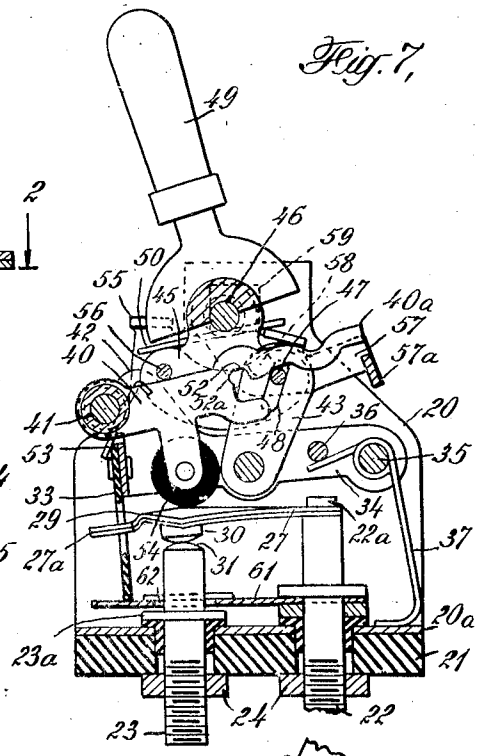


Fig. 6.

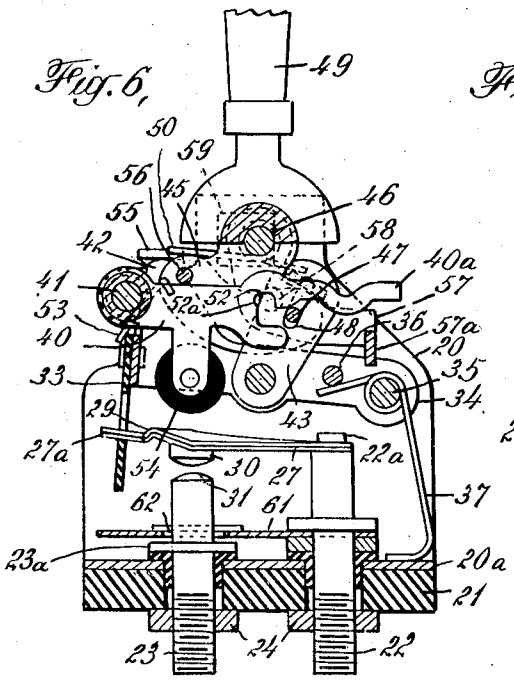
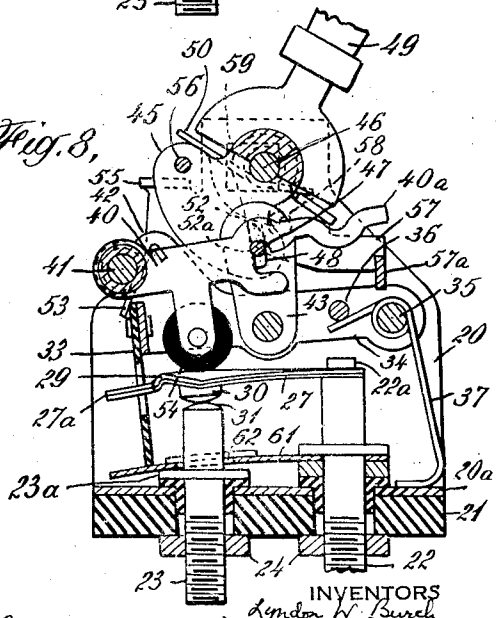


Fig. 8.



INVENTORS
Lyndon W. Burch
Malcolm K. Parkhurst
BY
Pennie Davis Marvin & Edmonds
ATTORNEYS

May 16, 1944. M. K. PARKHURST ET AL 2,348,996

CIRCUIT BREAKER

Filed March 5, 1942 2 Sheets-Sheet 2

Fig. 2.

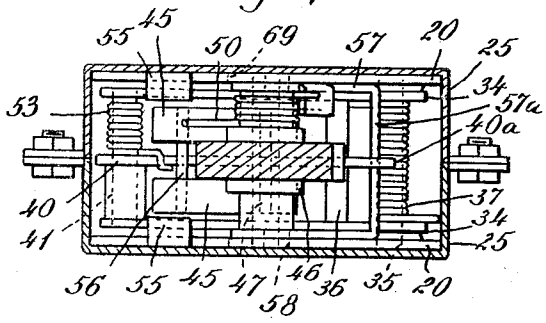


Fig. 4.

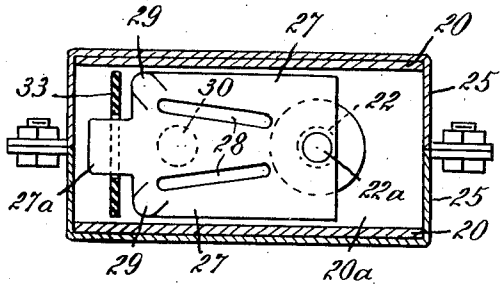


Fig. 5.

