No. 890,183. PATENTED JUNE 9, 1908

R. SCOTT.

MAGNETIC CIRCUIT BREAKER.

APPLICATION FILED JAN. 17, 1906.

Fig. 1.

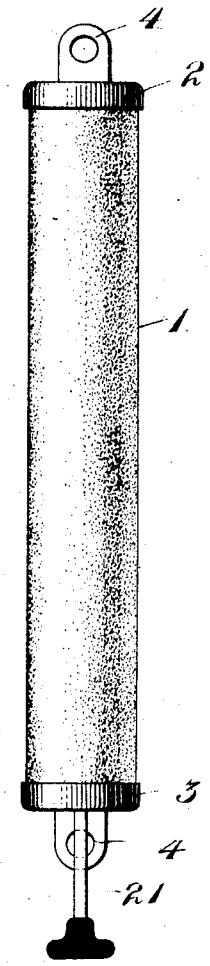
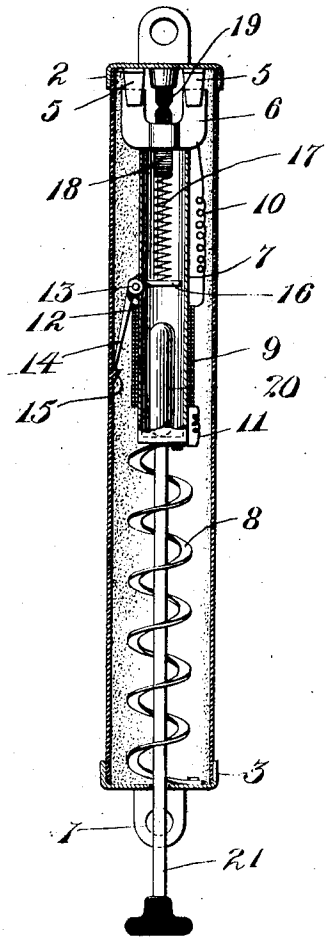


Fig. 2.



Witnesses

Frank S. Ober

Walter M. Chapin

Inventor

Ralph Scott.

By his Attorneys

Rosenbaum & Stockbridge

UNITED STATES PATENT OFFICE.

RALPH SCOTT, OF NEW BRUNSWICK, NEW JERSEY, ASSIGNOR TO SCOTT ELECTRICAL EQUIPMENT COMPANY, A CORPORATION OF MAINE.

MAGNETIC CIRCUIT-BREAKER.

No. 890,183. Specification of Letters Patent. Patented June 9, 1908

Application filed January 17, 1906. Serial No. 296,449.

To all whom it may concern:

Be it known that I, RALPH SCOTT, a citizen of the United States, residing at New Brunswick, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Magnetic Circuit-Breakers, of which the following is a full, clear, and exact description.

My invention relates to magnetic circuit breakers, and has for its principal object the provision of a circuit breaker corresponding in general form to the usual inclosed fuse, and adapted to be used in lieu thereof upon a panel board. In addition to this object I further aim to secure a magnetic circuit breaker which shall act with very great precision for a particular current value, regardless of varying conditions of temperature, humidity, wear, dust, corrosion, or any other unfavorable influence.

A still further object of the invention is to provide a magnetic circuit breaker in which the rupture of the circuit is made with unusual suddenness and under influences and conditions which serve to destroy the arc at an initial stage of its formation.

With these and other objects in view my invention consists in the construction, combination, location and arrangement of parts as hereinafter set forth and shown, and finally particularly pointed out in the appended claims.

In the drawing, Figure 1 is a side view of a circuit breaker embodying the principles of my invention; Fig. 2 is a sectional view of the same.

So far as I am aware, a perfectly satisfactory magnetic circuit breaker, inclosed within a small space, and providing sufficiently for the precise and abrupt rupture of the circuit for a given current, has not been secured up to the present time. The flame and heat generated by the ordinary rupture of a high potential power circuit is extremely intense, and unless means are provided for choking and destroying this arc at its inception, it is bound to have considerable destructive effect. While circuit breakers are in use which secure a precise break of the circuit for given current values, and are so constructed as not to be greatly injured by the flash, they are ordinarily large, heavy, complicated and expensive, and the weight and heaviness of the parts is disadvantageous, both on the score of sensitiveness and speed. Both of these features, sensitiveness and speed, are, however, of the greatest importance, and it is also desirable to reduce the weight and size of the circuit breakers on the ground of economy, convenience and appearance. By the present invention I aim to provide a circuit breaker in which the foregoing purposes are attained.

