

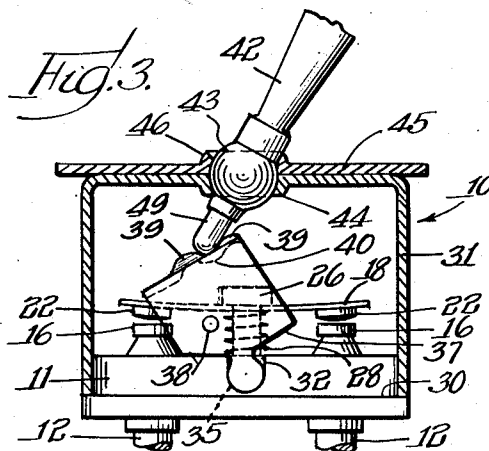
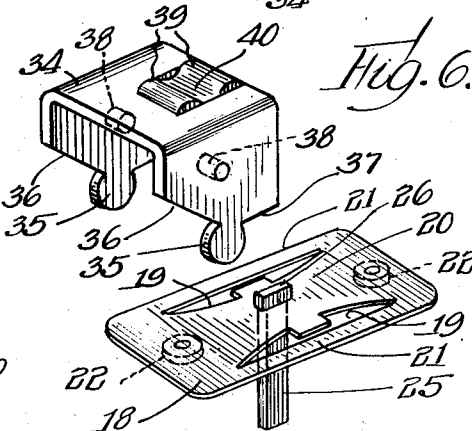
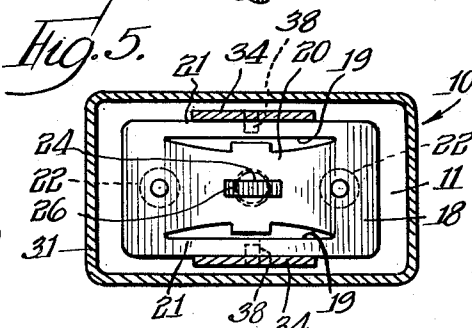
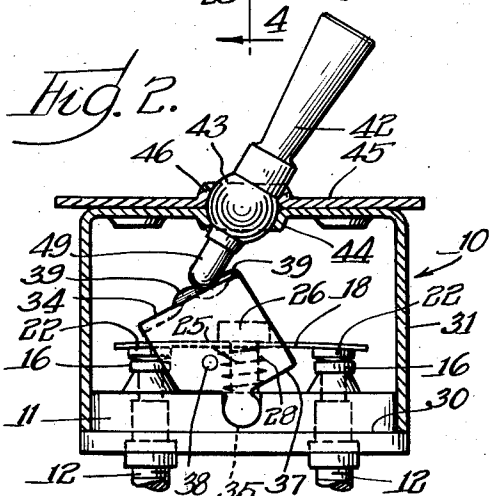
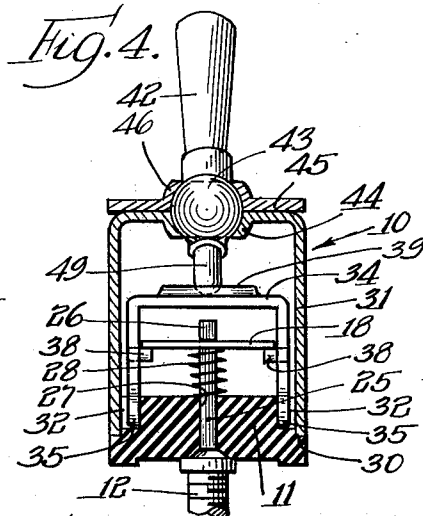
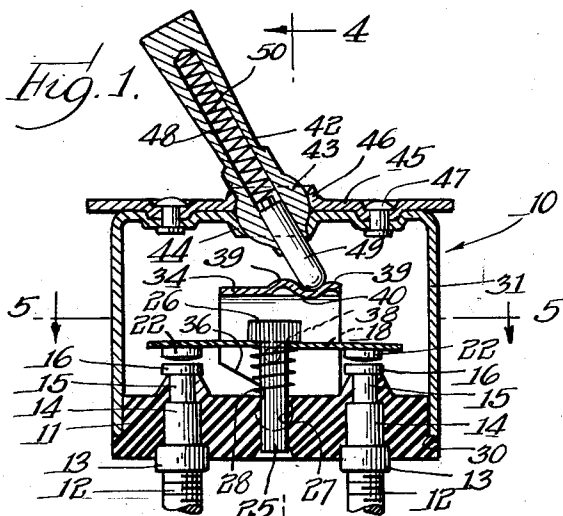
June 22, 1954

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2,681,962

COMBINED CIRCUIT BREAKER AND SWITCH

Filed July 2, 1951



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UNITED STATES PATENT OFFICE

2,681,962

COMBINED CIRCUIT BREAKER AND SWITCH

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Application July 2, 1951, Serial No. 234,775

14 Claims. (Cl. 200—113)

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This invention relates to a combined circuit breaker and switch.

