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RELAYS WITH GUIDED CONTACT SPRING

Filed Aug. 8, 1957

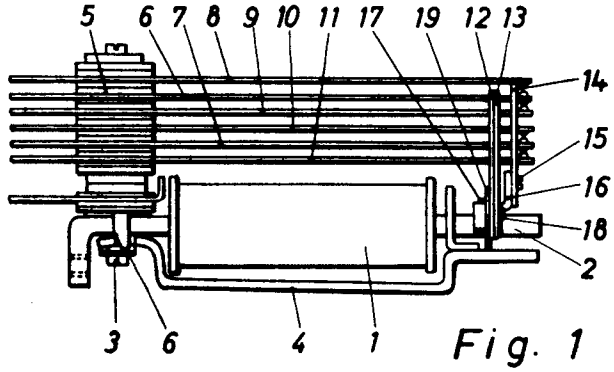


Fig. 1

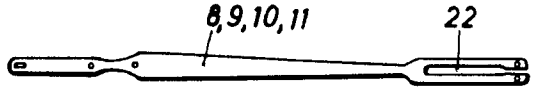


Fig. 2



Fig. 3

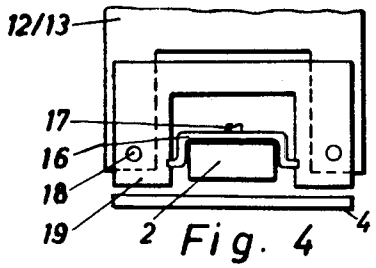


Fig. 4

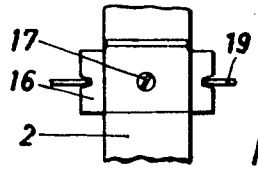


Fig. 5

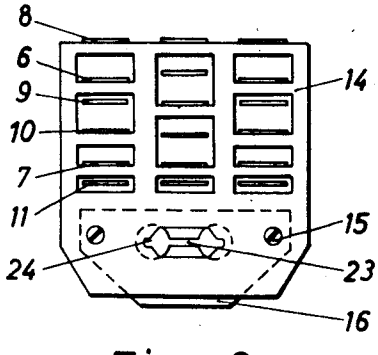


Fig. 6

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RELAYS WITH GUIDED CONTACT SPRING

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7 Claims. (Cl. 200—104)

This invention relates to relays of the type in which the moving contact springs are positively guided by means of lattice-like cards of insulating material and in which the stationary contact springs are supported by means of cards of a similar type.

In certain known types of relays the contact springs are connected with the armature or the flange or core of the coil solely by means of supporting flaps or lugs. Relays comprising a positive guide for the contact springs have proved to be more suitable especially in cases where it is necessary, for instance, in the event of one contact spring being welded to its opposing spring, to keep the remaining contact spring from assuming the other extreme position. This is required particularly in railway signalling in order to satisfy the necessarily strict safety regulations. Furthermore, relays with a positively-guided spring are more advantageous from the manufacturing standpoint because the contact springs are simpler in shape and are therefore easier to stamp out with less waste of material. Furthermore, in certain designs the control cards can be inserted after the springs have been assembled. This is, for the most part, not possible in other arrangements for positively guiding springs consisting, for example, of supporting rods or toothed guides.

According to the invention an improvement in such relays is accomplished by having the movable contact springs connected together by means of their associated control cards, and coupled to the armature only when the latter is pulled up, while the control card for the stationary contact springs or counter-springs is firmly attached to the core or flange of the coil and is coupled only indirectly with the stationary contact springs.

For some time it has been known that when employing relays with positively-guided contact springs it is necessary also to connect the armature positively or directly with the moving contact springs for indicating the sticking of the relay on account of the welding of the contacts to one another. However, practical experiments carried out with relays according to the present invention have shown that this advantage is only a slight one and that direct coupling of the moving contact springs with the armature can readily be dispensed with when employing only an indirect connection of the stationary contact springs with the associated card. This not only eliminates propagation of armature bounce when the armature is released, but also makes it possible to so design the springs as to produce a good double contact at the spring tips and at the same time assure stable guidance.

To this end, according to a further embodiment of the invention, the arrangement is such that the movable contact springs, which are free to move in openings in the control cards of the counter or stationary contact springs, come to rest on the lower edges of these openings when the armature releases. In this way the motion of the card for the movable contact springs is limited while the armature itself, during the release, is still free

to move a slight distance further to its final rest position after the card comes to rest. Furthermore, it is advantageous to arrange the card which supports the stationary contact springs between the card for the moving contact springs and the contact points of the springs, that is, closely behind the contact-making points. In this way the two contact-making points on each slotted spring can remain movable, for example, up to 1 mm. with respect to one another without hindering the positive guidance action. The support directly behind the contact points almost completely eliminates the effects of the springs' elasticity upon the forced retention of all the moving springs in the event of a welding or sticking of the contacts.