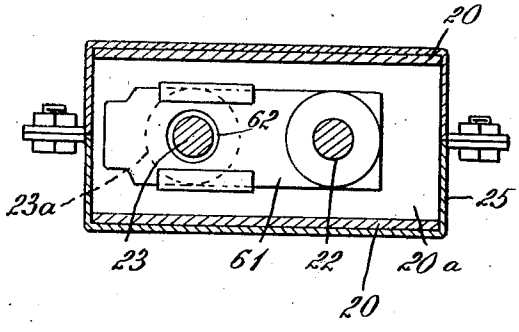
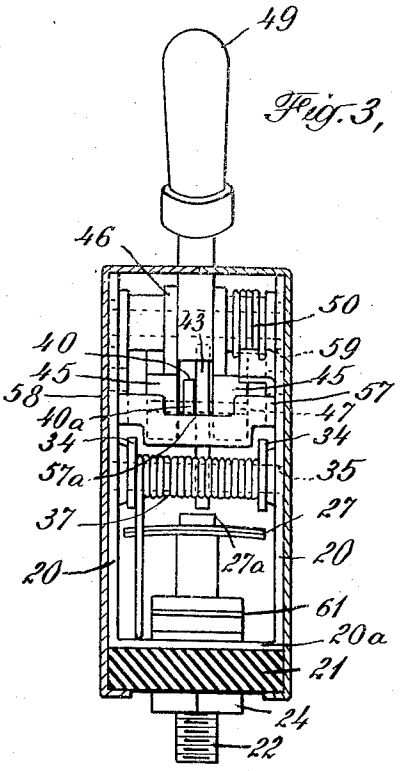


Fig. 3.



INVENTORS
Lyndon W. Burch
Malcolm K. Parkhurst
BY
Pennie Davis Marvin & Edmonds
ATTORNEY

Patented May 16, 1944 2,348,996

UNITED STATES PATENT OFFICE

2,348,996

CIRCUIT BREAKER

Malcolm Kingsley Parkhurst, New York, and Lyndon W. Burch, Pelham, N. Y., assignors to The Wilcolator Company, Elizabeth, N. J., a corporation of Delaware

Application March 5, 1942, Serial No. 433,479

22 Claims. (Cl. 200—116)

This invention relates to circuit breakers of the type including a switch which may be opened automatically by an actuator to break the circuit and which may be operated manually by a handle, or the like, independently of the actuator to open or close the circuit at will, and has particular reference to a novel device of this type including means by which the circuit may be opened and closed manually for flashing, signaling, etc. This application is a continuation-in-part of our copending application Ser. No. 420,994, filed November 29, 1941.

One feature of the invention resides in the provision of a novel combination circuit breaker and flasher which, when the current exceeds a predetermined value, is operated automatically by a suitable actuator to open a switch in the circuit and in which the circuit may be opened and closed manually, as for the purpose of flashing or signaling, preferably through the switch which is operated by the actuator. In a circuit breaker made in accordance with the invention, the switch may be opened automatically by an actuator, such as a thermo-responsive member forming part of the circuit, the member being preferably in the form of a bimetallic snap element which is actuated when overheated by excessive current in the circuit. The switch is also movable to its closed position manually by a handle, or the like, against the action of a biasing means tending to open the switch. Thus, when the switch is open, the circuit breaker may be operated for flashing by closing the switch manually and then releasing the handle so that the biasing means returns the switch to its open position, this action being repeated as desired. In the preferred construction, the switch is provided with a locking member which is normally latched in an inoperative position but is released by operation of the actuator so as to hold the switch open and prevent reclosing thereof by the actuator. The handle is movable to one position to close the switch and return the locking member to its inoperative position where it is latched until released again by the actuator. Also, the handle is movable to another position to render the locking member inoperative and close the switch temporarily for flashing, but this movement of the handle does not cause the locking member to be latched, so that when the handle is released the locking member reopens the switch.

Another feature of the invention resides in the provision of a novel combination circuit breaker and flasher in which the switch may be opened independently of the operation of the actuator. Preferably, the locking member for the switch is urged by a spring, or other biasing means, in a direction for opening the switch but is normally held in its inoperative position by the latch which is operatively connected to the handle. When the switch is closed, the handle is movable to release the latch so that the locking member under the action of its spring opens the switch independently of the operation of the actuator and locks the switch in its open position. Thus, the handle may be used for opening the switch independently of the actuator, latching the locking member so that the switch may be closed and held closed by the actuator, and closing the switch intermittently for flashing.

