W. KAISLING.

CIRCUIT BREAKER RELAY.

APPLICATION FILED FEB. 1, 1915.

1,324,452.

Patented Dec. 9, 1919.

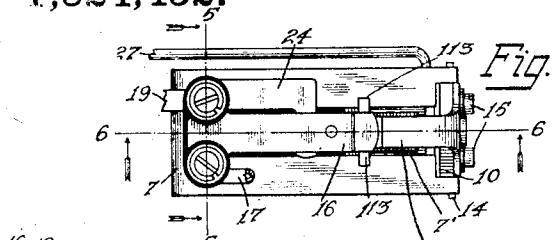

Fig. 4.

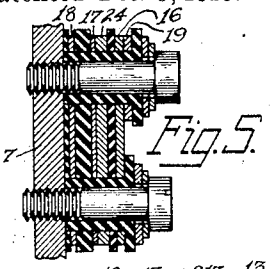

Fig. 5.

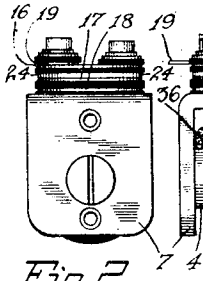

Fig. 2.

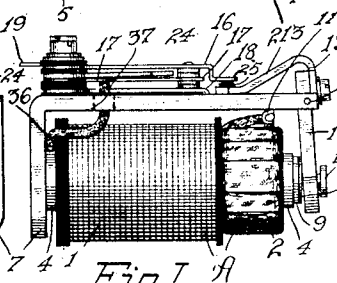

Fig. 1.

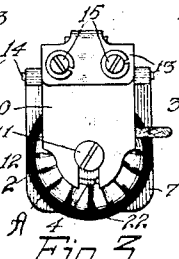

Fig. 3.

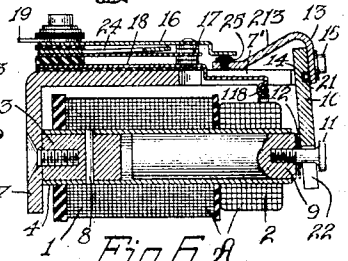

Fig. 6.

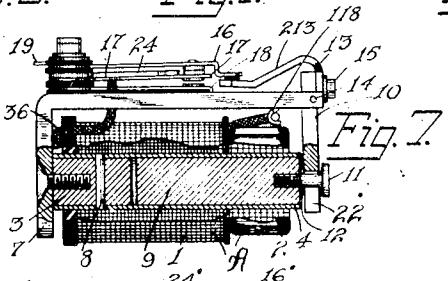

Fig. 7.

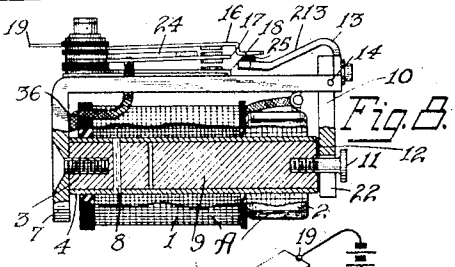

Fig. 8.

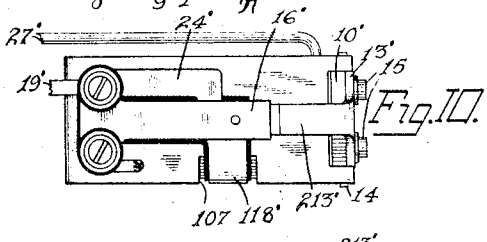

Fig. 10.

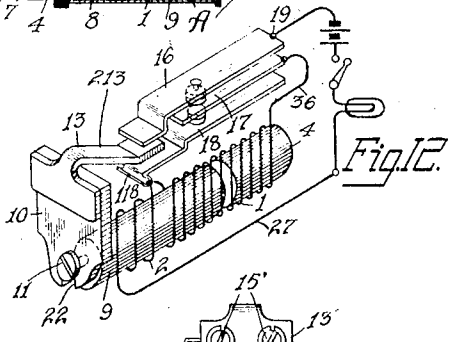

Fig. 12.

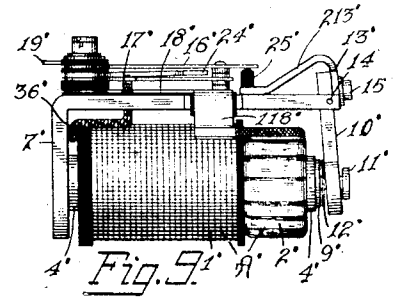

Fig. 9.

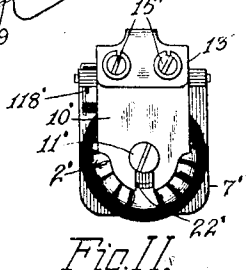

Fig. 11.

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UNITED STATES PATENT OFFICE.

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CIRCUIT-BREAKER RELAY.

1,324,452. Specification of Letters Patent. Patented Dec. 9, 1919.

Application filed February 1, 1915. Serial No. 5,361.

To all whom it may concern:

Be it known that I, WILLIAM KAISLING, a citizen of the United States of America, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Circuit-Breaker Relays, of which the following is a specification.

