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RELAY

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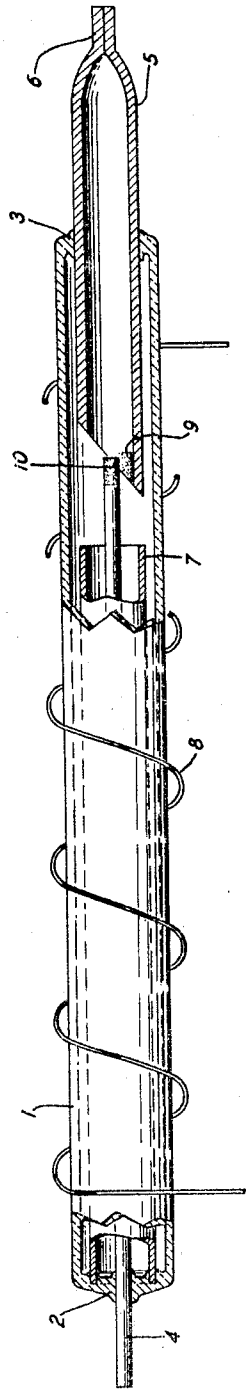

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RELAY

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This invention relates to circuit controlling devices and more specifically to relays of the type known as dry reed relays comprising a vessel with enclosed contacts and a magnetic flux source external to the said vessel.

An object of the invention is to reduce the cost and increase the utility and durability of such devices as well as the reliability of operation.

Another object of the invention is to permit large scale manufacture of this type relay and at the same time maintaining a high degree of accuracy, uniformity, and speed of operation of said relay.

A further object of the invention is the improvement of dry reed relays generally.

The prior art discloses many relays of the dry reed type comprising a vessel with enclosed spring contacts and a magnetic flux source external to said vessel. Reference is made to United States patents, Dorn and Handke, 1,836,654, issued December 5, 1931, and Ellwood, 2,289,830, issued July 14, 1942.

The application to practical use of the relays disclosed in the prior art has been impeded considerably due to the slow and costly methods of manufacturing them with sufficient accuracy, uniformity, and speed. Much of this difficulty arises from the problem of obtaining the correct spatial relationship between the electrodes within the vessel. In the present invention a new structure for such relays is presented in accordance with which such relays can be manufactured more expeditiously with the degree of accuracy and uniformity necessary for their large scale commercial application. One of the contacts is a magnetic spring wire surrounded by a flux conducting cylinder, one end of said spring wire being secured in one end of the vessel which in the preferred embodiment of the invention is a glass tube, the other end of said spring wire electrode being free and also being the contact end. The other electrode is a magnetic metal tube, one end of which is secured in the other end of the glass tube, and the other end of said metal tube being cut so as to introduce an unsymmetrical distribution of magnetic flux about the wire. A step cut in the end of the tube or a diagonal cut across the end will attain this result.

The aforementioned spring wire, being of a smaller diameter than the orifice of the metal tube, extends a short distance into the metal tube. Excitation of the external magnetic means causes the magnetic spring wire electrode

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to make contact with the inside of the magnetic metal tube electrode. The offset cutting of the free end of the metal tube insures a greater flux concentration on one side of the spring wire electrode than on the other. In addition the use of a metal tube as one of the electrodes provides for ease of manufacture. As mentioned supra one of the more difficult problems in the manufacture of this type relay is obtaining the proper spatial relationship between the electrodes. A spring jig can be inserted through the orifice of the metal tube electrode to grip the spring wire electrode and hold it in the desired position while the sealing processes on the glass tubing is carried out. Since the electrodes are secured in said seals, the spring wire electrode will be permanently positioned when the sealing operation is completed. The jig can then be removed from the metal tube leaving the relay ready for evacuation and refilling with a non-corrosive gas. The jig should be of a type to sufficiently center the wire in the tube with acceptable tolerances in diameters of wire and tube.

In the manufacturing of other relays of this type, highly skilled technicians are required to properly construct said other relays, whereas in the present invention relatively unskilled workers can be employed for manufacturing said invention.

