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SEALED REED RELAY AND METHOD OF MANUFACTURING THE SAME

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Fig. 1

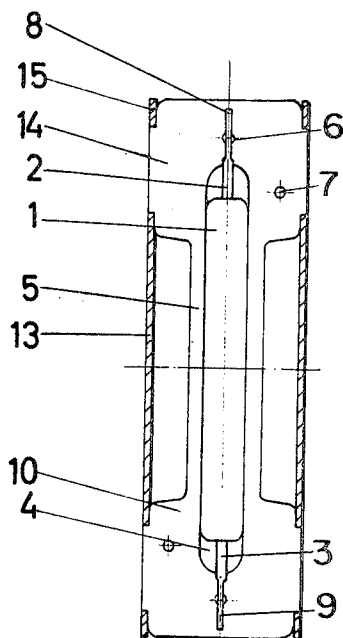


Fig. 2

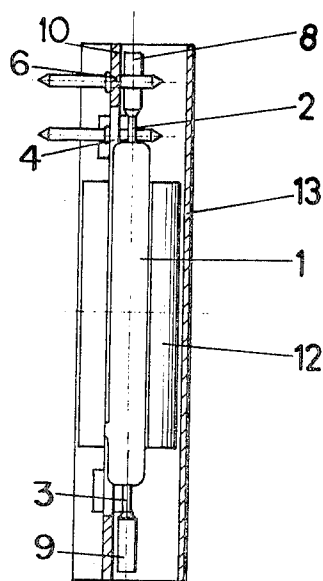
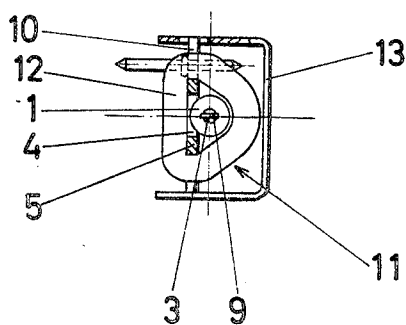


Fig. 3



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SEALED REED RELAY AND METHOD OF MANUFACTURING THE SAME

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9 Claims

ABSTRACT OF THE DISCLOSURE

A reed relay of simple construction is provided, in which an exciting winding in the form of a prismatic body is wound on a base plate. The winding is such that one side face of the winding is adjacent to the base plate while the other side faces of the winding enclose the protective tube or several protective tubes.

The present invention relates to a reed relay comprising reed contacts arranged inside the operating coil in which the exciting winding at least partly directly encloses the protective tube or tubes respectively and, moreover, to a method of manufacturing such a reed relay.

There is a need for the invention especially in telecommunication and telephone systems, other communications transmission systems, as well as for controlling and regulating arrangements in which such types of reed relays are used to an increasing extent owing to their insensitivity to environmental influences, and because they do not require any maintenance at all, and are featured by a long service life.

As is well known with respect to reed relays, contacts arranged inside a protective tube, simultaneously act as armatures. In the most simple case these reed contacts consist of two contact blades made of contact metal, which are sealed into a small glass envelope. The ends of these reeds overlap each other inside the small glass envelope and maintain a small spacing. When causing a magnetic field to act in such a way upon the reed contact that the reeds are magnetized with an opposite polarity, they will attract each other under the influence of the magnetic field. Accordingly, the contact is closed by the action of the magnetic field as soon as the force becomes greater than the spring forces of the two reeds, whereas in the absence of the magnetic field, a separation of the contact is effected owing to the spring action.

In conventional reed relays of this type the magnetic field is produced by an exciting coil in the axial direction in which the reed contacts are arranged. To this end it is known to apply directly to the outside of the protective tube or of several protective tubes respectively, in a parallel arrangement, if necessary by inserting an insulating material, the exciting or operating winding, and to fix the reed contacts with the aid of spacers and a latching plate which, at the same time, also serve to restrict the winding space on either side, in the desired position (German Patent No. 1,181,817). To this end the spacing plates are provided with slot-shaped openings into which the spring ends of the reed contacts are inserted, and are locked by way of twisting.

The conventional arrangement has the advantage that the winding is disposed in the closest proximity of the reed contacts and, therefore, exerts a stronger magnetic effect thereupon, than when using a special coil body. On the other hand, it has the disadvantage of making it absolutely necessary to fix the ends of the contact units in the slots of the terminal plates in cases where the relay

is supposed to be handled reliably and without causing the contact units to fall out of the relay in the course of time. On account of this, however, the removal of one of the contact units from the relay is rendered difficult in cases where one unit becomes faulty during operation and has to be replaced by a new one. Moreover, to this there is added that in the conventional arrangement difficulties will arise whenever, deviating from the standard equipment, other types of reed contacts are to be accommodated, for example switch-over contacts comprising two connecting terminals on one face side, whereas the usual reed contacts designed as operating contacts, only comprise one connecting terminal on each face side. In this case each time different spacing plates with a different arrangement of slots would have to be manufactured and kept in store which, however, is unacceptable when aiming at an economic production, especially also since the conventional construction consists of a relatively large number of parts, the assembly of which calls for special facilities.

