W. M. SCOTT.

CIRCUIT BREAKER TRIPPING STRUCTURE.

APPLICATION FILED NOV. 24, 1920.

1,425,700.

Patented Aug. 15, 1922.

FIG. 1

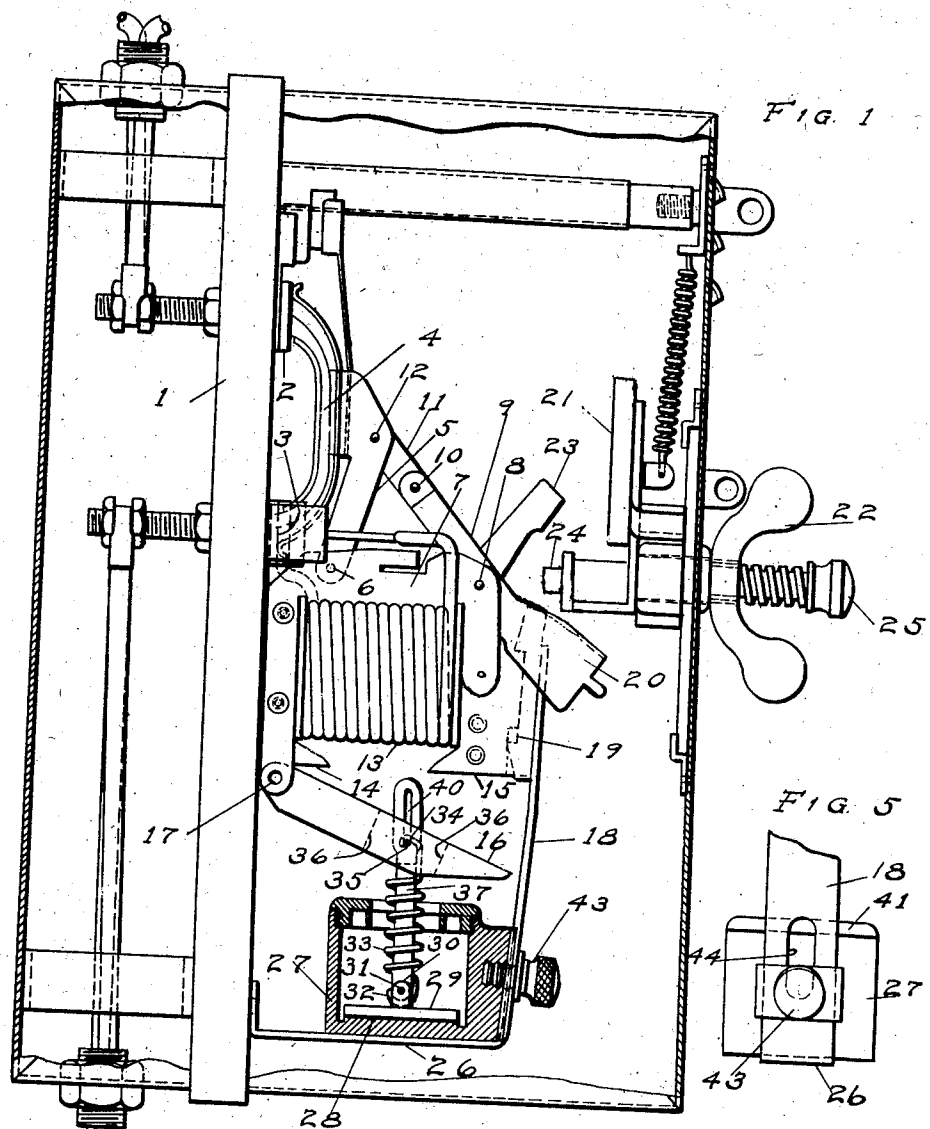


FIG. 5

FIG. 3

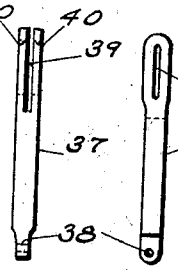
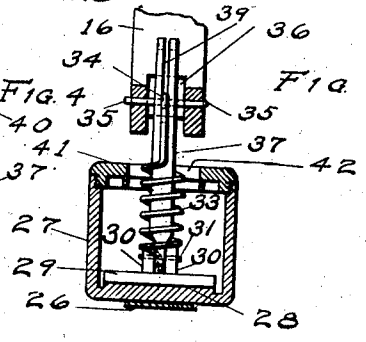


FIG. 4

FIG. 2



INVENTOR

William M. Scott

BY

Cornelius L. Ehret

His ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM M. SCOTT, OF TREDYFFRIN TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA.

CIRCUIT-BREAKER-TRIPPING STRUCTURE.

1,425,700. Specification of Letters Patent. Patented Aug. 15, 1922.

Application filed November 24, 1920. Serial No. 426,129.

