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POLARIZED MAGNETIC SWITCH STRUCTURE

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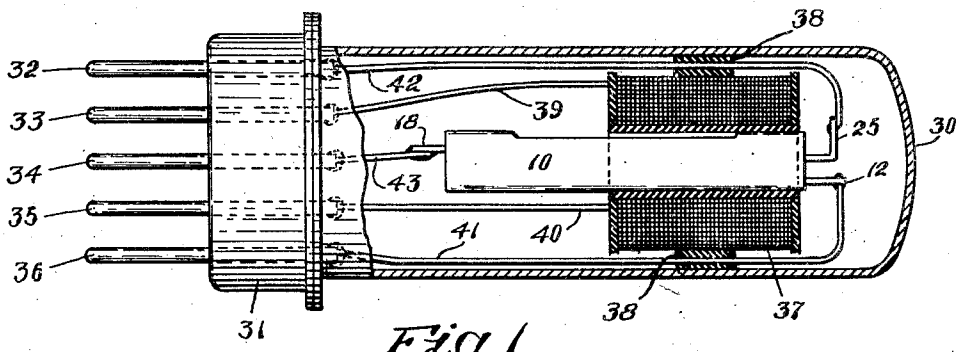

Fig. 1.

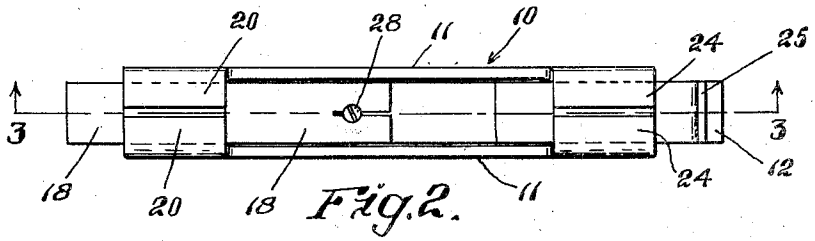

Fig. 2.

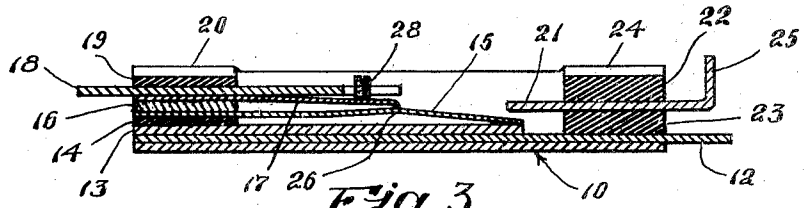

Fig. 3.

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POLARIZED MAGNETIC SWITCH STRUCTURE

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4 Claims. (Cl. 200—93)

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This invention relates to magnetic switches, and has as an object, the provision of a simple, inexpensive, magnetic switch capable of high speed operation.

The high speed, magnetic switches proposed heretofore, have included pairs of metal, reed armatures supported as cantilever beams in the opposite ends of sealed tubes, with their free ends overlapping. When a coil wound around such a pair of armatures is energized, their free ends are attracted together through being magnetized, and close an electric circuit in which they are included. Such switches are expensive to manufacture, their speed of operation is too low for many duties, and they have the disadvantage that the free ends of their armatures bounce away from each other when they strike, causing erratic operation.

This invention provides a high speed, magnetic switch having but a single reed armature supported as a cantilever beam, the free end of which extends between oppositely supported members of magnetic metal, whereby upon the energization of an encircling coil, the armature is attracted by one member and repelled by the other member, resulting in a very high operating speed. Through the free end of the armature contacting one magnetic member when the energizing coil is energized, and contacting the other magnetic member when the coil is deenergized, a double pole switch is provided. Damping is applied to the armature between its ends for preventing bouncing. The construction is inexpensive since it comprises a simple channel member having turned over ears which press upon spacers of insulating material which hold the armature and the damping and magnetic members in position.

The invention will now be described with reference to the drawing, of which:

Fig. 1 is a side elevation, partially in section, of an assembled relay embodying this invention;

Fig. 2 is a plan view looking downwardly upon the channel of Fig. 1 with the armature and the damping and magnetic members assembled therein, and

Fig. 3 is a sectional view along the lines 3—3 of Fig. 2.