The principal object of this invention is to provide an improved combined circuit breaker and switch embodying a single switch means for use in electrical circuits wherein the switch means may be operated automatically and freely upon the occurrence of a circuit overload condition, wherein manually operated means may operate the switch means to open and close the circuit as desired, wherein the manually operated means does not interfere with the opening of the switch means upon the occurrence of an overload condition, which is simple in construction and fool-proof in operation, which is inexpensive to manufacture and install, and which has a long useful life.

The combined circuit breaker and switch of this invention has many uses, particularly in low voltage circuits such as found in the automotive field and in ranges up to about 115 volts A. C. Briefly, it includes an insulating base having stationary contacts carried thereby and a snap-acting bimetallic element supported by the base and carrying contacts for normally engaging the stationary contacts to complete an electric circuit through the bimetallic element. The bimetallic element operates when the temperature thereof increases to a predetermined value upon the occurrence of an overload condition to separate the contacts for opening the electric circuit. A lever is pivotally carried by the base and has means thereon for engaging the bimetallic element when the lever is moved to one of two positions, an "off" position, to separate the contacts and open the electric circuit. When the lever is in the other position, the "on" position, it does not interfere with the operation of the bimetallic element. A cover is also provided for the base. The lever may be one of a pair of toggle levers, the other toggle lever being pivotally carried by the cover and extending therethrough to serve as a handle to be manually manipulated for opening and closing the contacts forming the switch means.

Preferably, the switch means includes two pairs of contacts so that deterioration of the contacts in use is maintained at a minimum. The stationary contacts are preferably formed on posts extending through the base and these posts in addition to forming electrical connections also may form mounting means for the switch unit.

Further objects of this invention reside in the details of construction of the combined circuit

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breaker and switch and the cooperative relationships between the component parts thereof.

Other objects and advantages of this invention will become apparent to those skilled in the art upon reference to the accompanying specification, claims and drawing, in which:

Fig. 1 is a vertical sectional view through the combined circuit breaker and switch of this invention showing the same in "off" position;

Fig. 2 is a view similar to Fig. 1 but showing the combined circuit breaker and switch in "on" position with the electric circuit closed;

Fig. 3 is a view similar to Fig. 2 showing the combined circuit breaker and switch in "on" position but with the contacts separated due to the existence of an overload condition in the electric circuit;

Fig. 4 is a vertical sectional view taken substantially along the line 4—4 of Fig. 1;

Fig. 5 is a horizontal sectional view taken substantially along the line 5—5 of Fig. 1;

Fig. 6 is an exploded perspective view of the snap-acting bimetallic element and one of the toggle levers associated therewith.

The combined circuit breaker and switch of this invention is generally designated at 10. It includes a base 11 made of suitable electrical insulating material such as molded "Bakelite" or the like. Secured in the base 11, preferably during the molding operation, are a pair of posts 12 having shoulders 13 and 14 and extension 15 for firmly securing the posts in the base 11. The outer ends of the posts are preferably screw-threaded for the purpose of making electrical connections thereto and for mounting the unit. The inner ends of the posts 12 are provided with stationary contacts 16. In this respect the contacts 16 may be formed of suitable contact material and secured to the ends of the posts as by welding or the like.

The combined circuit breaker and switch of this invention utilizes a snap-acting, temperature-responsive, bimetallic element 18. This bimetallic element 18 is elongated and is provided with a pair of longitudinally extending slits 19 to form a central leg 20 and a pair of outer legs 21. The center leg 20 is slightly longer than the outer legs 21 and is also crowned to provide snap-acting characteristics to the bimetallic element. A pair of contacts made of suitable contact material are secured to the bimetallic element adjacent the ends thereof as by welding or the like. The movable contacts 22 are adapted to engage the stationary contacts 16 to complete

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an electric circuit through the bimetallic element 18 across the contact posts 12.

