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M. G. NELSEN

2,852,639

RELAY

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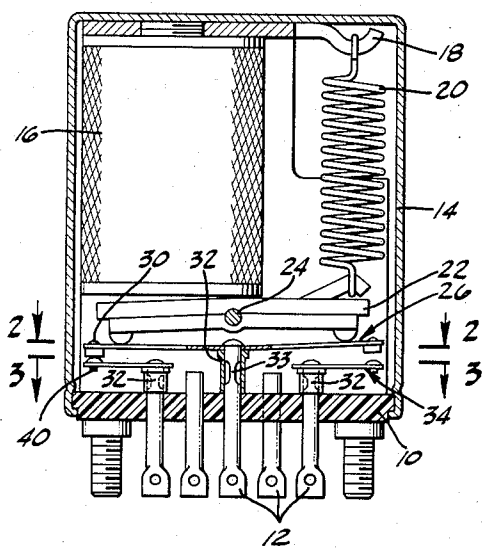


FIG. 1.

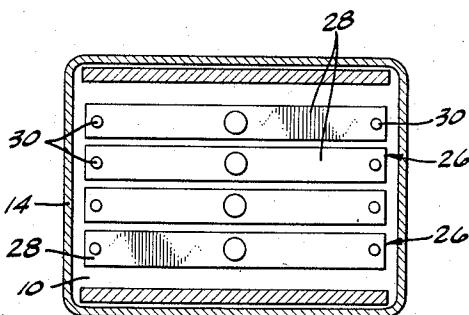


FIG. 2.

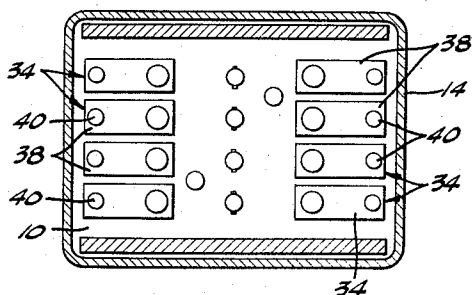


FIG. 3.

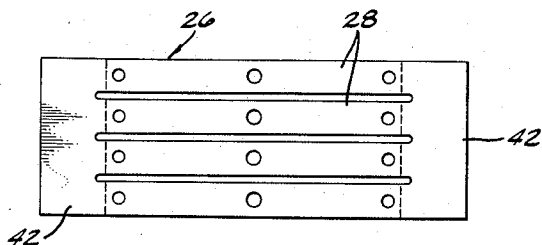


FIG. 4.

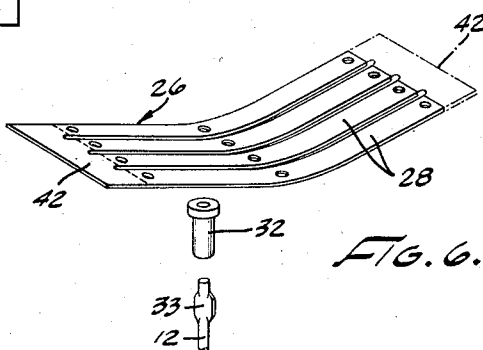


FIG. 6.

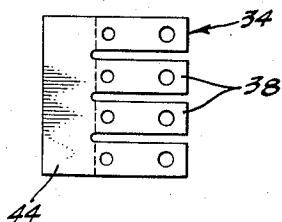


FIG. 5.

MARVIN G. NELSEN
INVENTOR.

BY

Lyon & Lyon
ATTORNEYS

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2,852,639

RELAY

Marvin G. Nelsen, La Canada, Calif., assignor to Leach Corporation, Los Angeles, Calif., a corporation of Delaware

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4 Claims. (Cl. 200—104)

This invention relates to relays and, more particularly, to an improvement in hermetically sealed relays and the manufacture thereof.

A feature of this invention is the provision of a hermetically sealed relay which is simpler to manufacture than heretofore.

Another feature of the present invention is the provision of a relay which is capable of resisting high values of vibration and shock.

Still another feature of the present invention is the provision of a relay having a balanced magnetic structure and contact structure.

Still another feature of the present invention is the provision of a novel and useful hermetically sealed relay which employs fewer parts than heretofore.

