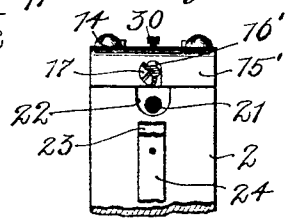
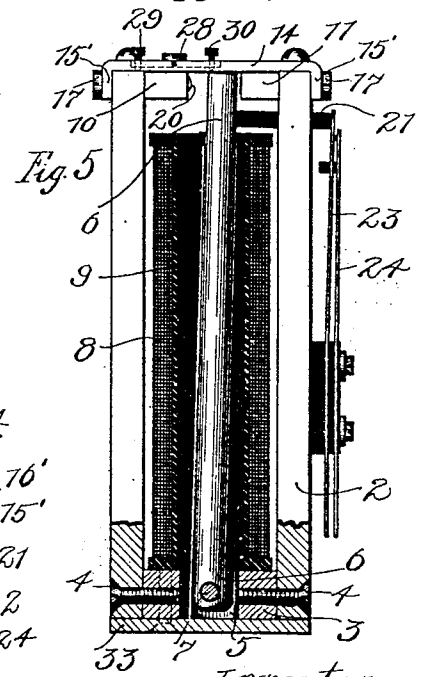
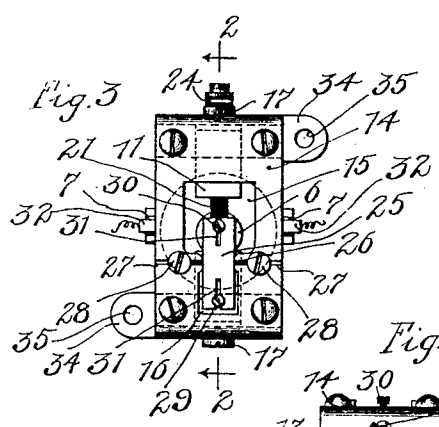
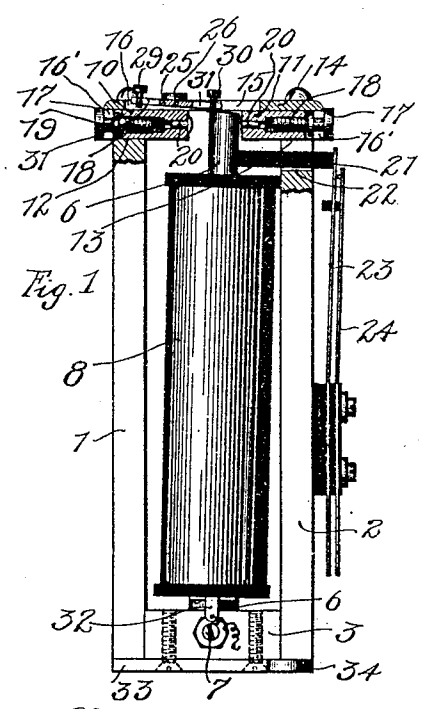
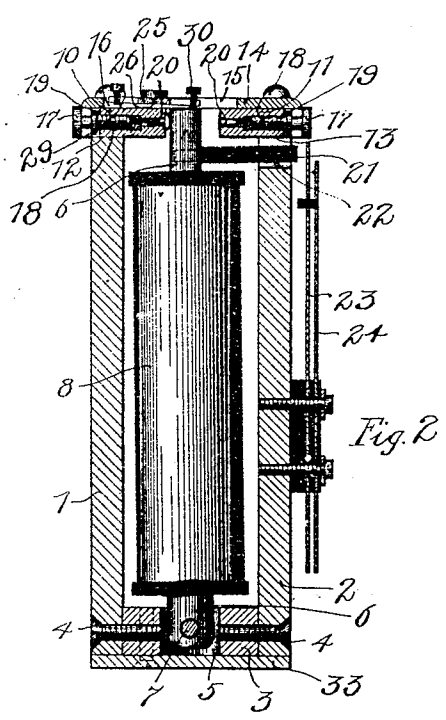


DRAFTSMAN

No. 853,305.

PATENTED MAY 14, 1907.

W. KAISLING.
CIRCUIT CHANGING APPARATUS.
APPLICATION FILED NOV. 23, 1903.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM KAISLING, OF CHICAGO, ILLINOIS, ASSIGNOR TO STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

CIRCUIT-CHANGING APPARATUS.

No. 853,305.

Specification of Letters Patent.

Patented May 14, 1907.

Application filed November 23, 1903. Serial No. 182,390.

To all whom it may concern:

Be it known that I, WILLIAM KAISLING, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Circuit-Changing Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to circuit changing apparatus and particularly to the class known in the art as relays.

The principal object of my invention is the provision of a relay in which the armature portion is magnetically operated in either direction, and in which said armature portion requires greater energy to operate in one direction than in another.