The central leg 20 of the bimetallic element 18 is centrally provided with a rectangular hole 24 for receiving a rectangular post 25 having an enlarged head 26. The post 25 is adjustably received in a rectangular hole 27 in the base 11, the post being received therein by a force fit. In this respect the post 25 is provided with serrations for assisting in maintaining the post in proper position in the hole 27. A spring 28 encompasses the post 25 and extends between the bimetallic element 18 and the base 11 for maintaining the bimetallic element against the enlarged head 26 of the post. Thus, the post 25 and the spring 28 operate to mount the bimetallic element 18 on the base 11. When the bimetallic element is being so mounted, the post 25 is inserted into the base 11 to a predetermined point properly to position the bimetallic element 18 for the purpose of calibrating the same with respect to temperature.

When the condition of the electric circuit is normal, the temperature of the bimetallic element 18 is such that the contacts 22 carried thereby engage the stationary contacts 16 for completing the electric circuit as illustrated in Fig. 2. When, however, an overload condition occurs in the electric circuit, the temperature of the bimetallic element 18 increases and when the temperature increases to a predetermined value determined by the calibration of the unit, then the bimetallic element snaps to the position illustrated in Fig. 3 for separating the contacts 22 from the stationary contacts 16. This breaks the electric circuit. When the temperature of the bimetallic element 18 decreases to a predetermined lower value, the bimetallic element then snaps back to the position illustrated in Fig. 2 for re-closing the contacts. In the particular arrangement illustrated here in the drawing, the bimetallic element will continue to cycle so long as the overload condition exists in the circuit. The substantially rectangular hole in the central leg 20 in the bimetallic element 18 and the rectangular post 25 operate to prevent rotation of the bimetallic element 18 so that the contacts 22 and 16 are maintained in alignment.

A cover 31 is suitably secured to the base 11 and rests against a shoulder 30 provided on the periphery of the base 11. The cover 31 may be secured to the base 11 as by crimping the same thereto. On opposite sides of the central post 25 the base 11 is provided with a pair of recesses 32.

A U-shaped lever 34 overlies bimetallic element 18 and has its ends 35 received in the recesses 32 for the purpose of pivotally mounting the lever 34 on the base 11. The lever 34 is provided with a pair of surfaces 36 for engaging the upper surface of the base 11 to limit pivotal movement in one direction of the lever 34. It is also provided with a pair of surfaces 37 for engaging the upper surface of the base 11 for permitting limited movement thereof in the opposite direction. As shown in Fig. 1, the surface 37 limits the pivotal movement of the lever 34 in one direction and as shown in Figs. 2 and 3 the surface 36 limits the pivotal movement in the opposite direction. Thus, the lever 34 is pivotally mounted for movement between two positions. The lever 34 also carries a pair of pins 38 below the bimetallic element 18 which are adapted to engage the under sides of the outer legs 21 of the bimetallic element 18. When the lever 34 is in the position illustrated in Figs. 2

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and 3 the pins 38 are remote from the bimetallic element 18 so that the bimetallic element 18 is free to open and close the contacts 16 and 22 in response to overload conditions in the electric circuit. In this position the lever 34 and its pins 38 offer no restraint to the operation of the unit as a circuit breaker. When, however, the lever 34 is moved to the other position as illustrated in Fig. 1, the pins 38 engage the outer legs 21 of the bimetallic element 18 to snap the contacts 22 thereof away from the stationary contacts 16. Thus, when the lever 34 is in the position illustrated in Fig. 1, the contacts are separated and the circuit opened independently of overload conditions in the circuit. The top of the lever 34 is provided with a pair of projections 39 and a recess 40 therebetween which are utilized for the purpose of moving the lever 34 between the two positions.

The lever 34 forms one lever of a pair of toggle levers, the other toggle lever being designated at 42. This toggle lever 42 is provided with a spherical surface 43 which engages a socket 44 formed in the cover 31. A plate 45 also having a socket 46 is secured to the cover 31 by any suitable means such as rivets 47. The sockets 44 and 46 and the spherical surface 43 operate pivotally to mount the toggle lever 42 in the cover 31. The toggle lever 42 extends through the cover 31 and the outer end thereof serves as a handle to be manually manipulated. The toggle lever 42 is internally provided with a bore 48 in which is slidably mounted a plunger 49 which is spring pressed toward the toggle lever 34 by means of a spring 50 within the bore 48. The spring pressed plunger 49 of the toggle lever 42 engages in the recess 40 between the projections 39 to form an operating connection between the two toggle levers 34 and 42.

