March 1, 1955 F. L. HULBERT 2,703,351

COMPENSATOR FOR ELECTRIC CIRCUIT BREAKERS

Filed June 22, 1953 2 Sheets-Sheet 1

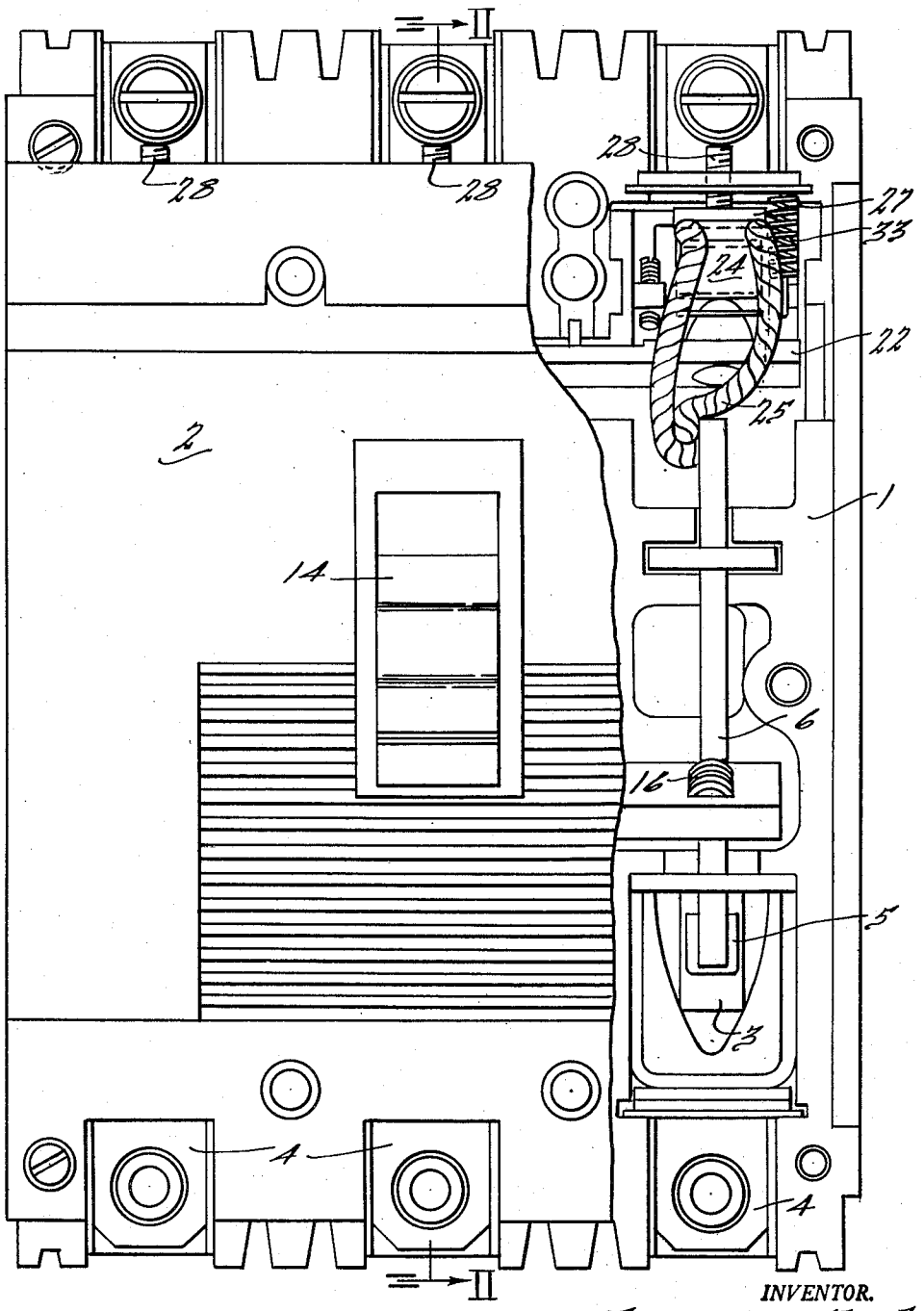


Fig. 1.

