March 13, 1951 A. RUFOLO 2,544,727

CIRCUIT BREAKER

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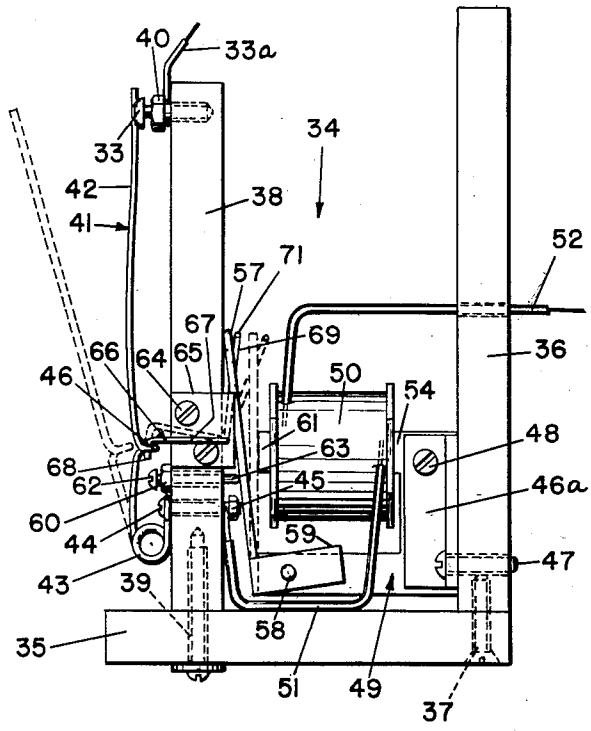


FIG. 1

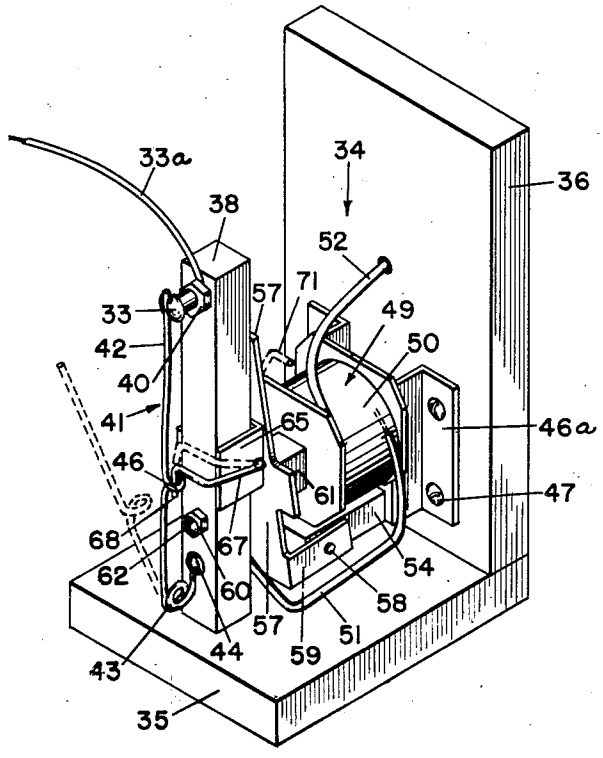


FIG. 2

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CIRCUIT BREAKER

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Original application April 20, 1945, Serial No. 589,447, now Patent No. 2,532,336, dated September 11, 1950. Divided and this application November 7, 1946, Serial No. 708,365

4 Claims. (Cl. 200—106)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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This invention concerns a circuit breaker and particularly concerns a circuit breaker of the type that is electromagnetically actuated.

This is a division of my copending application Serial No. 589,447, filed April 20, 1945, now Patent No. 2,532,336, September 11, 1950, entitled "Dielectric Test Apparatus and Method."

An object of the invention is to provide an electric circuit breaker.

Another object is to provide an electric circuit breaker that is electromagnetically operated.

A further object is to provide a circuit breaker having a fixed contact, a movable contact, resilient means for urging the movable contact away from the fixed contact, a latch for holding the movable contact against the fixed contact in opposition to the resilient means and electromagnetic means for upsetting the latch upon flow of current through the circuit breaker.

Further objects and advantages of this invention, as well as its construction, arrangement and operation are apparent from the following description and claims in connection with the accompanying drawing, in which

Fig. 1 is a side elevation showing a preferred form of the circuit breaker, and

Fig. 2 is a perspective view of the circuit breaker illustrated in Fig. 1.

The circuit breaker 34 is mounted upon a Bakelite base plate 35 having a vertically disposed Bakelite panel 36 secured thereto by means of screws 37. Mounted upon base plate 35 in spaced relation from panel 36 is a Bakelite column 38 secured in place by a screw 39 and forming a support for circuit breaker 34.

A contact 33 is positioned at the top of column 38 and can be adjusted relative to column 38 by screwing therein. A locknut 40 is provided for locking contact 33 in place. Contact 33 is connected through a conductor 33a to an electrical source (not shown). A switch arm 41 is provided with a movable portion 42 arranged for movement relative to contact 33 whereby it can be electrically engaged with contact 33 as shown in solid lines (Fig. 1) or can be sprung away from contact 33 as shown in dotted lines. The lower portion of switch arm 41 is formed into convolutions 43, which afford a spring action for actuating the movable portion 42 away from contact 33. The free end of convolutions 43 is secured to column 38 by means of a bolt 44 and a nut 45. Movable portion 42 of contact arm 41 is provided with a lateral offset loop portion 46. Switch arm 41 including convolutions 43 can be formed from spring wire if desired and preferably can be made from bronze.

