July 5, 1938. O. MASENG 2,122,693

BIMETAL AND CIRCUIT BREAKER EMPLOYING THE SAME

Filed Oct. 10, 1935

Fig. 1.

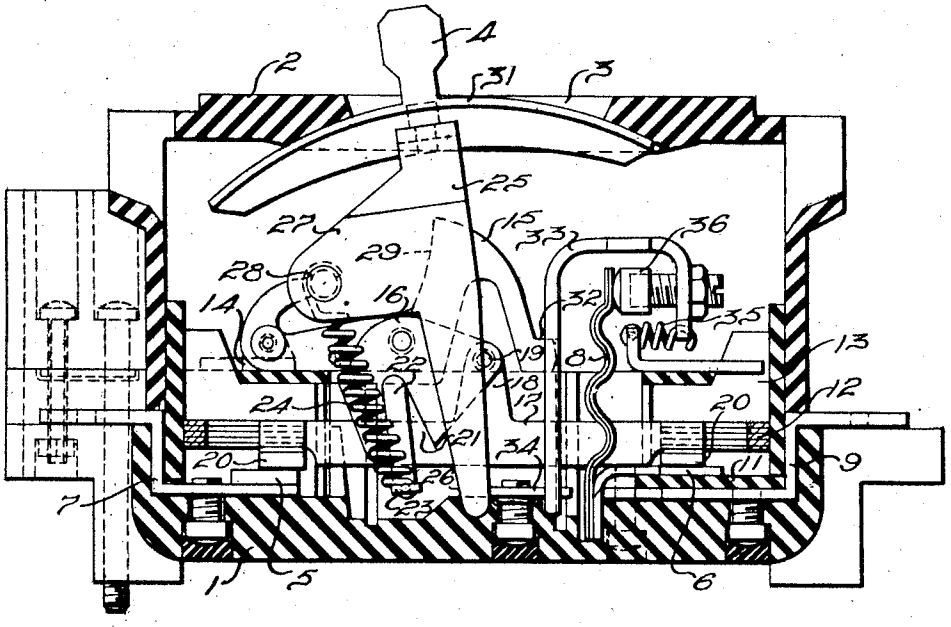


Fig. 2.

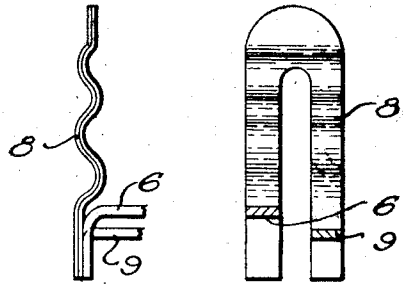
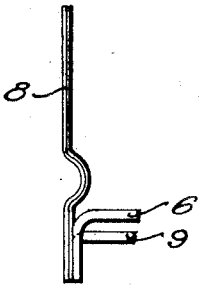


Fig. 3.

Fig. 4.



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2,122,693

BIMETAL AND CIRCUIT BREAKER EMPLOYING THE SAME

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Application October 10, 1935, Serial No. 44,341

11 Claims. (Cl. 200—116)

This invention relates generally to thermostatic bimetallic members and apparatus for making and breaking electrical circuits employing the same, and more particularly to automatic electric circuit breakers employing current responsive bimetallic tripping elements.

In the design of automatic electric circuit breakers of low ampere ratings employing bimetallic members carrying the line current and adapted to actuate the automatic tripping mechanism, difficulty has been encountered in securing low ampere rating bimetals which would be capable of carrying the heavy short circuit currents which the circuit breaker may be called upon to rupture. In selecting a bimetal of sufficient resistance to give a sufficient response to a low value of current to operably trip the automatic circuit interrupting mechanism it has commonly been found necessary to reduce the cross section of the bimetal with a consequent tendency for the element to be damaged by the short circuit currents which may be encountered. For bimetallic members adapted to carry without damage a short circuit current of 5000 amperes or more, a 15 ampere rating has in the past been considered approximately the lowest obtainable rating. The actuating current and therefore the permissible rating in terms of current for any given bimetal is influenced by its cross section. For any given cross section in a bimetallic member in accordance with the present invention, the permissible rated actuating current is reduced substantially without any increased hazard to the bimetallic element by heavy short circuit currents. Thus, employing the smallest bimetallic cross section which has heretofore been considered safe for short circuit currents of 5000 amperes or more, it is possible to secure a much lower rating for the circuit breaker employing this bimetal. Or in other words, a lower line current will actuate the bimetal sufficiently to trip the automatic mechanism. This enables the circuit breakers employing bimetallic members, according to the present invention, to achieve lower ampere ratings while at the same time being capable of interrupting short circuit currents of 5000 amperes or more. Furthermore, in the use of a bimetal for the ampere ratings now common, it is possible to use a member of heavier cross section to produce the same response as before and thus introduce a desirable factor of safety.

One object of the present invention is to provide an automatic electric circuit breaker capable of interrupting heavy short circuit currents and having a low ampere rating.

