April 8, 1941. E. A. WILLIAMS 2,237,801

CIRCUIT BREAKER

Filed Feb. 1, 1935

Fig. 1.

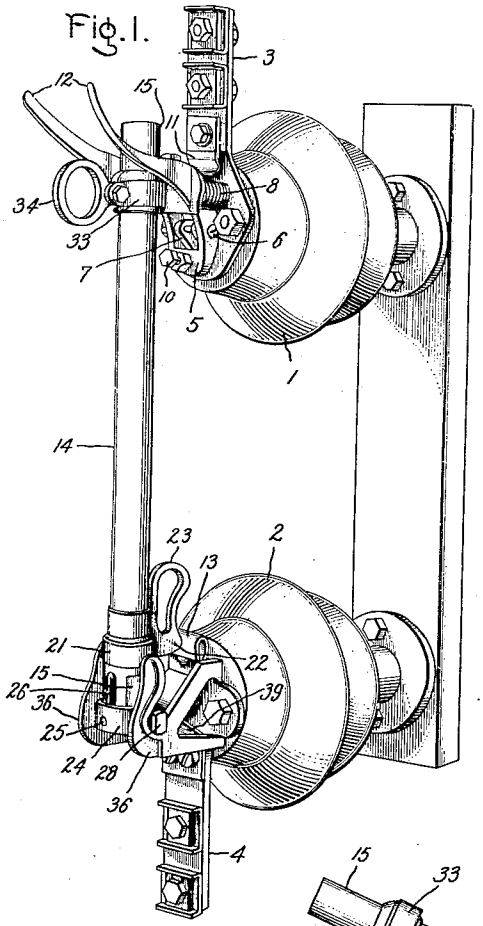


Fig. 3.

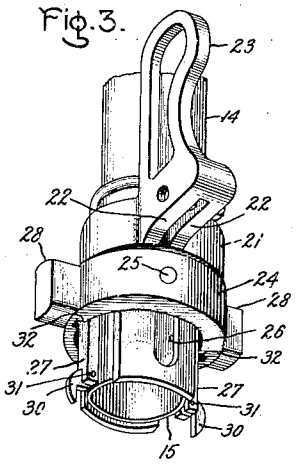
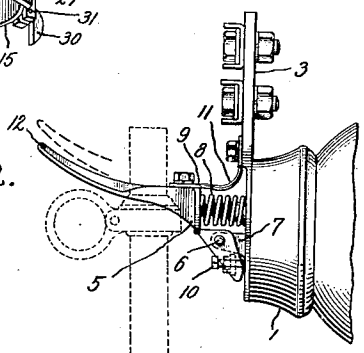


Fig. 2.



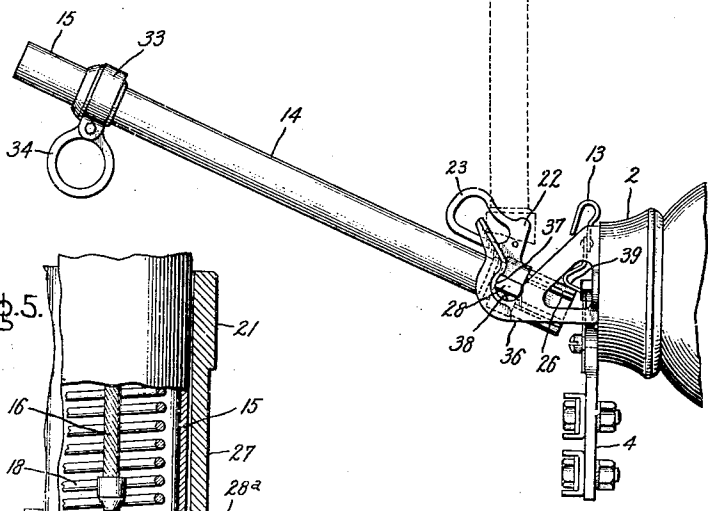


Fig. 4.

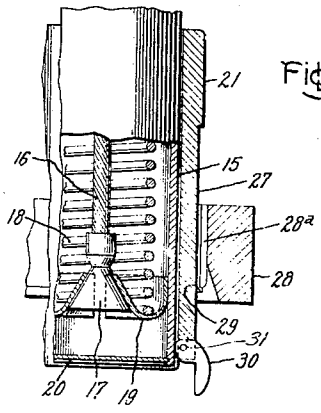


Fig. 5.

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Edwin A. Williams,
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UNITED STATES PATENT OFFICE

2,237,801

CIRCUIT BREAKER

Edwin A. Williams, Springfield, Pa., assignor to General Electric Company, a corporation of New York

Application February 1, 1935, Serial No. 4,568

13 Claims. (Cl. 200—116)

My invention relates to circuit breakers of the type having a fuse for completing the circuit between spaced terminals and having a fuse carrying member which is moved from between the terminals after operation of the fuse to prevent arcing between the terminals.