When the toggle levers 34 and 42 are in the position illustrated in Fig. 1, that is, the "off" position, they are maintained in that position by the spring 50 acting on the plunger 49 and the movable contacts 22 are separated from the stationary contacts 16 for maintaining the electric circuit open. When, however, the toggle levers 34 and 42 are moved to the position illustrated in Fig. 2, that is, the "on" position, they are maintained in that position by the spring 50 acting on the plunger 49 and the pins 38 are moved away from the bimetallic element 18 so that the movable contacts 22 engage the stationary contacts 16 to complete the electric circuit. If now an overload condition should occur in the electric circuit, the temperature of the bimetallic element 18 is increased to separate the movable contacts 22 from the stationary contacts 16, as illustrated in Fig. 3, to open the electric circuit.

Thus, the toggle levers 34 and 42 cooperating with the bimetallic element 18 operate as a manually operated switch for opening and closing the electric circuit as desired, this being accomplished by moving the toggle levers between the "off" and "on" positions. When, however, the toggle levers 34 and 42 are moved to the "on" position, then the bimetallic element 18 operates freely and automatically as a circuit breaker to open and close the electric circuit in accordance with overload conditions therein.

While for purposes of illustration one form of this invention has been disclosed, other forms thereof may become apparent to those skilled in the art upon reference to this disclosure and, therefore, this invention is to be limited only by the scope of the appended claims.

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I claim as my invention:

1. A combined circuit breaker and switch comprising, an insulating base, a stationary contact carried by the base, a snap acting bimetallic element supported by the base and carrying a contact for normally engaging the stationary contact to complete an electric circuit through the bimetallic element, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts for opening the electric circuit and operating when the temperature thereof decreases to a predetermined value to engage the contacts for closing the electric circuit, and a pair of spring biased toggle levers including a lever pivotally carried by the base and movable between two positions and maintained at either of said two positions and having means thereon free from the bimetallic element when the lever is in one position to permit free operation of the bimetallic element but engaging the bimetallic element when the lever is in the other position to separate the contacts and open the electric circuit.

2. A combined circuit breaker and switch comprising, an insulating base, a stationary contact carried by the base, a snap acting bimetallic element supported by the base and carrying a contact for normally engaging the stationary contact to complete an electric circuit through the bimetallic element, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts for opening the electric circuit and operating when the temperature thereof decreases to a predetermined value to engage the contacts for closing the electric circuit, a cover carried by the base, and a pair of spring biased toggle levers movable between two positions and maintained at either of said two positions, one of the levers being pivotally carried by the cover and extending therethrough to serve as a handle to be manually manipulated, and the other lever being pivotally carried by the base and having means thereon free from the bimetallic element when the toggle levers are in one position to permit free operation of the bimetallic element but engaging the bimetallic element when the toggle levers are in the other position to separate the contacts and open the electric circuit.

3. A combined circuit breaker and switch comprising, an insulating base, a stationary contact carried by the base, a snap acting bimetallic element supported by the base and carrying a contact for normally engaging the stationary contact to complete an electric circuit through the bimetallic element, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts for opening the electric circuit, a cover carried by the base, and a pair of toggle levers including a first lever pivotally carried by the cover and extending therethrough with its outer end serving as a handle to be manually manipulated and with its inner end provided with a spring pressed plunger, and a second lever pivotally carried by the base and engaged by the spring pressed plunger and having means thereon for engaging the bimetallic element when the toggle levers are moved to one position to separate the contacts and open the electric circuit.

4. A combined circuit breaker and switch comprising, an insulating base, a stationary contact carried by the base, a snap acting bimetallic

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element supported by the base and carrying a contact for normally engaging the stationary contact to complete an electric circuit through the bimetallic element, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts for opening the electric circuit and operating when the temperature thereof decreases to a predetermined value to engage the contacts for opening the electric circuit, a cover carried by the base, and a pair of toggle levers movable between two positions and including a first lever pivotally carried by the cover and extending therethrough with its outer end serving as a handle to be manually manipulated and with its inner end provided with a spring pressed plunger, and a second lever pivotally carried by the base and engaged by the spring pressed plunger and having means thereon free from the bimetallic element when the toggle levers are in one position to permit free operation of the bimetallic element but engaging the bimetallic element when the toggle levers are in the other position to separate the contacts and open the electric circuit.

