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RELAY

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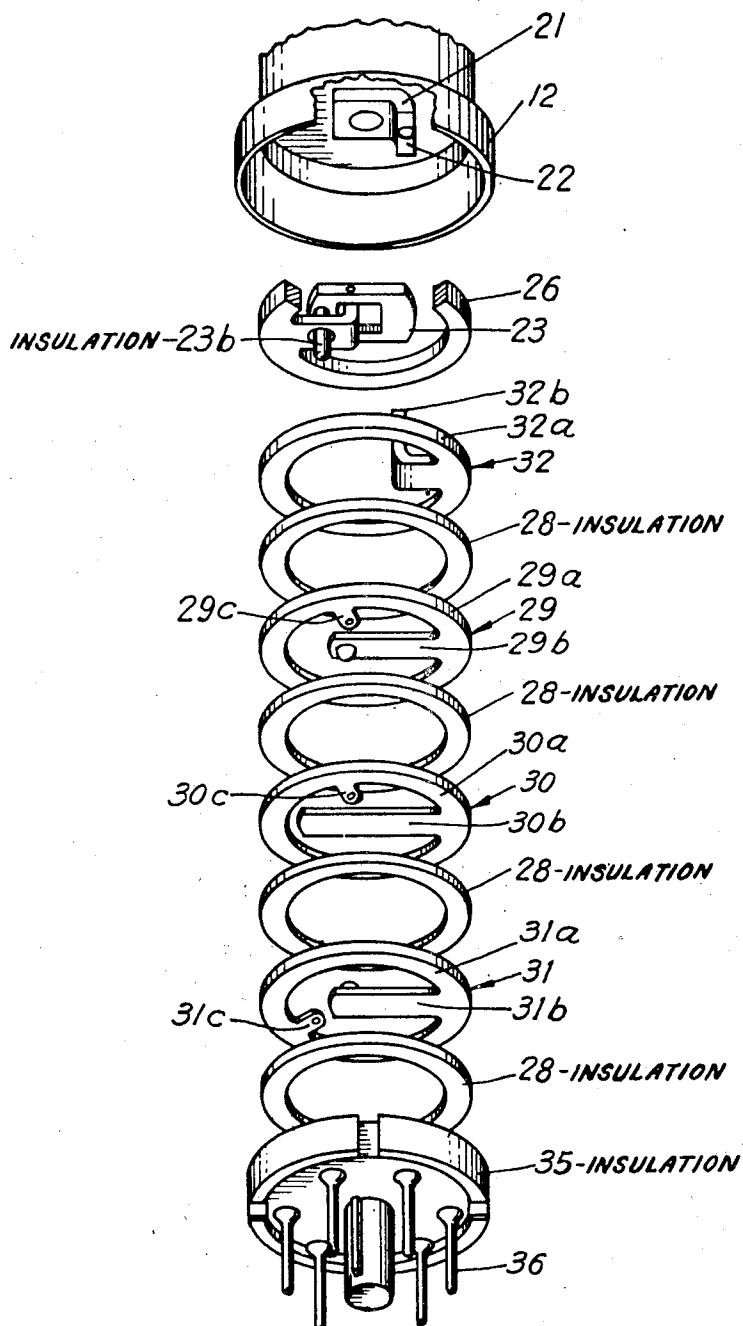


Fig. 2

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RELAY

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This invention relates to relays of the electro-magnetic type.

An object of the invention is to provide a compact relay of convenient shape.

Another object is to provide a relay that is sensitive, reliable in operation, and relatively immune to vibration.

Still another object is to provide a relay design that is adapted for economical manufacture and in which the number and arrangement of the contacts can be readily varied to meet different requirements.

Briefly, the invention consists of a relay substantially all parts of which are enclosed in a cylindrical case of paramagnetic material constituting a portion of the magnetic circuit of the relay and also constituting the frame for directly supporting the winding, core, armature, contact elements, and terminal connections of the relay.

A full understanding of the invention and the manner in which the foregoing objects, together with other more specific objects and features, are achieved, will become apparent from the following detailed description with reference to the drawing in which:

Fig. 1 is a longitudinal section through one embodiment of the relay and

Fig. 2 is an exploded view showing various elements of the relay in perspective.