The object of my invention is to provide an improved construction and arrangement in a circuit breaker of this type and particularly to provide a circuit breaker in which a cartridge fuse may be mounted without disturbing the adjustment of the fuse.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

In the accompanying drawing, Fig. 1 is a perspective view of a circuit breaker embodying my invention showing the circuit breaker in the closed position; Fig. 2 is a side elevation of the circuit breaker showing the circuit breaker in the open position; Fig. 3 is a rear view of the lower end of the fuse holder showing the fuse cartridge in the lowered position; Fig. 4 is a fragmentary sectional view taken through the trunnion of the fuse holder and showing the fuse cartridge in the lowered position, and Fig. 5 is a fragmentary sectional view taken through the trunnion of the fuse holder and showing the fuse cartridge in the raised or latched position.

Referring to the drawing, the circuit breaker comprises spaced insulators 1 and 2 on which are carried upper and lower terminals 3 and 4 respectively. On the upper terminal is a contact 5 which is pivoted on a pin 6 carried by ears 7 projecting from the front of the terminal. The contact is biased in a counter-clockwise direction, as viewed in Fig. 2, by a compression spring 8 arranged between the front face of the terminal and a boss 9 on the rear of the contact. The pivotal movement of the contact is limited by an adjustable stop 10 which is threaded into the lower end of the contact and engages the terminal below the pivot pin 6. The contact is electrically connected to the terminal by a flexible conductor 11. The contact is provided with forked contact arms 12. The lower terminal 4 carries a spring contact 13.

The circuit between the contacts 5 and 13 is completed by a cartridge fuse of the type shown in application Serial No. 724,041, filed May 5, 1934, and assigned to the General Electric Company, assignee of this invention. This cartridge fuse comprises a tubular housing 14 of insulating material having metal ferrules or contacts 15 secured at each end between which a fuse (not shown) is electrically connected. The lower end of the fuse is connected to a flexible conductor 16 which terminates in a conical member 17. A spring 18 surrounding the lower end of the flexible conductor urges a split cup-shaped contact 19 against the conical member 17. Each half of the contact 19 is provided with a tapered wall of the same contour as the conical member 17. The spring 18, which forces the contact 19 downwardly, therefore wedges the contact against the inside of the metal ferrule and makes a good contact between the contact 19 and the metal ferrule. The lower end of the ferrule is closed by a disk 20 of insulating material. The flexible conductor 16 and the fuse which is connected to the upper end thereof is subjected to the force of compression spring 18. When the fuse ruptures due to excessive current, the disk 20, the contact 19, and the compression spring 18 are forced through the lower end of the ferrule 15. The force with which these parts are expelled may be increased by the gas pressure resulting from the arc which ruptures the fuse. The above described fuse cartridge is a complete unit which is mounted in the circuit breaker without disturbing the adjustment of the fuse contained within the housing. It is typical of fuses which may be used for this circuit breaker.

Before mounting the fuse cartridge in the circuit breaker, a holder which comprises a metal sleeve 21 is placed over the lower ferrule. The upper end of this sleeve is split and is provided with adjacent flanges 22 which are clamped together to secure the sleeve to the ferrule. The flanges terminate in an eye 23. Below the flanges 22 is a trunnion having a collar 24 in which the the sleeve is longitudinally slidable. Rotation of the sleeve in the collar is prevented by pins 25 which are riveted to the collar and which project into longitudinal slots 26 arranged on opposite sides of the sleeve. The longitudinal movement of the sleeve in the collar is limited by engagement of the pins 25 with the upper and lower ends of the slots. Between the slots 26 the lower end of the sleeve is slotted to provide diametrically opposite spring fingers 27. These spring fingers are opposite the pivot pins 28 of the trunnion. The normal position of the spring fingers is parallel to the axis of the sleeve 21 so that the fingers do not normally interfere with sliding of the sleeve in the trunnion.

When the trunnion is at the lower end of the sleeve, the sleeve and trunnion are latched together by moving the lower ends of spring fingers

