March 30, 1926. 1,578,411

J. ERICKSON

ELECTROMAGNETIC RELAY

Filed Oct. 1, 1920

Fig. 2

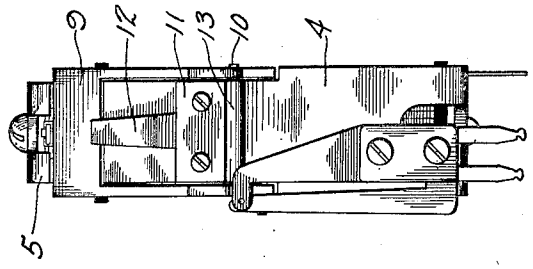


Fig. 3

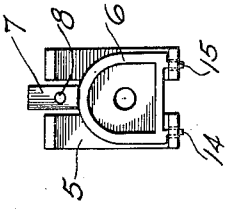
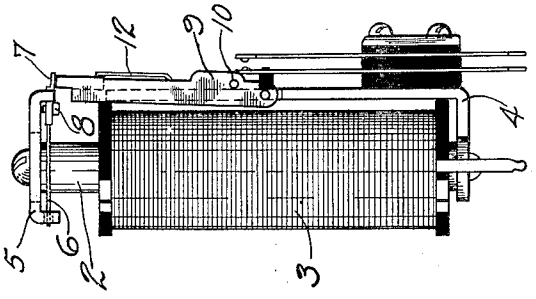


Fig. 1



Inventor

John Erickson

Chas. M. Landy. Atty.

Patented Mar. 30, 1926.

1,578,411

UNITED STATES PATENT OFFICE.

JOHN ERICKSON, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AUTOMATIC ELECTRIC INC., OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE.

ELECTROMAGNETIC RELAY.

Application filed October 1, 1920. Serial No. 414,109.

To all whom it may concern:

Be it known that I, JOHN ERICKSON, a citizen of the United States of America, and a resident of Chicago, Cook County, and State of Illinois, have invented certain new and useful Improvements in Electromagnetic Relays, of which the following is a specification.

My invention relates in general to electromagnetic relays, but more especially to relays of the alternating current type; and the object of the invention is the provision of an alternating current relay which will attract its armature when energized and hold the same steady in attracted position.

Numerous efforts have been made before to produce a satisfactory relay of this type. One form especially has come into quite extended use, and comprises a relay having a permanent air gap and an armature which when attracted moves into the air gap in a direction at right angles to the lines of force. This relay is fairly steady in operation and has given satisfactory service in many cases, but is not entirely free from the objectional vibration which is commonly known as "chattering." Stated more specifically, the object of my invention is the improvement of a relay of the foregoing type with a view to eliminating all unsteadiness and vibration, and the desired result is accomplished by adding a kind of magnetic brake which is not only exceedingly simple but which eliminates all armature vibration.

The preferred construction of the brake and the manner of its application will be described fully hereinafter, reference being had to the accompanying drawing.

In the drawing, which comprises a single sheet, Fig. 1 is a side view of alternating current relay embodying my invention; Fig. 2 is a rear view of the same relay; while Fig. 3 is a detail which has been added in order to show the construction of the brake more clearly.

As stated hereinbefore, the relay itself is of well known construction, and hence need be only briefly described. It comprises a core 2, supported on a heel piece 4, and having a winding 3. At the upper end of the core the pole piece 5 is secured by means of a machine screw. It will be seen that this construction affords a magnetic circuit which is entirely closed except for a small air gap between the pole piece 5 and the heel piece 4. The armature of the relay is indicated by the reference character 9 and is a U shaped stamping of soft iron as shown clearly in Fig. 2. The armature is attached or pivoted to the heel piece 4 by a rod 10 which is clamped to the heel piece under the convex portion 13 of the brass plate 11. When the relay is in de-energized condition the horizontal portion of the armature lies just outside the air gap in the magnetic circuit. An extension 12 of the plate 11 is properly adjusted as a stop to limit the outward movement of the armature.

Having described briefly the essential parts of the relay itself the construction of the brake will now be explained. The brake is preferably a light stamping of soft iron of the shape shown most clearly in Fig. 3. It comprises a member 6 having an extension which is partially enclosed in a thin strip of brass 7. This brass strip is folded around the edges of the said extension to form a sleeve and is further secured by means of a brass rivet 8. The rivet 8 also serves as a stop to limit the stroke of the armature. The brake member is secured to the pole piece 5 by means of two projections 14 and 15 which fit loosely in corresponding holes in the pole piece. The extension of the brake member, with its brass sleeve 7, rests lightly on top of the armature 9. It will be understood that the brass sleeve 7 serves to prevent the brake from sticking to the armature.

