June 15, 1954 B. B. SCHWARTZ ET AL 2,681,397

CIRCUIT BREAKER

Filed Jan. 2, 1953 2 Sheets-Sheet 1

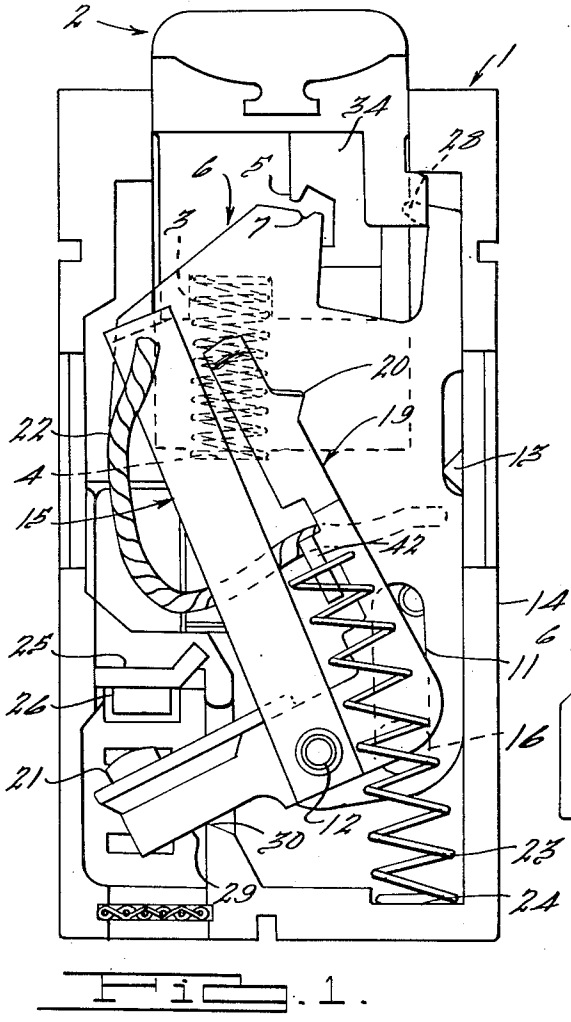


FIG. 1.

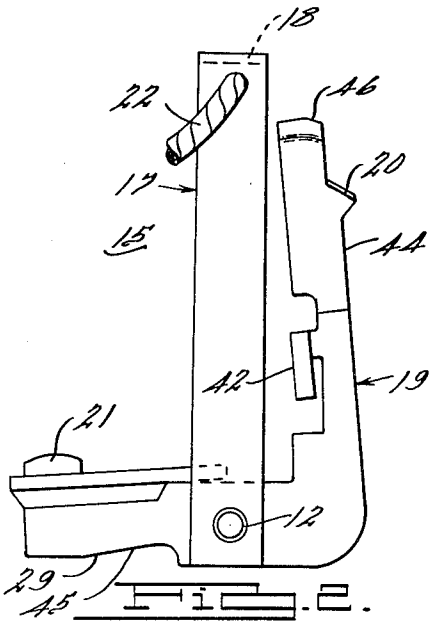


FIG. 2.

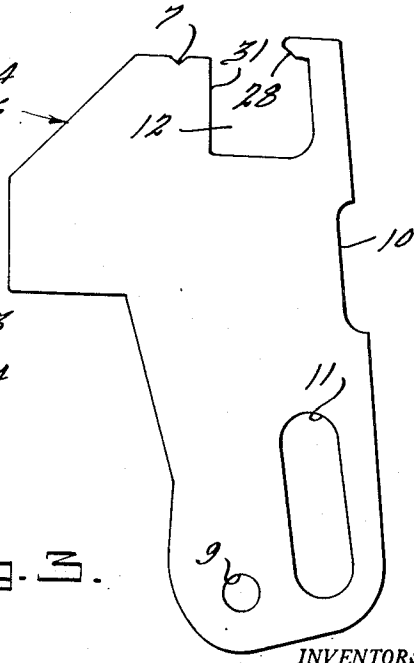


FIG. 3.