My invention also embodies novel features of construction and for operating such a relay.

My improved relay consists primarily of a permanent U-shaped magnet in the bend of which is pivoted an electromagnet core, about which is disposed a magnetizing winding which may either move with the core or be stationary with respect to the permanent magnet. The upper end of the core swings between the pole faces of the permanent magnet and at either end of its stroke may be associated with switching mechanism for changing or establishing any desired circuits. I provide novel means whereby the actuation of the core in one direction requires more energy than actuation in another direction. This I accomplish by the use of a magnetic brake which consists of a small armature pivoted so that the greater portion thereof lies over one of the poles of the permanent magnet, the other end of the armature being normally in contact with the swinging end of the core. Normally the lines of force form a closed circuit through the limb of the permanent magnet over which is pivoted the armature, through the armature and through the core. The end of the armature over the core is thus attracted, while the end over the pole piece, being of the same polarity as the pole piece, is repelled thereby. If a current be now passed through the energizing coil to give the end of the core a like polarity as the pole end over which the armature is pivoted

the core would be repelled by this pole end and will be attracted by the other pole end of the permanent magnet which is of opposite polarity. The armature being of opposite polarity from the core is repelled thereby and consequently a very little energy is required to actuate the core toward the permanent magnet pole of opposite polarity, as the braking action of the braking armature is removed. On the other hand, should the current through the energizing coil give the core a polarity unlike that of the permanent magnet pole over which is pivoted the braking armature, the core will be attracted by this pole end and repelled by the other pole, which now is of like polarity as the core. The braking magnet, however, being of opposite polarity, will be strongly attracted by the core, the consequence being that the core is resisted by this magnetic braking action and it requires much more energy to attract it toward the armature supporting pole.

I shall describe my invention more clearly with reference to the accompanying drawings in which:—

Figure 1 is an elevation view, Fig. 2 is a longitudinal vertical section taken on line 2, 2 of Fig. 3; Fig. 3 is a top view, Fig. 4 is a detail view of a portion of the relay, and Fig. 5 shows a modified relation of core and energizing winding.

Like characters of reference refer to like parts throughout the figures.

The permanent U-shaped magnet may be integral or may consist, as shown, of limbs 1 and 2 united by a yoke piece 3 by means of screws 4, 4. A circular opening 5 passes through the center of the yoke piece and an electromagnet core 6 is pivoted at its lower end in said opening between pivot screws 7, 7, passing into said opening through the sides thereof. An energizing coil 8 surrounds the core 6 and may be secured thereto to swing therewith, or may be stationarily mounted upon the yoke 3, as shown in Fig. 5, the core opening 9 thereof in this case being large enough to permit free swinging of the core. Pole pieces 10 and 11 at the upper end of the limbs 1 and 2, respectively, are adapted to be adjusted inwardly and outwardly and are disposed in slots 12 and 13. A cap piece 14 of non-magnetic material extends across the ends of the limbs 1 and 2 over the pole pieces

thereon and has a larger central opening 15 and a smaller opening 16 leading into said larger opening. The side ends 15', 15' of this cap are turned downwardly to extend for a distance along the outer sides of the limbs 1 and 2 and are provided with slots 16', said slots passing between the heads 17 of screws 18 and collars 19 on said screws, the threaded ends of the screws engaging the outer ends of the pole pieces. By turning these screws the pole pieces are either pushed inwardly or drawn outwardly to adjust the air gap between the pole faces and the core.

The inner end of the pole faces may be provided with studs 20 of non-magnetic material to prevent magnetic sticking of the core against the pole faces. An actuating stud 21 of insulating material extends horizontally from the top of the core and through an opening 22 which may be a continuation of slot 13. As the core swings toward the pole piece 11 this actuating stud forces a contact spring 23 against another contact spring 24 to thus close a circuit. These springs are mounted upon the limb 2, but insulated therefrom and from each other, and may be of any number and of any arrangement. These springs might, however, be placed in any other position as, for instance, upon the limb 1. Suppose now that the pole piece 10 should be of north polarity and the pole piece 11 of south polarity, and that a current be sent through the energizing coil which would give the end of the core a north polarity, the core will be attracted by the south pole of the magnet and repelled by the north pole of the magnet and the actuating stud will engage the switch springs to cause desired circuit changes. If the current be reversed to give the core a south polarity, the armature will be swung to the left. As it is sometimes desirable that the core should move more readily in one direction than in the other, that is, should require more energy to move it one direction than the other, I provide novel means for magnetically braking the core upon energizing current passing through the energizing coil in a certain direction. This I accomplish by the use of a keeper or armature 25 pivoted between the openings 15 and 16 in the cap piece 14 so that the greater portion thereof lies directly over the pole piece 10 for instance, the inner end of the armature being long enough to extend over the top face of the core in any of its positions. The armature is mounted upon a pivot pin 26, which extends at either side thereof and is disposed in slots 27 and held therein by the heads of screws 28. To adjust the air gap between the top of the pole piece 10 and the armature end disposed thereover, I provide an adjusting screw 29, and to adjust the air gap between the end of the core and the armature I provide an adjusting screw 30, these adjusting screws being held in any

