Jan. 26, 1965 M. A. HAYWARD 3,167,693

ELECTROMAGNETIC RELAY

Filed Sept. 13, 1961

Fig. 1

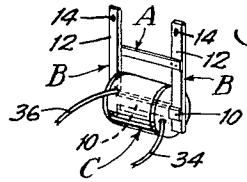


Fig. 2

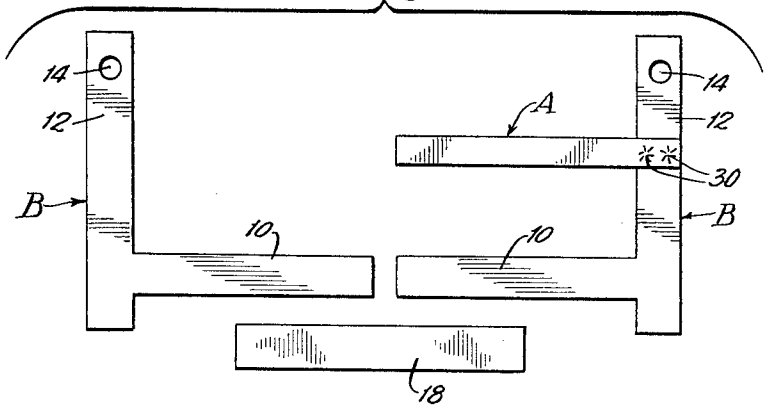


Fig. 3

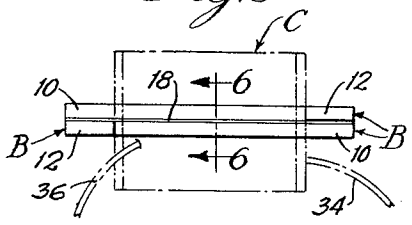


Fig. 4

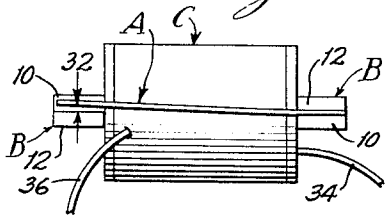


Fig. 5

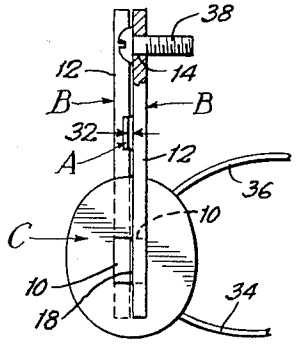
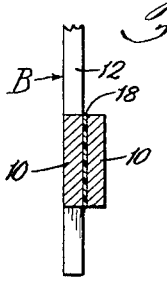


Fig. 6



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ELECTROMAGNETIC RELAY

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4 Claims. (Cl. 317—165)

This invention relates to a low-cost relay and particularly one of small size for toys and other small and miniature applications, such as for radio, television, missile and rocket control circuits and the like.

One object of the invention is to provide an efficient relay provided with a minimum number of parts for simplicity, low-cost and light weight.

Another object is to provide a relay consisting of a coil and three other parts which serve as core, mounting means, armature and circuit-establishing elements for the control circuit, the closure of which is responsive to energization of the relay coil.

More specifically it is my object to provide a two-part core member and an armature connected as by spot-welding to one the parts, the two parts being connected together in such manner that they are electrically insulated from, yet magnetically associated with, each other and with the armature in such manner that a substantially closed magnetic circuit is provided for attraction of the armature to the other core member part upon energization of the relay coil.

A further object is to provide a pair of core members of T formation with one leg of each T serving as a core through a relay coil and the other legs of the two T's being at opposite ends of the coil, and an armature connected to one of the core members and normally spaced from the other for attraction thereby to close a control circuit when the relay coil is energized, the core members being provided with performations for combination supporting and terminal screws whereby the core member and such screws serve as a support for the relay as well as circuit connections for the circuit controlled by the relay.

Still a further object is to cement the core members if desired to opposite sides of a strip of insulation such as Teflon interposed between the two core members whereby each core member may serve as one terminal of the controlled circuit.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of the relay to be disclosed, whereby the objects above contemplated are attained, as hereinafter more fully set forth, pointed out in my appended claims and illustrated in detail on the accompanying drawing, wherein:

FIG. 1 is a perspective view, substantially full size, of a low-cost relay embodying my invention.

FIG. 2 is an enlarged side elevation showing the parts of my relay with the exception of the relay coil.