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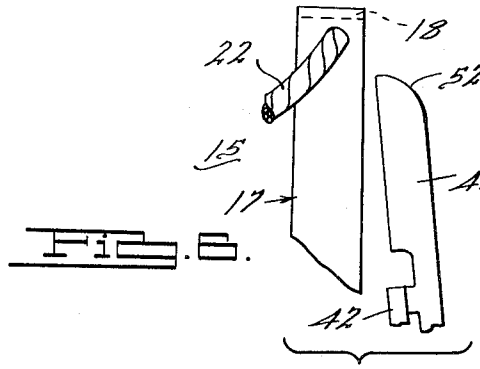


Fig. 6.

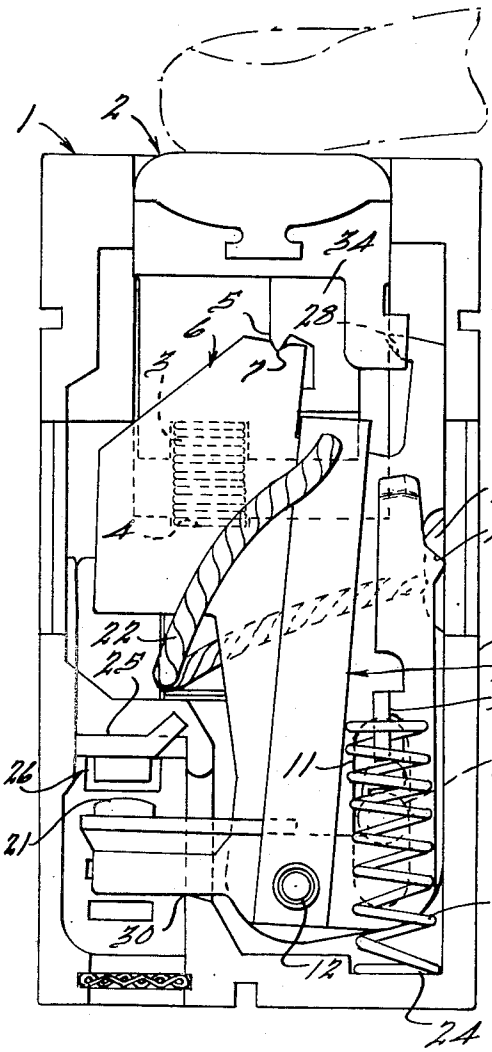


Fig. 4.

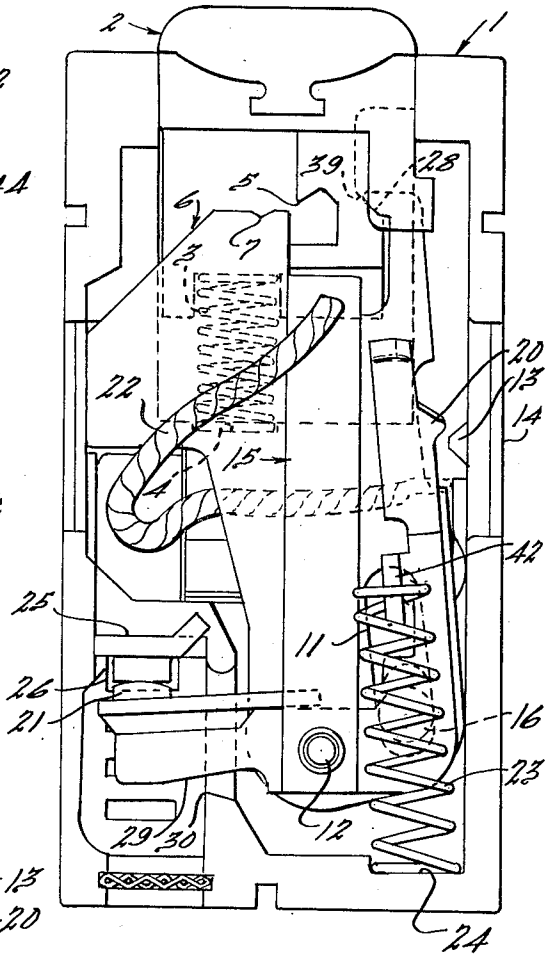


Fig. 5.

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CIRCUIT BREAKER

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9 Claims. (Cl. 200—116)

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This application relates to circuit breakers and discloses an improvement in the circuit breaker disclosed in prior Patents 2,374,778, issued May 1, 1945, to E. T. Platz; 2,385,727, issued September 25, 1945, to E. T. Platz; 2,487,725, issued November 8, 1949, to E. T. Platz; and 2,563,103, issued August 7, 1951, to R. S. Davis.

