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J. F. O'BRIEN ET AL

2,544,719

ELECTROMAGNETIC CIRCUIT BREAKER

Filed Aug. 22, 1945

2 Sheets-Sheet 1

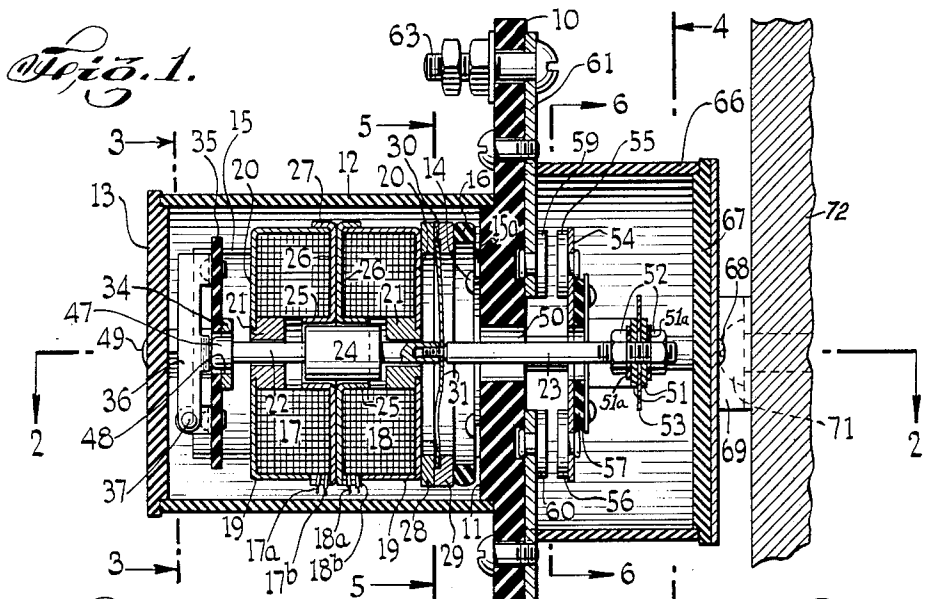


Fig. 3.

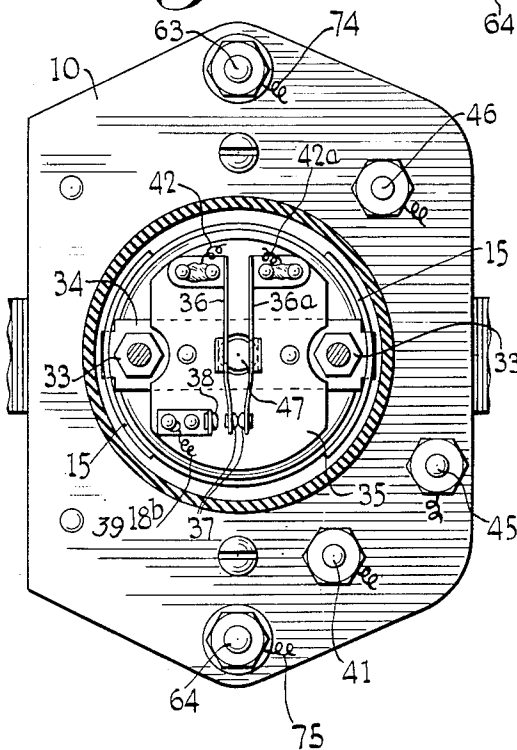
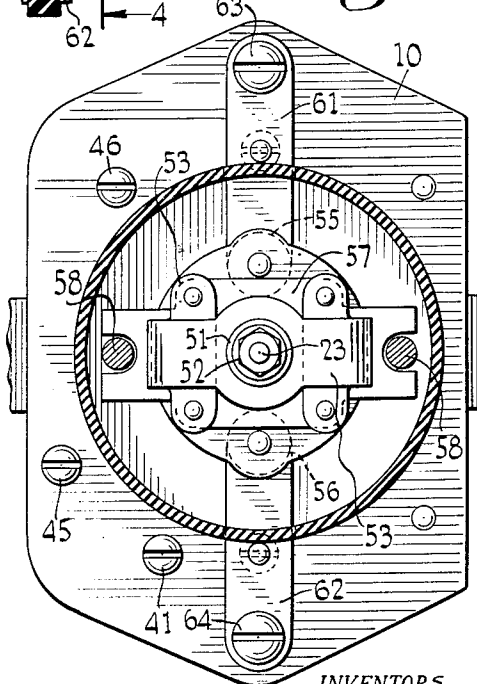


Fig. 4.