27 into slots 28a on the inside of the trunnion so that the ends of the spring fingers bear on shoulders 29 at the lower ends of the slots. When in this position, which is shown in Fig. 5, the spring fingers prevent lowering of the sleeve in the trunnion, and the pins 25 which engage the lower ends of slots 26 prevent raising of the sleeve in the trunnion. The fuse which is carried by the sleeve is therefore latched to the trunnion in this position. The spring fingers are moved to the latching position by cams 30 which are pivoted in slots in the lower end of the spring fingers on pins 31. The cams cooperate with the outer surface of the metal ferrule to force the spring fingers outwardly into slots 28a. The trunnion is provided with cut away portions 32 above the cams so that the cams may be rotated while the trunnion is in the lower position. When in the latched position, the cams project inwardly beneath the disc 20. When the fuse operates, the disc 20, the contact 19, and the compression spring 18 are expelled through the lower end of the ferrule, and the impact of one of these parts on the cams moves the cams to the position shown in Figs. 3 and 4. In this position, the spring fingers move out of slots 28a and unlatch the fuse holder sleeve and the trunnion. A collar 33 having an operating eye 34 is clamped to the upper metal ferrule on the fuse cartridge. The upper edge of the collar is tapered and is adapted to fit into a complementary concave tapered surface on the under side of each contact arm 12 to complete the connection between the contact arms and the fuse cartridge. The compression spring 8 forces the contact arms against the upper edge of the collar. Since the complementary surfaces of the contact arms are concave, the fuse is latched in place when the collar is in this position. The upper end of the fuse cartridge extends above the contact arms, and the contact arms therefore guide the movement of the fuse cartridge.

The fuse is carried on the lower terminal 4 on brackets 36 each having a slot 37 with a circular portion 38 at the lower end. The pivot pins 28 of the trunnion fit in the slots and provide a hinged mounting for the lower end of the fuse cartridge. The pivot pins are flattened and provided with rounded edges which closely fit the circular portions 38 and prevent lifting of the pins from the slots when the fuse is in the position shown in Fig. 2.

In the use of the circuit breaker, the fuse holder sleeve 21 is clamped on the ferrule at one end of the fuse cartridge, the trunnion is moved to the lower end of the sleeve, and the cams 30 are pivoted inwardly to latch the trunnion and sleeve. The fuse is then inverted so that the trunnion is at the upper end and the pivot pins 28 of the trunnion are inserted in slots 37. A hook is then inserted in the operating eye 34 and the fuse is pivoted upwardly about pins 28 to the circuit closing position shown in Fig. 1. In this position, the upper edge of collar 33 is forced under the complementary surfaces on the under sides of contact arms 12, and the rear edges of flanges 22 are forced against spring contact 13. The contact arms are lifted by the collar 33, compressing the spring 8. Due to the force of the spring and the shape of the abutting surfaces of the contact arms and the collar, the fuse is latched in the circuit closing position.

Upon operation of the fuse, the disc 20, the contact 19, and the spring 18 are expelled from the lower end of the fuse housing, moving the cams outwardly to the position shown in Figs. 3 and 4 and tripping the latch between the fuse holder sleeve and the trunnion. The fuse housing now moves longitudinally downward under the force of spring 8 until the stop 10 engages the front of the upper terminal and stops movement of the contact arms. The housing continues its downward movement until the pins 25 on the trunnion engage the upper ends of slots 26 in the fuse holder sleeve. As soon as the collar 33 is clear of the contact arms, the latch effect of the contact arms holding the fuse between the terminals is released. The fuse is now pivoted about the trunnion pins 28, the pivotal movement being started by the lower spring contact 13 and continued by gravity. When the fuse reaches the position shown in Fig. 2, the lower end which projects below the trunnion engages a stop 39 on contact 13, preventing further movement of the fuse.

The fuse is removed by pulling in a longitudinal direction on operating eye 34 until the fuse holder sleeve moves clear of stop 39, then pivoting the fuse downwardly, until the flattened sides of pivot pins 28 are in line with slots 37 and lifting the fuse until the pins are clear of the slots. Another fuse cartridge may now be substituted and the circuit breaker reassembled.

What I claim as new and desire to secure by Letters Patent of the United States, is—

1. A circuit breaker comprising a pair of spaced terminals, a fuse housing having a fuse therein, a holder providing a hinged support for said housing and permitting longitudinal sliding movement of said housing therein, means for preventing sliding of said housing in said holder, said means being rendered ineffective by operation of said fuse, means released by longitudinal movement of said housing for holding said housing between said terminals, and means for moving said housing from between said terminals.

2. A circuit breaker comprising a pair of spaced terminals, a fuse housing having a fuse therein, a hinged support for said housing in which said housing is longitudinally slidable, latch means between said housing and support for preventing sliding of said housing in said support, said means being rendered ineffective by operation of said fuse, means released by longitudinal movement of said housing for holding said housing between said terminals, and means for moving said housing from between said terminals.

3. A circuit breaker comprising a pair of spaced terminals, a fuse containing housing having a member which is expelled therefrom by operation of the fuse, a trunnion providing a hinged support for said housing and having a collar in which said housing is longitudinally slidable, latch means between said collar and said housing for preventing sliding of said housing in said collar, said latch means being released by impact of said member, means released by longitudinal movement of said housing for holding said housing between said terminals, and means for moving said housing from between said terminals.