These patents disclose a circuit breaker having a push button type operation which may be manually operable successively for opening and closing the breaker contacts. The breaker is automatically operable for opening the breaker contacts upon the occurrence of an overload in the load circuit containing the breaker.

Previously in the art of circuit breakers, various attempts have been made to obtain a circuit breaker mechanism which provides "quick-make" and "quick-break". These terms may be defined as follows: When the circuit breaker is in the "on" position; i. e., when the contacts thereof are engaged, and the opening or separation of the contacts is effected, by either manual or automatic operation, and this separation is effected by the circuit breaker mechanism by a rapid movement of one contact away from the other, independently of the initiating agency, then this rapid separation is known as "quick break"; similarly when the circuit breaker mechanism, once set into operation manually while in the "off" or contact separated condition, causes the contacts to move together rapidly, independently of the initiating agency, then this operational feature is known as "quick make."

Many different beneficial results flow from these features, including less heating of the contacts, less erosion of the contacts, both of which result in longer contact life.

A significant disadvantage of circuit breakers of the prior art was the "bouncing" of the contacts upon "quick make." This bouncing resulted in a multitude of progressively smaller arcs being drawn between the contacts, and therefore, accelerated contact erosion and heating, even though the breaker provided a "quick make" mechanism.

The problem then presented was twofold: First, to provide a "quick make" mechanism for a circuit breaker; and secondly, to eliminate the usual bouncing disadvantage with its attendant contact wearing found in prior art "quick make" breaker constructions.

Therefore, a prime object of this invention is to provide a "quick make" mechanism for a circuit breaker.

Another object of the invention is to provide a

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"quick make" mechanism for a circuit breaker that is free of undesirable bouncing of the contacts.

Another object is to provide a "quick make" breaker mechanism that is readily adaptable to an existing "slow make" breaker.

A circuit breaker mechanism providing features that satisfy the above objects is illustrated in the accompanying drawings in which:

Fig. 1 is an elevational view of a circuit breaker in the "off" (contact separated) position with the side removed showing the interior construction.

Fig. 2 is an elevational view of a composite contactor and bimetal latch.

Fig. 3 is an elevational view of the support plate.

Fig. 4 is an elevational view of a circuit breaker with the side removed showing the breaker mechanism in an intermediate position prior to "quick make."

Fig. 5 is an elevational view of a circuit breaker with the side removed showing the breaker in the fully "on" position.

Fig. 6 is a fragmentary view of an alternative embodiment of the composite member of Fig. 2.

Referring to the drawings, a circuit breaker as disclosed herein includes a casing 1 of a molded insulating material shown with one side removed (Figs. 1, 4, 5). Extending through the rear wall of this casing is a line connector 25 having secured thereto a fixed contact 26, and a load connector (not shown). Formed integral with the side and bottom, respectively, of casing 1 are extensions 13 and 30 adapted to be engaged by the breaker mechanism as hereinafter described. Also formed in the rear wall of this casing are grooves (not shown) in which an operator, or a handle 2 is slideably disposed, which in conjunction with the front side of casing 1 serve to guide the handle in its inward and outward movement. Beneath the handle 2, with one end extending into a recess thereof is a handle return spring 3 the opposite end of which is seated on an abutment 4 projecting from the back side of casing 1. Also, below the operating handle 2 and adjacent to the rear wall of the casing 1 (Figs. 1, 3, 4, 5) and arranged to be engaged by an extension 5 of the handle 2 when the breaker is in the "off" position is a support plate 6 (Fig. 3). Extension 5, upon inward movement of handle 2, contacts this support plate 6 in the notch 7, preventing lateral movement of the support plate and imparting the operating force applied to the handle to the breaker mechanism. The support plate 6

has cut-out portions 9, 10, 11, and 12 (Fig. 3). Cut-out portion 9 journals pivot pin 12 of the composite contactor and latch bimetal 15 and cutout portion 10 provides clearance for lug 13 extending from side 14 of casing 1. Cut-out portion 11 receives guide lug 16 which projects from the rear wall of casing 1. This lug 16 defines the movement of support plate 6 upon operation of the breaker mechanism.

Extending from the upper portion of support plate 6 is a cam 28 which interacts with a cam surface 39 (Fig. 5) on handle 2 as disclosed in Patent 2,563,103 referred to supra to return support plate 6 positively to the open circuit position.

