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 hereinafter more fully described and then pointed out in the claims.

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 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 6 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 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 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 16b of the solenoid 18. The other terminal 16a 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 45. See Figs. 3, 4 and 7. The coacting contact finger 36a is connected to one terminal 17b of the "On" 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 16b of the "Off" coil 18. The other terminal 16a 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
end with a head 47, see Figs. 1 and 7, which
extends through a central aperture 49 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 en-
gageable with the spring contacts 35, 35a and
serves to separate the same to make and break
the circuit. Thus, as best seen in Fig. 7, the con-
tact 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, for
contact between the contact arm 36 and the fixed
contact 28.

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, 55a.
The spring 53 is insulated from the plate 54 by a
transverse member 51f of insulating material hav-
ing its bifurcated ends guided by posts 58 secured
to the base 10.

The contacts 55, 55a are adapted to engage with
fixed contacts 53, 53a, respectively, secured to the
inner ends of straps 51, 52 on the part 10 and
connected at their outer ends to binding posts
55, 55a, respectively, included in the main cir-
cuit 74, 75.

The circuit closing contact members and asso-
ciated parts are enclosed by a relatively short
tubular casing portion 66 and closure 67 secured
to the end of said casing portion 66 by screws
93 engaging the threaded outer ends of the spacing
members or posts 56 on said partition 10, and the
entire device may be secured to any desired sup-
port 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 attached
to the terminals 63, 64, respectively, and the
circuit is controlled by the closing device which
includes the elements 55, 55a, 56, 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 35a, 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 35, 35a, and simultaneously move
the contacts 55, 55a on the bridge member 54 into
gen engagement with the contacts 55, 56 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-piece 24, and is adapted to 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 55a is broken, the solenoid coil 17 is
energized through leads 18a, 18b, 43, contact
38, lead 42 and terminal 46, and thereby cause

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