Still another feature of the invention resides in the provision of a novel combination circuit breaker and flasher in which the switch may be closed manually even when the actuator tends to open it due to an overload condition in the circuit. In one form of the invention, the locking member for the switch is mounted on a lever which is mounted on a lever which is urged in a direction to open the switch but is normally held by the latch in a position to permit closing of the switch. Preferably, the handle is movable to exert a cam action on the lever and thereby cause the lever to close the switch against the action of the actuator when the latter tends to open the switch. Accordingly, with the new construction, the circuit breaker may be closed manually and held closed in the event that an emergency makes it necessary to energize the circuit even when an overload condition prevails.

These and other features of the invention may be better understood by reference to the accompanying drawings, in which

Fig. 1 is a vertical sectional view of a circuit breaker made in accordance with the invention;

Figs. 2, 3, 4 and 5 are sectional views on the lines 2—2, 3—3, 4—4 and 5—5, respectively in Fig. 1, and

Figs. 6, 7 and 8 are views similar to Fig. 1 but with the casing of the circuit breaker removed, showing different positions of the device.

The circuit breaker, as illustrated, comprises a frame having sides 20 and a bottom 20*a*, the top and ends of the frame being open. The bottom of the frame is seated on an insulating base 21 to which it is secured by terminal screws 22 and 23 extending through aligned openings in the frame and base, the screws being insulated from the frame and having their heads disposed above the bottom. A nut 24 is threaded on the outer end of each screw to clamp it in position and hold the frame against the insulating base. Preferably, the frame and base are enclosed in a casing made up of two removable sections 25 and 25*a* fitted closely over the sides of the frame and the base.

The terminal screw 22 supports an actuator in the form of a bimetallic snap element 27, the snap element being secured to the screw in any suitable manner, as by means of a reduced portion 22*a* on the head of the screw extending through an opening near one end of the snap ele-

ment and riveted over the element so as to clamp it against the head of the screw. Preferably, the snap element is of the form shown in an application of Lyndon W. Burch, Serial No. 325,979, filed March 26, 1940, now Patent No. 2,299,562, issued October 20, 1942. More particularly, the snap element comprises a sheet of bimetal having a pair of slots **28** extending along the intermediate portion of the sheet and diverging slightly toward its free end. The slots terminate a substantial distance from the free end of the sheet, and the metal between the outer ends of the slots and the adjacent corners are crimped or gathered, as shown at **29**, to reduce the effective perimeter of the sheet and cause it to assume a dished shape. A contact **30** is secured to the lower face of the snap element near its upper end and coacts with a fixed contact **31** on the top of terminal screw **23**.

By means of the terminal screws **22** and **23**, the circuit breaker is connected in the circuit so that the current passes through the terminal **22**, along the sheet of bimetal and through the normally closed contacts **30—31** to the terminal **23**. As long as the current does not exceed a predetermined value, the snap element remains in its normal position (Fig. 1) where it holds the contacts **30—31** firmly in engagement to complete the circuit. However, if the current exceeds the predetermined value, it heats the bimetal **27** sufficiently to cause it to reverse its curvature with a snap action and open the contacts, as shown in Fig. 6. By properly proportioning the dimensions of the bimetal and the spacing between the slots **28**, the snap element may be made to operate at any desired current rating to open the contacts. It will be apparent that after the circuit is broken by operation of the snap element, the latter immediately commences to cool because there is no longer a flow of current through it, and, accordingly, the snap element acts to return to its initial position and reclose the contacts.

The switch of the circuit breaker is provided with control means comprising a locking member **33** adjacent the free end of the actuator **27**. Preferably, the locking member is made of insulating material and has a slot for receiving an ear **27***a* on the free end of the actuator, the slot being elongated vertically so that the actuator may move up and down a limited distance relative to the locking member. The locking member is secured to the free end of a lever comprising a pair of spaced arms **34** movable on a pivot **35** mounted in the side walls **20** of the frame at the opposite end of the lever, the arms being connected together rigidly by a stud **36** intermediate their ends. The lever **34** is urged clockwise on its pivot **35**, as seen in Fig. 1, by suitable means such as a spring **37** coiled around the pivot and held at one end by the frame and at the opposite end by the stud **36** on the lever. Because of the spring **37**, the free end of lever **34** is normally urged upwardly and tends to raise the locking member **33** and thereby open switch **30—31**.