INVENTORS
JOSEPH F. O'BRIEN
EARL S. BOYNTON

BY *Henry J. Luke*
ATTORNEY

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Fig. 2.

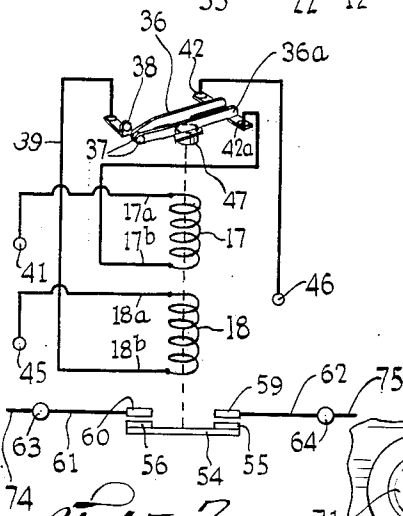
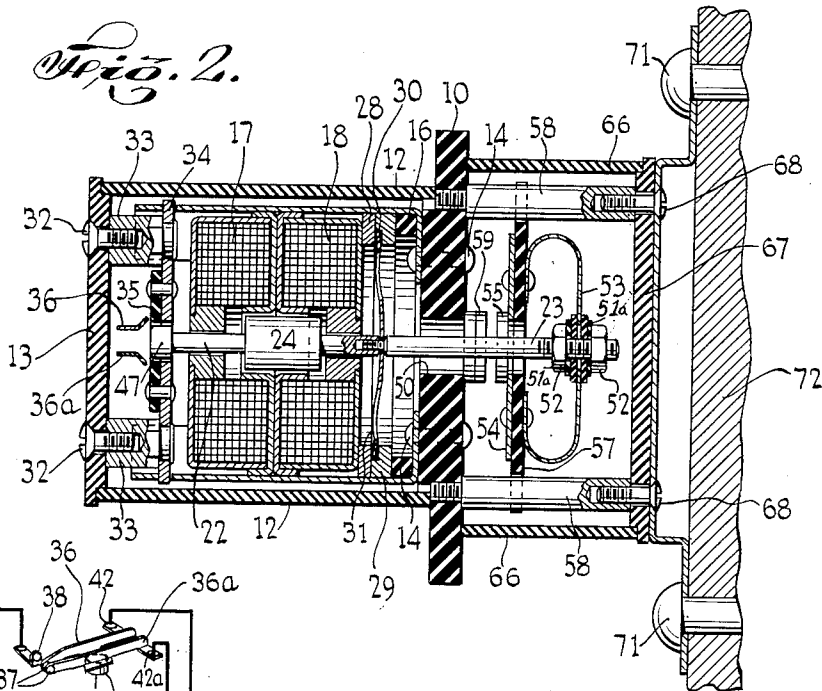


Fig. 7.

Fig. 6.

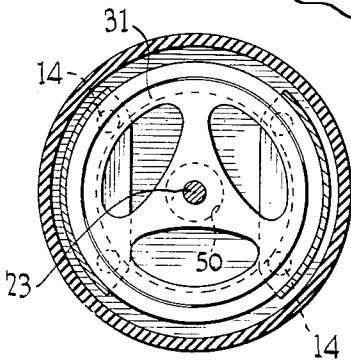
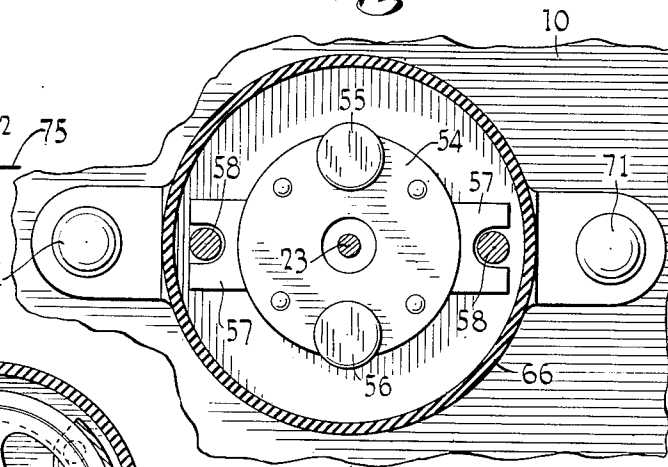


Fig. 5.