Cut-out portion 12 of support plate 6 defines a latch surface 31 (Fig. 3) arranged to be engaged by a latch hook 18 of the bimetal portion 17 of a composite member 15 when the mechanism is in the "on" position. This composite member 15 overlies the support plate 6 and is secured to it in a pivotal relationship by pivot pin 12. Composite member 15 is comprised of a bimetal 17 having a latch hook 18, and an L-shaped contactor 19. Secured to one end of the lower leg 45 of this contactor 19 is a moveable contact 21. Formed integral with the upper leg 44 of the contactor 19 is a mainspring lug 42 and a cam lug 20. Having its upper end seated against mainspring lug 42 and its lower end seated in the casing 1 at 24 is a mainspring 23. This mainspring 23 biases composite member 15 counterclockwise about pivot pin 12 and also inward against support plate 6. The extent of the inward deflection of composite member 15, when the breaker mechanism is in the "on" circuit position, is controlled by a turned-down portion 46 of upper leg 44 of contactor 19. This turned-down portion 46 abuts the upper surface of support plate 6 and thus determines the overlap of latch hook 18 at latching surface 31 of support member 6 when the breaker mechanism is in the "on" or closed circuit position.

Secured to the upper end of bimetal 17 is a flexible conductor 22 which connects the bimetal 17 with a load connector (not shown) which extends through the back of casing 1.

The manual operation of the preferred embodiment is as follows: Upon manual depression of handle 1 when the breaker is in the "off" or open circuit position (Fig. 1), i. e., with the contacts 26, 21 separated, extension 5 of operating handle 2 engages the support plate 6 in notch 7. Upon further inward movement of the operating handle 2 against the bias of spring 4, the support plate 6 moves downward with its movement restricted by the lost motion engagement of the cut-out portion 11 and guide lug 16. As the support plate moves downward under the force transmitted through operating handle 2, the composite member 15 having pivot pin 12 journaled in cut-out portion 9 of the support plate 6 also moves downward until the lower edge 29 of contactor arm 19 strikes projection 30 in the bottom of casing 1. Further depressing of the handle 2 is transmitted to composite member 15 and converts this downward movement of composite member 15 to clockwise rotary movement around pivot pin 12 against the bias of mainspring 23. This results in composite member 15 moving clockwise until latch hook 18 of bimetal 17 clears latching surface 31 (Fig. 3) of support plate 6. Mainspring 23 which exerts an upward as well as an inward bias on composite member 15 then forces latch hook 18 inward behind latching surface 31, until the turned down portion 46 on the upper leg 44 of contactor 19 abuts the upper surface of support plate 6. Upon handle 2 being released, support plate 6 moves upwardly carrying composite member 15. After a short upward movement lug 20 of contactor 19 strikes extension 13 on the side of the case 1. The breaker mechanism is then in the position shown in Fig. 4 with the contacts 21, 26 spaced apart. Upon further release of handle 2, extension 13 of casing 1 retards further upward movement of composite member 15 and, therefore, of support plate 6 and also cams these elements to the left. Further upward movement of the handle, as upon its complete release by an operator, results in the disengagement of notch 7 of support plate 6 from the handle extension 5. At this release point the support plate 6 and composite member 15 move rapidly upward and to the left under the influence of mainspring 23, but independently of the position or operation of handle 2, until contacts 21, 26 are engaged. The breaker is then in the "on" position as shown in Fig. 5.

If it is desired to open the breaker manually, handle 2 is again depressed. A cam surface 34 (Fig. 1) of the handle 2 strikes the undersurface of latch hook 18 of bimetal 17, raising it upward until latching surface 31 of the support plate 6 is cleared, at which time the composite member 15 is rotated counterclockwise about pivot 12 under the force of mainspring 23, separating contacts 26, 21 instantaneously. Automatic opening of the mechanism is accomplished by the release of bimetal 17 due to warping under an electrical overload. The breaker then is in the fully "off" position of Fig. 1.

An alternative embodiment of the composite member is shown in Fig. 6. In this embodiment the projection 20 in the upper leg 44 of contactor 19 is deleted. To obtain the "quick make" action, a cam surface 52 is formed upon the end of upper leg 44 of contactor 19. This cam surface 52 engages extension 13 of casing 1, thus providing the retardation and cam action to disengage the breaker mechanism from the handle and permit the contacts to close instantaneously.