The operation of the relay is as follows: Suppose that an alternating current is passed through the winding of the relay, the relay terminals being connected to some

suitable circuit for this purpose. Armature 9 will at once be attracted (see Fig. 1) and will turn about the pivot 10 in a counter clock-wise direction until the movement is stopped by the head of rivet 8, when the upper horizontal portion of the armature will lie squarely within the air gap between the pole piece 5 and the heel piece 4. The major portion of the magnetic flux generated will follow a path which includes the core 2, pole piece 5, armature 9 and heel piece 4. It will be seen, however, that the brake member, which except for the thin brass residual is in actual contact with the armature 9, will partially short circuit that portion of the air gap which lies between the pole piece 5 and the armature 9, and a portion of the flux will therefore pass from the pole piece to the armature by way of the brake member. The cross section of the brake member is so small that it does not shunt enough of the flux to interfere with the operation of the relay, that is, with the normal attraction of the armature; but the small portion of flux which does pass through the brake member is effective to cause the brake member to be sharply attracted to the armature, and a frictional contact is thus secured between the sleeve 7 and the armature which eliminates all vibration. The effectiveness of the brake is due to the fact that it operates on exceedingly small current values and retains frictional control of the armature at all times except when the value of the current is at, or very close to zero. Since a relatively heavy armature is used its inertia is sufficient to bridge over these short periods and absolute steadiness is secured.

Having described my invention, what I consider to be new and desire to have protected by Letters Patent will be pointed out in the appended claims.

What I claim as my invention is:

1. In an alternating current relay, an armature, and a friction brake for steadying the armature in attracted position as long as the relay is energized.

2. In an alternating current relay, an armature and an electro-magnetically operated brake continuously operated for steadying said armature in attracted position while the initial supply of current to the relay remains untouched.

3. In an alternating current relay, an armature adapted to be operated when the relay is energized, and a brake for steadying the armature in attached position, said brake being held in frictional contact with said armature by magnetic attraction.

4. In an alternating current relay, a path for magnetic flux including an air gap, an armature adapted to move into said air gap at right angles to the lines of force flowing across said gap, and mechanical means for steadying said armature in its advanced position.

5. In an alternating current relay, a path for magnetic flux including an air gap, an armature adapted to move into said air gap at right angles to the lines of force flowing across said gap, and a braking member held in frictional contact with said armature by magnetic attraction.

6. In an alternating current relay, a path for magnetic flux including an air gap, an armature adapted to move into said air gap at right angles to the lines of force flowing across said gap, a member of magnetic material shunting part of said air gap, and a braking surface on said member held in frictional contact with said armature.

7. In an alternating current relay, a path for magnetic flux including an air gap, an armature adapted to reduce said air gap when attracted, a braking member for said armature, and a second path for magnetic flux including said braking member and a constant non-ferrous gap between said braking member and the said armature.

8. In an alternating current relay, a path for magnetic flux including an air gap, an armature adapted to reduce said air gap when attracted, a braking member for said armature, a second path for magnetic flux including said braking member whereby the said member is held in frictional contact with said armature when the same is operated, and a non-magnetic material interposed between said member and armature to prevent the brake from sticking.

9. In an alternating current relay, paths for magnetic flux including a non-ferrous gap whose length is subject to change and a second non-ferrous gap whose length is constant, and an armature included in both gaps and adapted to change the length of said first gap when the relay is energized.

10. In an alternating current relay, paths for magnetic flux including a non-ferrous gap whose length is subject to change and a second non-ferrous gap whose length is constant, an armature included in both gaps and adapted to change the length of said first gap when the relay is energized, and a braking member held in contact with said armature by the flux flowing across said constant gap.

11. In an alternating current relay, a pole piece, an armature, pivoting means permitting said armature to approach said pole piece when the relay is energized but preventing said armature from engaging the pole piece, and a friction brake for steadying the said armature in operated position.

12. In an alternating current relay, a pole piece, an armature, pivoting means permitting said armature to approach said pole piece when the relay is energized but preventing said armature from engaging the

pole piece, and an electromagnetically operated brake for steadying said armature in operated position.

13. In an alternating current relay, an armature responsive to the energization of the relay, and a friction brake for steadying the armature after the same has come to rest in attracted position.

14. In an alternating current relay, an armature responsive to the energization of said relay, and a brake member in frictional contact with said armature for preventing the same from vibrating while in attracted position.

Signed by me at Chicago, Cook County, Illinois, this 28th day of September, 1920.

JOHN ERICKSON.