Normally, the locking member **33** is held in an inoperative position against the action of spring **37** by latch means comprising a trigger **40** movable on a pivot **41** on the free end of lever **34**. As shown, the pivot **41** is mounted between raised extensions **42** on the free ends of the lever arms, whereby it is located a substantial distance above the pivot **35** of the lever. The trigger cooperates with a toggle comprising a toggle arm **43** pivoted between the lever arms **34** intermediate their ends, and a second toggle member in the form of a yoke having two toggle arms **45** integral with a rotatable shaft **46** mounted between the sides **20** of the frame, as will be described in greater detail presently. The upper end of the toggle arm **43** is disposed between the toggle arms **45**, and a pin **47** is mounted at its ends in the arms **45** and extends through an elongated slot **48** in the arm **43**. The toggle arms **45** are rotatable with the shaft **46** by means of a handle **49** which may be integral with the shaft. Preferably, the shaft **46** is normally urged counterclockwise (Fig. 1) to break the toggle by a spring **50** coiled around the shaft.

The trigger **40** extends through the space between the toggle arms **45** and is disposed on one side of the lower toggle arm **43** above pin **47**. In its lower edge, the trigger is provided with a notch **52** in which pin **47** is adapted to be engaged, the notch having an undercut portion **52***a* for a purpose to be described. The free end of the trigger is urged downwardly to hold the notch over the pin, as by means of a spring **53** coiled around the trigger pivot **41**. Thus, in the normal position of the parts, as shown in Fig. 1, the toggle **43—45** is set against the action of springs **37** and **50** and is positively held in its set position by trigger **40** which, because of its notch **52**, prevents the toggle pin **47** from moving laterally and thereby breaking the toggle.

As long as the toggle is held in its set position by trigger **40**, the pin **47** engages the lower end of slot **48** and holds lever **34** down against the action of its spring so that the locking member **33** remains in its lowermost position and permits the switch **30—31** to be closed by actuator **27**. However, the toggle is adapted to be released by operation of the actuator, and to this end we provide on the trigger **40** an insulating member **54** directly above the free end of the actuator. Accordingly, when the actuator is overheated due to an excessive current in the circuit, it snaps upwardly against the trigger member **54** and raises the trigger on its pivot **41** to disengage the notch **52** from toggle pin **47**. Thereupon, the toggle breaks under the action of spring **50** and allows the spring **37** to snap lever **34** upwardly on its pivot **35**, with the result that locking member **33** is raised with a snap action and positively holds the switch in its open position, as shown in Fig. 6. The upward movement of the free end of lever **34** under the action of spring **37** is limited by stops **55** which may take the form of ears integral with the sides **20** of the frame, the ears being engaged by the raised portions **42** of the lever. The spring **37** is of sufficient strength to prevent the actuator **27** from moving back to its initial position and closing the switch even when the actuator cools to a very low temperature. When the toggle is released by trigger **40**, the toggle pin **47** rides upwardly in slot **48** and outwardly along the lower edge of the trigger, and the handle **49** moves to the left due to the counterclockwise rotation of shaft **46**. This movement of the handle and shaft is limited by a pin **56** extending between the toggle arms **45** above trigger **40**, the pin engaging the trigger to prevent further movement of the handle by spring **50** when the handle reaches a substantially vertical position (Fig. 6).

When it is desired to close switch **30—31**, the handle is moved to the right, as seen in Fig. 6, to reset the toggle. During this movement of the handle, toggle pin **47** rides down the slot **48** and

at the same time moves inwardly under trigger **40** until it is opposite the notch **52**, whereupon the trigger spring **53** snaps the trigger downwardly to engage the notch over the toggle pin. The resetting movement of the toggle forces lever **34** downwardly about its pivot **35** and thereby returns locking member **33** to its inoperative position so that the actuator **27**, due to its cooling, closes the switch. If the overload condition in the circuit has been removed, the toggle is held in its set position by engagement of its pin **47** in the trigger notch **52**, whereby the locking member **33** is maintained inoperative and the switch remains closed. However, if there is still an overload condition in the circuit, the actuator is immediately reheated by the excessive current and snaps back to its raised position so as to elevate the trigger and release the toggle, whereby the switch is again locked in its open position as previously described.

It may be desirable in some instances to provide for closing the circuit even when it is overloaded, as, for example, when it is necessary to energize the circuit temporarily for an emergency. In our new circuit breaker, the switch may be held in its closed position manually by handle **49** regardless of the operation of the actuator **27**. More particularly, when the handle **49** is moved to the right to reset the toggle and lower the locking member, as previously described, further movement of the handle to the right beyond the position shown in Fig. 1 causes toggle pin **47** to move laterally into the undercut portion **52***a* of the notch **52** and exert a thrust to the left against trigger **40**. Since the toggle pin is disposed a substantial distance above the pivot **35** for lever **34**, this thrust exerts a turning moment on the lever and causes it to move counterclockwise on its pivot against the action of spring **37**. As a result, the insulating member **54** is moved downwardly against the free end of the actuator and forces contact **30** down against contact **31**, as shown in Fig. 8, the switch being held closed as long as the handle is forced to the right as far as it will go. During this action, the trigger **40** is prevented from moving upwardly on the pivot **41** by engagement of the toggle pin in the undercut notched portion **52***a*. When the handle is released, the spring **37** moves lever **34** upwardly on its pivot to return the parts to their normal positions shown in Fig. 1, and if the current passing through the actuator is still too great, the latter will snap upwardly to release the toggle and thereby cause the switch to be locked in its open position.