Referring first to Figs. 2 and 3, the channel member 10 which may be of brass, has the spaced, parallel sides 11, and has open ends. The brass strip 12 extends through the channel in contact with the bottom thereof, and has one end extending beyond the right hand end, facing the drawing, of the channel for providing an electrical wiring connection. The strip 13 of magnetic metal is stacked on top of the strip 12 at the left hand end of the channel 10 and extends inwardly into the channel as illustrated by Fig. 3. The spacer strip 14 of electric insulating material is stacked on the strip 13. The outer end of the armature 15 of magnetic metal, is stacked on the strip 14, and the strip 16 of brass is stacked on the outer end of the armature. The outer end of the metal damping member 17 is stacked on the strip 16, and the brass strip 18 is stacked on the member 17 and has its outer end extending beyond the left hand end of the channel for providing an electrical wiring connection. The strip 19 of electric insulating material is stacked on the strip 18, and the ears 20 which are extensions of the sides 11 of the channel 10, are bent over as illustrated by Figs. 2 and 3, and press against the strip 19 and hold the described stacked assembly in position.

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The free inner end of the armature 15 and the inner end of the strip 13 extend substantially the same distance into the channel 10. The strip 21 of magnetic metal is supported in the right hand end of the channel between the spacers 22 and 23 of electric insulating material, the ear extensions 24 of the sides 11 of the channel being bent over so as to press against the spacer 22 for holding the member 21 in position.

The inner end of the member 21 overlaps the inner end of the armature 15 as illustrated by Fig. 3. The outer end 25 of the member 21 extends perpendicular to the member 21 for extending the direct magnetic path as will be described.

Both sides of the inner end of the armature have suitable electric contact surfaces provided thereon as do the lower surface of the inner end of the member 21 and the upper surface of the inner end of the strip 13.

The armature 15 is bent between its ends so as to have a humped portion 26 which is contacted by the downwardly extending inner end of the damping member 17. The screw 28 is threaded into the inner end of the strip 18, and its inner end contacts the member 17 and presses its inner end against the armature 15

Referring now to Fig. 1, the assembled relay illustrated, includes the enclosing tube 30 having the base 31 with the socket prongs 32, 33, 34, 35 and 36. The magnetizing coil 37 encircles the channel and supports same within the tube 30, the spacer 38 supporting the coil between the walls of the tube. The wires 39 and 40 connect the ends of the coil to the socket prongs 33 and 35

respectively. The wire 41 connects the strip 12 to the prong 36. The wire 42 connects the member 25 to the prong 32, and the wire 43 connects the strip 18 to the prong 34.

In operation, when the coil is deenergized, the inner end of the armature touches the inner end of the strip 13 thereby closing a circuit in which the prongs 34 and 36 are connected. When the coil is energized as by the application of direct current to the prongs 33 and 35, the magnetic field within the coil magnetizes the armature 15 and the strip 13 so that their inner ends have the same polarity, and the free end of the armature is repelled by the inner end of the strip 13. At the same time the member 21 is magnetized so that its inner end has the opposite polarity causing to attract the free end of the armature. This attraction and repulsion causes the armature to hinge about the humped portion 26 thereof which the inner end of the damping member 17 contacts, and to move upwardly against the inner end of the member 21 so as to close an electric circuit in which the prongs 32 and 34 are included, and to open the circuit in which the prongs 34 and 36 are connected. When the coil is again deenergized, the armature, the strip 13 and the member 21 become demagnetized, and the spring tension in the armature causes it to return its free end in contact with the inner end of the strip 13.

The damping member 17 by pressing against the armature 15 damps same against vibration and bouncing. The correct damping pressure is regulated by the adjustment of the screw 28 which then is sealed in position as by the application of a suitable cement thereto.

The perpendicular extension 25 of the magnetic member 21 serves to prolong the direct magnetic path between the member 21 and the left hand end of the armature when the coil 37 is energized, thus increasing the magnetic flux and the efficiency.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not limited to the exact apparatus and arrangement of apparatus illustrated, as modifications thereof may be suggested by those skilled in the art without departure from the essence of the invention.

What is claimed is:

1. A magnetic switch comprising a support, a flexible reed, contact making, armature of magnetic metal supported as a cantilever beam from one end of said support, a first member of magnetic metal extending alongside said armature and insulated therefrom, a contact member of magnetic metal insulated from said armature and supported from the other end of said support and having one end overlapping the free end of said armature, a damping reed of spring metal supported as a cantilever beam from said support, and having its fixed end spaced from the fixed end of said armature, and having its free end in contact with said armature between its ends, and pressing the free end of said armature against said first member, and a coil around said armature and members for causing, when energized, said free end of said armature to be repelled by said first member and to be attracted by said second member.

2. A magnetic switch as claimed in claim 1, in which the armature is bent towards and away from its point of contact with the damping reed.

3. A magnetic switch as claimed in claim 1, including adjustable means, said adjustable means being attached to the support and contacting the damping reed between its ends, and forcing its free end against the armature.

4. A magnetic switch as claimed in claim 1, in which the armature is bent towards and away from its point of contact with the damping reed, and including adjustable means, said adjustable means being attached to the support and contacting the damping reed between its ends, and forcing its free end against the armature.

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