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A bracket 46a is secured to panel 36 by means of screws 47. Secured to bracket 46a by means of screws 48 is an electromagnet 49 having a horseshoe core 54. On the upper leg of core 54 is mounted a winding 50. An electrical conductor 51 connects winding 50 in series with bolt 44 and switch arm 41, the other end of winding 50 being connected through conductor 52 to an electrical source (not shown). An armature 57 having an offset 59 is rotatably mounted at 58 on the lower leg of horseshoe core 54. Armature 57 extends adjacent pole piece 61 of core 54. Armature 57 is adapted upon energizing of winding 50 and magnetizing of core 54 to be attracted to pole piece 61 in the dotted line position shown in Fig. 1 and upon deenergizing of winding 50 and demagnetizing of core 54 armature 57 can be withdrawn away from pole piece 61 into the solid line position shown in Fig. 1. Horseshoe core 54 and armature 57 rotatably mounted thereon form a substantially closed magnetic circuit, thereby increasing the magnetic efficiency of electromagnet 49. An adjustment screw 62 having a stop surface 63 is threaded in column 38 and serves to adjust the limit of throw of armature 57 away from pole piece 61. A locknut 60 secures screw 62 in adjusted position.

Secured to column 38 by screws 64 is a bracket 65. Rotatably mounted in bracket 65 is a bell-crank latch 66 having an arm 67 provided with a terminal offset 68 adapted to hook into loop 46 of switch arm 41 to retain the latter in the solid line position shown in Fig. 1. Bell-crank latch 66 is provided with another arm 69 having a terminal offset 71 adapted to hook about armature 57 in sliding engagement therewith. If desired, armature 57 can be adjusted to leave a small space between itself and offset 71 so that latch 66 can be moved by a striking action of armature 57 upon offset 71.

Circuit breaker 34 can be set in closed-circuit position (solid line position in Fig. 1) when current is not flowing through the device by actuating switch arm 41 into electrical engagement with contact 33 against the action of spring convolutions 43 and hooking offset 68 of latch 66 into engagement with loop 46 of switch arm 41 whereby arm 69 of latch 66 withdraws armature 57 away from pole piece 61. If desired, armature 57 can be designed to rest on its own weight against stop surface 63.

Flow of current through the circuit breaker trips the device into the dotted line positions shown in Fig. 1 since current flowing through relay windings 50 magnetizes core 54 and causes pole piece 61 to attract armature 57 with the

result that latch 66 is tripped and rotated slightly clockwise so that offset 68 of latch 66 disengages loop 46 of switch arm 41 to allow the latter to spring away from contact 33 and break the circuit.

Circuit breaker 34 is set in closed-circuit position by moving switch arm 42 into electrical engagement with contact 33 and rotating latch 66 counterclockwise until offset portion 68 hooks into loop 46 of switch arm 41 whereby armature 57 is withdrawn away from pole piece 61.

It is to be understood that various modifications and changes may be made in this invention without departing from the spirit and scope thereof as set forth in the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. A latch-trip switch comprising a support, a fixed electric contact on said support, a movable electric contact wire adapted to move into closed position in engagement with said fixed contact and into open position out of engagement with said fixed contact, integral wire means at one end of said contact wire yieldingly urging said movable contact wire into open position, a loop in said movable contact wire intermediate its ends, a first lever mounted for rotation about a fixed axis on said support into open and closed position, latch means on said first lever selectively engageable with the loop of said movable contact wire to retain said first lever and movable contact wire in closed position, a second lever mounted for rotation about a fixed axis on said support into open and closed position, and means on said second lever engageable with said first lever to actuate said first lever from closed to open position when said second lever is actuated from closed to open position.

2. A latch-trip switch comprising a support, a fixed electric contact on said support, a movable electric contact wire adapted to move into closed position in engagement with said fixed contact and into open position out of engagement with said fixed contact, a spring formed of convolutions and mounted on said support for urging said movable contact wire into open position, said movable contact wire and spring being formed integrally of electrically conductive spring wire, a loop in said movable contact wire intermediate its ends, a bell crank mounted for rotation about a fixed axis on said support into open and closed position, latch means on one arm of said bell crank selectively engageable with the loop of said movable contact wire to retain said bell crank and movable contact wire in closed position, a lever mounted for rotation about a fixed axis on said support into open and closed position, and means on said lever engageable with the other arm of said bell crank to actuate said bell crank from closed to open position when said lever is actuated from closed to open position.

3. A circuit breaker comprising a support, a fixed electric contact on said support, a movable

electric contact wire adapted to move into closed position in an engagement with said fixed contact and into open position out of engagement with said fixed contact, a spring formed of convolutions and mounted on said support for urging said movable contact into open position, said movable contact and spring being formed integrally of electrically conductive spring wire, a loop in said movable contact wire intermediate its ends, a bell crank mounted for rotation about a fixed axis on said support into open and closed position, latch means on one arm of said bell crank selectively engageable with the loop of said movable contact wire to retain said bell crank and movable contact wire in closed position, a lever mounted for rotation about a fixed axis on said support into open and closed position, means on said lever engageable with the other arm of said bell crank to actuate said bell crank from closed to open position when said lever is actuated from closed to open position, and electromagnetic means for actuating said lever from closed to open position upon flow of current therethrough, said movable contact wire, spring and electromagnetic means being connected electrically in series.

4. A latch-trip switch comprising a support, a fixed electric contact on said support, a movable electric contact wire adapted to move into closed position in engagement with said fixed contact and into open position out of engagement with said fixed contact, integral wire means at one end of said contact wire yieldingly urging said movable contact wire into open position, a loop in said movable contact wire intermediate its ends, a lever mounted for rotation about a fixed axis on said support into open and closed position, and latch means on said lever selectively engageable with the loop of said movable contact wire to retain said lever and movable contact wire in closed position, said lever being rotatable into open position to disengage said latch means from the loop of said movable contact wire to permit said movable contact wire to move into open position.

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