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ADJUSTABLE POLARIZED REED RELAY

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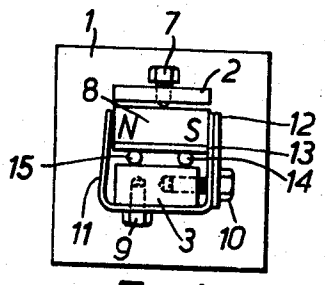


FIG. 1.

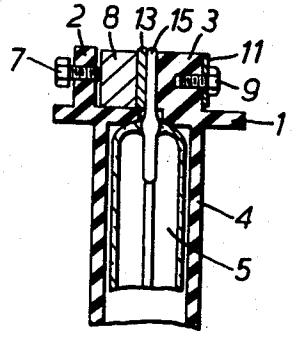


FIG. 2.

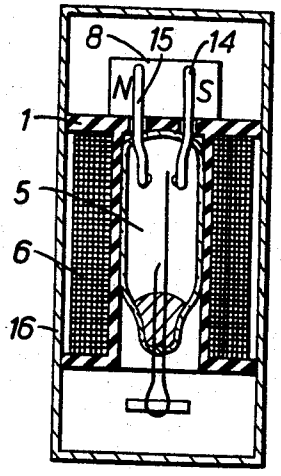


FIG. 3.

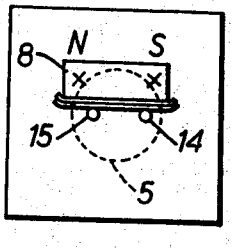


FIG. 4.

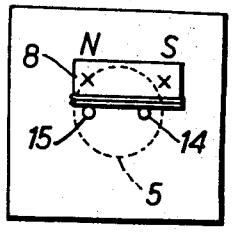


FIG. 5.

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ADJUSTABLE POLARIZED REED RELAY

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Int. Cl. H01h 51/28
U.S. Cl. 335—153 4 Claims

ABSTRACT OF THE DISCLOSURE

A polarized relay wherein the polarizing magnet is adjustable relative to the relay pole pieces so as to affect the bias effect on said pole pieces.

This invention relates to polarised electromagnetic relays employing encased reed contacts, and more particularly changeover contacts.

In such relays it is usual to provide means for adjusting the sensitivity and/or mark-to-space balance of the contact and this adjustment is sometimes effected by applying selective demagnetising fields to the relay after the relay is sealed into its can. This can provides a magnetic shield for the relay to prevent its being affected by the operation of adjacent relays of various types. The presence of the shielding can tends to complicate the adjustment.

The object of the present invention is to provide a polarised sealed reed changeover contact relay using a bar magnet as the polarising means, which is both simple and accurate in adjustment.

According to the invention there is provided an electromagnetic relay comprising an operating coil, a sealed reed contact unit housed within said operating coil and having first and second contact posts projecting outwardly from said coil a polarising bar magnet positioned with its opposite pole faces respectively adjacent said first and second contact posts, spring means having two parts respectively engaging said magnet at two points spaced along the magnetic axis thereof, and adjusting means arranged to adjust the position of one of the parts of said spring means in the direction of said magnetic axis so as to vary the position of said magnet relative to said contact posts.

The various features and advantages of the invention will be apparent from the following description of an exemplary embodiment thereof taken in conjunction with the accompanying drawings in which:

FIG. 1 is a plan view of the magnet and adjusting means of a relay embodying the invention with the screening can removed,

FIG. 2 is a sectional view of part of the relay of FIG. 1,

FIG. 3 is a section of the complete relay enclosed in its screening can,

FIG. 4 shows the magnet adjusted to achieve a balanced both-side stable condition of the changeover contact, and

FIG. 5 shows the magnet adjusted to achieve a one-side side stable position of the changeover contact.

Referring now to FIGS. 2 and 3, a moulded support member **1** is provided with two upstanding portions **2** and **3** on one face thereof and a hollow core section **4**, which provides both a housing for an encapsulated reed contact **5** and a bobbin for an operating coil **6**.

The upstanding portion **2** is provided with a screw-threaded bore to receive a magnet fixing screw **7** the end of which bears against a bar-shaped permanent magnet **8**.

The upstanding portion **3** is provided with screw-threaded boses to receive a spring fixing screw **9** and a spring adjusting screw **10** respectively. A generally U-shaped leaf spring **11** is held firmly in place against upstanding portion **3** by means of spring fixing screw **9**. The two limbs of the U-shaped spring are bent inwards towards each other such that, with the spring adjusting screw **10** left loose, the ends of the spring **11** bear on the bar magnet **8** to retain the said bar magnet in position. An additional spring stiffening member **12**, which is initially slightly bow-shaped such that its two ends are in contact with one limb of the leaf spring **11**, helps the action of adjusting screw **10**, when tightened, in such a manner that greater force is exerted on the bar magnet **8** by such, one limb of the leaf spring **11**.

The position of the bar magnet **8** may now be adjusted over a fairly large range of movement provided that, with the leaf spring **11** untensioned by the adjusting screw **10**, the magnet is well to the right of its centre position (similar to the position shown in FIG. 5).