Referring to the drawing in which like parts are designated by the same reference sign, 1 denotes a tubular casing, conveniently made of fiber of the character and dimensions usually employed for inclosed fuses. The tube 1 has at its ends a pair of metallic heads or caps 2, 3, with eyes 4 therein, adapted to be received in the usual terminal clamps of a panel board. In this way the metallic heads 2 and 3 are made to constitute the terminals of the circuit to be broken, they being, of course, insulated from one another by the insulating character of the fiber tube 1.

5 designate plates or contacts projecting from the interior face of the cap 2, and 6 denotes a yoke or blade formed to closely engage the contacts 5 in the manner of an ordinary knife blade switch, and making a highly efficient electrical contact therewith. The contacts 5 constitute the fixed element and the blade or yoke 6, the movable element of the circuit breaker. While I have described this particular construction for supporting and arranging the fixed and movable elements of the circuit breaker, I do not desire to be limited or restricted thereto, since any other arrangement could be used, it being merely essential to provide metallic or conducting contacts capable of being separated by the action of the circuit breaking mechanism.

The movable element 6 of the circuit breaker is illustrated in the drawing as secured upon a tubular support 7 which is freely movable within the surrounding casing 1, being only connected thereto by spiral spring 8 which is under a constant tension to pull the tubular support 7 downwardly toward the bottom of the casing. In practice I make the spiral spring 8 in the form of a resilient flat metallic ribbon, so as to be capable of coiling closely and compactly at the bottom of the casing. The lower end of this spring 8 is mechanically and electrically connected to the lower head 3.

9 designates a magnetic coil or solenoid

fixed upon the tubular support 7, and having its terminal ends or wires 10, 11, respectively connected to the yoke or blade 6, and the contacting spring 8.

12 denotes what I shall term a trigger, in the form of a bell crank lever, pivoted at 13, upon the tubular support 7, and having an arm 14 extending outward into the path of a projecting lug 15 on the interior wall of the casing 1.

16 designates an arm of the trigger projecting into the tubular support 7, and preferably at a point beyond the end of the coil or solenoid 9. The trigger is normally pressed into the relation shown, in which its arm 14 engages the lug 15, by a spiral spring 17, also contained within the tubular support 7. The upper abutment of the spring 17 is formed in a practical embodiment of the invention, by a small carbon pencil 18 guided to have a limited longitudinal movement within the yoke or blade 6.

19 denotes a fixed carbon pencil secured upon the head 2, and in the path of the movable pencil 18. The arrangement is such that when the parts are in circuit closing relation, the pencil 18 abuts against the fixed pencil 19, and provides a positive abutment for the small compression spring 17.

20 denotes a magnetic core loosely contained within the tubular support 7 and capable of being attracted upward by the energization of the coil or solenoid 9.

21 indicates a rod or plunger attached to the tubular support 7 and extending outward through a hole in the lower head 3 of the circuit breaker.

