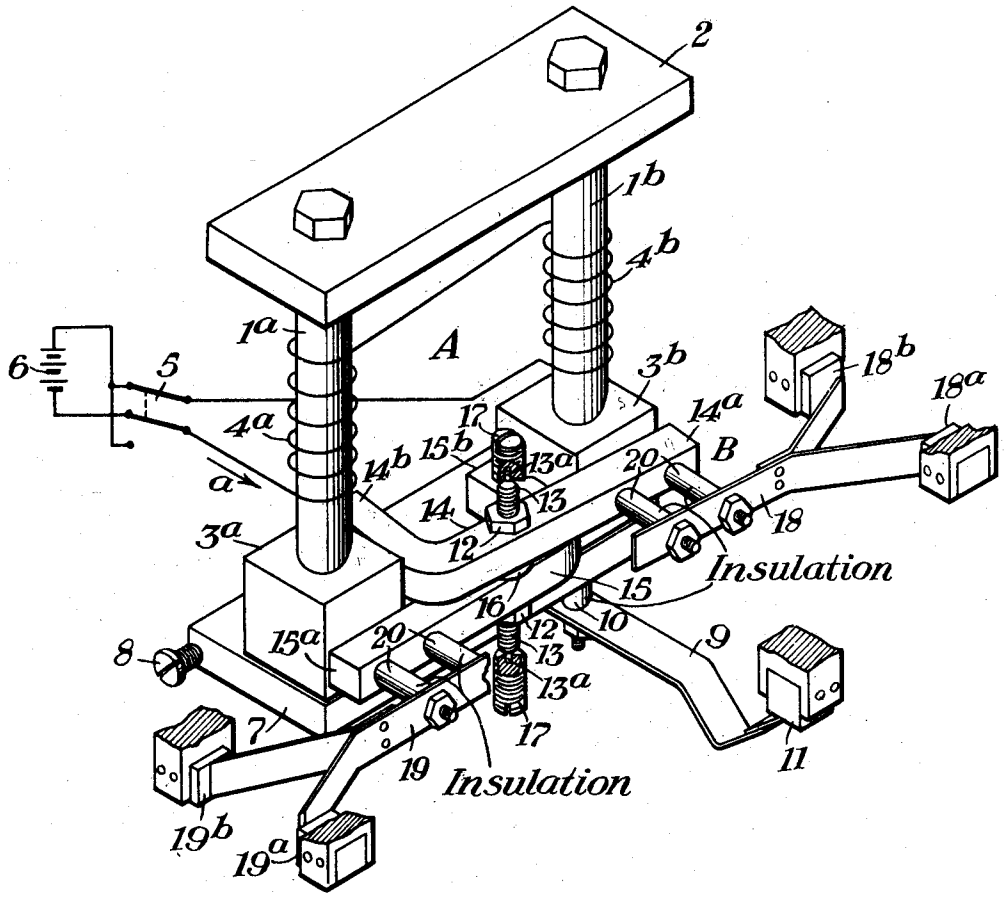
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ELECTRICAL RELAY

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ELECTRICAL RELAY

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My invention relates to electrical relays, and particularly to electrical relays of the polarized type comprising a neutral armature responsive to the presence and absence of operating current, and a polarized armature responsive to the polarity of the operating current.

I will describe one form of relay embodying my invention, and will then point out the novel features thereof in claims.

The accompanying drawing is a view partly diagrammatic, showing in isometric projection, one form of relay embodying my invention.

Referring to the drawing, the reference character A designates an electromagnet of the usual type, comprising two parallel cores 1^a a nd 1^b connected at the top by a back strap 2, and terminating at the bottom in enlarged pole pieces 3^a and 3^b, respectively. As here shown, the pole pieces are square and have their inside faces confronting. The cores 1^a and 1^b are provided with the usual energizing windings 4^a and 4^b, respectively, which windings are connected in series and are supplied with direct current from a suitable source such as a battery 6, through a pole changer 5. A neutral armature 7 is pivotally supported on pivot pins 8, only one of which is visible in the drawing, so that this armature moves toward and away from the pole pieces 3^a and 3^b in accordance with the presence and absence of operating current in electromagnet A. Attached to the underside of the armature 7, by means of insulating studs 10, is a contact finger 9. The contact finger 9 co-acts with a fixed contact 11 of graphite or other suitable electrical conducting material in such manner that contact 9—11 is closed only when windings 4^a and 4^b are energized.