adjusted position by passing through clamping slots 31 extending at the ends of the armature. Under normal conditions, there will be a tendency to create a magnetic circuit through the limb 1, pole piece 10, the armature 25, the core 6, and the yoke piece 3. As the pole piece 10 and the portion of the armature thereover are of like polarity, the armature will be repelled at this end and the other end will rest upon the top of the core. Thus under normal conditions the core will be braked and held in any position by the armature. As current now flows through the energizing coil to create north polarity in the end of the core, the armature will be repelled by the core and, consequently, the braking action will be removed to allow the core to be readily and quickly attracted by the south pole of the magnet, very little energy being required. On the other hand, should current pass to create south polarity in the core end, the armature will be strongly attracted by the end of the core and the braking action caused thereby will require much more energy through the energizing coil in order that the core may swing over toward the north pole of the permanent magnet. The closer the armature end will be allowed to come to the end of the core by means of the adjusting screw 30, the stronger will be this attracting action and the amount of energy required for actuating the core can thus be regulated. Upon interruption of the energizing current when the core is in position as shown in Fig. 1, the armature will again engage the top of the magnet to lock the magnet in position so that the circuit conditions at the switch springs will be maintained. The energizing coil may be provided with terminal tips 32, 32, which enable the coil to be connected in a circuit. As the relay when operative is in an upright position, I provide a base piece 33, provided with lugs 34, 34, having openings 35, 35, by means of which the relay may be screwed to a mounting base.

In Fig. 5 I have shown a modified construction. The energizing coil 8 instead of being arranged to swing with its core as in the construction illustrated in the other figures, is rigidly secured to the yoke piece 3. The core opening 9 in this modification is made sufficiently large to permit the free swinging of the core therein. The other parts of the device are constructed precisely as described with reference to the other figures.

Changes may readily be made in the mechanical construction and arrangement of the relay parts without departing from the spirit of the invention, and I do not, therefore, wish to be limited to the relay as shown.

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

1. In a device of the class described, the

combination with a magnet, of an armature adapted to swing between the poles thereof, means for polarizing said armature, and braking means for retarding the actuation of said armature when it is polarized in one direction, and for releasing said armature when polarized in reverse direction.

2. In a device of the class described, the combination with a magnet, of an armature adapted to swing between the poles thereof, an energizing coil for polarizing said armature, and braking means mechanically associated with said armature for normally retarding actuation thereof and for retarding actuation thereof when said armature is polarized in one direction and for releasing said armature when polarized in the reverse direction.

3. In a device of the class described, the combination with a magnet, of an armature adapted to swing between the poles thereof, an energizing coil for polarizing said armature in either direction, and a brake mechanically engaging said armature and included in and controlled by the magnetic circuit through said armature and magnet, said brake being adapted to retard the actuation of said armature when said armature is polarized in one direction and to release said armature when it is polarized in the reverse direction.

4. In a device of the class described, the combination with a U-shaped permanent magnet, of an armature adapted to swing between the poles thereof, a winding for polarizing said armature whereby said armature may be attracted in either direction by said permanent magnet, a brake lever disposed in the path of the magnetic circuit through said core and said magnet, current flow in one direction through said polarizing winding causing attraction of said brake lever against the armature end, whereby the actuation of the armature upon attraction is retarded, and current flow in the opposite direction through said winding causing said brake to be released from the armature end to allow unimpeded actuation thereof.

5. In a device of the class described, the combination with a U-shaped permanent magnet, of an armature pivoted at the bend thereof and adapted to swing between the poles thereof, and a mechanical brake adapted for frictional engagement with the armature end to retard the actuation thereof, upon current flow through the energizing winding in one direction said mechanical brake being magnetically controlled by the magnetic circuit through said magnet and armature.

6. In a device of the class described, the combination with a permanent U-shaped magnet, of an armature pivoted in the bend thereof and adapted to swing between the poles thereof, energizing coils surrounding said armature for causing polarization there-

of, a magnetic brake normally having frictional engagement with the end of the core to retard the actuation thereof, current flow through the energizing winding in one direction causing increased frictional engagement of the brake with the armature, and current flow in the opposite direction through said winding causing release of said braking mechanism from said armature.

7. In a device of the class described, the combination with a permanent U-shaped magnet, of an armature adapted to swing between the poles thereof, means for polarizing said armature to cause its attraction by either of the magnet poles, and magnetic means for resisting the actuation of said armature.