Furthermore a multiple position rotary machine similar to what is used in the commercial production of vacuum tubes and lamps can be utilized in the production of this relay. As a result of the above-mentioned advantages the cost of manufacturing the relay disclosed in this invention is much less than the cost of manufacturing other high quality relays of this general type.

The invention can be more easily and fully understood from the detailed description given infra, read in conjunction with the drawing now to be described.

The drawing shows a detailed view of the relay in which all the essential parts are shown.

The electrode containing vessel 1 which in the preferred embodiment is made of glass tubing has air-tight seals 2 and 3 at either end and is filled with a non-corrosive gas, preferably hydrogen although other gases may be used. Electrodes 4 and 5 are secured in place by the said seals 2 and 3. Around electrode 4 is a flux conducting cylinder 7. Electrodes 4 and 5 are composed of material capable of conducting flux and current such as a nickel-iron alloy. The contact points 9 and 10 of electrodes 5 and 4

are infused with gold. Both of these electrodes, in the preferred embodiment, are composed of an alloy of approximately fifty-one per cent nickel and forty-nine per cent iron. It is to be noted however, that other suitable magnetic alloys may also be employed in the stead of the above-mentioned preferred material, and the contact points 9 and 10 may be infused with material other than gold. The sealed vessel 1 is preferably a glass tube of high quality precision manufacture, although other type tubing may be used.

A heretofore difficult problem in the manufacture of this type switch is the positioning of one electrode with respect to the other. Alleviation of this problem is accomplished by having electrode 5 be a rigid metal tube with an orifice at the position of seal 6. A jig may be inserted in this orifice to grip the other electrode 4 and position it with respect to electrode 5. Said orifice is sealed by seal 6 after vessel 1 has been filled with a non-corrosive gas.

Around electrode 4 is a cylindrical metal tube 7 which is composed of a magnetic material. It has been found that in the prior art where a metal tube such as 7 was not employed a considerable amount of flux was lost along the length of the electrode with a resultant loss in the sensitivity of the electrodes to the energization of coil 8.

The path of the flux begins along electrode 4 and metal tube 7. A part of the flux in metal tube 7 flows to electrode 4 at the free end of metal tube 7. The flux path then continues along the remaining right-hand (in the drawing) end of electrode 4 and jumps the air gap to electrode 5. Inasmuch as the end of electrode 5 is cut off at an angle as illustrated in the drawing more of the flux leaving electrode 4 will flow to electrode 5 via that section of electrode 5 overlapping electrode 4 than will flow to electrode 5 via that section of electrode 5 not overlapping electrode 4. This difference is of course caused by the differences in air gaps.

The uneven distribution of flux flowing from electrode 4 to electrode 5 causes the electrode 4 to move in the direction of the greatest concentration of flux lines which is of course in the direction of that part of electrode 5 which overlaps electrode 4. Electrical contact between the two electrodes is thus effected. To break contact it is only necessary to de-energize coil 8 which will cause decay of the magnetic field and the contacts will then release. Coil 8 is external to containing vessel 1 and is the source of the magnetic flux field which actuates the switch.

It is to be understood that the form of the invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the composition, shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention, or the scope of the subjoined claims.

What is claimed is:

1. A magnetically operated relay device comprising an elongated vitreous tube, a wire spring contact member extending through an end wall of said tube and supported solely therein by the seal between said tube and said member, a hollow contact member extending into the other end wall of said tube and supported and positioned therein solely by the seal between said hollow tube and said member, said hollow tube having an interior opening of adequate diameter for the insertion of a jig therethrough to hold said wire spring member into a desired close spacing relation with respect to said hollow member during sealing, the interior end of said hollow member being cut off at an angle such that one side of its end lies opposite to the end of the wire spring member for making a contact and the other side of its end is spaced away lengthwise from said end of the wire spring member, and the outer end of said hollow cylindrical member being collapsed to form an airtight seal, said wire spring member and said hollow member consisting of magnetic material.

2. A relay in accordance with claim 1 wherein said wire spring member is surrounded for most of its length except a portion at the free interior end thereof by a magnetic cylinder sealed into said vitreous tube and completely out of contact with said wire spring member throughout its length.

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