Another object of this invention is to provide an automatic electric circuit breaker utilizing a heavy current responsive bimetallic member without reducing its sensitivity.

Another object of this invention is to provide an electric circuit breaker employing a corrugated bimetallic member to actuate its tripping mechanism.

Another object of this invention is to provide a thermostatic bimetallic member having structural means for increasing its effective movement.

Another object of this invention is to provide a thermostatic bimetallic member having a lateral corrugation or corrugations to increase its effectiveness and response.

Other objects and features of this invention will be readily apparent to those skilled in the art from the following specification and the appended drawing illustrating certain preferred embodiments of the invention in which:

Figure 1 is a side elevational view of a circuit breaker with the side of the enclosure cut away to show the interior of the breaker mechanism with the parts in closed circuit position.

Figure 2 is a side elevational view of a bimetallic member according to the present invention.

Figure 3 is a front elevational view of the member shown in Figure 2.

Figure 4 is a side elevational view of a slightly modified form of bimetallic member.

Referring to the drawing, Figure 1 shows a circuit breaker mechanism specifically disclosed and claimed in the application of John G. Jackson and Wallace T. Allen, Serial No. 12,798, filed March 25, 1935, with a current responsive bimetallic tripping element according to the present invention. This figure illustrates one form of circuit breaker in which the bimetallic member according to the present invention may be used although it is obvious that the bimetallic member is susceptible to use in any type of circuit breaker or in any other apparatus in which a thermostatic member is employed.

The circuit breaker illustrated has an enclosing structure comprised of a base 1 and cover 2. The top of the cover is provided with a slot 3 through which extends an operating knob 4. The base 1 is in the form of a shallow cup in which, at opposite ends, are disposed stationary contacts 5, 6. Contact 5 is secured to a conducting connector 7 leading to the exterior of the enclosure. Contact 6 is rigidly connected to one leg of a U-shaped bimetallic member 8, to the other leg

of which is secured a conducting connector 9 leading to the exterior of the breaker. The connector 9 and the contact 6 are rigidly secured to the base 1 and serve to support the bimetallic member 8 in operating position. The sheet 11 insulates the contact 6 from the connector 9 so that the current must traverse the bimetallic member in its path through the circuit breaker. An arc suppressor 12 and shield 13 are disposed over each of the contacts 5 and 6.

On a bracket 14 rigidly secured to the base 1 adjacent the top thereof is pivotally mounted a carrier 15. Upon this carrier, intermediate its ends, are pivotally mounted a pair of plates 16 disposed on opposite sides of the carrier. A conducting bar 17 has an integral finger 18 extending from the midportion thereof which is pivotally supported on the plates 16 by the pivot 19 which also serves to join the plates 16 together for common movement as a unit. The conducting bar 17 has contacts 20 mounted thereon adjacent the ends thereof in position to engage the stationary contacts 5 and 6.

The plates 16 are equipped with parallel notches 21 in which is located a flipper 22 having parallel legs which are disposed in the notches on opposite sides of the conducting bar 17. The ends of the flipper legs are joined by a cross bar 23 to which a pair of operating springs 24 are connected.

A U-shaped operating member 25 is fulcrumed in grooves 26 in the bottom of the cup-shaped base 1. The legs of the U are extended at 27 and are joined together by a pin 28 to which the ends of the operating springs 24 are secured. The member 25 has a shield 31 rigidly secured thereto which carries the operating knob 4 and closes opening 3 in the cover.

The carrier 15 is provided with a surface 29 which is engaged by the pin 28 for resetting the breaker after automatic operation. The carrier is provided at its free end with a latching surface 32 normally engaged by a latch 33 which is pivotally carried by the supporting plate 34 and is biased toward latching position by spring 35. The latch 33 has a portion thereof provided with an adjustable insulating abutment 36 which is disposed on the low expansion side of the bimetal in a position to be engaged thereby when the bimetal bends due to excess current.

The parts as shown are in the closed circuit position. To open the contacts manually the handle 4 is moved clockwise, thus carrying the springs 24 in the same direction until the flipper 22 moves to the opposite side of the slot quickly carrying the springs past the dead center position of the bell crank formed by the plates 16, whereupon the conducting bar 17 is quickly snapped to open position. To manually close the breaker the handle 4 is then moved in the opposite direction and a reverse action of the parts occurs.

Upon the occurrence of an overload current the bimetal 8, which is in series with the breaker, becomes heated and bends clockwise moving the latch 33 out of engagement with the surface 32, whereupon the carrier 15 swings upwardly under the bias of the operating springs 24 and the contacts will thus be automatically moved to "off" position. To reset the breaker the handle 4 is moved to the right whereupon the pin 28 engages surface 29 and moves the latching surface 32 into position to be engaged by the latch 33. The parts will then be in normal "off" position and the operation to "on" position will be as previously described.