8. In a device of the class described, the combination with a permanent U-shaped magnet, of an armature adapted to swing between the poles thereof, means for polarizing said armature to cause its attraction by either of the magnet poles, and magnetic means for resisting the actuation of said armature in one direction.

9. In a device of the class described, the combination with a U-shaped permanent magnet, of an armature in the shape of a core pivoted in the yoke of said magnet and adapted to swing between the magnet poles, means for polarizing said core to cause attraction thereof by either magnet pole, and a keeper disposed above one of said magnet poles and extending over the path of the swinging core, said keeper being adapted to mechanically affect said core to resist its actuation.

10. In a device of the class described, the combination with a U-shaped permanent magnet, of an armature in the shape of a core pivoted in the yoke of said magnet and adapted to swing between the magnet poles, means for polarizing said core to cause attraction thereof by either magnet pole, and a pivoted keeper disposed above one of said magnet poles and extending over the path of the swinging core, said keeper being adapted to mechanically affect said core to resist its actuation.

11. In a device of the class described, the combination with a permanent U-shaped magnet, of a core pivoted in the yoke of the magnet and adapted to swing between the magnet poles, an energizing coil for polarizing said core to cause its attraction by either of the magnet poles, and a keeper pivoted so that one end is disposed over one of the magnet poles and the other end thereof extends over the path of the core and in contact with said core.

12. In a device of the class described, the combination with a permanent U-shaped magnet, of an armature core pivoted in the yoke of the magnet and adapted to swing between the magnet poles, an energizing coil for

polarizing said core to cause attraction thereof by either of the magnet poles, and a pivoted keeper, one end of said keeper being disposed over one of the magnet poles, the other end thereof being in contact with said core, whereby said core is held in any actuated position.

13. In a device of the class described, the combination with a U-shaped permanent magnet, of a core pivoted in the bend thereof and extending upwardly to swing between the magnet poles, an energizing coil for said core, a keeper disposed over one of the magnet cores and extending over the path of the core and normally in contact therewith, current through said energizing coil in one direction causing attraction between the other magnet pole and the core and repulsion between the keeper and the core, while current in the opposite direction through said energizing coil causes attraction between said core and the keeper and attraction between the core and the pole over which said keeper is disposed, said keeper when attracted being adapted to come into contact with the swinging core to resist its actuation.

14. In a device of the class described, the combination with a permanent U-shaped magnet, of an electromagnet core pivoted at the yoke of the magnet and extending upwardly to swing between the poles of the magnet, a keeper pivoted between one of the poles of the magnet and the core to extend over said pole and part-ways between the poles over the path of the core and normally in contact with the core, an energizing winding for said core, current through said winding in one direction causing polarization of said core to cause attraction between the core and the other pole and repulsion between the core and the keeper, current through said winding in an opposite direction polarizing said core to cause attraction between the core and the keeper, and attraction between the core and the pole over which the keeper is disposed, whereby the actuation of the core is resisted.

15. In a device of the class described, the combination with a permanent U-shaped magnet having inwardly extending pole pieces, a core pivoted at the yoke of the magnet and extending upwardly to swing be-

tween the pole faces, adjusting means for said pole pieces for regulating the air gap between the core and the pole faces, a keeper pivoted over the inner end of one of the pole pieces, one end of the keeper extending over said pole piece, and the other end extending over the core and normally in contact therewith, and an energizing winding for polarizing said core, current in one direction through said winding causing attraction between said core and the keeper and attraction between the core and the pole over which the keeper is disposed, thus bringing said keeper into mechanical connection with said core to retard its actuation, current through said core in an opposite direction causing repulsion between said keeper and attraction between the core and the other pole piece.

16. In a device of the class described, the combination with a permanent U-shaped magnet having inwardly extending pole pieces, of a core pivoted in the magnet bend and extending upwardly to swing between the pole faces, adjusting means for regulating the air gap between the core and the pole faces, a keeper pivoted over the inner end of one of the pole pieces, one end of the keeper being disposed over said pole piece and the other end thereof extending over the core normally in contact therewith, an energizing winding for polarizing said core, current through said coil in one direction causing attraction between said keeper and its associated pole piece, whereby the actuation of the core in this direction is braked, current through the coil in the opposite direction causing repulsion between said core, the keeper and the associated pole piece, and attraction between the core and the other pole piece, adjusting screws for adjusting the air gap between said keeper and the associated pole piece and core, an actuating stud on said core, and switch springs adapted to be actuated by said stud upon attraction of the core.

In witness whereof, I hereunto subscribe my name this ninth day of November A. D., 1903.

WILLIAM KAISLING.

Witnesses:

ARTHUR BOETTCHER,
JOHN STAHR.