INVENTORS
JOSEPH F. O'BRIEN
EARL S. BOYNTON

BY

Henry J. Lucke
ATTORNEY

UNITED STATES PATENT OFFICE

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ELECTROMAGNETIC CIRCUIT BREAKER

Joseph F. O'Brien, Lebanon, and Earl S. Boynton,
East Orange, N. J., assignors to John B. Pierce
Foundation, New York, N. Y., a corporation of
New York

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1 Claim. (Cl. 200—100)

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This invention relates to electromagnetic circuit breakers, and the same has among its objects to provide a simple, efficient and reliable apparatus in which the several operating parts are so constructed and arranged that the same may be positively and accurately fitted within the circuit breaker enclosure or housing.

Further, said invention has for its object to provide an electric circuit breaker in which the operating parts controlling the making and breaking of the electric circuits are initially actuated by solenoid-induced action, and thereupon continued and completed by a cooperating snap spring or the like which serves to positively hold the said operating parts duly to circuit making and breaking positions.

Further, said invention has for its object to provide an electric circuit breaker in which the solenoid-induced moving parts are, for a part of their movement, actuated by snap spring means, and said snap spring means controlled by suitable cushioning means to avoid undue shock or impact being communicated to said moving parts in the course of the operation thereof.

Other objects will in part be obvious and, in part, be pointed out hereinafter.

To the attainment of the aforesaid objects and ends our invention consists in the novel features of construction and in the combination, connection and arrangement of parts herein-after more fully described and then pointed out in the claim.

In the accompanying drawings:

Fig. 1 is a central longitudinal section, showing one form of electric circuit breaker constructed according to, and embodying our said invention;

Fig. 2 is a vertical longitudinal section on the line 2—2 of Fig. 1;

Fig. 3 is a transverse section on the line 3—3 of Fig. 1;

Fig. 4 is a transverse section on the line 4—4 of Fig. 1;

Fig. 5 is a transverse section on the line 5—5 of Fig. 1;

Fig. 6 is a transverse section on the line 6—6 of Fig. 1, and

Fig. 7 is a diagrammatic view of the circuit connection.

In said drawings 10 designates a substantially flat base of insulating material forming a partition having a shouldered circular central portion 11 to receive one end of a tubular casing portion 12, provided at its outer or free end with a cover 13. Upon the base 10 are secured

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by screws 14, the inturned ends 15a of arcuate side wall members 15, which embrace an annular member 16 of insulating material; 17, 18 denote solenoids which are enclosed within casings or cups 19 having ends 20 provided with apertures in which are secured bearings 21 within which works a two-piece switch rod 22, 23 having interengaging screw-threaded ends. Upon the switch rod part 22 is fixed a plunger or armature 24 which is slidably guided within the flanges 25 at the edges of central openings in the spacing members 26 and flanges 27 at their outer edges enclosing the open, opposing ends of the solenoid casings 19. Between the outer side of the solenoid casing 19 of the solenoid 18 and the opposing surface of the insulating ring 16 are clamped a pair of retaining rings 28, 29. The ring 29 is provided along its inner edge with an annular recess 30 to receive the edge of a 20
dished, circular spring 31 clamped upon the switch rod between the opposing, threaded engaging end parts 22, 23 thereof.

The solenoids 17, 18 and associated parts are maintained duly positioned within the tubular casing portion 12 by screws 32, see Fig. 2, which extend through threaded spacing sleeves or nuts 33 and engage with a bridge-piece 34 secured at its ends to the free ends of the arcuate side wall frame members 15. Upon the outer side of the bridge-piece 34 is secured a plate of insulating material 35 upon which are secured the corresponding ends of movable spring circuit-closing fingers 36, 36a, having normally closed or 25
engaging contact points 37 at their free ends, one of which is adapted to engage with a fixed contact 38 on the plate 35 and connected to one end of a conductor 39 whose other end is connected to one terminal 18b of the solenoid 18. The other terminal 18a of said solenoid 18 is connected to the binding post 45, see Fig. 4, on the base 10. The contact finger 36 is connected by a conductor 42 to a binding post 46. See Figs. 3, 4 and 7. The coacting contact finger 36a is connected to one terminal 17b of the "On" 30
coil 17 by a conductor 42a, the other terminal 17a of the "On" coil being connected to a binding post 41. See Figs. 3, 4 and 7. The contact finger 36 when separated from its spring-contact connection with the coacting contact finger 36a makes electrical engagement with the fixed contact 38 which is connected by a conductor 39 to one terminal 18b of the "Off" coil 18. The other terminal 18a of the "Off" coil is connected to a binding post 45. See Figs. 3, 4 and 7.