To all whom it may concern:

Be it known that I, WILLIAM M. SCOTT, a citizen of the United States, residing in Tredyffrin Township, in the county of Chester, State of Pennsylvania, have invented a new and useful Circuit-Breaker-Tripping Structure, of which the following is a specification.

My invention relates to time element or start delaying devices, more particularly of the sucker type, and relates more particularly to such devices in relation to tripping mechanism for electric switches or automatic circuit breakers.

It is an object of my invention to provide a time element or start delay structure of such character that it shall respond immediately to heavy overloads which in magnitude are not sufficiently near the magnitude of overload corresponding with a short circuit to cause approximately instantaneous operation or separation of the sucker elements.

In accordance with my invention the movable element of the start delaying or time element device is resiliently or yieldingly connected with the member whose movement it delays, whereby for all forces of normal order of magnitude applied to or by said member the movable element of the delay device will yield and separate from its coacting stationary element when conditions are normal as to adhesion or co-action of the fixed and movable elements with respect to each other, but, under abnormal conditions, as those corresponding with abnormal resistance to separation of said movable and fixed elements from each other or their relative movement, the resilient or yielding connection will allow substantial movement of said member independently of the movable element of the delay device, until, under application of abnormal force, said member nevertheless reaches a position to trip the circuit breaker or effect other desired operation.

In accordance with my invention, there is provided also means for guiding the movable sucker element and to prevent less than predetermined separation between said member and the movable element of the delay device.

My invention resides in the features hereinafter described and claimed.

For an illustration of one of the forms my invention may take, reference may be had to the accompanying drawing, in which:

Fig. 1 is a side elevational view, partly in section, illustrating mechanism embodying my invention.

Fig. 2 is a fragmentary vertical sectional view of the delay device and its connections, taken at right angles to the sectional view thereof in Fig. 1.

Fig. 3 is a side elevational view of the guiding and separating member.

Fig. 4 is an elevational view at right angles to that of Fig. 3.

Fig. 5 is a front elevational view of means for adjusting the normal position of armature and start delaying device.

Referring to the drawing, 1 is a base of insulating material upon which are secured the stationary contacts or terminal blocks 2 and 3 adapted to be bridged and connected by the movable contact member 4 carried by the arm 5 pivoted at 6 to a fixed member 7 carried by the base 1. Pivoted to the member 7 at 8 is a toggle link or lever 9 pivoted at 10 to the toggle link or lever 11 pivoted to the arm 5 at 12.

In the position illustrated the toggle 9, 11 is overtravelled in that the pivot 10 is to the right and above the line joining the centers of the pivots 8 and 12. The contact member 4 is accordingly held locked in circuit closing position illustrated. Carried by the member 7 is an electro-magnet whose winding is 13, connected in series with the circuit controlled by the contact 4, or in any other arrangement therein or in any other circuit. The electro-magnet has the poles 14 and 15 with which is adapted to co-act the armature 16 pivoted at 17. Slidable upward between the pole piece 15 and the strap or bracket 18 is the member 19 whose upper end is adapted to strike upwardly against the operating arm 20 forming an extension of the toggle link 9.

The member 20 may be actuated for closing or resetting the circuit breaker by rotation of the member 21 by handle 22; and the breaker may be manually tripped by actuation of the member 23 by inward movement

of the rod 24 when actuated from its outer end at the button 25.

Carried by the horizontally extending portion 26 of the bracket or strap 18 is the cup or chamber 27 whose suitably surfaced bottom 28 constitutes the fixed or stationary element of a start delaying device of the sucker type. Co-acting with the stationary sucker element 28 is the movable sucker element 29, oil or equivalent material being placed in the cup 27 to a depth suitably above the element 29. By the ears or lugs 30, 30 on the sucker element 29 is carried a pin 31 with which engages between the lugs 30, 30 the lower hooked end 32 of a helical spring 33 whose upper end 34 hooks over the pin 35 carried by the armature 16 and extending across the slot 36 formed therein.

Within the spring 33 is disposed the guide and separator rod or bar 37 through a hole 38 in the lower end of which extends the aforesaid pin 31, whereby the rod 37 is pivoted to the movable sucker element 29. At its upper end the rod 37 has the open ended slot 39 in which is received the upper end 34 of the spring 33, the rod 37 having the elongated slots 40 in its two upper end portions between which is formed the slot 39. Through the slots 40 extends the aforesaid pin 35 carried by armature 16.

The cup 27 is provided with a screw threaded cover 41 having an opening 42 through which freely extend the spring 33 and rod 37.

Threaded into the side of the cup 27 is the thumb screw 43 extending through the vertical slot 44 in the member 18, whereby the normal position of the armature 16 with respect to the magnet poles 14 and 15 may be adjusted by raising the cup 27 to suitable position while the screw 43 is loose, and then tightening the screw 43 and so clamping the cup 27 in adjusted position to the fixed member 18.