FIG. 3 is a plan view on the same scale as FIG. 2 showing the assembly relationship of the two core members and the coil (in dot-and-dash lines) of my relay.

FIG. 4 is a plan view of the completely assembled relay.

FIG. 5 is an end elevation of the relay as viewed from the left end of FIG. 2, a portion of one core member being shown in section, and

FIG. 6 is a further enlarged sectional view on the line 6—6 of FIG. 3.

On the accompanying drawing, I have used the reference character A to indicate in general a flat strip armature, B to indicate a T-shaped core member, two of which are used, and C to indicate a relay coil. The four parts A, B, B and C together form my relay. Each core member B has a coil leg **10** and an end leg **12**. The armature A is spot-welded to one of the end legs **12** as illustrated for

instance at **30**, and the core members are assembled as in FIG. 3 with a strip of insulation **18** of Teflon tape or the like between their coil legs **10**. If desired the legs **10** may be cemented to the tape **18** to form a mechanical connection between the core members which at the same time electrically insulates them from each other but permits the flow of a magnetic circuit with very little reduction in the magnetic flux introduced by the relatively thin insulating material which may be on the order of .003" as compared to the thickness of the core members which may be .030" or thereabouts whereas the armature A may be approximately .005" thick.

The parts of FIG. 2 are assembled as in FIG. 3 with the coil C surrounding the legs **10** of the core members. The coil C has leads **34** and **36** for an energizing current while the core members B have perforations **14** for a pair of mounting screws **38** (as in FIG. 4) which may also serve as terminal screws. A gap **32** is shown in FIGS. 4 and 5 between the free end of the armature A and the end leg **12** of the other core member B, and it is obvious that when the coil is energized the armature will be attracted to the adjacent end leg **12** to establish a control circuit from one screw **38** to the other. The core members B are of course formed of magnetic material, as is the armature A, but the armature is preferably of spring material to maintain the gap **32** until such time as the coil C is energized, and to return the armature to its initial position providing the gap when the coil is de-energized.

It is also advantageous to silver plate at least the free end of the armature A and the adjacent portion of the end leg **12** of the other core member B to provide better circuit-making contact characteristics. An inexpensive way of doing this is to apply copper flash to the parts shown in FIG. 2 and then silver plate to a thickness such as, .001" over their entire surfaces.

Since the perforations **14** are adapted to receive combination mounting and terminal screws such as shown at **38** in FIG. 4, the screws thus serve a double purpose and help in reducing the number of parts and overall cost of the relay and its installation.

From the foregoing specification, it will be obvious that I have provided a relay having a minimum number of parts and one which is economical to assemble as it takes very little time to spot-weld the armature A to one of the core members B, cement the core members together and slip the legs **10** into the pre-wound coil C. At the same time the construction eliminates the necessity of providing contacts and terminals for the relay-controlled circuit as the mounting screws **38** that pass through the perforations **14** serve a double purpose as indicated.

Some changes may be made in the construction and arrangement of the parts of my relay above disclosed without departing from the spirit and purpose of my invention. It is accordingly my intention to cover by my claims such modified forms of structure and use of mechanical equivalents as may reasonably be included within their scope.

I claim as my invention:

1. In a relay of the character disclosed, a relay coil, a pair of sheet metal core members each having a coil leg within said relay coil and an end leg at one end thereof, the two end legs being at opposite ends of said coil, an armature spot-welded flat-wise against one of said end legs and having a free end spaced from and flat-wise adjacent the other of said end legs for attraction to and electrical contact with said other end leg when said core members and armature are magnetized by passage of current through said coil, said coil legs of said core members being cemented together with a layer of material interposed between the two to electrically insulate them from each other but permit the passage of a magnetic circuit therebetween, said core members serving as terminals for the relay controlled circuit.

2. In a low-cost relay, a relay coil, a core comprising a pair of T-shaped members of sheet metal each having a coil leg and an end leg, said relay coil surrounding said coil legs and located between said end legs, an armature of sheet metal having one end secured flat-wise against one of said end legs and its other end flat-wise adjacent and spaced from the other end leg, and means for electrically insulating said core members from each other whereby said pair of core members each serve as one terminal of the controlled circuit of said relay.

3. The relay of claim 2 wherein said end legs are perforated, and combination mounting and terminal screws through said perforations.

4. The relay of claim 2 wherein said last means comprises a strip of insulating material between said coil legs, said coil legs being cemented to said strip.

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