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CIRCUIT BREAKER.

APPLICATION FILED JULY 29, 1916.

1,330,094.

Patented Feb. 10, 1920.

Fig. 2.

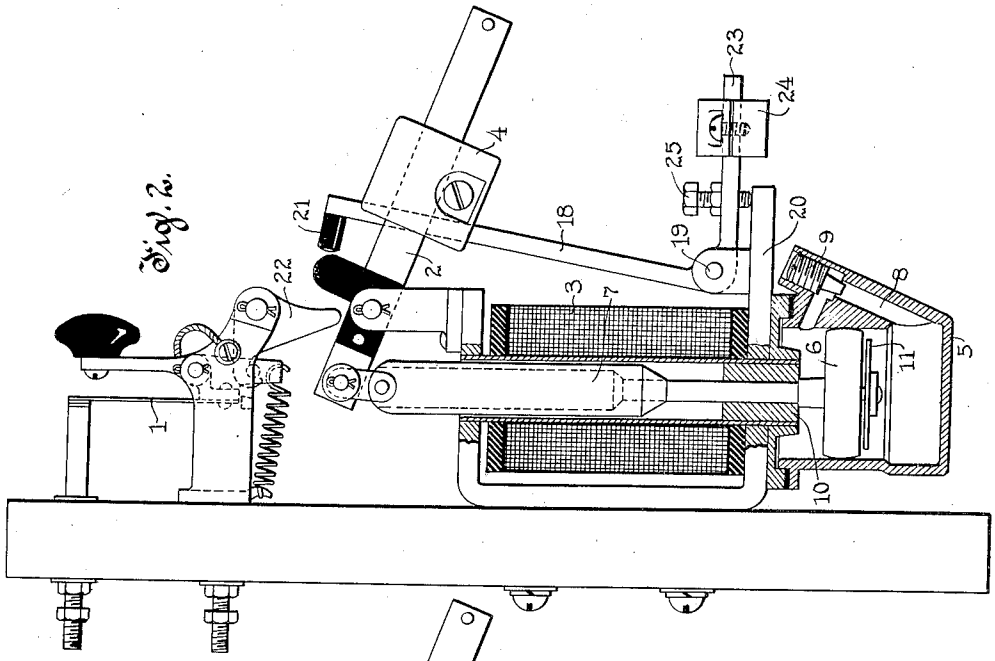
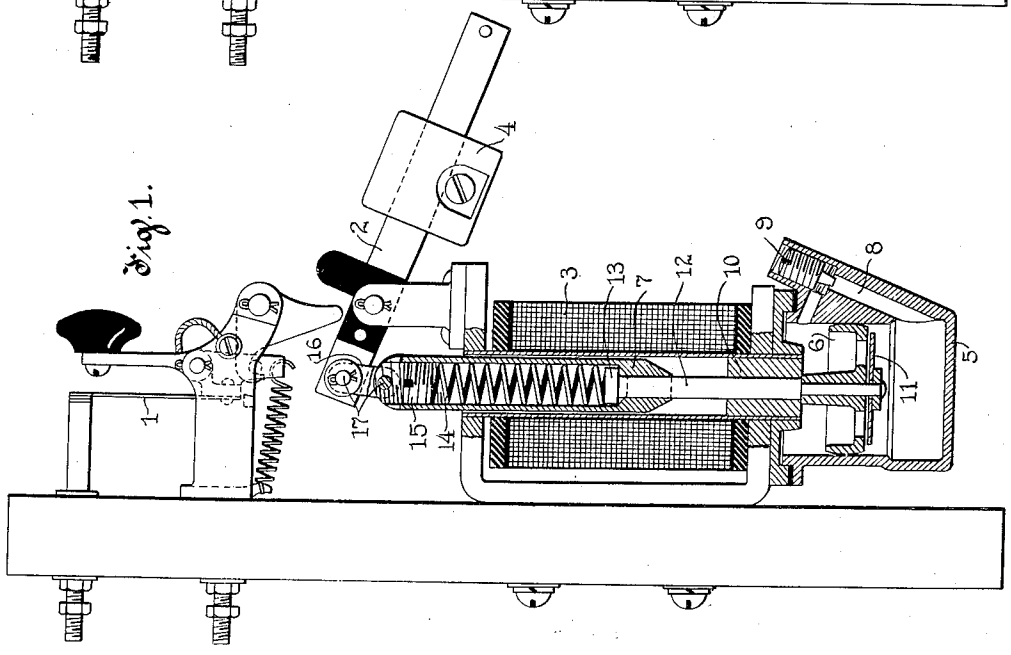


Fig. 1.