An electrically insulating strip **13** is inserted between the bar magnet **8** and the two contact posts **14, 15**, of the encapsulated reed contact **5**. The polarising effect of the bar magnet **8** on the reed contact, and hence the sensitivity of the complete relay at its coil **6**, is controlled by varying the effective thickness of the insulating strip **13**. Typically, the required spacing has been found to be in the order of 0.004" and this is conveniently obtained by sticking two strips of 0.002" thick self-adhesive polyester film to the magnet face.

Once the sensitivity and bias have been adjusted, the magnet fixing screw **7** is tightened against the magnet face such that the magnet and insulating strip **13** are trapped between the screw **7** and the two contact posts **14, 15**, which, in turn, bear against the inner face of upstanding portion **3**. This effectively stiffens the contact posts **14, 15**, by preventing flexing or bending thereof, and also tends to hold the reed capsule firmly in the adjusted position.

Alternatively, a locking varnish or encapsulant may be used to maintain either or both the magnet **8** and the reed capsule **5** in position.

FIG. 3 shows a section of the completed relay, now surrounded on at least five of the six sides by a magnetic shield made, for example, from a high permeability ferrous material. The remaining open side (not shown) of the box formed by the shield is conveniently formed from a sheet of insulating material into which the coil and contact lead-out pins are inserted.

The box-like structure formed by the shield **16** can be completely filled with a thermoplastic or thermosetting resin such as "Araldite" (registered trade mark).

Two types of changeover action are used in the art; a balanced both-side-stable contact section in which the moving spring contact remains in contact with the particular fixed contact to which it was last moved and a one-side stable contact action in which the moving contact always returns to a particular one of the fixed contacts on removal of the energising current in the coil **6**.

In the both-side stable condition, the bar magnet **8** has to be adjusted so that the currents required in the coil to pull the moving contact away from each of the fixed contacts are the same or at least substantially the same. This condition, therefore, is referred to as "balanced."

In a bar magnet, the theoretical pole centre lies within the boundaries of the magnet and the two pole centres are denoted by X in FIGS. 4 and 5. In FIG. 4, which depicts the balanced both-side-stable adjustment, the pole centres X are approximately symmetrical with the contact posts but the actual position for balance is largely determined by the various magnetic unbalances in the reed contact and surrounding magnetic structures.

FIG. 5 shows the North pole centre X opposite to contact post **15**, and the South pole centre X remote from contact post **14**. This gives the position where the magnetisation flux density in contact post **15** is at its maximum and the flux density in contact post **14** is substantially lower. This position of the bar magnet makes the changeover contact one-side-stable; in this case the lever contact rests against the contact associated with contact post **15** when no current is flowing in coil **6**.

By arranging the magnet dimensions in relation to the distance between the contact posts **14, 15**, and also, by arranging that there is a sufficient range of adjustment catered for by leaf spring **11** and adjusting screw **10**, the relay can be adjusted to be one-side-stable or both-side-stable at will. It can be appreciated from FIGS. 4 and 5 that the spacing between the theoretical magnetic poles is different from (either greater or less than) the distance between the contact posts.

A further feature of the present invention is that, by arranging for suitably located holes in the screening can **16** opposite adjusting screw **10** and fixing screw **7**, the relay may be adjusted or readjusted at any time throughout its life without having to remove the relay from the can.

Alternatively, if no further adjustment is required during life, the magnet **8** may be fixed in position by a locking varnish or the like during manufactures; so eliminating the need for magnet fixing screw **7**.

Further simplification of assembly can be achieved by arranging for the upstanding portion **3** of the moulded support member **1** to have a shaped slot therein into which a correspondingly shaped leaf spring **11** is inserted and firmly located thereby. This eliminates the need for spring fixing screw **9**.

Alternative forms of spring may, of course, be used. For example two separate springs, either leaf or coil, may be provided, each bearing on one end of the bar magnet **8** such that the magnet assume a position which balances the forces of the two opposing springs, and at least one of the springs is adjustable so as to cause movement of the magnet in accordance with the degree of adjustment.

Sealed reed changeover contacts are available in two forms; having either "mercury-wetted" or "dry" contacts. Generally speaking, the mercury-wetted contact is used for high current working and the dry contact is used for low current working. The present invention is equally applicable to both types of contacts.

I claim:

1. An electromagnetic relay comprising an operating coil, a sealed reed contact unit housed within said operating coil and having first and second contact posts projecting outwardly from said coil, a polarising bar magnet positioned with its opposite pole faces respectively adjacent said first and second contact posts, spring means having two parts respectively engaging said magnet at two points spaced along the magnetic axis thereof, and adjusting means arranged to adjust the position of one of the parts of said spring means in the direction of said magnetic axis so as to vary the position of said magnet relative to said contact posts.

2. A relay according to claim **1** wherein said spring means is a spring of U-shape of which the junction between the limbs of the U-shape is anchored with respect to said contact posts by anchoring means and of which the two limbs respectively engage opposite pole faces of said bar magnet.

3. A relay according to claim **2** wherein said operating coil is mounted on a former having a bore which receives said contact unit and an end cheek through which said contact posts project, said end cheek having spaced apart upstanding projections defining a space therebetween to receive said contact posts and said bar magnet, said anchoring means being arranged to anchor said spring to one of said upstanding projections.

4. A relay according to claim **3** including a securing screw acting in a screw threaded bore through one of said upstanding projections to press said bar magnet in a direction to clamp said contact posts between the other of said upstanding projections and said bar magnet.

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U.S. Cl. XR.

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