My invention relates to circuit breaker relays and more particularly to devices of the solenoid type although certain features of my invention are not limited to this particular type. In connection with power circuits such as are used on automobiles which include the ignition, lighting, starting, charging circuits, etc., overload circuit breaker, relays are introduced in the main power lead, which remain inert as long as not more than a predetermined amount of current flows but which operate to interrupt the circuit and vibrate their armature as an indication thereof, when a greater amount than the predetermined flow of current traverses the coil of the relay.

One of the objects of my invention is to provide an improved and simplified device of this character having certain electrical and mechanical advantages. One of the features of my invention resides in an improved arrangement whereby an excess flow of current will traverse a low resistance path through the electromagnet followed by the introduction of a high resistance energizing circuit which produces a vibration of the armature to indicate the excessive flow. Other features will be more particularly pointed out in the ensuing part of the specification and claims. For a better understanding of my invention reference is to be had to the accompanying drawing in which—

Figure 1 is a side elevation of the preferred form of my invention;

Fig. 2 is a left end view of Fig. 1;

Fig. 3 is a right end view of Fig. 1;

Fig. 4 is a top or plan view of Fig. 1;

Fig. 5 is a sectional view through the mounting of the contact springs along the line 5, 5 of Fig. 4;

Fig. 6 is a longitudinal sectional view along the line 6, 6 of Fig. 4;

Fig. 7 shows the device of Fig. 1 with its armature in a partially attracted position;

Fig. 8 shows the armature fully attracted;

Fig. 9 is a side view of a modified form of my invention;

Fig. 10 is a top or plan view of Fig. 9;

Fig. 11 is a right end view of Fig. 9; and

Fig. 12 illustrates diagrammatically the relay connected in a power circuit.

Referring now more particularly to the preferred form of my invention illustrated in Figs. 1 to 8 inclusive, an electromagnet A is provided comprising a comparatively low resistance helix 2 and a relatively high resistance helix 1 both of which are supported upon a tube 4 preferably of a non-magnetizable material. A rear core 3 is placed within the tube and rigidly secured to a heel iron or return pole piece 7 carrying an armature 10 at its forward end. Said armature is pivotally supported by means of a pin 14 which is securely clamped in a transverse slot 21 in the armature by means of a clamping element 13 secured by screws 15. At the forward end of the electromagnet a core 9 is provided being slidably supported within the tube 4 and operatively attached to the armature 10 by means of a screw 11 preferably of a non-magnetizable material said screw extending through a slot 22 at the lower end of the armature and so adjusted as to allow a slight independent movement of the armature. A separator washer 12 preferably of a non-magnetizable material is inserted between the armature 10 and movable core 9 so as to prevent freezing. The rear core 3 is held in definite relation to the tube 4 by means of a pin 8.

A set of three normally closed contact springs are provided comprising the armature contact 16, an intermediate movable contact 17 and a stationary contact 18 all insulatingly mounted upon the heel iron as shown more particularly in Fig. 5. A stop plate 24 is also provided for controlling the follow up movement of the intermediate spring 17. A rearwardly extending arm 213 is provided carrying an insulating buffer 25 for actuating the contact springs, ears 113 on the extension 213 resting on each side of the slot 7' in the heel iron. The stationary contact 18 carries a forwardly positioned terminal 118 extending through slot 7' and adapted to be connected to one terminal of each of the windings as diagrammatically illustrated in Fig. 12. The other terminal 27 of the low resistance winding

2, is adapted to be connected to an outside conductor and the contact spring 16 is connected to a rearwardly extending terminal 19 adapted also for connection to an outside conductor.

In the preferred method of connecting the device, one terminal of each of the windings is connected to the terminal 118 of contact 18, the other terminal of winding 2 being connected directly to one terminal of the circuit. The other terminal 36 of the high resistance winding extends through a hole 37 in the heel iron and is connected to the intermediate contact 17. Thus it will be seen that with the relay in its normal position the high resistance winding is short-circuited due to contacts 17, 18 being normally connected so that normally the protected circuit includes only the low resistance winding 2. The relay is adjusted so that it will not attract its armature sufficiently to interrupt contacts 17, 18 so long as the normal or predetermined amount of current is flowing. For the purpose of illustration, I have shown the circuit breaker relay diagrammatically in Fig. 12 and for simplicity's sake I have shown only one lamp in circuit with the circuit breaker relay. Should something happen to this circuit so that its resistance is lowered a predetermined extent, the increased flow of current through winding 2 draws in the movable core 9 and attached armature 10. The core 9 and armature 10 upon being attracted immediately interrupt contacts 17, 18 so that the shunt across the terminals of high resistance winding 1 is interrupted thereby including this winding in series with winding 2 and thus in the protected circuit. The core and armature continue in their attracting movement and upon reaching the intermediate position as shown in Fig. 7, intermediate contact 17 engages its stop 24 so that the continued movement of the armature (the core 9 being fully attracted) causes the armature contact spring 16 to leave contact 17 thus interrupting the circuit through the windings of the relay. At this time (Fig. 8) both armature and core 9 are fully attracted and the interruption of the energizing circuit for the relay allows the armature to retract so that due to the slight play between the armature and the head of screw 11, said armature retracts sufficiently to again close contacts 16, 17 only, without moving core 9. Therefore the armature immediately is attracted to again interrupt the energizing circuit. As long as the increased flow of current exists the armature continues to vibrate on an energizing circuit including both windings of the relay and contacts 16, 17 only, and as this energizing circuit is of comparatively high resistance I have found that this vibration may continue for some time without affecting the relay. The high resistance winding 1 of the circuit breaker relay when placed in series relation with the low resistance winding 2 reduces the current flow, as previously described, but permits sufficient current to traverse the series connected windings to bring about the full attraction of the armature 10. The reduction of current flow due to the high resistance winding 1 also reduces the sparking at the interrupter contacts 16 and 17 to a minimum. The vibration of the armature produces an audible signal so that the operator knows the circuit has been affected in some way. If the circuit is then opened the relay will deënergize and restore its armature and contacts. If the circuit is again closed and the increased flow of current still exists the relay will vibrate as before.