5. A combined circuit breaker and switch comprising, an insulating base, a pair of stationary contacts carried by the base, a snap acting bimetallic element having a pair of contacts for normally engaging the stationary contacts to complete an electric circuit through the bimetallic element, means between the contacts of the bimetallic element for supporting the bimetallic element on the base, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts carried by the bimetallic element from the stationary contacts for opening the electric circuit, and a lever pivotally carried by the base and having means thereon for engaging the bimetallic element adjacent its mounting means when the lever is moved to one position to separate the contacts carried by the bimetallic element from the stationary contacts and open the electric circuit.

6. A combined circuit breaker and switch comprising, an insulating base, a pair of stationary contacts carried by the base, a snap acting bimetallic element having a pair of contacts for normally engaging the stationary contacts to complete an electric circuit through the bimetallic element, means between the contacts of the bimetallic element for supporting the bimetallic element on the base, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts carried by the bimetallic element from the stationary contacts for opening the electric circuit, a cover carried by the base, and a pair of toggle levers, one of the levers being pivotally carried by the cover and extending therethrough to serve as a handle to be manually manipulated, and the other lever being pivotally carried by the base and having means thereon for engaging the bimetallic element adjacent its mounting means when the toggle levers are moved to one position to separate the contacts carried by the bimetallic element from the stationary contacts and open the electric circuit.

7. A combined circuit breaker and switch comprising, an insulating base, a pair of stationary contacts carried by the base, an elongated snap acting bimetallic element having a contact adjacent each end for normally engaging the stationary contacts to complete an electric circuit

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through the bimetallic element, said elongated snap acting bimetallic element having a pair of longitudinal slits defining a pair of outer legs and a central leg and the central leg being crowned, means for mounting the central leg of the bimetallic element on the base, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts carried by the bimetallic element from the stationary contacts for opening the electric circuit, and a lever pivotally carried by the base and having means thereon for engaging the outer legs of the bimetallic element when the lever is moved to one position to separate the contacts carried by the bimetallic element from the stationary contacts and open the electric circuit.

8. A combined circuit breaker and switch comprising, an insulating base, a pair of stationary contacts carried by the base, an elongated snap acting bimetallic element having a contact adjacent each end for normally engaging the stationary contacts to complete an electric circuit through the bimetallic element, said elongated snap acting bimetallic element having a pair of longitudinal slits defining a pair of outer legs and a central leg and the central leg being crowned, means for mounting the central leg of the bimetallic element on the base, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts carried by the bimetallic element from the stationary contacts for opening the electric circuit, a cover carried by the base, and a pair of toggle levers, one of the levers being pivotally carried by the cover and extending therethrough to serve as a handle to be manually manipulated, and the other lever being pivotally carried by the base and having means thereon for engaging the outer legs of the bimetallic element when the toggle levers are moved to one position to separate the contacts carried by the bimetallic element from the stationary contacts and open the electric circuit.

9. A circuit breaker comprising, an insulating base having a central rectangular opening, a pair of posts secured to and extending through the base on opposite sides of the central opening and each having a stationary contact on its end, an elongated snap acting bimetallic element having a contact adjacent each end for normally engaging the stationary contacts to complete an electric circuit through the bimetallic element, said elongated snap acting bimetallic element having a pair of longitudinal slits defining a pair of outer legs and a central leg and the central leg being crowned and provided with a central rectangular opening, a central post of rectangular cross section having a head and extending through the central opening in the bimetallic element and adjustably secured in the central opening in the base, spring means on the central post between the bimetallic element and the base for maintaining the bimetallic element against the head on the central post, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts carried by the bimetallic element from the stationary contacts for opening the electric circuit.

10. A combined circuit breaker and switch comprising, an insulating base having a central rectangular opening, a pair of posts secured to and extending through the base on opposite sides of the central opening and each having a sta-

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tionary contact on its end, an elongated snap acting bimetallic element having a contact adjacent each end for normally engaging the stationary contacts to complete an electric circuit through the bimetallic element, said elongated snap acting bimetallic element having a pair of longitudinal slits defining a pair of outer legs and a central leg and the central leg being crowned and provided with a central rectangular opening, a central post of rectangular cross section having a head and extending through the central opening in the bimetallic element and adjustably secured in the central opening in the base, spring means on the central post between the bimetallic element and the base for maintaining the bimetallic element against the head on the central post, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts carried by the bimetallic element from the stationary contacts for opening the electric circuit, a pair of recesses in the base on opposite sides of the central post, a U-shaped lever extending over the bimetallic element and having its ends pivotally mounted in the recesses, and means on the lever for engaging the outer legs of the bimetallic element when the lever is moved to one position to separate the contacts carried by the bimetallic element from the stationary contacts and open the electric circuit.

