Oct. 26, 1965 M. SCATA 3,214,533

REED-RELAY WITH ADJUSTABLE FERRITE ELEMENT

Filed June 12, 1962

FIG. 1

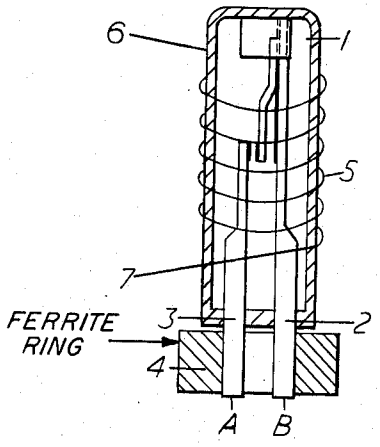


FIG. 2

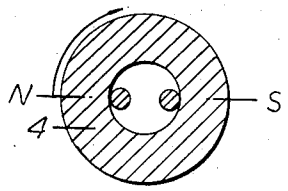


FIG. 3

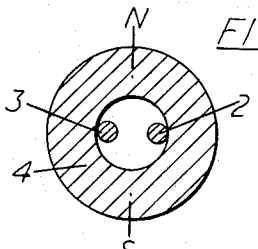
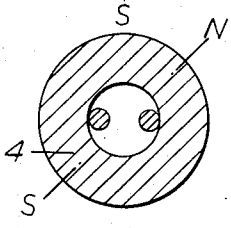


FIG. 4



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REED-RELAY WITH ADJUSTABLE FERRITE ELEMENT

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4 Claims. (Cl. 200—87)

This invention relates in general to reed-relays and in particular to reed-relays having an adjustable ferrite element positioned externally of the relay. Its principal object is to provide a reed-relay whose sensitivity can be altered simply and economically to adapt the relay for a wide variety of applications.

Prior-art arrangements are known in which reed-relays of the "π" type have ferrite elements rigidly secured between the magnetic terminals protruding from the relay. The combination of the magnetic flux from the ferrite element and from the energizing coil of the relay permits the contact sensitivity to be set at a desired value. These prior-art devices have the disadvantage that the sensitivity of each relay is dependent upon the components selected and once adjusted are not readily changeable without substitution of different-valued components.

According to the present invention, a reed-relay is provided having a polarized ferrite ring encircling the external terminals of the relay, which ring when rotated varies the resulting flux such that a wide variety of sensitivity levels may be obtained.

A feature of the invention resides in the arrangement wherein the adjustment of the sensitivity of the relay can be made without removing the relay from associated equipment.

Other objects and features of the invention will become apparent and the invention will be best understood when the specification is read in conjunction with the drawings comprising FIGS. 1 to 4 in which:

FIG. 1 shows a side view of a known "π" type reed-relay having a ferrite ring element positioned around its magnetic terminals;

FIG. 2 shows an end view of the relay of FIG. 1 with the magnetic axis of the ferrite element lying within the plane of the relay terminals;

FIG. 3 shows the ferrite element of FIG. 2 with its magnetic axis normal to the plane of the relay terminals; and

FIG. 4 shows the ferrite ring of FIG. 2 with its magnetic axis located intermediate a plane parallel to the terminals of the relays and a plane normal to the terminals of the relay.

Referring now to FIG. 1 of the drawings, the reed-relay comprises a glass envelope **1** containing magnetic contacts **2** and **3** sealed therein in an air-tight manner. A coil **5** encircles the relay near the contact points of the noted magnetic contacts and ferrite ring **4** encircles the external portion of the relay terminals.

Ring **4** consists of a ferro-magnetic material having the characteristic of an electrical insulator and thus can mechanically contact the terminals **2** and **3** protruding from envelope **1** to frictionally hold the ring in any rotated position without adversely affecting the electrical circuit. Also, the ferrite ring **4** has a permanent magnetization and has a magnetic axis as indicated by the line NS.

Referring now to FIG. 2 of the drawings, it can be seen that when the ferrite ring **4** has its magnetic axis coincident with the plane passing through the relay terminals **2** and **3**, the flux generated by the ferrite ring and the coil **5**, when energized, are in aiding relationship. With the ring **4** in this position, the relay will operate in response to a small amount of current through coil **5**.

Assume that the magnetic axis of the ferrite ring is rotated about the terminals **2** and **3** to a position perpendicular to the plane of the relay terminals **2** and **3**. In this position, the magnetic flux from the ferrite core will be ineffective and the operation of the relay will be dependent solely upon the flux generated by the winding **5**.

FIG. 4 illustrates the ferrite ring **4** having its magnetic axis placed in an intermediate position between 0 and 90 degrees with respect to a plane passing through the terminals **2** and **3**. In this case the value of the magnetic flux appearing on the contact arms of the relay is dependent on the particular angle of the magnetic axis with respect to the plane of the terminals.

It can thus be seen that the sensitivity of the relays can be altered from one extreme to the other by rotating the ferrite ring about the terminals **2** and **3**. One such extreme is one in which the resultant magnetic flux is the combination of the flux from the ferrite ring and from the energizing winding. The other extreme is one wherein the sensitivity of the relay is controlled solely by the flux generated by the magnetic winding. Therefore, memory functions can be obtained by merely positioning the magnetic axis of the ferrite ring in the various positions. Additional functions can be obtained by varying the current through the operating windings in combination with the rotational positioning of the ferrite ring.

While the principles of the invention have been described above in connection with specific apparatus and applications, it is to be understood that this description is made only by way of example and not as a limitation on the scope of the invention.

What is claimed is:

1. A magnetically operated switch structure comprising a pair of spaced parallel bars of magnetic material each having a contact portion associated therewith, said contact portions being positioned in flux linking relationship with each other, one of said contact portions being movable to make and break an electrical connection between said bars, an enclosing envelope within which the said contact portions of said bars are enclosed with the remainder of said bars extending externally out of one end of said envelope and sealed therethrough in a vacuum-tight manner, adjustable permanent magnet means comprising a ferrite annulus associated with the said external portion of said bars, and a flux generating winding associated with the said contact portion of said bars, the said movement of the contact portion of said bars being jointly controlled by said permanent magnet means and said flux generating winding means.

2. A magnetically operated switch structure as set forth in claim **1** wherein the said annulus is rotatably mounted on said external portion of said bars.

3. A magnetically operated switch structure as set forth in claim **2** wherein said adjustable annulus is mechanically supported on said external portion of said bars.

4. A magnetically operated switch structure as set forth in claim **1** wherein rotation of the magnetic axis of said ferrite annulus varies the amount of flux linking said contacting portion of said bars for movement into electrical contact with each other.

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