In Figs. 9 to 11, I have illustrated a modified form of my invention the principal difference between this form and the first described consisting in the absence of the central slot 7^1 in the heel piece. That is, in this modified form the rearwardly extending arm 213^1 carried by the armature rests directly upon the heel iron 7^1 and instead of extending the terminal 118^1 through the center of the heel iron it overlaps one side of the heel iron and extends downwardly through a slot 107 to be attached to the terminal of the low resistance winding. In this modified form of my invention I have indicated the parts thereof which are similar to parts of the preferred form, by like reference characters except for the addition of the suffix prime.

In working out my invention I have embodied it in several different modifications but I contemplate employing the different features in other ways than that shown. It will also be apparent that changes and modifications will readily occur to those skilled in the art and therefore I do not desire to be limited to the exact structure as shown and described but aim to cover all that which comes within the spirit and scope of the appended claims.

Having described my invention what I claim as new and desire to secure by United States Letters Patent, is—

1. A circuit-breaker relay including an electromagnet having high and low resistance windings, normally closed contacts for said relay, a shunt about said high resistance winding including certain of said contacts, a circuit for said relay including certain of said first contacts and said low resistance winding, an armature for said relay adapted to be attracted when said circuit is closed to operate said shunt contacts to remove said short-circuit from about said high resistance winding thereby including said high resistance winding in circuit with said low resistance winding

causing a further operation of said armature to open the contacts included in the initial energizing circuit of said relay.

2. A circuit breaker relay including an electromagnet having two windings, contacts for said relay normally short-circuiting one of said windings, an initial energizing circuit for said relay including the other winding and other normally closed contacts of said relay whereby a flow of current through said second winding and its included contacts affects the first said contacts to interrupt the short circuit so that both windings are included in circuit with said second mentioned contacts, and means whereby a continued application of current operates to intermittently open and close said second mentioned contacts only.

3. A circuit breaker including an electromagnet having two windings, an armature for said magnet, contacts controlled by said armature and normally short-circuiting one of said windings, other normally closed contacts, circuit connections including the other of said windings and said other normally closed contacts adapted to be closed to cause an initial operation of said armature to open said first normally closed contacts, thereby rendering said first winding effective to cause a continued attracting movement of said armature whereby the other of said contacts are interrupted to open the circuit of both of said windings, said armature upon retracting again closing the circuit for both of said windings to cause a reattraction thereof without again closing said short circuit.

4. A circuit breaker relay including an electromagnet provided with high and low resistance windings, a contact for said relay normally shunting the high resistance winding, an interrupter contact for said relay adapted to be included in circuit with said windings, an armature for said relay, and circuit connections including the said low resistance winding and said interrupter contact whereby a flow of current through said low resistance winding operates said armature to open said shunt circuit and to include said pair of windings in circuit with said interrupter contact to cause an intermittent operation of said relay.

5. A relay of the class described including an electromagnet having high and low resistance windings, a contact for said relay normally closing a shunt circuit around said high resistance winding, an interrupter contact normally in circuit with said low resistance winding, means whereby when an abnormal flow of current through said low resistance winding occurs said shunt circuit contact is operated and said windings are connected in series circuit to cause a continued operation of said relay to open said interrupter contact, thereby interrupting the circuit of said windings and causing said relay to operate as a buzzer to give an audible signal.

6. The combination with a relay structure of the character described including an electromagnet provided with a pair of windings, of a plurality of contacts for said relay, two of said contacts closing a shunt circuit around one of said windings, and a third one of said first contacts and one of said shunting contacts included in an interrupter circuit for said pair of windings.

7. A relay of the class described including an electromagnet provided with a pair of windings, an armature for said relay, contacts for said relay controllable by said armature, a shunt circuit around one of said windings including two of said contacts, and a circuit including a third one of said first contacts, one of said shunting contacts and said pair of windings.

Signed by me at Chicago, county of Cook and State of Illinois, in the presence of two witnesses.

WILLIAM KAISLING.

Witnesses:
GEORGE E. MUELLER,
B. O'BRIEN.