INVENTOR.
Francis L. Hulbert.
BY Myron J. Geibold
ATTORNEY.

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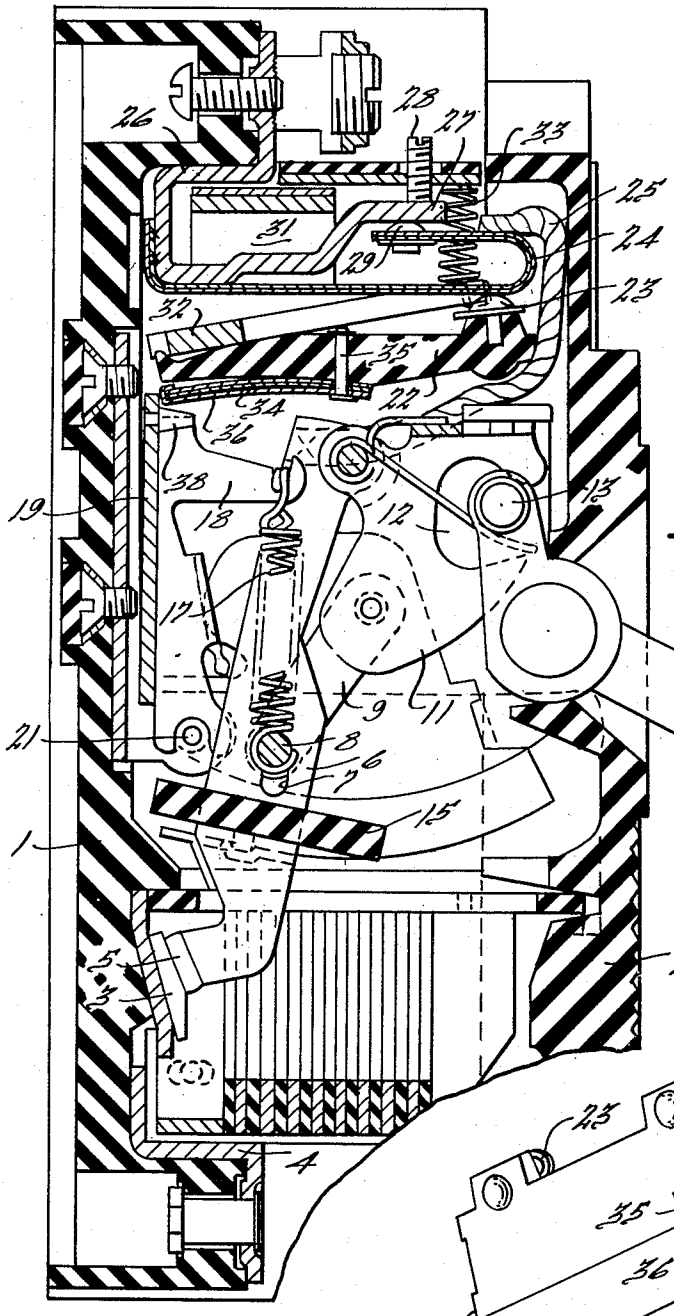


Fig. 2.

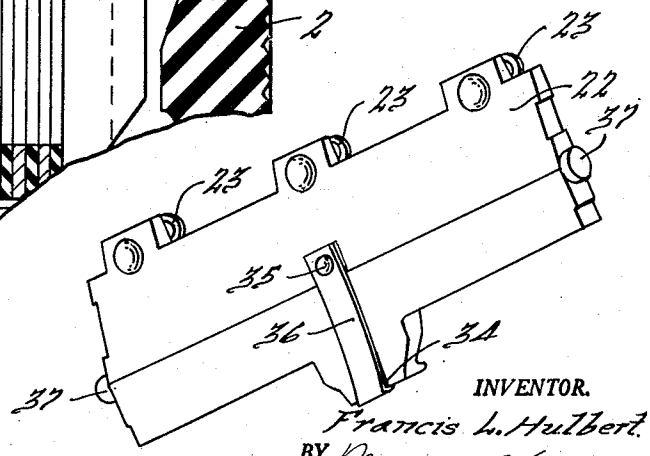


Fig. 3.