11. A combined circuit breaker and switch comprising, an insulating base having a central rectangular opening, a pair of posts secured to and extending through the base on opposite sides of the central opening and each having a stationary contact on its end, an elongated snap acting bimetallic element having a contact adjacent each end for normally engaging the stationary contacts to complete an electric circuit through the bimetallic element, said elongated snap acting bimetallic element having a pair of longitudinal slits defining a pair of outer legs and a central leg and the central leg being crowned and provided with a central rectangular opening, a central post of rectangular cross section having a head and extending through the central opening in the bimetallic element and adjustably secured in the central opening in the base, spring means on the central post between the bimetallic element and the base for maintaining the bimetallic element against the head on the central post, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts carried by the bimetallic element from the stationary contacts for opening the electric circuit, a pair of recesses in the base on opposite sides of the central post, a U-shaped lever extending over the bimetallic element and having its ends pivotally mounted in the recesses, and means on the lever for engaging the outer legs of the bimetallic element when the lever is moved to one position to separate the contacts carried by the bimetallic element from the stationary contacts and open the electric circuit, a cover carried by the base, said U-shaped lever forming one of a pair of toggle levers, the other toggle lever being pivotally carried by the cover and extending therethrough with its outer end serving as a handle to be manually manipulated and with its inner end provided with a spring pressed plunger engaging the U-shaped lever.

12. A combined circuit breaker and switch comprising, an insulating base, a pair of stationary contacts carried by the base, a snap act-

ing bimetallic element having a pair of contacts for normally engaging the stationary contacts to complete an electric circuit through the bimetallic element, means between the contacts of the bimetallic element for supporting the bimetallic element on the base, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts carried by the bimetallic element from the stationary contacts for opening the electric circuit, a pair of recesses in the base on opposite sides of the mounting means for the bimetallic element, a U-shaped lever extending over the bimetallic element and having its ends pivotally mounted in the recesses, and means on the lever for engaging the bimetallic element adjacent its mounting means when the lever is moved to one position to separate the contacts carried by the bimetallic element from the stationary contacts and open the circuit.

13. A combined circuit breaker and switch comprising, an insulating base, a pair of stationary contacts carried by the base, a snap acting bimetallic element having a pair of contacts for normally engaging the stationary contacts to complete an electric circuit through the bimetallic element, means between the contacts of the bimetallic element for supporting the bimetallic element on the base, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts carried by the bimetallic element from the stationary contacts for opening the electric circuit, a pair of recesses in the base on opposite sides of the mounting means for the bimetallic element, a U-shaped lever extending over the bimetallic element and having its ends pivotally mounted in the recesses, and means on the lever for engaging the bimetallic element adjacent its mounting means when the lever is moved to one position to separate the contacts carried by the bimetallic element from the sta-

tionary contacts and open the circuit, a cover carried by the base, said U-shaped lever forming one of a pair of toggle levers, the other toggle lever being pivotally carried by the cover and extending therethrough with its outer end serving as a handle to be manually manipulated and with its inner end provided with a spring pressed plunger engaging the U-shaped lever.

14. A combined circuit breaker and switch comprising, an insulating base, a stationary contact carried by the base, a snap acting bimetallic element supported by the base and carrying a contact for normally engaging the stationary contact to complete an electric circuit through the bimetallic element, said snap acting bimetallic element operating when the temperature thereof increases to a predetermined value to separate the contacts for opening the electric circuit and operating when the temperature thereof decreases to a predetermined value to engage the contacts for opening the electric circuit, a cover carried by the base, and spring biased lever means carried by the base and extending through the cover and movable between two positions and maintained at either of said two positions and having means thereon free from the bimetallic element when the lever means is in one position to permit free operation of the bimetallic element but engaging the bimetallic element when the lever means is in the other position to separate the contacts and open the electric circuit.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,249,837	Lee	July 22, 1941
2,462,244	Wise	Feb. 22, 1949
2,520,873	Bean	Aug. 29, 1950
2,520,874	Bean	Aug. 29, 1950