In accordance with a further aspect of the invention the shape of the springs is adapted to the positive guidance principle by slotting the front end of the stationary contact springs in a known manner with a relatively long slot of about 20 mm., while leaving the front end of the movable contact springs unslotted in order to assure sufficiently smooth operation of all contact springs controlled by the armature. Preferably, the moving contact springs are provided in their middle portion with a slot which helps to reduce the spring rate without diminishing the permissible spring load at the front end.

The omission of the direct connection of the armature with the associated card results in the further advantage that during the attraction and release action there will be no motion of the card in a longitudinal direction along the springs at the junction point between the springs and the card. Since the front end of the armature moves along a circular arcuate track the card in the prior art moved lengthwise along the springs in addition to moving in the desired direction transversely of the springs. The resulting friction longitudinally of the springs caused an undesirable increase in the armature load. It is no longer necessary to eliminate this friction by making the guide slots in the card which guide the springs of a width greater than the thickness of the springs. Thus a well-known card consisting of two parts may be used for the moving contact springs which retain the springs when in free motion and which may also be inserted or replaced subsequent to the assembly of the spring set. Nevertheless, control card guidance with respect to the relay's stationary parts remains simple if, according to the invention, the control card moved by the armature is guided on the side adjacent to the armature by means of a guide plate attached to the armature and sliding in two slots in a guide angle attached to the core coil, and furthermore if said control card is held tightly on the outermost movable spring of each spring assembly by means of studs located on the control card, which engage holes stamped in said springs.

It is also very easy to adjust the counter or stationary spring control cards, on which proper relay operation naturally depends, if, in accordance with a further feature of the invention, slots are provided in the control card itself, as well as in the guide angle with which it is fastened, which make it possible to move the control card slightly one way or the other, once it has been partially loosened by means of a screwdriver.

The invention will now be described with reference to an embodiment thereof shown in Figures 1 through 6 of the accompanying drawing. The example chosen for illustration is a flat-type relay as shown in Fig. 1. Figs. 2 and 3 show individual contact springs. Figs. 4 and 5 show the guide for the control card which is actuated by the armature, and Fig. 6 is a view of the mounting arrangement of the card for the stationary contact springs.

In Fig. 1, relay coil 1 is mounted on coil core 2. Arma-

ture 4 is movably attached to the core by means of a known hinge arrangement 3. The spring assemblies (usually 3) are attached by means of screws and insulating shims to the core at 5. The movable contact springs are indicated by reference numerals 6 and 7 and the counter-springs or stationary springs by 8, 9, 10 and 11. Springs 6 and 7 are connected directly to each other at their front ends by a two-part control card 12/13. Springs 8, 9, 10 and 11 are supported at the extreme front end directly behind their contact points by a one-part control card 14. The latter is attached by means of two screws 15 to a guide angle 16, which in turn is attached by means of screw 17 to the front end of core 2. A guide plate 19 is attached to control card 12/13 by means of screws 18 and the front of armature 4 presses against it when the latter pulls up. As shown in Figs. 4 and 5, guide plate 19 slides in guide slots on both sides of guide angle 16. Control card 12/13 is further guided by three small studs, not shown, on its edge facing away from armature 4. These studs fit into holes 20 of springs 6 (Fig. 3). These springs have no slots on their front end but have only one slot 21 about in their center to reduce the spring rate. Stationary springs 8, 9, 10 and 11 (Fig. 2), however, are provided at their front end with a relatively long slot 22.

With the relay in home or unenergized position, armature 4, supported, for example, at attachment point 3, by an armature restoring spring, lies a short distance from the edge of guide plate 19. When the relay pulls up, the armature moves toward the edge of guide plate 19, pushes it in the direction of the springs and in so doing releases movable contact springs 6 and 7, which till then were resting on the edges of the notches or holes in control card 14 (Fig. 6). When they move out of this position, stationary contact springs 9 and 11 at first move with them until they in turn rest on the edges of the cooperating notches in control card 14. As springs 6 and 7 continue to move, contact is made with counter-springs 8 and 10, which give way under the pressure of springs 6 and 7 until the armature pulls up completely. When the relay is again released, the armature is returned to normal position through the action of springs 6, 7, 8 and 10 and the armature restoring spring and the movement described above is reversed. Movable contact springs 6 and 7 are in the home position when they reach the edges of the cooperating notches in control card 14, in which case the back contacts are again closed. The armature, however, moves a short distance farther. Any bounce resulting from the armature striking, however, can no longer be imparted to the contact springs. Springs 8 and 10 are also again at the proper edges of control card 14.