INVENTOR.
Francis L. Hulbert
BY Myron J. Seibold
ATTORNEY.

United States Patent Office 2,703,351 Patented Mar. 1, 1955

2,703,351

COMPENSATOR FOR ELECTRIC CIRCUIT BREAKERS

Francis L. Hulbert, Dearborn, Mich., assignor to Square D Company, Detroit, Mich., a corporation of Michigan

Application June 22, 1953, Serial No. 363,318

7 Claims. (Cl. 200—116)

This invention relates to an automatically and manually operable electric circuit breaker employing a current responsive bimetallic member for effecting automatic operation of the breaker, and has for its object the provision of a simple, economical and effective means for compensating for the movement of the bimetallic members of a multipole breaker under the influence of ambient temperature changes.

Another object of the invention is to provide a single bimetallic member exposed to the same ambient as a multiplicity of current responsive bimetals in a multipole automatic circuit breaker and compensating for ambient temperature changes for all of the current responsive bimetals.

Another object of the invention is the provision of a multipole automatic electric circuit breaker having a common crossbar for the poles of the breaker and a single, releasable member latched by said crossbar together with bimetallic members individual to the poles for effecting movement of said crossbar upon current overload through one or more bimetals to unlatch said releasable means, with a single bimetallic member determining the latching engagement between said releasable means and crossbar and flexing to increase the latching overlap upon a rise in ambient in response to which the current responsive bimetals move toward unlatching position.

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

Figure 1 is a front elevational view of the circuit breaker according to the present invention, with a portion of the front cover broken away to show a single outside pole of the breaker.

Figure 2 is a vertical sectional view on the lines II—II of Figure 1.

Figure 3 is a perspective view of the crossbar of this invention.

It will be understood that the invention herein may be applied to any automatic electric circuit breaker using a bimetallic member as a current responsive element for effecting automatic tripping and for purposes of illustration only it is in the drawing shown as applied to a circuit breaker of the type described and claimed in Jackson et al. Patent No. 2,426,880 granted September 2, 1947, for Circuit Breaker.

The device is shown as a 3-pole breaker including, as in the patent, a central pole carrying the operating mechanism and a pair of outside poles mounted thereon. The circuit breaker includes a base 1 and a front cover 2 sealably attached thereto and enclosing stationary contacts 3 mounted on terminals 4 extending to the exterior of the breaker enclosure. Cooperating with stationary contacts 3 are movable contacts 5 mounted upon the ends of pivotally mounted contact arms 6.

The central contact arm 6 is provided with a slot 7 through which extends a pin 8 connected to a pair of links 9 and 11, links 11 being provided with a notch 12 in which is disposed a pin 13 mounted upon an operating handle 14. Rigidly connected to the central contact arm 6 is an insulating bottom cross plate 15 to which the outer contact arms 6 are connected by means of slots in the plate 15 and springs 16 disposed in said slots. A spring 17 has one end connected to pin 8 and its opposite end connected to a projecting arm 18 rigid with a release lever 19 pivoted at 21.

At the top of the breaker is pivotally mounted an insulating crossbar 22. Mounted on the crossbar 22 are insulating abutments 23, one for each pole, here specifically three, and mounted for engagement with the abutments 23 are a plurality of bimetals 24 individual to the poles of the breaker and having a pair of flexible leads 25 connected between the bimetals 24 and the corresponding contact arms 6. A conducting terminal 26 for each pole extends from the exterior of the breaker enclosure to the interior thereof and there supports an end of each bimetal 24, the free end of the terminal 26 being indicated at 27 for engagement with the calibrating screw 28, the end 27 engaging an insulating pin 29 at the extreme free end of the bimetal 24 as an abutment to adjust the current-time calibration of the breaker pole.

A U-shaped magnetic yoke 31 embraces each bimetal 24 so as to be energized in response to current flow through the bimetal and cooperating therewith for each pole is an individual pivoted armature 32 biased to inoperative position by a spring 33 and attractable to the yoke upon the occurrence of a short circuit or heavy overload current through its associated pole to move the crossbar 22 without delay into unlatching position.