The operation is as follows: The circuit breaker being clamped into position on the panel board, or in any desired relation, current passes freely from the head 2 into the yoke or blade 6, connection 10, solenoid 9, connection 11, spiral spring 8, into the lower head or terminal 3. Under these circumstances, the solenoid 9 is energized and exerts a definite and predetermined force upon the core 20 tending to raise the same. The relation of the solenoid to the core 20 is such that the force of the former becomes sufficient to lift the latter at the current value for which it is desired the circuit breaker to act. When the current rises to this value, the weight of the core 20 is overcome, and it starts to move upward freely within its containing tube. As it moves upward the solenoid is able to act with greater efficiency, so that the core rapidly accelerates and acquires a considerable momentum. In this condition it strikes against the trigger or detent arm 16, which lies directly in its path, so that the trigger, which is very light, is deflected by the hammer blow, and passes out of contact with the lug 15 on the outside casing. The tubular support 7, with its connected yoke or blade 6, is now free to move downward under the tension of the spring 8, and a variety of other influences, which give a very abrupt and rapid motion. It will be seen that all the parts are very light, so that they are capable of acquiring a sudden movement with a moderate amount of force on account of their low inertia. The force, however, instead of being moderate is very considerable. The spring 8 is quite heavy and powerful, and acts directly on the movable parts without any intermediate devices. In this motion it is assisted by gravity. It is further assisted by its own magnetizing effect on account of the current spirally traversing it, which exerts a considerable force to collapse the spring. It is further assisted by the spring 17, which, through the pencil 18, exerts a force against the abutment 19 tending to depress the movable parts. By reason of all these forces, and on account of the lightness of the movable parts, it is evident that they will commence their downward movement with a maximum rapidity. In this way the yoke or blade 6 passes out of contact with the fixed element 5, but the circuit is not broken between these metallic parts, because the light carbon pencil 18 is projected toward its opposed pencil 19 by the spring 17, so that this pencil does not partake of the movement of the tubular support 7 during its initial stages. After the elements 5 and 6 become separated, however the spring 17 is so much extended as to exert no further force on the pencil 18, so that the latter breaks contact, and thereby the electric circuit at the point of its engagement with the carbon pencil 19. The flash, therefore, occurs between the carbon pencils, which are incapable of melting, and able to resist the heat. The flash is, however, broken almost at its inception by the vibration of the confined gases within the outer tube 1. The very sudden movement of the parts generates a spark which is so abruptly formed as to have all the characteristics of a small explosion, and the rush of gases within the confined space directly re-acts upon the arc to destroy it. The arc is further detroyed by the magnetic influence of the spiral spring 8, and the solenoid 9, which produce a magnetic field axially of the arc, which tends to blow it laterally. These influences, together with the great suddenness of movement of the circuit breaker, are sufficient to destroy the flash after a very minute interval of time and before it has had opportunity to incur damage to the contacts or mechanism.

What I claim, is:—

1. In a magnetic circuit breaker, a tubular casing having conducting heads or terminals, a tubular support, a spring for impelling the support longitudinally within said casing, means for holding said spring in such impelling relation within the casing, means for establishing a continuous circuit therethrough when in such relation, and magnetic

means for releasing said support to move longitudinally of the casing.

2. In a magnetic circuit breaker, a tubular casing having conducting heads or terminals, a movable element within said casing and adapted to contact with one head, a spring secured to said element and to the other head, said spring constituting a part of the electric circuit whereby it produces a magnetic field, and means for releasing said element whereby it is drawn downward by said spring, whereby the spring tension, gravity, and magnetic force, combine to exert a force upon said movable element.

3. In a magnetic circuit breaker, a tubular casing having conducting heads or terminals, a movable element within said casing having a carbon pencil adapted to make electric contact with one head, spring means for projecting said carbon pencil from the element, a spring secured to said movable element and fastened to the other head and forming part of the electric circuit, whereby it produces a magnetic field, and means for releasing said element whereby it is drawn downward by said spring whereby the spring tension, gravity, and magnetic force combine to exert a force upon said movable element.

4. In a magnetic circuit breaker, a tubular casing having conducting heads or terminals, a tubular support within said casing, a solenoid upon said support, a spring fixed to said support, said solenoid and spring forming part of the electric circuit, and means acted on by said solenoid for releasing said support.

5. A magnetic circuit breaker having a tubular body of insulating material and having metallic caps, adapted to be received upon a panel board, an element movable longitudinally in said tubular body, a spring connected to said movable element and to one of said caps for imparting a rectilinear movement longitudinally of the body to said element, a detent for maintaining the movable element in electrical contact with the other cap, said detent and element being wholly inclosed within said tubular body whereby the pressure due to the expansion of the gases therein is retained in said tubular body to assist in extinguishing an arc therein, and means displaced by an excessive current between the caps for releasing said detent and permitting the movable element to break the circuit.

6. A magnetic circuit breaker having a tubular body of insulating material and having metallic caps adapted to be received upon a panel board, an element movable longitudinally in said tubular body and normally completing an electric circuit between said caps, means connected to said movable element for imparting a rectilinear movement thereto, means within the element for releasing it to permit such movement and actuated by an excessive current in said circuit between the caps, said movable element and its connected parts being wholly inclosed within said tubular body whereby the pressure due to the expansion of the gases therein is retained in said tubular body to assist in extinguishing the arc therein.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

RALPH SCOTT.

Witnesses:
WALDO M. CHAPIN,
WILLIAM DORMAN. Jr