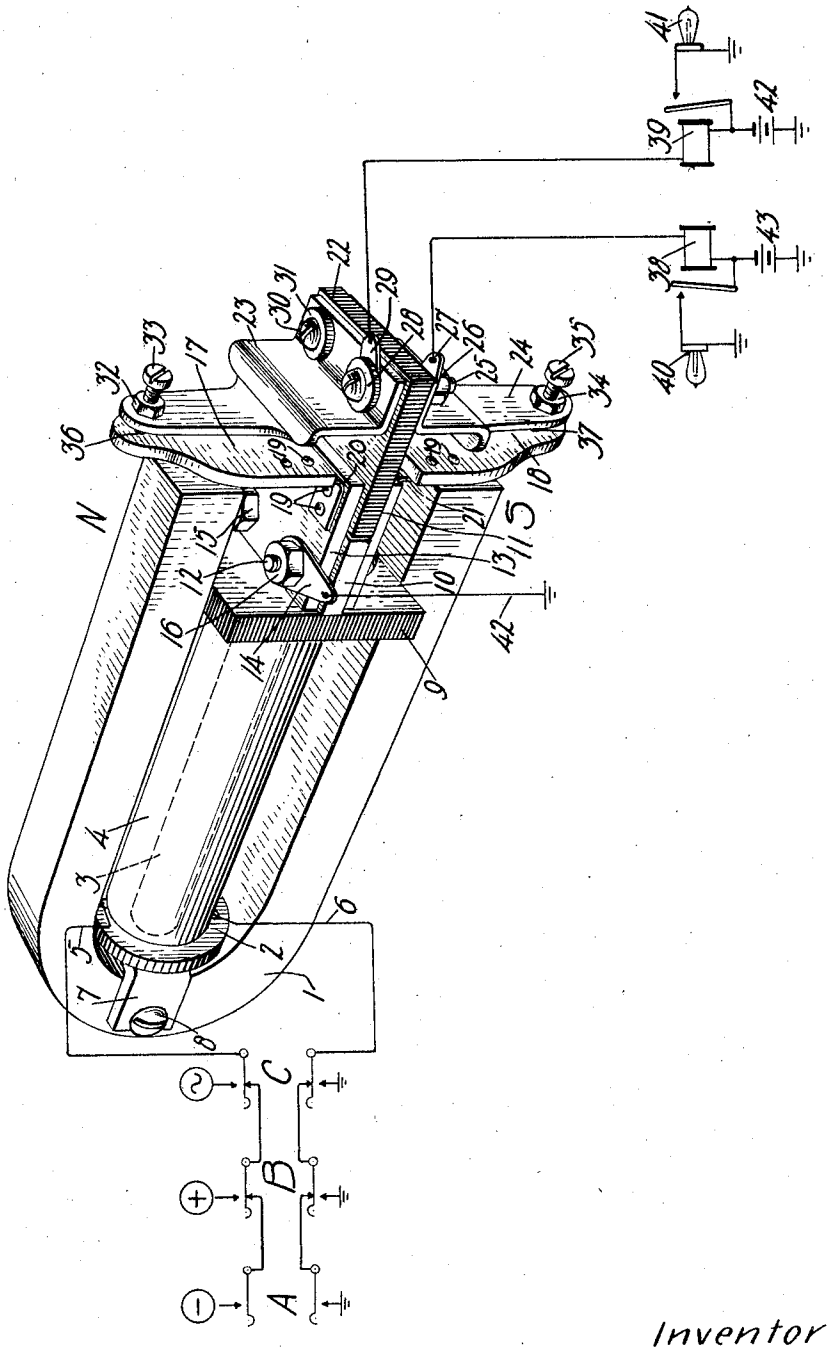
L. A. MORTIMER.

ELECTRICAL RELAY.

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1,345,798. **Patented July 6, 1920.**



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UNITED STATES PATENT OFFICE.

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ELECTRICAL RELAY.

1,345,798. Specification of Letters Patent. Patented July 6, 1920.

Application filed December 4, 1919. Serial No. 342,528.

To all whom it may concern:

Be it known that I, LOUIS A. MORTIMER, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Electrical Relays, of which the following is a full, clear, concise, and exact description.

This invention relates in general to electrically operable devices, and more particularly to electromagnets, the device herein described being what is termed a relay.

The principal object of the invention is to provide an improved device, of the character above mentioned, which is compact, positive in its operation, efficient and inexpensive.

This is accomplished in accordance with this invention, as is hereinafter more particularly described, by using a permanent magnet, preferably of the U type, and an electromagnet located so that one end of its core magnetically contacts at the neutral point of the permanent magnet. Normally the magnet path is through both legs of the permanent magnet. But, when the electromagnet is magnetized by a direct current, the magnetic flux in one of the legs is increased and in the other it is decreased. Consequently, the path of the flux is then through the core of the electromagnet and through the legs of the permanent magnet. It is upon these changes in the intensity and direction of the magnetic flux that the operation of this relay depends.

With this structure a variety of results are obtained. When direct current is applied in one direction, an armature will be actuated by one of the poles of the permanent magnet. With a reversal of current another armature will be actuated by the other pole of the permanent magnet. Alternating current will cause both armatures to be actuated.

The preferred form of the invention is shown in the drawing, together with a diagram of a circuit in which it might be used to advantage.