The compensator according to the present invention is embodied in a bimetallic strip 34 supported upon the crossbar 22 by a rivet 35. Outside of the bimetal strip 34 is a spring strip 36 parallel therewith and wrapped around its free end, the spring strip 36 performing only the function of providing a smooth latching surface for engagement by the releasable member 19. The bimetal strip 34 is mounted so that it flexes in the same direction as the bimetals 24, but, being located on the opposite side of the pivot 37 of the crossbar 22, its motion effectively subtracts from the ambient temperature movement of the current responsive bimetals; thus, as viewed in Figure 2, bimetals 24 tend to move downwardly as they are heated due to ambient and, hence, rotate crossbar 22 in clockwise direction toward unlatching position. However, this increased ambient temperature also moves the free end of the bimetal 24 downwardly and this is effected in a counterclockwise direction relative to the pivot 37 so that the movement of the bimetal strip 34 tends to increase the latching overlap with the releasable member 19.

As shown in Figure 2, the bimetal strip 34 and the current responsive bimetals 24 have been heated by the ambient so that if the strip 34 were not thermally responsive and were tight against the crossbar 22, it would be substantially in tripping position. However, due to the flexure of the bimetal strip 34, it has moved downwardly to provide a substantial overlap. The pin 38 is provided on the releasable member 19 to determine the maximum overlap between the bimetal strip and the releasing member 19 and is effective primarily in the calibration of the breaker.

The operation of the breaker is more fully described in the Jackson et al. patent cited above, the parts being shown in Figure 2 in the On position and movable to Off position by a counterclockwise rotation of the handle 14 which collapses the links 9 and 11, the contact arms 6 thereafter moving counterclockwise to open position under the bias of spring 17.

Upon the occurrence of a current overload or short circuit current through any one or more poles of the breaker, the crossbar 22 will be rotated in a clockwise direction under the action of the associated bimetal and/or armature for the pole or poles carrying the overload or short circuit, and will release the member 19 which then carries the spring 17 overcenter and also positively engages the central contact arm 6 to collapse the toggle and move all of the arms 6 into Off position. Releasable member 19 is moved to relatched position by moving the handle in a counterclockwise direction to Off position and then the parts may be returned to the On position of Figure 2 by a clockwise rotation of the handle.

With the present invention, it is seen that there is provided a simple and effective ambient temperature compensation in a multipole automatic electric breaker in which there is employed a single bimetal strip which compensates for ambient temperature changes on a multiplicity of current responsive bimetals therewith individual to the poles of the breaker, the single compensating

bimetal strip functioning regardless of the number of breaker poles provided.

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 a multipole manual and automatic electric circuit breaker, a plurality of pairs of stationary and movable contacts for the breaker poles, manual means for effecting engagement and disengagement of said contacts at will, means for effecting automatic separation of said contacts upon the occurrence of a current overload through any one or more of the breaker poles including a current responsive bimetal for each of the breaker poles and means rendering said bimetals responsive to the passage of current through their associated breaker poles, means releasable to effect automatic separation of said contacts, said bimetals controlling the release of said means, a single bimetal strip disposed in the same ambient temperature as the current responsive bimetals, and means whereby the flexing of said single bimetal strip compensates for the flexing of all said current responsive bimetals upon change in ambient temperature so that their control of the release of said releasable means is substantially independent of said ambient.

2. In a multipole manual and automatic electric circuit breaker, a plurality of pairs of stationary and movable contacts for the breaker poles, means for effecting automatic separation of said contacts upon the occurrence of a current overload through any one or more of the breaker poles including a current responsive bimetal for each of the breaker poles, a crossbar common to all the breaker poles and adapted to be moved by the flexing of one or more of the bimetals, means rendering said bimetals responsive to the passage of current through their associated breaker poles, means operable by said crossbar to effect automatic opening of said movable contacts, a single bimetal strip controlling the operation of said last mentioned means by said crossbar, and means whereby flexing of said single bimetal strip compensates for the movement of all said current responsive bimetals in response to changes in ambient temperature within the breaker.