The handle **49** may also be operated to open the switch independently of actuator **27**. In the preferred construction, the trigger **40** is provided at its free end with an extension **40***a* overlying a cross piece **57***a* on a bell crank lever **57**. The bell crank lever, as shown, comprises two arms connected by the cross piece and pivoted intermediate their ends on pins **58** journaled in the sides **20** of the frame. At their ends remote from the cross piece, the arms of the bell crank lever are provided with openings through which reduced ends of the toggle shaft **46** extend, the ends of the shaft being disposed in enlarged openings **59** in the sides of the frame. The shaft **46** is normally urged to the right in the openings **59**, as by means of spring **37**. With this construction, when handle **49** is moved to the left from the position shown in Fig. 1, the toggle shaft **46** is swung bodily to the left in the openings **59** about the pins **58** of the bell crank lever as a pivot, the toggle pin **47** being held by trigger **40** against lateral movement but being movable downwardly against the action of spring **37** to accommodate this movement of shaft **46**. As the shaft **46** swings to the left, bell crank lever **57** is moved counter-clockwise on its pivot **58** so that the cross piece **57***a* is raised against the extension **40***a* of the trigger and moves the trigger upwardly to disengage its notch **52** from the toggle pin **47** and thereby release the toggle. The lever **34** is then snapped upwardly by spring **37**, as previously described, so that the locking member **33** opens the switch. Thereafter, the switch is held in its open position until handle **49** is moved to the right to reset the toggle and the trigger.

The new circuit breaker may also be employed for manually opening and closing the circuit intermittently for flashing, or the like. For this operation, the switch **30—31** is initially opened by moving handle **49** to the left from the position shown in Fig. 1, as previously described, so that the parts assume the positions shown in Fig. 6. The handle **49** is then moved further to the left so that the trigger **40** and therefore the free end of lever **34** are depressed by the pin **56**, as shown in Fig. 2 and Fig. 7. That is, when handle **49** is moved further to the left it causes the shaft **46** and its toggle arms **45** to move counter-clockwise about the pins **58** of the bell crank lever **57** as a pivot, the shaft moving bodily in the frame openings **59**, with the result that the pin **56** is depressed and exerts a cam action on the top of trigger **40** so as to force the free end of lever **34** downwardly about the pivot **35**. Accordingly, the locking member **33** is moved downwardly to its inoperative position and permits the snap element **27** to close switch **30—31**. When handle **49** is released, the spring **37** returns the parts to their initial positions shown in Fig. 6, so that the locking member is raised again and opens the switch with a snap action. This operation may be repeated as often as desired, as for the purpose of signaling when a lamp is connected in the circuit.

In order to prevent overheating of the snap element **27** when the switch is closed forcibly during an overload in the circuit, as shown in Fig. 8, we prefer to shunt part of the current around the snap element. To this end, a shunt switch is provided which, as shown, comprises a contact blade **61** secured at one end to terminal **22** between the frame base **20***a* and the snap element **27**. Near its free end, the blade has an opening **62** through which the head of terminal **23** projects with a substantial clearance, the blade overlying a shoulder **23***a* on terminal **23** and being normally spaced from the shoulder. When the handle **49** is forced to the right as far as it will go (Fig. 8), the snap element **27** is first depressed over-center by the member **52** to close the switch, and then the lower end of locking member **33** engages the free end of blade **61** and forces it downwardly into engagement with shoulder **23***a*. Accordingly, the greater part of the overload current passes between the terminals through the blade, and excessive heating of the snap element **27** is prevented. When the handle is released, the parts return to the positions shown in Fig. 1, and since the snap element is not overheated, due to the shunt **61**, the switch will remain closed until the snap element is heated sufficiently to trip the locking mechanism, if the overload condition still prevails. The shunt blade **61**, being made of spring metal, disengages the terminal shoulder **23***a* when the handle is re-

leased, so that the shunt is removed, and this movement of the blade occurs before switch 30—31 can open, due to the inherent time lag in the snap element 27, whereby arcing between blade 61 and shoulder 23a is prevented.

It will be apparent from the foregoing that we have combined in a single instrument an automatic circuit breaker, a manual switch for opening the circuit at will or resetting the circuit breaker, and a flasher. This is an advantageous feature of our new construction, because heretofore it has been necessary to employ a circuit breaker, a manual switch and a flasher as separate units in the circuit to perform the several operations for which our new device is adapted. All of the manual operations are performed by a single handle, and the device requires the use of only one switch.

