

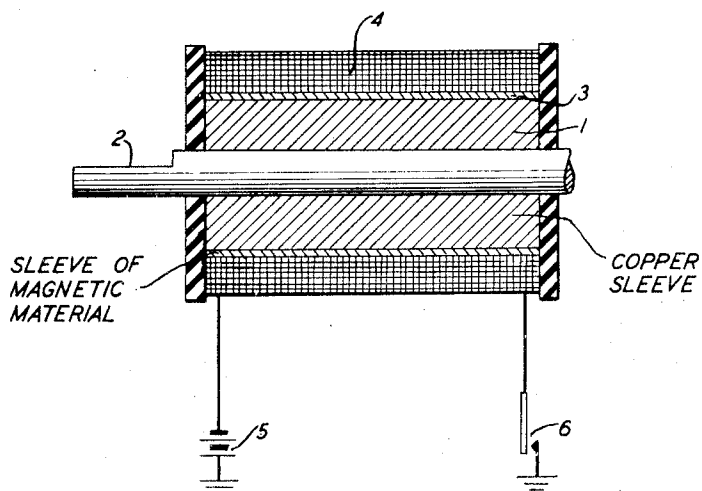
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RELAY

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RELAY

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3 Claims. (Cl. 175—21)

This invention relates to relays and more particularly to the structure of relays for the protection of contacts in the energizing circuits thereof.

It has been found by experimentation and by experience with respect to circuits in operation in commercial use that in some instances relay contacts become welded together due to excessive current transmitted thereover for the operation of relays. The resistance load offered by such relays and the battery potential employed did not indicate that such welding of the contacts should have occurred. From observations made it appeared that the welding of contacts occurred in many instances when such contacts were in the operating circuits of relays having copper sleeves surrounding their cores for securing delay action.

The tendency of contacts to weld together under such conditions has in the past been obviated by the use of palladium contacts and by the introduction of a resistance-condenser network in shunt of the winding of the relay having the copper sleeve. In considering a simpler method of preventing contact welding under the conditions above described, oscillograms were taken on a high speed oscilloscope of the closure of contacts connected into the operating circuit of a relay. These oscillograms showed that when the contacts closed the operating circuit of any relay, high current surges lasting for a fraction of a microsecond were produced. Usually these surges were of the order of one ampere or less and, therefore, of insufficient amperage to cause welding. However, when the relays observed were equipped with copper sleeves, these surge currents were found to be considerably greater than one ampere and caused welding in many cases.

The solution of the problem of contact welding appears, therefore, to depend entirely upon the provision of some means which will restrict the magnitude of the surge currents on contact closure. Since it is believed that the high surge currents produced in contacts controlling the operating circuits of copper-sleeved relays is probably due to the effect of the copper sleeves in reducing the inductance of the relay windings, the provision of means in the relays which will raise the inductance of the windings to these high surge currents on contact closure would, therefore, prevent contact welding.

It is, therefore, the object of the invention to provide means in a copper-sleeved relay to raise the inductance of the relay winding at the instant of closure of the operating circuit thereof, to thereby obviate the welding of the circuit closing contacts.

To attain this object and as disclosed in the

single figure of the drawing, the applicant has placed a thin sheet of magnetic material, such as Permalloy, formed into a sleeve over the copper sleeve and under the relay winding. As disclosed in the drawing, the relay in accordance with the invention has a copper sleeve 1 surrounding the core 2, a sleeve 3 of Permalloy approximately 6 mils in thickness and the winding 4 placed over the Permalloy sleeve. The relay is assumed to be operable in a circuit including the battery 5 and the contacts 6 of another relay.

A relay constructed in this manner having a copper sleeve $\frac{1}{16}$ " thick, a Permalloy sleeve .006" in thickness and a winding of 9,000 turns of wire with a resistance of 640 ohms, was found by the oscilloscope to draw a surge current of one ampere across the contacts in the operating circuit when 60 foot leads were used in the circuit and one ampere on a shorter circuit using 8 foot leads as compared with a standard relay of the same characteristics but without the Permalloy sleeve which drew a surge current of 2.5 amperes in a circuit of 60 foot leads and 1.6 amperes in a shorter circuit of 8 foot leads. It will be noted that the relay modified in accordance with the invention, that is, having the Permalloy sleeve, does not draw a surge current of over one ampere, a value which is not high enough to cause contact welding.

The present invention has been considered primarily with respect to preventing the welding or locking of contacts controlling the operating circuits of relays having copper sleeves, but it may also be useful in the solution of other contact problems such as in the reduction of contact erosion.

What is claimed is:

1. In an electromagnetic device, a core having a normally open magnetic circuit, a short-circuited winding surrounding said core, an operating winding surrounding said short-circuited winding and a foil of magnetic material having high permeability interposed between said windings.

2. In an electromagnetic device, a core having a normally open magnetic circuit, a short-circuited winding surrounding said core, an operating winding surrounding said short-circuited winding and a foil of Permalloy interposed between said windings.

3. In an electromagnetic device, a cord having a normally open magnetic circuit, a copper sleeve surrounding said core, an operating winding surrounding said sleeve and a sheet of Permalloy of substantially 6 mils in thickness formed into a sleeve and interposed between said copper sleeve and said winding.

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