Control card 14 can be accurately adjusted by slightly loosening one of screws 15 (Fig. 6) and inserting a small screwdriver in slots 23, for example (in guide angle 16), and 24 (in control card 14) and giving it a slight turn. Of course, the same may be done on the other side of the control card.

The invention is not limited to the embodiment shown as an example, but can be applied with equal success to other relay designs, for example to standard round-type relays. In that case it is advisable to have control card 12/13 engage the actuating member of the armature and control card 14 engage the armature support. If difficulties are encountered in arranging a guide arrangement similar to that shown in Figs. 4 and 5, control card 12/13 can be guided simply by means of springs 6 and 7. This can be done by providing not only the control card studs that engage holes 20 of springs 6, but also additional studs pointing downward that engage the cooperating holes 20 of the other spring 7 from above. It is also very simple to combine two flat-type relays according to the invention into one design, to form an interlocking relay.

What is claimed is:

1. A relay having a core, a coil on said core; an armature, a group of moving contact springs, a group of stationary contact springs, the springs of both said groups having a free end and having a portion insulatedly fixed to said core, a first lattice card of insulating material positively interconnecting said moving springs, a second lattice card of insulating material common to said stationary springs and having openings through which all of said springs pass, said movable springs normally resting on edges of the openings in said fixed card, said fixed card intermediate the free ends of said springs and said movable card, said movable card being positioned for positive movement in one direction by movement of said armature toward said core and for permissive movement in the opposite direction by the restoring action of said moving contact springs, means for causing given springs of said stationary group to rest on edges of the openings of said fixed card after positive movement of said movable card and means fixing said fixed card to said core.

2. A relay according to claim 1, characterized in that the moving contact springs, which are free for movement in the openings of said second card for the stationary contact springs, rest upon the lower edges of given of said openings upon release of said armature, thus limiting the motion of the first card carrying the moving contact springs, while the armature, in released position, is out of contact with said card last-mentioned, and given of said stationary springs are caused to rest against the upper edges of other of said openings after movement of said movable springs, whereby when the relay is changed from energized to deenergized condition any vibrations caused by the armature striking against the backstop are prevented from being transferred to the contact springs.

3. A relay according to claim 1 characterized in that the card supporting the stationary contact springs is positioned between said first card and the contact points of the springs and closely adjacent to said contact points.

4. A relay according to claim 1, characterized in that the card which is actuated by the armature, is guided on the side adjacent the armature by means of a guide plate resting in two channels of a guide member mounted on the core of the coil.

5. A relay according to claim 1, characterized in that the card which is actuated by said armature, is fixed relative to the moving contact springs by means of pointed edges provided on said card which engage corresponding punched holes provided in certain of said moving springs.

6. A relay according to claim 4, characterized in that in said card for the stationary contact springs, as well as also in the guide member to which said card is attached by screws, there are provided slots by means of which, after partially loosening the screws holding the card, the latter may be shifted by a small amount toward the one or the other direction by inserting and turning a screwdriver, for adjusting purposes.

7. A relay comprising a core, a plurality of movable contact springs having a free end and having a portion fixed to one end of said core and insulated therefrom, a first lattice card of insulating material having a plurality of openings through which said movable springs pass in tight contact so that movement of said card causes positive movement of said springs, a guide member fixed to said other end of said core, a guide channel in said member, a guide plate attached to said first card and slidably positioned in said channel, a second lattice card of insulating material attached to said member intermediate said first card and the free ends of said movable springs and having a plurality of openings therein vertically displaced with respect to one another, a plurality of stationary contact springs having a free end and having a portion fixed to said one end of said core and insulated therefrom, all of said springs extending through said openings and at least one of said stationary springs resting against the lower edge of one of said openings when said relay is in unenergized condition, in cooperative relation with respect to one of said movable springs, said

movable springs normally resting on the lower edges of selected ones of the openings in said second card, an armature for said core and a magnet coil for magnetizing said core to cause movement of said armature toward said core, this movement causing said armature to push said guide plate and move said first card in a direction to move said movable contact springs relative to said stationary springs, the stationary springs normally in contact with said movable springs adapted to rest against the upper edge of different ones of said openings after movement of said movable springs.

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