The operation is as follows:

Under normal conditions of adhesion or suction of the sucker element 29 to the fixed sucker element 28, the element 29 will separate from the element 28 upon exertion thereon by the armature 16 through the spring 33 of a force corresponding with a predetermined degree of excitation of the electro-magnet. That is, when a current of predetermined strength, such, for example, as that at which it is desired the circuit breaker shall be tripped, flows through the winding 13, the armature 16 will be attracted upwardly with a force transmitted to the sucker element 29 through spring 33, without substantial or undue elongation thereof, such that the sucker elements will separate and the armature 16 will then freely move upwardly, strike the member 19 which will in turn engage the member 20, cause the pivot 10 to move downwardly and toward the left across dead center position, whereupon the toggle will collapse and the movable contact member 4 will separate from the terminals 2 and 3, and so interrupt the circuit.

If, however, the adhesion between the members 28 and 29 should be materially in excess of normal degree of adhesion, as for example, when the oil or other material in the cup 27 thickens, dries, evaporates, or otherwise changes, upon flow of current through the winding 13 of magnitude at which it is desired the breaker should be tripped, the sucker elements will not separate. If then the current should materially further increase, the armature 16 will be attracted and begin to move upwardly, the spring 33 in the meantime elongating, but exerting upon the sucker element 29 a greatly increased force, until eventually the element 29 will separate from element 28 or, failing in this, the armature will continue moving upwardly, with accompanying further elongation of the spring 33, until armature 16 eventually strikes member 19 and trips the circuit breaker.

Accordingly, by my construction, in case of undue adhesion of the sucker elements the breaker may nevertheless be tripped, as by a current of materially greater magnitude than that for which normally set.

Accordingly, while the apparatus may fail, due to the abnormal degree of adhesion to the sucker elements, to open the circuit upon the existence of a current of predetermined strength for a suitable time, it nevertheless will be tripped in case of material increase in current strength beyond that value.

While the operation of the device has been above described as to one aspect, there is another and generally more important aspect regarding response to different degrees of overload. With that form of sucker structure in which the movable sucker element is rigidly and not resiliently attached to the movable member or armature, the sucker elements will not separate until after lapse of appreciable time, as several seconds, even when the overload, represented, for example, by the overload of current passing through the magnet winding 13, is several hundred per cent. Where, however, the resilient connection of the movable sucker element to the armature or equivalent is employed in connection with my invention, upon occurrence of an overload of a predetermined magnitude, for example, one hundred and fifty per cent, the separation of the sucker elements may be delayed. But upon occurrence of still greater overload, nevertheless of magnitude considerably below overload corresponding with short circuit, the sucker elements will be

separated from each other practically instantaneously, this action being possible by the extension or yielding of the spring 33, allowing the armature 16 upon such heavy overload to quickly move into a stronger field which effects practically instantaneous separation of the sucker elements.

The rod 37 limits downward movement of the armature 16 when the sucker element 29 is in its normal position in contact with the fixed element 28, because the pin 35 engages the lower ends of the slots 40.

The bar 37 serves also as a guide or means for maintaining suitable relative positions between the spring 33 and armature 16. If the sucker element 29 were related to the armature 16 only by the spring 33, the armature 16 might in descending allow misplacement of the element 29. The member 37, while not interfering with the co-action of the spring 33 with members 29 and 16, nevertheless serves to maintain co-ordination between them.

What I claim is:

1. In circuit breaker tripping mechanism, the combination with a movable tripping member, of a sucker comprising movable and stationary sucker elements normally adhering to each other and opposing separation only during slight movement away from each other, and a yielding connection between said tripping member and said movable sucker element.

2. In circuit breaker tripping mechanism, the combination with a movable tripping member, of a sucker comprising movable and stationary sucker elements normally adhering to each other and opposing separation only during slight movement away from each other, and a spring connecting said movable sucker element with said tripping member.

3. In circuit breaker tripping mechanism, the combination with a movable tripping member, of a sucker comprising movable and stationary sucker elements normally adhering to each other and opposing separation only during slight movement away from each other, a spring connecting said movable sucker element with said tripping member, and means common to said tripping member and said stationary sucker element for adjusting their normal position.

4. The combination with a movable member, of a sucker device for delaying start thereof, a yielding connection between a movable sucker element and said movable member, and a rigid guide member extending between said sucker element and said movable member and allowing relative movement between them.

5. The combination with a movable member, of sucker structure for delaying the start thereof, a yielding connection between a movable sucker element and said movable member, and a rigid member pivoted to said movable sucker element and having a connection with said movable member allowing lost motion between said rigid member and said movable member.

6. The combination with a movable member, of sucker structure for delaying the start thereof, a yielding connection between a movable sucker element and said movable member, and a rigid member extending between said movable sucker element and said movable member pivoted to one of them and having a guiding connection with the other.