The new combination circuit breaker and flasher is of compact construction and for this reason is admirably suited for use in circuits of aircraft, and the like, or for other uses in which the space requirement is an important item. The circuit breaker is positive in action, and because of the latching trigger 40, the switch is prevented from opening accidentally due to shocks or vibrations which are frequently encountered in aircraft, tanks, automobiles, and other vehicles. Also, after an overload condition occurs in the circuit, the locking mechanism holds the switch positively in its open position and prevents reclosing of the switch due to cooling of the actuator to very low temperatures or to vibration or shock. Since the actuator 27 has an inherent time lag, it allows a momentary overload in the circuit, as occurs in starting a motor, or the like, without opening the switch and tripping the locking mechanism. The circuit breaker may be made in a number of different current ratings depending on the resistance of the bimetallic actuator 27, and it may be used to replace the fuse, toggle switch and flashing switch combination now in general use in aircraft, the device being adapted to be mounted in the space previously occupied by the usual toggle switch.

We claim:

1. A circuit breaker which comprises switch means, an actuator for opening the switch means automatically, a member movable in response to operation of the actuator for locking the switch means in its open position, and manual means for rendering the locking member inoperative to permit closing of the switch means and for causing the switch means to open and close independently of automatic operation of the actuator.

2. A circuit breaker which comprises switch means, an actuator for opening the switch means automatically, a member movable in response to operation of the actuator for locking the switch means in its open position, and means movable manually to one position for rendering the locking member inoperative and latching it in its inoperative position and movable to another position for causing the switch means to close without latching the locking member.

3. A circuit breaker which comprises switch means, an actuator for opening the switch means automatically, a locking member acting to open the switch means and hold it open, and means movable manually to one position for rendering the locking member inoperative and latching it in its inoperative position and movable to another position for causing the switch means to close without latching the locking member.

4. A circuit breaker which comprises a switch, automatic means for actuating the switch in response to a change in the condition of the circuit, control mechanism for causing the switch to open and close independently of automatic operation of said actuating means and including a member acting to open the switch, and manual means for operating said mechanism and movable to one position for causing said mechanism to open the switch, to a second position for causing the mechanism to latch said member in an inoperative position to permit closing of the switch by the actuating means, and to a third position for closing the switch without latching said member.

5. A circuit breaker which comprises a switch, automatic means for actuating the switch in response to a change in the condition of the circuit, a member acting to open the switch independently of automatic operation of the actuating means, latch means for holding said member in an inoperative position to permit closing of the switch, the latch means being releasable by operation of the actuating means, and manual means movable to one position for causing the latch means to hold said member in its inoperative position, and to a second position for moving said member to its inoperative position while maintaining the latch means inoperative.

6. A circuit breaker which comprises a switch, a bimetallic snap element for connection in the circuit and operable to open the switch when the current exceeds a predetermined value, the element acting to close the switch when the circuit is broken, control means acting to open the switch independently of thermostatic operation of said element and for holding the switch open against the action of the element, manual means movable selectively to two positions for rendering said control means inoperative and thereby permitting closure of the switch by said element, and latch means operable in only one of said two positions for latching said control means in its inoperative position.

7. A circuit breaker which comprises a switch, automatic means for opening the switch in response to a change in the condition of the circuit and acting to close the switch when the switch is open, control means acting to open the switch independently of automatic action of the actuating means and for holding the switch open against the action of said actuating means, manual means movable selectively to two positions for rendering said control means inoperative and thereby permitting closure of the switch by said actuating means, and latch means operable in only one of said two positions for latching said control means in its inoperative position.

8. A circuit breaker which comprises a switch, automatic means for opening the switch in response to a change in the condition of the circuit and acting to close the switch when the switch is open, control means acting to open the switch independently of automatic action of the actuating means and for holding the switch open against the action of said actuating means, manual means movable selectively to two positions for rendering said control means inoperative and thereby permitting closure of the switch by said actuating means, latch means operable in only one of said two positions for latching said control means in its inoperative position, and means responsive to operation of said actuating means for releasing the latch means.

9. A circuit breaker which comprises a switch, an actuator for the switch, a member operable

to lock the switch in one position against movement by the actuator, the locking member having an inoperative position in which the switch is movable by the actuator, means normally urging the locking member toward its locking position, latch means normally set to hold the locking member in its inoperative position, means responsive to operation of the actuator for releasing said latch means, and a manually operable device movable to one position for forcing the locking member to its inoperative position and setting the latch means and movable to a second position for forcing the locking member to its inoperative position while maintaining the latch means inoperative.

10. A circuit breaker which comprises a switch, an actuator for the switch, a member operable to lock the switch in one position against movement by the actuator, the locking member having an inoperative position in which the switch is movable by the actuator, means normally urging the locking member toward its locking position, latch means carried by the locking member and normally set to hold the locking member in its inoperative position, means responsive to operation of the actuator for releasing said latch means, and a manually operable device movable to one position for forcing the locking member to its inoperative position and setting the latch means and movable to a second position for forcing the locking member to its inoperative position while maintaining the latch means inoperative.