The electromagnet A also controls a polarized armature B which, in the form here shown, comprises two L-shaped constantly magnetized members 14 and 15 rigidly fastened together by two nuts 12 screwed on a threaded rod 13 passing through holes in both members. The members 14 and 15 are preferably spaced from each other by a non-magnetizable spacer 16 in order to minimize any mutual de-magnetizing effect of the members. The ends 13^a of the rod 13 are turned down to form pivots which are journalled in vertical trunnion screws 17, thereby permitting the armature to rotate in a horizontal plane above the pivots. The members 14 and 15 are so proportioned and disposed, and the locations of the trunnion screws 17 are such, that when armature B is rotated in a clockwise direction to the extreme position in which it is illustrated in the drawing, the legs 15^a and 15^b of the member 15 are adjacent the pole pieces 3^a and 3^b, respectively, while the legs 14^b and 14^a of the member 14 are spaced by a considerable air gap from the pole pieces 3^a and 3^b, respectively. When armature B is rotated in a counter-clockwise direction to the other extreme position, however, the legs 15^a and 15^b of the member 15 are then spaced by air gaps from the pole pieces 3^a and 3^b while the legs 14^b and 14^a are adjacent the pole pieces 3^a and 3^b. If desired, the armature may be prevented from actually touching the pole pieces by short non-magnetizable stops (not shown) attached to the members on the sides adjacent the pole pieces. The members 14 and 15 are magnetized in such manner that the legs 14^a and 15^a are of one polarity and the legs 14^b and 15^b are of the other relative polarity. For purposes of explanation, I will assume that the legs 14^a and 15^a are north magnetic poles, and that the legs 14^b and 15^b are south magnetic poles. With the polarized armature B constructed in this manner, the operation of the armature is as follows: If current flowing in the direction indicated by the arrow *a* is supplied to the windings 4^a and 4^b, as when the pole changer 5 occupies the position in which it is illustrated in the drawing, pole piece 3^a becomes a south pole and pole piece 3^b becomes a north pole. Under these conditions, the leg 15^a of the member 15, being a north pole, is attracted to the outside face of pole piece 3^a, and the leg 15^b of the member 15, being a south pole, is attracted to the inside face of the pole piece 3^b; while the leg 14^b of member 14, being a south pole, is repelled from the inside face of the pole piece 3^a and leg 14^a being a north

pole, is repelled from the outside face of pole piece 3^b. Armature B is therefore swung in a clockwise direction to the extreme position in which it is illustrated in the drawing. If the polarity of the current supplied to the windings 4^a and 4^b is reversed, however, as when pole changer 5 is reversed, so that current flows in these windings in the opposite direction from that indicated by the arrow *a*, pole piece 3^a then becomes a north pole and pole piece 3^b becomes a south pole. As a result, leg 15^a of member 15, is repelled from the outside face of pole piece 3^a, and leg 15^b, is repelled from the inside face of pole piece 3^b; while leg 14^b of member 14, is attracted to the inside face of pole piece 3^a, and leg 14^a is attracted to outside face of pole piece 3^b. Armature B therefore rotates in a counter-clockwise direction to the other extreme position. If windings 4^a and 4^b are de-energized, the armature B will remain in the position to which it was last moved and the armature 7 will, of course, drop to open contact 9—11.

The polarized armature B may be employed to control one or more contacts in any desired manner. As here shown, the armature carries two Y-shaped contact members 18 and 19 which are attached to the members 14 and 15, respectively, by means of insulating studs 20. When armature B occupies the extreme position in which it is illustrated in the drawing, the contact member 18 engages a fixed contact 18^a of graphite or other suitable electrical conducting material, and the contact member 19 engages a similar fixed contact 19^b. When armature B is swung in a counter-clockwise direction to the other extreme position, however, the contact member 18 is moved away from the fixed contact 18^a and engages a similar fixed contact 18^b, while the contact member 19 is moved away from the fixed contact 19^b and engages a fixed contact 19^a.

One advantage of a polarized relay embodying my invention is that there are no movable joints in the magnetic circuit through the polarized armature other than the necessary working air gaps between the armature and the pole pieces, and the relay is therefore very efficient.

Another advantage of a relay embodying my invention is that the reversal of the polarized armature is accomplished by the repelling action of one member as well as by the attraction of the other member, so that a high torque is developed.

Although I have herein shown and described only one form of relay embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A relay comprising an electromagnet having two parallel cores each provided with a pole piece, a neutral armature arranged to swing toward or away from said pole pieces in response to the presence or absence of current in said electromagnet, a polarized armature comprising two L-shaped constantly magnetized members rigidly fastened together in such manner that the legs of one polarity extend in the same direction and the legs of the other polarity extend in opposite directions, and means for pivotally supporting said polarized armature in such manner that the legs which extend in the same direction are located between said cores and the legs which extend in opposite directions are located one beside each said pole piece in such manner that said armature is swung in one direction or the other by the combined attraction of one member and repulsion of the other member by both said pole pieces depending upon whether said electromagnet is energized by current of one relative polarity or the other.

2. A relay comprising an electromagnet having spaced rectangular pole pieces, a polarized armature comprising two L-shaped constantly magnetized members rigidly fastened together, and means for pivotally supporting said armature in such manner that the legs of said members having one polarity are movable toward and away from the inside confronting faces of said pole pieces respectively, while the legs of the other polarity are movable toward and away from outside faces of said pole pieces respectively.

3. A relay comprising an electromagnet having two parallel cores each provided with a pole piece, a neutral armature pivotally supported in a horizontal plane and arranged to swing toward or away from said pole pieces in response to the presence or absence of current in said windings, and a polarized armature comprising two L-shaped constantly magnetized members rigidly fastened together in such manner that the legs of one polarity extend in the same direction and the legs of the other polarity extend in opposite directions, and means for pivotally supporting said polarized armature for swinging motion in a horizontal plane between two extreme positions in such manner that when said electromagnet is energized by current of one relative polarity said armature is swung to one extreme position by the attraction between both legs of one said member and said pole pieces respectively and the repulsion between both legs of the other said member and said pole pieces respectively, but that when said electromagnet is energized by current of the other relative polarity said armature is swung to the other extreme position

by the repulsion between both legs of said one member and said pole pieces respectively and the attraction between both legs of said other member and said pole pieces respectively.

In testimony whereof I affix my signature.

NOBLE C. SHAW.