7. The combination with a movable member, of sucker structure for delaying the start thereof, a yielding connection between a movable sucker element and said movable member, and a rigid member extending between said movable sucker element and said movable member pivoted to one of them and having a pin and slot connection with the other.

8. The combination with a movable member, of a sucker structure for delaying the start thereof, a rigid member connecting a movable sucker element and said movable member and allowing relative movement between them, and a spring surrounding said rigid member forming a yielding connection between said movable sucker element and said movable member.

9. The combination with a movable member, of sucker structure for delaying the start thereof, pins carried, respectively, by said movable member and a movable sucker element, a spring connecting said pins, and a rigid member allowing relative movement of said movable member and said movable sucker element pivoted upon one of said pins and partaking of guiding movement upon the other of said pins.

10. The combination with a movable member having an opening therein, a pin extending across said opening, sucker structure, a pin carried by a movable sucker element, a spring connecting said pins, and a rigid member allowing relative movement between said movable member and said movable sucker element pivoted on one of said pins and partaking of guiding movement on the other, said rigid member extending into said opening.

11. The combination with a movable member having an opening therein, of sucker structure for delaying the start thereof, a rigid member allowing relative movement between said movable member and a movable sucker element and engaging one of them and extending into said opening, and a spring connecting said movable sucker element with said movable member.

12. The combination with a movable member, of sucker structure comprising fixed and movable sucker elements, a rigid member extending between the movable sucker element

and said movable member and attached to one of them and having a lost motion connection with the other, and a spring connecting said movable member and the movable sucker element.

13. The combination with a movable member, a sucker structure comprising fixed and movable sucker elements, a rigid member extending between the movable sucker element and said movable member and attached to one of them and having a lost motion connection with the other, and a spring surrounding said rigid member and connecting said movable sucker element with said movable member.

14. The combination with a movable member, of sucker structure comprising fixed and movable sucker elements, a rigid member pivoted to the movable sucker element and having a lost motion connection with said movable member, said movable member normally supported by the movable sucker element through said rigid member, and a spring connecting the movable sucker element with said movable member.

15. The combination with a movable member, of sucker structure comprising sucker elements normally adhering to each other at their adjacent surfaces, and a spring allowing movement of said movable member before separation of the sucker elements from each other, the influence of said spring ceasing immediately upon slight movement of one of said sucker elements away from the other.

16. The combination with electro-magnetic means comprising magnetic field-producing structure and a magnetizable member movable in an arc with respect thereto, of sucker structure comprising a fixed sucker element normally supporting said movable magnetizable member, a movable sucker element operatively connected to said movable magnetizable member, a fixed support for said fixed sucker element, and means for adjusting said fixed sucker element in the plane of arcuate movement of said magnetizable member to different heights corresponding with different distances laterally from the center of movement of said magnetizable member.

17. The combination with electro-magnetic means comprising magnetic field-producing structure and a co-acting movable magnetizable member, of sucker structure comprising fixed and movable sucker elements, a spring connecting the movable sucker element with said movable magnetizable member, a rigid member normally supporting said movable magnetizable member upon said fixed sucker element, a fixed support, and means for securing said fixed sucker element in different positions upon said support for adjusting the normal position of said movable magnetizable member with respect to said field-producing structure.

18. The combination with electro-magnetic means comprising magnetic field-producing structure and a co-acting movable magnetizable member, of sucker structure comprising fixed and movable sucker elements, a rigid member extending between the movable sucker element and said movable magnetizable member and having lost motion with respect to one of them, said rigid member normally supporting said movable magnetizable member upon said fixed sucker element, a fixed support, and means for securing said fixed sucker element in different positions upon said support for adjusting the normal position of said movable magnetizable member with respect to said field-producing structure.

19. The combination with an electro-magnet having an armature pivoted for movement in a vertical plane, of sucker structure comprising a fixed sucker element, a co-acting movable sucker element connected to said armature, said armature supported by said fixed sucker element when said electro-magnet is de-energized, a fixed support, and means for securing said fixed sucker element in different positions upon said fixed support for imparting to said armature different vertical positions and to impart to said sucker structure vertical positions differing as to their distance laterally from the pivot of said armature.

20. The combination with an electro-magnet, of an armature adapted to be attracted upwardly thereby and movable upon a horizontal pivot, sucker structure comprising a cup having a sucker surface, a co-acting movable sucker element connected to said armature, said cup normally supporting said armature when said electro-magnet is de-energized, an upwardly extending fixed support inclined to the vertical, and means for securing said cup in different positions upon said inclined support for adjusting the position of said armature with respect to said electro-magnet.

In testimony whereof I have hereunto affixed my signature this 17th day of November, 1920.

WILLIAM M. SCOTT.