In the bimetallic member shown in Figures 1 to 3, inclusive, substantially the entire effective length of the bimetal is provided with transverse corrugations. While the bimetallic member here shown is of U-shape it is obvious that similar corrugations may be employed upon bimetallic strips or bimetallic members of any other form. It has been found that the corrugations very greatly increase the effective movement of a given bimetal and thus provide for sufficient response to trip the automatic mechanism at a much lower current value than is otherwise the case and reduces this effective current and the permissible rating substantially over its former lowest value. This permits, on the one hand, the attainment of a much lower rating while maintaining the ability to carry heavy short circuit currents without damage, and on the other hand, the use of a much heavier bimetal for any given current value than has heretofore been possible.

The improved action of the corrugated bimetal as compared with the flat bimetal appears to be due to the change in shape and length within the corrugated portion of the bimetal and the change in resistance and heating in the path of the current throughout the bimetal, as well as the increase in lateral stiffening due to the lateral corrugations, all of which result in increased movement of the free end of the bimetal for a given current passed therethrough.

In the modified form of bimetallic member shown in Figure 4, a single corrugation is placed in the bimetal adjacent to its fixed end. While the member here shown does not have as great a movement at its free end as does the fully corrugated bimetal of Figures 1 to 3, inclusive, it still greatly increases the movement over that of a flat bimetal and may in some instances be a preferred form of construction.

The term "corrugated" as used in this specification and in the appended claims is intended to be given its broadest interpretation and to include any wrinkle, fold, ridge or groove or furrow in the member in accordance with the teachings of the present invention.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. In an automatic electric circuit breaker, separable contacts, means biasing said contacts to separated position, and means for releasing said contacts for movement to said position, said means including a current traversed, bimetallic strip having relatively fixed and free ends with its free end progressively movable in a direction at right angles to the plane of the strip, said strip being provided with structural means for increasing its effective movement in response to a given current value without increasing its resistance or overall working length.

2. In an automatic electric circuit breaker, stationary and movable contacts, manual means for moving said movable contact to engaged and disengaged positions, a member releasable to cause automatic movement of said movable contact to disengaged position, and means for releasing said member including a current traversed,

progressively movable, corrugated, bimetallic member.

3. In an automatic electric circuit breaker, separable contacts and means for causing automatic separation of said contacts in response to overload, said means including a current traversed, progressively moving, bimetallic member formed of continuous layers of metals of different temperature coefficient of expansion and provided with traverse corrugations.

4. In an automatic electric circuit breaker, stationary and movable contacts, means biasing the movable contact to separated position and means for releasing the movable contact for movement to said position, said means including a bimetallic member formed of continuous layers of metals of different temperature coefficient of expansion integrally joined together, said member being transversely corrugated and having relatively fixed and free ends with its free end progressively movable in response to change in temperature.

5. In an automatic electric circuit breaker, separable contacts, means biasing said contacts to separated position and means for releasing said contacts for movement to said position, said means including a bimetallic member formed of continuous layers of metals of different temperature coefficient of expansion and having relatively fixed and free ends with its free end progressively movable in response to change in temperature, said member being provided with at least one transverse corrugation.

6. In an automatic electric circuit breaker, stationary and movable contacts, manual means for moving said movable contact to engaged and disengaged position, a member releasable to cause automatic movement of said movable contact to disengaged position, a latch for said member and means for releasing said latch comprising a progressively movable, current traversed, bimetallic member formed of continuous layers of metals of different temperature coefficient of expansion integrally joined together, said member being provided with corrugations extending at substantially right angles to its direction of effective movement.

7. In an automatic electric circuit breaker, stationary and movable contacts, manual means for moving said movable contact to engaged and disengaged positions, and automatic means for moving said movable contact to disengaged position, said last mentioned means including a current responsive releasable latch comprising a progressively movable, current traversed, bimetallic member formed of continuous layers of metals of different temperature coefficient of expansion integrally joined together, said member being provided with corrugations extending at substantially right angles to its direction of effective movement.

8. A thermostatic member comprised of continuous layers of metals of different temperature coefficient of expansion integrally joined together, said member being generally U-shaped and provided with corrugations extending transverse to the legs of the U, said member being unstressed and progressively movable in response to change in temperature.

9. A thermostatic member comprised of continuous layers of metals of different temperature coefficient of expansion integrally joined together, said member being located substantially in a single plane but provided with transverse corrugations in said plane, said member being unstressed and progressively movable in response to change in temperature.

10. In an automatic electric circuit breaker, separable contacts and means for causing automatic separation of said contacts in response to overload, said means including a current-traversed, progressively moving, U-shape bimetallic member provided with corrugations transverse to its direction of movement.

11. In an automatic electric circuit breaker, separable contacts and means for causing automatic separation of said contacts in response to overload, said means including a current-traversed, progressively moving, U-shape bimetallic member having the open ends of its legs fixed and a transverse corrugation across said legs adjacent to said ends.

OLAV MASENG.

CERTIFICATE OF CORRECTION.

Patent No. 2,122,693. July 5, 1938.

OLAV MASENG.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 10, claim 3, for "traverse" read --transverse--; 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 18th day of June, A. D. 1940.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)