Object of the present invention is to provide an improved type of reed relay not having the aforementioned disadvantages. In a reed relay of the type mentioned hereinbefore and according to the invention as characterized in the main claim, this is accomplished in that the operating winding, in the form of a substantially prismatic body, is in such a way wound on to a base plate consisting of insulating material, that one lateral surface of the winding comes to lie in a form-locking manner close to the base plate, whereas the other lateral surfaces of the winding are designed self-supportingly (air-spaced), and include between them the protective tube or tubes respectively. Preferred types of embodiment of the invention are characterized in the subclaims.

By designing the coil body in this way and by arranging the operating winding in the way described hereinbefore, there is achieved the production-technical advantage but the operating winding does not need to be wound directly onto the protective tube or tubes respectively, so that a subsequent equipment with desired contact units or the removal of one of the contact units is possible without further ado. In spite of this, there is achieved the advantage that, as in the well known case, the winding is disposed in the closest proximity of the reed contacts, so that it is sufficient to provide the coil with less windings (turns). The base plate acting as the coil body can be manufactured in a particular simple way on a low-cost basis because in this case there is concerned a punched hard-paper item, hence a component which is typical for mass production.

Further advantages and details of the invention will now be explained with reference to the accompanying drawings in which there is shown a particular advantageous example of embodiment of a reed relay. In these drawings:

FIG. 1 shows a longitudinal section of a reed relay in which the operating winding has been removed for making visible details of the coil body,

FIG. 2 shows a longitudinal section which is turned by 90° with respect to the showing of FIG. 1, and

FIG. 3 shows a cross-sectional view of this relay but, unlike the showing of FIG. 1, with the operating winding applied.

The reed contact as shown in FIGS. 1 to 3 consists of a protective tube 1 into the face sides of which contact springs (reeds) 2, 3, are sealed. Of course, also several such reed contacts may be provided which are then arranged parallel in relation to one another. The protective tube or tubes 1 are lying in an opening 4 of the base plate 5 acting as the coil body, with the latter being designated in the shape of an oblong frame of insulating material. The opening 4 is adapted to the diameter of

the protective tube 1 in such a way, that the tubes can be mechanically fixed in the transverse direction, but do not project through the opening. In the longitudinal direction the opening 4 extends somewhat beyond the face-sided limiting walls of the protective tube or tubes 1 respectively, in order to compensate for manufacturing tolerances of the protective tubes in the longitudinal direction. The base plate 5 may be designed differently wide, quite depending on the number of protective tubes 1 arranged next to each other. In the mass production of reed relays of the type as used in particular in the field of telephone engineering, these different types of embodiments of the base plate 5, however, neither have a disadvantageous effect upon the production technique nor on the stock-keeping, because these parts, as already emphasized hereinbefore, are punched items which are extremely simple and inexpensive in manufacture.

The base plate 5, however, not only represents the hold member for both the operating winding and the reed contacts, but, in addition thereto, enables the mounting of a plurality of connecting elements for establishing the electrical connections with associated circuits. To this end the base plate 5, within the range of its face-sided ends, is provided with a number of bore holes 6, 7 corresponding to the number of soldering terminals, into which short wire contact members are pressed. One particularly advantageous production technique will result on account of the fact that the wire contact members, as one continuous whole, as supplied from one or more wire stocks, are each time shot into the bore holes 6, 7 of the base plate 5, and are then cut to the desired lengths. It is appropriate to provide these wire contact members with a cornered, in particular square cross-sectional profile so as to provide them with a self-clamping tight fit after being pressed (shot) in, and to prevent them from becoming loose even under rugged mechanical-stress conditions.

In certain cases it may be advantageous for the connecting elements of individual or all of the reed contacts to be led out on one side only, so that the reed relay is designed capable of being plugged like an electron tube, and may thus be connected to a printed circuit board. This advantage is likewise accomplished in the most simple way by the present invention, in that the wire contact members are pressed-in at such raster-shaped spaced relations as to project with one short portion of their length on either side out of the base plate 5. On the side facing the protective tube or tubes 1 respectively, the wire contact members may then be connected either to the reed contacts or the ends of the operating winding, i.e. the wire contact members associated with the bore holes 6 are connected to the contact springs (reeds) 2, 3 of the protective tube 1, and those of the wire contact members associated with the bore holes 7 are connected to the ends of the windings. A soldered connection with the wire contact members which, to this end, are provided at their ends with flat shaped soldering lugs 8, 9, retains the reed contacts in the desired position. Wire contact members as led out on the other side of the reed relay, may be inserted (plugged) in correspondingly adapted plug-in holes provided in a printed circuit board and, if so required, may be connected thereto by way of dip soldering.