11. In a circuit breaker having a switch, an actuator for opening the switch automatically to break the circuit and acting to close the switch when the circuit is broken, a member operable to lock the switch in its open position against movement by the actuator and movable between operative and inoperative positions, manually operable means connected to the locking member and movable selectively to two positions to move the locking member to its inoperative position and permit closing of the switch by the actuator, a latch operable in only one of said positions of the manual means for holding the locking member in its inoperative position, the latch being inoperative in the other position of the manual means, means responsive to movement of the switch for releasing the latch, and means responsive to release of the latch for moving the locking member to an operative position to lock the switch.

12. In a circuit breaker having a switch, a member for locking the switch in its open position, a pivot on which the locking member is movable between operative and inoperative positions, means for urging the locking member toward its operative position, a toggle connected to the locking member for moving the member to its inoperative position, a latch coacting with the toggle to hold the locking member in its inoperative position, means responsive to opening of the switch for moving the latch on its pivot to release the locking member and cause it to lock the switch in its open position, and a handle connected to the toggle and movable to one position to cause the latch to lock the toggle and hold the locking member in its inoperative position and movable to a second position to move the locking member to its inoperative position while maintaining the latch inoperative.

13. In a circuit breaker having a switch, a member for locking the switch in its open position and movable between operative and inoperative positions, a toggle connected to the locking member, means normally acting to expand the toggle and move the locking member to its operative position, a latch coacting with the toggle to hold it in a set position against the action of said expanding means and thereby maintain the locking member inoperative, means responsive to opening of the switch for actuating the latch to release the toggle and cause said member to lock the switch in its open position, and a handle connected to the toggle and movable to one position to cause the latch to lock the toggle and hold the locking member in its inoperative position and movable to a second position to force the locking member to its inoperative position while maintaining the latch inoperative.

14. In a circuit breaker having a switch and an actuator for opening the switch automatically to break the circuit, the actuator acting to close the switch when the circuit is broken, a member for locking the switch in its open position and movable between operative and inoperative positions, a toggle connected to the locking member, means normally acting to expand the toggle and move the locking member to its operative position, a latch mounted on the locking member and coacting with part of the toggle for holding it in a set position to maintain the locking member inoperative, the latch having a part operable by the actuator for moving the latch to release the toggle and cause said member to lock the switch, a handle connected to the toggle for setting it, the handle being movable to one position to force the toggle beyond its set position against the action of said expanding means to exert a thrust on said latch part for closing the switch against the action of the actuator, a member operable by movement of the handle to a second position for moving the latch to release the toggle, and means operable by movement of the handle to a third position for forcing the locking member to its inoperative position while maintaining the latch inoperative.

15. In a circuit breaker having a switch and an actuator for opening the switch automatically to break the circuit, the actuator acting to close the switch when the circuit is broken, a member for locking the switch in its open position and movable between operative and inoperative positions, a toggle connected to the locking member, means normally acting to expand the toggle and move the locking member to its operative position, a latch mounted on the locking member and coacting with part of the toggle for holding it in a set position to maintain the locking member inoperative, the latch having a part operable by the actuator for moving the latch to release the toggle and cause said member to lock the switch, a handle connected to the toggle for setting it, a member operable by movement of the handle to one position for moving the latch to release the toggle, and means operable by movement of the handle to a second position for forcing the locking member to its inoperative position while maintaining the latch inoperative.

16. In a circuit breaker having a switch and an actuator for opening the switch automatically to break the circuit, the actuator acting to close the switch when the circuit is broken, a member for locking the switch in its open position and movable between operative and inoperative positions, a toggle connected to the locking member, means normally acting to expand the toggle and move the locking member to its operative position, a

latch mounted on the locking member and coacting with part of the toggle for holding it in a set position to maintain the locking member inoperative, the latch having a part operable by the actuator for moving the latch to release the toggle and cause said member to lock the switch, a handle connected to the toggle for setting it, the handle being movable to one position to force the toggle beyond its set position against the action of said expanding means to exert a thrust on said latch part for closing the switch against the action of the actuator, and means operable by movement of the handle to a second position for forcing the locking member to its inoperative position while maintaining the latch inoperative.

17. A circuit breaker which comprises a switch, an actuator for opening the switch automatically to break the circuit and acting to close the switch when the circuit is broken, a member operable to lock the switch in its open position against movement by the actuator and normally urged toward its locking position, manual means for moving the locking member to an inoperative position and including an operating shaft which is rotatable and movable laterally, a latch for holding the locking member in its inoperative position and movable by the actuator to release the locking member, a lever connected to the shaft, a pivot spaced from the shaft and on which the lever is movable, a handle for rotating the shaft to actuate the manual means and operable to move the shaft laterally to fulcrum the lever on its pivot and thereby move the latch to release the locking member, and means operable by the handle for actuating the manual means to move the locking member to its inoperative position while maintaining the latch inoperative.