Between the legs N and S of a U shaped permanent magnet 1 is located an electromagnet, of which 3 (shown in dotted lines) is the soft iron core, and 4 is the winding terminating in wires 5 and 6. The core 3 terminates in a bent flattened piece 7, which is fastened to the permanent magnet 1, by a screw 8. A fiber disk 2 is provided to protect the winding 4. A fiber block 9 is fastened on the core 3 of the electromagnet and fits snugly between the legs N and S of the permanent magnet to hold the core 3 rigid. Core 3 ends in a flattened portion 10. Supporting members 11 and 13 are bolted fast to the flattened portion 10 by means of bolts 12 and 15. Between supporting members 11 and 13 is held a fiber base 22. Under the nut 16 of the bolt 12 is placed a lug 14 which furnishes a means of grounding, through the wire 42, the supporting members 11 and 13. Spring members 20 and 21 serve as hinge supports for armatures 17 and 18 respectively. Rivets 19 are used to permanently fasten the spring member 20 to supporting member 13 and to armature 17. Likewise, spring member 21 is permanently fastened by means of rivets 19 to supporting member 11 and armature 18.

Contact members 23 and 24 are fastened to fiber base 22 by means of bolts 25 and 30. Bolt 30 is insulated from contact member 23 by means of insulating washer and sleeve 31. Similarly bolt 25 is insulated from contact member 23 by means of washer and sleeve 28.

In order to provide a means for connecting the contact member 23 and 24 in a circuit, a lug is placed between the insulator 28 contacting with contact member 23, and a lug 27, is placed under the nut 26 of the bolt 25.

Contact member 23 is provided with a threaded screw 33, having a lock nut 32, passing through contact member 23 and contacting with armature 17 at a point 36. Contact member 24 is provided with a similar contacting screw 35, having the locknut 34, which contacts with armature 18 at point 37.

In the circuit of which this relay forms a part, A, B and C are switching keys in which the inner or normal contacts are in contact with the swinging contacts. The outer or alternative contacts are connected to a source of current as shown. Left alternative contact A is connected with the negative pole of a current source of which the positive pole is grounded. Left alternative contact B is connected with the positive pole of a current source of which the negative pole is grounded. Left alternative contact C is

connected to one of an alternating current source of which the other side is grounded. The right alternative contacts A, B, and C are connected to a return ground.

Normally current flows from grounded battery 42 through relay 39, lug 29, contact member 23, screw 33, contact 36, armature 17, spring 20, supporting member 13, lug 14 and wire 42 completing the circuit through ground.

Similarly current flows from grounded battery 43 through relay 38, lug 27, contact member 24, screw 35, contact 37, armature 18, spring 21, supporting member 11, bolt 12, lug 14, wire 42, completing the circuit through ground.

Thus relays 38 and 39 are normally energized.

The circuit from battery 42, through relay armature and contact 39, and lamp 41 to ground, is held open at the relay armature by the energization of relay 39. Similarly the circuit from grounded battery 43 through relay armature and contact 38 and lamp 40 to ground is held open at the relay armature by the energization of relay 38.

When key A is operated, negative current flows through left alternative contact of key A through the normal contacts of keys B and C, over the line 5, through winding 4 of the electromagnet, energizing the core 3, over line 6, through the right normal contacts of keys C and B, through the right alternative contact of key A to ground. The core 3 is energized so that the end 10 becomes a north pole and end 7 a south pole.

The tendency is therefore for leg S to be magnetically strengthened and for the leg N to be weakened. Armatures 17 and 18 being under the magnetic influence of the electromagnet become north poles. Consequently armature 18 is attracted to leg S and armature 17 is repelled by leg N. If sufficient current is introduced in the circuit the armature 18 breaks contact with screw 35 at point 37 and the circuit through which current energizes relay 38, is opened. The circuit through lamp 40 is then closed and lamp 40 lights giving the desired signal.

Similarly, operating key B produces the opposite magnetic effect in the relay. The armature 17 is drawn away from screw 33 opening the contact 36. Relay 39 then releases and lamp 41 lights.

When key C is operated, the operation of the armatures is a combination of what happened in the two preceding cases. But the residual magnetism of the legs N and S is great enough to keep both of the armatures 17 and 18 drawn away from the screws 33 and 35. Both lamps 40 and 41 then light in the manner before shown.

Three signals are thus shown, lamp 40 when negative current is applied to the relay, lamp 41 when positive current is similarly applied, and the combination of the two lamps 40 and 41 when alternating current is applied.

What is claimed is:

1. A relay comprising a U shaped permanent magnet, an iron core supported thereby and extending midway between the legs thereof, a magnetizing coil mounted on said core, a pair of armatures mounted on said core, one of said armatures extending over one pole of the permanent magnet, the other of said armatures extending over the other pole of the permanent magnet, and a contact member for each of said armatures, said contact members being supported by the said core and insulated therefrom and from each other.

2. A relay comprising a U shaped permanent magnet, an iron core magnetically contacting therewith and supported thereby midway between the legs thereof, a magnetizing coil mounted on said core, a pair of armatures resiliently mounted on said core, one of said armatures extending over and in front of one pole of said permanent magnet, the other of said armatures extending over and in front of the other pole of said permanent magnet and a contact member for each of said armatures, said contact members being supported by the said core and insulated therefrom and from each other.

In witness whereof, I hereunto subscribe my name this 28th day of November A. D., 1919.

LOUIS A. MORTIMER.