Moreover, a contacting of this kind permits in the most simple way the reed relay to be equipped with various types of reed contacts. Thus, it is possible to provide the base plate 5 with bore holes 6 and associated wire contact members in such a way that also reed contacts can be used which are designed as switch-over contacts (two-way contacts) and, to this end, are provided with two connecting terminals on one face side. On the other hand, individual contact positions provided for reed contacts, may also remain unoccupied in the relay. Besides this plurality of contacting possibilities there is still provided the advantage that both the construction

and manufacture of the connecting elements are suitable for simple mass production.

According to a further embodiment of the invention the base plate 5 is provided with flange-like widenings 10 extending in the coil axis, for limiting the winding space in the axial direction. For the purpose of providing the reed relay with the operating winding, both the base plate 5 and an auxiliary mandrel extending along the coil axis, are inserted and turned in a coil winding machine, after the one end of the wire has been fixed to the unit. Thereupon the operating winding is applied between the flange-like widenings 10 on to the one outside surface of the base plate 5 and of the oppositely arranged outside surface of the auxiliary mandrel, until reaching the desired number of turns. The flange-like widenings 10 thus simultaneously represent the coil ends. In this way the base plate 5 performs quite a number of different functions since it simultaneously acts as a holding device for the reed contacts and the connecting elements and, moreover, as a coil body and limitation for the winding. As will be shown hereinafter, the base plate 5 even serves to perform another function. In distinction to the well known construction, the number of parts required for the relay unit, is reduced to a minimum, a manufacture thereof is simplified and rendered more inexpensive, and there is achieved a very considerable reduction in weight.

Upon completing the coil, the wire is cut off, and the auxiliary mandrel is removed. Since the employed coil body is a flat base plate there will be obtained, subsequently to the removal of the auxiliary mandrel, a partly self-supporting coil 11 which is designed in the shape of a prismatic body, or prism-shaped body, as may be taken from FIG. 3. In this way there will result an extremely stable structure although the coil 11 is only applied with one of its winding surfaces 12 in a form-locking manner to the base plate 5. For the purpose of further improving the stability, however, the wire turns, in particular at the beginning and the end of the operating winding, may be provided with a coat of lacquer for holding together the wire turns, or may be treated with any other binding agent. This lacquer must be hard and flexible and, at the same time, must have a high power of binding with the wire. Upon removing the auxiliary mandrel it is now possible to insert in its stead one or more reed contacts in the winding space which has been left free.

After the soldering lugs 8, 9 of the reed contacts and the wire ends of the coil 11 have been connected to the associated wire contact members in the manner described hereinbefore, the reed relay may be encapsulated. To this end there is used a U-shaped screen member 13 which, by snap action, is joined to the base plate 5. To this end, the base plate 5 is provided within the area of its flange-like widenings 10, with engaging members 14 for engaging the slots 15 provided in the screen member 13. As is well known, the screen member 13 performs the function of a magnetically conducting envelope (shield) for simultaneously screening external magnetic fields and for guiding the own magnetic field as produced by the coil 11.

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 reed relay comprising reed contacts in a protective tube, an exciting winding wound to form a prism-shaped hollow body having three sides, a base plate formed of insulating material, one side of said winding lying in a form-locking manner close to the base plate, and the other sides of said winding self-supportingly including the protective tube between them.

2. A reed relay according to claim 1, in which said base plate is designed in the shape of an oblong frame having an opening which is adapted to both the length

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and the diameter of said protective tube respectively, with said opening receiving and mechanically fixing said tube respectively in a parallel arrangement.

3. A reed relay according to claim 2, in which said base plate is provided with flange-like widenings extending along the coil axis, which serve to restrict the winding space in the axial direction.

4. A reed relay according to claim 3, in which said base plate, within the area of its flange-like widenings, comprises a number of bore holes corresponding to the number of soldering terminals, with short wire contact members of a square-cornered cross-section being pressed into said bore holes.

5. A reed relay according to claim 4, in which said wire contact members project with a short portion of their length on either side of said base plate, and are arranged at raster-shaped spaced relations.

6. A reed relay according to claim 1, in which for purposes of encapsulation, a U-shaped sheetmetal screen member is used which is engaged to said base plate by way of snap action.

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7. A reed relay according to claim 6, in which said base plate, is provided with engaging members which are aimed at engaging slots provided in said sheetmetal screen member.

8. A reed relay according to claim 1, in which said base plate consists of a punched hard-paper item.

9. A reed relay according to claim 1, in which said exciting winding, at least within the area of its sides, is provided with a coat of hard-setting binding agent, in particular lacquer, for holding together the turns of said exciting coil.

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