Referring first to Fig. 1, the relay therein disclosed comprises a casing 10 of iron or other paramagnetic material which constitutes the frame for supporting all the other elements of the relay and also constitutes a portion of the magnetic circuit. It is preferably of cylindrical shape and includes an upper section 11 of relatively small diameter and a lower section 12 which may be shorter but is of larger diameter. The upper end 11 is closed by an integrally formed end wall 13, and the two sections 11 and 12 are interconnected by a transverse annular wall 14.

Centrally disposed within the upper section of the case and secured to the end wall 13 is a cylindrical core member 15 of paramagnetic material, and a winding 16 is interposed between the core 15 and the casing wall 11. The winding may be additionally insulated from the core member 15, the end wall 13, and the side wall 11, by insulating walls 17, 18, and 19 respectively. A washer 20 dimensioned to fit snugly within the insulating

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wall 19 and around the core member 15 may be provided at the lower end of the winding.

There is secured to the lower end of the core 15 a pole piece 21 of paramagnetic material having a pole face 22 offset from the axis of the relay and perpendicular to the axis. This pole piece cooperates with an armature 23 of paramagnetic material which is pivotally supported near its center of gravity by a pin 24 from a tongue 25 of an armature-supporting element of paramagnetic material, the tongue 25 extending radially inwardly from an annular base section 26 which has an upper surface fitting against the inner surface of the annular wall or shoulder 14 and has a peripheral surface corresponding in shape to that of the inner surface of the large cylindrical casing section 12. A thin wall 27 of insulating material such as paper or plastic is provided as an insulating lining for the large section 12. It will be observed that the armature 23 has a slot 23a provided therein for the entry of the end of the supporting tongue 25, the end of which is turned upwardly so that the transverse plane of the pivot pin 24 is positioned above the upper surface of the base portion 26 of the armature-supporting element. The end of the armature 23 opposite that end juxtaposed to the pole face 22 has secured thereto a pin 23b, preferably of insulating material, which projects down through a hole 25b in the tongue 25 into engagement with a contact to be actuated thereby.

A contact assembly is positioned immediately below the armature-supporting element and comprises a plurality of insulating washers 28 and three contact elements 29, 30, and 31 (Fig. 2) arranged in a stack between the insulating washers. Each contact element consists of a base portion 29a, 30a, or 31a, as the case may be, and an inwardly extending tongue 29b, 30b, or 31b, as the case may be, and also has a short inwardly extending soldering lug 29c, 30c, or 31c. It will be observed from inspection of Fig. 1 that the contact tongue 30b is longer than the tongues 29b and 31b so that it extends therebeyond into the path of the actuating pin 23b of the armature. As shown in Fig. 1, the winding 16 is energized, and the right end of the armature 23 is drawn against the pole face 22, in which position the pin 23b has moved downwardly to carry the tongue 30b against the contact 31b. The contact tongues are

of spring metal so that when the winding 18 is de-energized, the restoring force of the tongue 30b will carry it out of contact with the tongue 31b and into contact with the tongue 29b, rocking the pin 23b and the armature 23 clockwise in so doing. Movement of the armature 23 away from the pole piece 22 is preferably limited by a stop which is constituted by the upturned end of a tongue 32b of a stop member 32 (Fig. 2) having an annular base portion 32a corresponding in general dimensions to the insulating washers 28 and stacked between the uppermost of the washers 28 and the base portion 26 of the armature-supporting element.

A lower end wall 35 is provided to form a closure for the case 10. In addition, it functions to compress the contact assembly and the armature-supporting element against shoulder 14 and provide terminal connections to the exterior for the contacts and the winding of the relay. Thus, the end wall is preferably formed with contact pins 36 and a central guide member 37 corresponding in shape to a standard radio tube base, so that the relay can be mechanically supported and connections completed thereto by inserting it in a standard radio socket. The various pins 36 are connected to the contacts by flexible wires extending to the soldering lugs 29c, 30c, and 31c and by extending the lead wires from the winding 16 to a pair of the pins 36.

The end closure member 35 may be secured in place in accordance with standard radio tube practice by indenting the lower edge of the cylindrical section 12 into recesses provided therefor at suitable intervals around the end wall 35 as indicated at 38.