4. A circuit breaker comprising a pair of spaced terminals, a fuse containing housing having a member which is expelled therefrom by operation of the fuse, a hinged support for said housing having a collar in which said housing is longitudinally slidable, a latch for preventing sliding of said housing in said collar, said latch being tripped by expulsion of said member to re-

lease said housing, means released by longitudinal movement of said housing for holding said housing between said terminals, and means for moving said housing from between said terminals.

5. A circuit breaker comprising a pair of spaced terminals, a fuse containing housing having a member which is expelled therefrom by operation of the fuse, a hinged support for said housing having a collar in which said housing is longitudinally slidable, a latch including spring fingers for preventing sliding of said housing in said collar, said spring fingers being biased to the released position, means operated by expulsion of said member for releasing said spring fingers, means released by longitudinal movement of said housing for holding said housing between said terminals, and means for moving said housing from between said terminals.

6. A circuit breaker comprising a pair of spaced terminals, a fuse containing housing having a member which is expelled therefrom by operation of the fuse, a hinged support for said housing in which said housing is longitudinally slidable, a latch for preventing sliding of said housing in said collar, said latch being tripped by expulsion of said member to release said housing, a contact on one of said terminals exerting a longitudinal force on said housing for holding said housing between said terminals, said contact being rendered ineffective to hold said housing by longitudinal movement of said housing, and a contact on the other terminal exerting a force tending to move said contact from between said terminals.

7. A circuit breaker comprising a pair of spaced terminals, a fuse containing housing, a trunnion providing a hinged support for said housing and having a collar in which said housing is longitudinally slidable, means for preventing sliding of said housing in said collar, said means being rendered ineffective by operation of said fuse, means released by longitudinal movement of said housing for holding said housing between said terminals, and means for moving said housing from between said terminals.

8. A circuit breaker comprising a pair of spaced terminals, a fuse containing housing, a hinged support for said housing having a collar in which said housing is longitudinally slidable, means for preventing sliding of said housing in said collar, said means being rendered ineffective by operation of said fuse, means released by longitudinal movement of said housing for holding said housing between said terminals, and means for moving said housing from between said terminals.

9. In a circuit breaker, spaced contact terminals, means for mounting a fuse housing connected between said terminals including a supporting collar for the fuse housing arranged to provide for longitudinal sliding of the fuse housing in the collar, spring biased means arranged to exert force on the fuse housing tending to effect longitudinal sliding of the fuse housing in said collar and latching means for holding the fuse housing against such longitudinal sliding, said latching means being arranged to be released by operation of a fuse in the fuse housing thereby to permit said spring biased means to effect longitudinal sliding of the fuse housing.

10. Supporting means for mounting an elongated fuse housing in a circuit breaker having spaced contact terminals arranged to be electrically connected by a fuse in said housing, said supporting means including a fuse housing receiving element arranged to provide for longitudinal sliding of the fuse housing with relation to said element and latching means for preventing such longitudinal sliding of the fuse housing, said latching means being arranged to be released by operation of a fuse in the fuse housing to thereby permit longitudinal sliding of the fuse housing with relation to said element.

11. In a circuit breaker, a supporting structure, terminal means including contact elements carried by said structure in spaced relationship, a fuse housing having spaced terminals fixedly secured thereto, means for slidably supporting said housing with said spaced fuse housing terminals normally in direct engagement respectively with said spaced contact elements, said last mentioned means being arranged to provide for substantially longitudinal sliding of said housing relative to said contact elements to effect disengagement of at least one of said fuse housing terminals from its corresponding contact element and latching means normally operative to prevent such sliding of said housing and arranged to be released in response to operation of a fuse in said housing.

12. In a circuit breaker, spaced contact terminals, means for mounting a fuse housing connected between said terminals including a supporting collar for one end of the fuse housing arranged to provide for longitudinal sliding of the fuse housing in the collar, a contact member rotatably mounted on one of said contact terminals, a spring interacting between said contact member and said one contact terminal to exert force on the fuse housing tending to effect longitudinal sliding of the fuse housing in said collar, and latching means for holding the fuse housing against such longitudinal sliding, said latching means being arranged to be released by operation of a fuse in the fuse housing thereby to permit said contact member and said spring to effect longitudinal sliding of the fuse housing.

13. A dropout fuse device comprising, in combination, a pair of spaced terminal members, a sleeve rotatably mounted on one of said terminal members, a fuse housing slidably mounted at one end in said sleeve, a contact arm rotatably mounted on the other of said terminal members, spring means biasing said arm to exert force on the other end of said fuse housing and tending to effect longitudinal sliding thereof in said sleeve, and latching means holding said fuse housing against said longitudinal sliding, said latching means being released by operation of a fusible element in said fuse housing to effect sliding thereof in said sleeve and rotation of said fuse housing and said sleeve on said one terminal member.

EDWIN A. WILLIAMS.