Having described the circuit breaker herein disclosed, reference should be had to the claims which follow for a determination of the invention.

We claim:

1. In a circuit breaker having a casing, a fixed contact, an operating member slideably disposed in said casing, a support plate actuable by said operating member, a composite member actuable by said support plate, the composite member including an electroresponsive latch element engageable and disengageable from said support plate upon successive operation of said operator and a moveable contact carrying element, said composite member and said casing comprising means whereby said fixed and said moveable contacts are caused to close instantaneously.

2. In a circuit breaker, a casing, a fixed contact, an operating member slideably disposed in such casing, a support plate actuable by said operating member, a composite member actuable by said support plate including an electroresponsive latch element engageable and disengageable from said support plate upon successive operation of said operator and a moveable contact carrying element, said contact carrying element and said casing comprising means to cause said fixed and moveable contacts to close instantaneously.

3. In a circuit breaker, a casing, a fixed con-

tact, an operating member, a support plate actuated by said operating member, a composite member including an electroresponsive latch member engageable and disengageable from said support plate upon successive operation of said operator, a contactor, and a moveable contact, said contactor having means which interacts with said casing to cause said fixed and moveable contacts to close instantaneously.

4. In a circuit breaker, a casing, a fixed contact, a mechanism including a resiliently biased operating member, a support plate actuable by said operating member, a composite member including an electroresponsive latch element, a contactor, and a moveable contact, a resilient element for moving said support plate and said composite member to open circuit position from closed circuit position upon operation of the operating member and to closed circuit position from open circuit position upon a successive operation of the operating member, the casing and the composite member having interacting means to cause the mechanism to be released from the operating member to permit the fixed and moveable contacts to close instantaneously.

5. In a circuit breaker having a casing, a fixed contact, a mechanism, including a resiliently biased operating member, a support plate actuable by said operating member, a composite member including an electroresponsive latch element, a contactor, and a moveable contact, a resilient element for moving said support plate and said composite member to open circuit position from closed circuit position upon operation of the operating member and to closed circuit position from open circuit position upon a successive operation of the operating member, the casing and the composite member having interacting means to cause the support plate to be released from the operating member to permit the fixed and moveable contacts to close instantaneously.

6. In a circuit breaker, a casing, a fixed contact, a mechanism including a resiliently biased operating member, a support plate actuable by said operating member, a composite member including an electroresponsive latch element, a contactor, and a moveable contact, a resilient element for moving said support plate and said composite member to open circuit position from closed circuit position upon operation of the operating member and to closed circuit position from open circuit position upon a successive operation of the operating member, the composite member interacting with said casing whereby the mechanism is cammed free of said operating member to permit the fixed and moveable contacts to close instantaneously.

7. In a circuit breaker, a casing, a fixed contact, a mechanism including a resiliently biased operating member, a support plate actuable by said operating member, a composite member including an electroresponsive latch element, a contactor, and a moveable contact, a resilient element for moving said support plate and said composite member to open circuit position from closed circuit position upon operation of the operating member and to closed circuit position from open circuit position upon a successive operation of the operating member, the contactor interacting with said casing whereby the mechanism is cammed free of said operating member to permit the fixed and moveable contacts to close instantaneously.

8. In a circuit breaker, a casing, a fixed contact, a mechanism including a resiliently biased operating member, a support plate actuable by said operating member, a composite member including an electroresponsive latch element, a contactor, and a moveable contact, a resilient element for moving said support plate and said composite member to open circuit position from closed circuit position upon operation of the operating member and to closed circuit position from open circuit position upon a successive operation of the operating member, the contactor having means thereon which interacts with said casing to cam the mechanism free of said operating member to permit the fixed and moveable contacts to close instantaneously.

9. In a circuit breaker, a casing, a fixed contact, a mechanism including a resiliently biased operating member, a support plate actuable by said operating member, a composite member including an electroresponsive latch element, a contactor, and a moveable contact, a resilient element for moving said support plate and said composite member to open circuit position from closed circuit position upon operation of the operating member and to closed circuit position from open circuit position upon a successive operation of the operating member, the combination comprising cam means interconnecting said resilient element and said casing whereby said fixed and moveable contacts are caused to close instantaneously.

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