To facilitate alignment of the elements supported within the enlarged section 12 of the case with each other and with the pole face 22, a pin 39 may be extended through the shoulder 14 and through the armature base 26 and the rest of the elements in the contact stack. The pin 39 is surrounded by an insulating bushing 39a so that it will not short circuit the contact elements.

The particular arrangement of contacts shown in the drawings is only one of many that can be employed, since a larger or a smaller number of contacts may be employed according to the requirements of the relay. When a larger number of contacts are employed, the insulating washers 28 may be made thinner or fewer in number to compensate for the additional contacts employed, or the lower section 12 of the case can be made longer.

The armature 23 is preferably dynamically balanced so that it is relatively insensitive to vibration or sudden movements such as may occur when the relay is employed on a moving vehicle or the like.

The relay is relatively sensitive for its size and weight because of the fact that the outer casing functions not only as a supporting frame, but also as a portion of the magnetic circuit of low reluctance. It will be observed that the contact area between the upper face of the armature-supporting element 26 and the lower face of the shoulder 14 of the case is relatively large, insuring low reluctance at this point. Furthermore, the reluctance of the magnetic path between the armature 23 and the supporting tongue 25 is relatively low. The sensitivity of the relay can be increased by employing special magnetic materials such as permalloys for constructing the case 10, core 15, pole piece 21, armature 23, and armature-supporting element 26.

The relay can be assembled very rapidly in manufacture, since the placing of the armature assembly and the contact assembly is accomplished by simply loading the parts into the open end of the relay case while the latter is bottom side up, placing the end wall 35 into position and pressing in the lugs 38. The contact leads are connected into the contact lugs and brought out through the hollow terminals 38 prior to placing of the end wall 35 in position; thereafter the wires are cut off at the tips of the prongs 36 and soldered in accordance with standard radio tube practice.

Although for the purpose of explaining the invention one particular embodiment thereof has been described in substantial detail, numerous changes can be made from the exact construction shown without departing from the invention. As an example of changes that can be made, it is not necessary that the case 10 or all portions thereof be made of circular cross-sectional shape. It may be desirable in some instances to make at least the lower portion of non-circular shape to prevent rotation of the parts mounted therewithin without resorting to the use of the guide pin 39.

I claim:

1. An electrical relay comprising: a cup-shaped casing containing in the closed end thereof an actuating winding; means including a movable armature constituting a magnetic circuit for said winding; and a contact assembly for actuation by said armature, said contact assembly comprising a plurality of contact elements each having a parametrically continuous base portion fitting within and transversely supported by said casing, and insulator elements interposed between and corresponding in shape to the said base portions of said contact elements and fitting within and transversely supported by said casing, and means compressing said contact and insulator elements together within said casing.

2. An electrical relay comprising: a cup-shaped casing of paramagnetic material containing a paramagnetic core member secured to the closed end of the casing; an actuating winding within said casing and surrounding said core member the core member extending completely through said winding and having a pole piece exterior of said winding; an armature assembly including a pivoted armature in cooperative relation with said core member and casing for movement in response to energization of said winding; said armature assembly including an armature-supporting element of paramagnetic material fitting within and of the same parametric shape and dimension as the parametric shape and dimension of the interior surface of said casing whereby said armature assembly is mechanically supported by said casing against transverse movement and completes a magnetic circuit of low reluctance between said armature and casing; a contact assembly comprising contact elements each having parametrically continuous base portions fitting within and transversely supported by said casing and insulator elements stacked with said contact elements and corresponding in shape to the base portions of said contact elements and fitting within and transversely supported by said casing; a shoulder integral with said casing against which the end of said armature-supporting element rests; and means compressing said armature-supporting element, the base portions of said contact elements, and said insulator elements in a single stack against said shoulder and longitudinally supporting all said elements con-

stituting said stack in desired longitudinally arranged relation to each other; said casing comprising a first section of uniform cross section adjacent the closed end and containing said winding, and a second section of uniform cross section larger than the cross section of said first section and containing said armature assembly and said contact assembly, said casing including a transverse wall interconnecting said first and second sections and constituting said shoulder against which said armature-supporting element rests.

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