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CIRCUIT-BREAKER.

1,330,094. Specification of Letters Patent. Patented Feb. 10, 1920.

Application filed July 29, 1916. Serial No. 111,990.

To all whom it may concern:

Be it known that I, ARTHUR SIMON, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Circuit-Breakers, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to circuit breakers and more particularly to those of the combined time element and instantaneous type.

The invention has among its objects to provide a simple and efficient circuit breaker having a retarded response to overloads up to a predetermined value and a substantially instantaneous response to overloads in excess of such value.

Other objects will hereinafter appear.

In the accompanying drawing, wherein is illustrated an embodiment of the invention,

Figure 1 is a side elevation view, partly in section, of a circuit breaker constructed in accordance therewith; and,

Fig. 2 is a similar view of a modified construction.

Referring to Fig. 1 of the drawing, the circuit breaker comprises a switch 1 arranged to be engaged and tripped by a lever 2, which latter is actuated by an overload solenoid 3. The degree of overload at which the solenoid responds is determinable by an adjustable weight 4 upon the said lever and the solenoid in responding is retarded by a dash pot 5 having a piston 6 operating therein, the latter being connected to the lower end of solenoid plunger 7. A bypass 8 having an adjustable plug valve 9 serves to determine the rate of descent of the piston 6 thereby fixing the time element of the circuit breaker.

The plunger 7 is constructed hollow and is tapered at its lower end to coöperate with a flat faced magnetic plug 10 at the lower end of solenoid 3. This construction provides a relatively flat pull curve characteristic near the beginning of the stroke and a relatively steep characteristic near the end thereof, corresponding to a weak initial pull and a strong final pull. For accelerating the movement of the plunger during the latter part of its stroke the lower portion of the dash pot 5 is enlarged, thereby permitting the compressed fluid to pass above the piston as the latter enters said enlarged portion, thus relieving the latter portion of the plunger stroke of dash pot retardation. The piston 6 is provided with a downwardly opening valve 11 which serves to relieve the plunger 6 of dash pot retardation during upward movement thereof.

The above described arrangement of parts is substantially identical with that of my co-pending application Serial No. 99,038, filed May 22, 1916.

For enabling an immediate response of the above described circuit breaker to overloads exceeding a predetermined value a yielding connection is provided between the plunger 7 and the piston 6. This connection includes a rod 12 having a head 13 slidingly fitted within the lower portion of the hollow plunger 7, the head 13 being retained therein by a coöperating shoulder. A helical spring 14 is inclosed within said hollow plunger with its lower end resting upon the head 13 of the rod 12, while its upper end engages a plug 15 screw threaded within the upper end of said plunger. The plunger is connected with the lever 2 by means of a link 16 and pins 17.

During overloads not exceeding a predetermined value, the operation of the circuit breaker is in no wise affected by the elements last described. However, upon the occurrence of an overload in excess of such value, the down thrust of the plunger 7 compresses the spring 14, thus permitting the plunger, together with the tripping lever 2, to descend independently of the piston 6, thereby relieving the circuit breaker of the retarding action of the dash pot and interrupting circuit practically instantaneously.

Following circuit interruption in the manner above described the plunger 7 is free to rise under the influence of the spring 14

until the head of the rod engages the contracted shoulder at the lower end of the plunger bore, following which the plunger and piston may move in unison as before while the lever 2 returns to the resetting position of the switch 1 under the influence of the weight 4, which relation of parts is sustained until the occurrence of a subsequent overload.