18. A control device comprising a switch, an actuator operable to open the switch automatically and acting to close the switch on opening thereof, a normally inoperative member movable to an operative position for opening the switch independently of the actuator and for locking the switch open, a pivot for said locking member, a latch pivoted on the locking member, a toggle connected to the locking member and having an operating shaft which is rotatable and movable laterally, biasing means acting to expand the toggle and move the locking member to its operative position, the latch normally holding the toggle in a set position against the action of the biasing means and being movable by the actuator to release the toggle, a lever connected to the toggle shaft and pivoted independently of the shaft, a handle movable selectively to one position for rotating the shaft to expand the toggle and cause the latch to hold the locking member in its inoperative position, the handle being movable to a second position for moving the shaft laterally to fulcrum the lever on its pivot and thereby move the latch to release the toggle, and the handle being movable to a third position for forcing the locking member to its inoperative position against the biasing means while maintaining the latch inoperative, whereby the switch is closed by the actuator and is reopened by the locking member through the biasing means on release of the handle.

19. A circuit breaker comprising a normally closed switch, a bimetallic actuator for actuating the switch, means for connecting the actuator and the switch in series in a circuit whereby excessive current heats the actuator and causes it to flex and open the switch, a lever engageable at its free end portion with the actuator, a pivot on which the lever is movable to cause the actuator to open the switch and hold it open, a toggle connected to the lever for moving it to an inoperative position to permit closing of the switch by the actuator, the toggle including a toggle arm connected to the lever, an operating shaft, a toggle arm on the shaft, and a pin on one of the arms disposed in a slot in the other arm, biasing means acting to break the toggle and move the lever to lock the switch in its open position, a latch pivoted on the free end portion of the lever and having a notch engageable with the pin to hold the toggle in a set position and thereby maintain the lever inoperative, the actuator being movable relative to the lever to fulcrum the latch on its pivot and thereby disengage the notch from the pin, means for urging the latch toward the pin, a latch releasing member connected to the toggle shaft and pivoted at a point remote from the shaft, a handle for rotating the shaft to set the toggle and operable to move the toggle beyond its set position against the action of said biasing means to cause the pin to exert a thrust on the latch and thereby move the latch bodily on said lever pivot to close the switch against the action of the actuator, the handle being operable to move the shaft bodily to fulcrum said member on its pivot and release the latch independently of the actuator, and means operable by the handle for moving the lever to its inoperative position while maintaining the latch inoperative.

20. A circuit breaker comprising a normally closed switch, actuating means for opening the switch automatically and acting to close the switch on opening thereof, manually controlled means for opening and closing the switch independently of automatic operation of the actuating means and including a member acting to open the switch and hold it open against movement by the actuating means, and a handle for operating the manual means and movable to one position for causing the manual means to lock said holding member in an inoperative position to permit closing of the switch by the actuating means, the handle being movable to an intermediate position to release said holding member and thereby open the switch, and the handle being movable to a third position for causing the manual means to close the switch while maintaining said holding member inoperative.

21. A circuit breaker comprising a normally closed switch, a bimetallic actuator for connection in the circuit and operable to open the switch when the circuit is overloaded, the actuator acting to close the switch on cooling when the circuit is broken, manually operable means movable to one position for opening the circuit independently of the actuator and to a second position for closing the switch against the action of the actuator when the circuit is overloaded, and means responsive to movement of the manual means to said second position for shunting the actuator to prevent overheating thereof.

22. A circuit breaker comprising a normally closed switch, a bimetallic actuator for connection in the circuit and operable to open the switch when the circuit is overloaded, manually operable means movable to one position for opening the circuit independently of the actuator and to a second position for closing the switch independently of the actuator, and means responsive to movement of the manual means to said second position for shunting the actuator to prevent overheating thereof.

MALCOLM KINGSLEY PARKHURST.
LYNDON W. BURCH.

CERTIFICATE OF CORRECTION.

Patent No. 2,348,996. May 16, 1944.

MALCOLM KINGSLEY PARKHURST, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 18, strike out the words "which is mounted on a lever"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of July, A. D. 1944.

Leslie Frazer
Acting Commissioner of Patents.

(Seal)

CERTIFICATE OF CORRECTION.

Patent No. 2,348,996. May 16, 1944.

MALCOLM KINGSLEY PARKHURST, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 18, strike out the words "which is mounted on a lever"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of July, A. D. 1944.

Leslie Frazer
Acting Commissioner of Patents.

(Seal)