The switch rod part 22 is provided at its outer

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end with a head 47, see Figs. 1 and 7, which extends through a central aperture 48 in the bridge-piece 34, and is adapted to engage with a stop screw 49 passing centrally through the cover 13 of the casing 12. The head 47 is engageable with the spring contacts 36, 36a and serves to separate the same to make and break the circuit. Thus, as best seen in Fig. 7, the contact arms are spring closed to close the control circuit through the "On" coil 17 preparatory to control switch operation. When the "On" coil acts, the contact arms are separated, breaking the control circuit through the "On" coil and closing the control circuit through the "Off" coil 18, preparatory to control switch operation, by contact between the contact arm 36 and the fixed contact 38.

The other threaded end of the switch rod part 23 extends through an aperture 50 in the base 10 and is secured by washers 51 and nuts 52, by insulating disks 51a to the intermediate portion of a resilient loop spring 53, see Figs. 1, 2 and 4 secured at its ends to a bridge member or plate 54 carrying contacts 55, 56. The spring 53 is insulated from the plate 54 by a transverse member 57 of insulating material having its bifurcated ends guided by posts 58 secured to the base 10.

The contacts 55, 56 are adapted to engage with fixed contacts 59, 60, respectively, secured to the inner ends of straps 61, 62 on to the partition 19 and connected at their outer ends to binding posts 63, 64, respectively, included in the main circuit 74, 75.

The circuit closing contact members and associated parts are enclosed by a relatively short tubular casing portion 66 and closure 67 secured to the end of said casing partition 68 by screws 68 engaging the threaded outer ends of the spacing members or posts 58 on said partition 10, and the entire device may be secured to any desired support by a bracket 69 having offset ends through which extend screws 71 and into a wall or fixed support 72.

The main circuit conductors 74, 75 are connected to the terminals 63, 64, respectively, and the circuit is controlled by the closing device which includes the elements 55, 56 and 59, 60, under the influence of the solenoid means 17, 18 and the snap-spring disk 31.

When the solenoid coil 17 is energized through the leads 17a, 17b, 42a, contacts 36a, 37, 36 and lead 42, the switch rod parts 22 and 23 will be moved to the left, as shown in Fig. 2, and cause the end 47 of the switch rod part 22 to separate the contacts 36, 36a, and simultaneously move the contacts 55, 56 on the bridge member 54 into engagement with the contacts 59, 60 to complete the main circuit. As the armature parts 22, 24 move to the left, as viewed in Figs. 1 and 2, the movement thereof will be aided by the snap-spring 31, until the dead center is overcome, whereupon the switch rod will be held positively locked by the action of said snap-spring disk 31. When the main circuit including the contacts 55, 56 and 59, 60 is to be broken, the solenoid coil 18 is energized through leads 18a, 18b, 39, contact 38, lead 42 and terminal 46, and thereby cause

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the switch rod parts 22, 23 to move to the right, as shown in Fig. 2, and overcome the tension of the snap-spring disk 31 and thereby withdrawing the end 47 of the armature of its engagement with the contact fingers 36, 36a, and cause the said switch rod parts 22, 23 to move to the right, and the contacts 55, 56 to become disengaged from their cooperating contacts 59, 60, and thus break the main circuit 74, 75.

Whereas, we have illustrated and described our invention by reference to typical preferred embodiments of the invention, it will be understood that changes and modifications of the invention may be made without departing from the invention as defined by the appended claim.

We claim:

An electrical circuit breaker comprising a casing; a set of contacts respectively connected in a load circuit; "On" and "Off" coils stationarily mounted in said casing; an armature in electromagnetic relation with said coils; means including a switch rod for reciprocally mounting said armature; and contacts carried by said switch rod for engagement with said load circuit contacts upon excitation of said "On" coil; in combination with a pair of electrical contact arms spring closed to close the circuit connections with said "On" coil; means carried by said switch rod for separating said pair of contact arms to break the circuit through said "On" coil; and a contact engageable by one of said contact arms when said contact arms are separated for closing the circuit through said "Off" coil; whereby excitation of said "On" coil moves said armature and said switch rod to close the load circuit, to break the circuit through said "On" coil, and to close the control circuit through said "Off" coil preparatory to control switch operation; and whereby excitation of said "Off" coil moves said armature and said switch rod to break the circuit through said "Off" coil and to release said contact arms for spring closing to close the circuit through said "On" coil preparatory to control switch operation.

JOSEPH F. O'BRIEN.

E. S. BOYNTON.

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