The sensitiveness of the above described parts for instantaneous response may be varied by screwing down the plug 15 within the hollow plunger for which purpose a key slot is provided in the upper face of said plug. Obviously this adjustment might be otherwise accomplished.

Referring now to Fig. 2 of the drawing, the parts constituting the time element circuit breaker are substantially identical with those above described. The parts for producing an immediate response, however, have been modified. In this construction a magnetic bar 18 is hingedly mounted at 19 upon the lower leg of solenoid frame 20 for attraction toward the upper leg of said frame. The upper end of said bar 18 is provided with an insulating projecting portion 21 for engaging and tripping the switch arm 22 upon attraction of said bar. An arm 23, preferably integral with the bar 18, projects at an angle from the lower end thereof and is provided with an adjustable weight 24 which biases the said bar to stand in open position with its upper end remote from the magnet frame. The said arm 23 is further provided with an adjustable screw 25 which serves to limit the outward movement of the bar 18.

During moderate overloads the action of the circuit breaker is in nowise affected by the elements above described. However, upon the occurrence of an overload exceeding a certain value the magnet bar 18 is forcibly drawn toward the magnet frame 20 against the action of its biasing means, whereby circuit is interrupted practically instantaneously through the tripping of switch 1. Following circuit interruption in the manner above described, the bar 18 is free to respond to its biasing means whereupon the switch 1 is free to resume normal position, as illustrated.

The sensitiveness of the above described circuit interrupting means for instantaneous response may be varied by shifting the weight 24 along the arm 23. A similar result may be attained by adjustment of the screw 25 which serves to vary the length of the air gap between the free end of the magnet bar 18 and the magnetic frame 20. It may be noted, however, in this connection that adjustment of the said screw furthermore operates to vary the calibration of the entire circuit breaker, including the time element portions thereof, since by variations of the air gap the reluctance of the entire magnet is altered.

What I claim as new and desire to secure by Letters Patent is:

1. In combination, a switch, an overload winding, and means operable by said winding to trip said switch immediately under given overload conditions and subject to a given delay under certain other overload conditions, said means including a plunger for said winding subjected to a substantially uniform pull during the major portion of its stroke and an augmented final pull and retarding means for said plunger adapted to release the same substantially at the initiation of said augmented final pull.

2. In combination, a switch, an overload winding, means operable by said winding to trip said switch immediately under given overload conditions and subject to a given delay under certain other overload conditions, said means including a plunger for said winding subjected to a substantially uniform pull during the major portion of its stroke and an augmented final pull and retarding means for said plunger adapted to release the same substantially at the initiation of said augmented final pull, and means for varying the sensitiveness of response of said tripping means.

3. In combination, a switch, an overload winding, means operable by said winding to trip said switch immediately under given overload conditions and subject to a given delay under certain other overload conditions, said means including a plunger for said winding subjected to a substantially uniform pull during the major portion of its stroke and an augmented final pull and retarding means for said plunger adapted to release the same substantially at the initiation of said augmented final pull, and means for adjusting said tripping means for variation of the sensitiveness of response thereof either for delayed or immediate tripping of said switch.

4. In a circuit breaker, in combination, a switch, tripping means therefor including an electromagnetic winding and a plurality of movable magnetic members to be attracted thereby for tripping said switch immediately or subject to a given delay selectively upon energization of said winding to predetermined different degrees, and means for adjusting one of said magnetic members relatively to said winding for variation of the sensitiveness of response of the former.

5. In a circuit breaker, in combination, a switch, tripping means therefor including a solenoid winding, a pair of magnetic members to be attracted through energization of said winding, means for adjusting one of said magnetic members relative to said wind-

ing to vary the sensitiveness of response of the former and means for varying the sensitiveness of said tripping means while maintaining a given relation between said magnetic members and said winding.

6. In a circuit breaker, in combination, a switch, tripping means therefor including a solenoid winding, a pair of magnetic members to be attracted through energization of said winding, means for adjusting one of said magnetic members relatively to said winding and means for varying the sensitiveness of response of each of said magnetic members without varying the position of either.

In witness whereof, I have hereunto subscribed my name.

ARTHUR SIMON.