3. In a multipole manual and automatic electric circuit breaker, a plurality of pairs of stationary and movable contacts for the breaker poles, means for effecting automatic separation of said contacts upon the occurrence of a current overload through any one or more of the breaker poles including a current responsive bimetal for each of the breaker poles, a crossbar common to all the breaker poles and adapted to be moved by the flexing of one or more of the bimetallic members, means rendering said bimetal members responsive to the passage of current through their associated breaker poles, means releasable to effect automatic opening of said movable contacts, a single bimetal strip controlling the operation of said releasable member by said crossbar and flexing to compensate for the movement of all said bimetallic members in response to changes in ambient temperature within the breaker, said compensating bimetal strip being mounted upon the common crossbar and latching said releasable means.

4. In a manual and automatic electric circuit breaker, a plurality of pairs of stationary and movable contacts for the breaker poles, means for effecting automatic separation of said contacts upon the occurrence of a current overload through any one or more of the breaker poles including a current responsive bimetal for each of the breaker poles, a crossbar common to all of the breaker poles, a latching surface on said cross bar, means normally engaging said latching surface and releasable thereby to effect automatic separation of said contacts, and a single bimetal strip carried by the crossbar and controlling the overlap between said latching surface and said releasable means, said strip being faced so as to increase the overlap upon increase in ambient temperature.

5. In a multipole manual and automatic electric circuit breaker, a plurality of pairs of stationary and movable contacts for the breaker poles, means for effecting automatic separation of said contacts upon the occurrence of a current overload through any one or more of the breaker poles including a current responsive bimetal for each of the breaker poles, a crossbar common to all the breaker poles and adapted to be moved by the flexing of one or more of the bimetallic members, means rendering said bimetal members responsive to the passage of current through their associated breaker poles, means releasable to effect automatic opening of said movable contacts, a single bimetal strip controlling the operation of said releasable member by said crossbar and flexing to compensate for the movement of all said bimetallic members in response to changes in ambient temperature within the breaker, said compensating bimetal strip being mounted upon the common crossbar and latching said releasable means, means pivotally mounting said crossbar for rotation about a point intermediate the front and back edges thereof, abutment surfaces at one side of said pivotal mounting engageable by said current responsive bimetals and said compensator strip being mounted so that its free end operates at the opposite side of said pivotal mounting and is movable away from said crossbar upon an increase in ambient temperature.

6. In a multipole automatic electric circuit breaker, a plurality of pairs of stationary and movable contacts for the breaker poles, means for effecting automatic separation of said contacts upon the occurrence of a current overload through any one or more of the breaker poles including a current responsive bimetal for each of the breaker poles, a crossbar common to all the breaker poles and adapted to be moved by the flexing of one or more of the bimetals, means rendering said bimetal members responsive to the passage of current through their associated breaker poles, means releasable to effect automatic opening of said movable contacts, a single bimetal strip mounted on said crossbar and latching said releasable means and flexing to compensate for the movement of all said current responsive bimetal members in response to changes in ambient temperature within the breaker, and a spring strip mounted generally parallel to said compensator strip and enclosing the latching end thereof to provide a smooth latching surface engageable by said releasable means.

7. In a multipole automatic electric circuit breaker, a plurality of pairs of stationary and movable contacts for the breaker poles, means for effecting automatic separation of said contacts upon the occurrence of a current overload through any one or more of the breaker poles including a current responsive bimetal for each of the breaker poles, a crossbar common to all the breaker poles and adapted to be moved by the flexing of one or more of the bimetals, means rendering said bimetal member responsive to the passage of current through their associated breaker poles, means releasable to effect automatic opening of said movable contacts, a single bimetal strip mounted on said crossbar and latching said releasable means and flexing to compensate for the movement of all said bimetallic members in response to changes in ambient temperature within the breaker, means pivotally mounting said crossbar for rotation about a point intermediate the front and back edges thereof, abutment surfaces at one side of said pivotal mounting engageable by said current responsive bimetals, said compensator strip being mounted so that its free end operates at the opposite side of said pivotal mounting and is movable away from said crossbar upon an increase in ambient temperature.

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