These and other features of the invention are achieved in a hermetically sealed relay of the type wherein contacts are assembled to terminals which extend through a header. The magnetic structure and moving contact structure, as well as the stationary contact structure, are all enclosed in a can which is sealed at one end to the header. The magnetic structure consists of a solenoid which operates on an armature which is centrally pivoted. The movable contacts are also centrally pivoted and positioned to be pushed against the stationary contacts on one side or the other, dependent upon whether the armature is pivoted into its operating position by the solenoid or released and pivoted into a nonoperating position by a compression spring. Both movable and stationary contacts each are made from single pieces of material which are cut and scored so that a unitary piece may be properly assembled to a plurality of the header terminals rapidly. After the unitary pieces are fastened, the scored portions are simply removed, thus leaving a plurality of separate current-carrying contact springs and contact terminals assembled in place. This operation heretofore required each current-carrying spring and contact to be assembled individually and separately into position and then adjusted, in order to achieve proper operation. By this invention, this time-consuming and pains-taking process is entirely eliminated. A further saving in time and material is made by directly mechanically fastening the stationary contacts, as well as the movable contacts, to the terminals that protrude through the header to enable external connections to the contacts.

The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings, in which:

Figure 1 is a cross-section of an embodiment of this invention;

Figure 2 is a view along the plane 2—2 of Figure 1, showing the movable contact assembly in the embodiment of the invention;

Figure 3 is a view along the plane 3—3 of Figure 1,

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showing the stationary contact assembly in the embodiment of the invention; and

Figures 4, 5, and 6 respectively show how the contact springs are punched out initially with the scored portions to enable simple and time-saving assembly of the relay contacts.

Referring now to Figure 1, there is shown an embodiment of the invention in cross section. This includes a header 10, through which protrude contact pins 12. These pins afford external connection with the contacts of the relay which are hermetically sealed. The header 10 is hermetically sealed in well-known manner to a can 14 after the internal assembly has been completed. A solenoid coil 16 is affixed to the bottom end of the can. A hook 18, also affixed to the same end of the can, affords a means for connecting thereto a tension spring 20. The other end of the spring is connected to an armature 22, which pivots about a bearing shaft 24. The solenoid, when energized by means of leads (not shown), establishes a magnetic field which pulls up on the left side of the armature, thus depressing the right side. When the solenoid is unenergized, the spring restores the armature to its initial position, in which the right side is pulled up and the left side is depressed.

In being operated in this fashion, the armature acts upon four movable contacts 26, which may better be seen in Figure 2. These movable contacts consist of a current-carrying contact spring 28, and at either end of the spring is a contact button 30. These movable contacts are previously soldered to a bushing 32. This type of bushing is shown more clearly in Figure 6. A hole in the contact spring at the soldered portion insures that the solder connection is a good one. The end portion 33 of each contact pin is flattened, as may be seen from the cross-sectional view of Figure 1 and the perspective view of Figure 6. Thus, when the movable contacts—four of which are formed of a single piece of material and have the bushings soldered thereto—are pushed over the proper contact pins, the flattened portions of the pins grip and hold the bushings and contacts securely. The stationary contacts 34, four of which are formed from a unitary piece of material, each include a current-carrying spring 38 having a contact button 40 mounted on one end and a hole on the other end by means of which it is soldered firmly to a bushing 32. The contact pins associated with the stationary contacts also have their ends flattened so that, when the stationary contacts and bushings are forced down on the contact pins, the bushings are held securely.

In the assemblage of a system of this sort heretofore, it has been necessary to individually mount each of the contacts on a support. Thereafter, the mounted contacts had to be adjusted individually until the proper alignment was made between the movable and fixed contacts. Then, they had to be held until a soldering operation was performed. This entailed considerable labor and the use and handling of a large number of very small parts in the assemblage of the relay. I have found that by forming the movable contacts in the manner shown in Figures 4 and 6 and the stationary contacts in the manner shown in Figure 5 there is an elimination of a considerable number of the small parts required heretofore, as well as problems of alignment and soldering.

As shown in Figure 4, the movable contacts are made up from one piece of the contact spring material, wherein the spacing between the springs, as well as the holes required, are punched out. The material 42 at the ends of the contact springs is left in place; however, it is scored as represented by the dotted lines so that it may be broken away easily. Thus, the contact buttons 40 are put in place, the bushings are soldered in place, and the contact springs are positioned over the respective

pins as a unit and forced down, whereby the four springs are secured in place in the proper position without further adjustments. The scored material is then broken away.

As shown in Figure 5, four of the stationary contacts similarly are formed from a single piece of material, with the required openings being stamped in the contact spring and the excess spring material 44 still being left in place but being heavily scored. Thus, after contact buttons and bushings are mounted, the two sets of stationary contacts are easily assembled on the pins to which they are assigned. The scored material is broken away and no further adjustment is required.

It is will be noted from Figure 6 that the movable contact springs are given a curve, which tends to edge them away from the fixed contacts when they are mounted in the relay. This curve, in addition to the force provided by operation of the armature, insures a positive and rapid break of the contacts when such operation is indicated.

It should be readily apparent from the above that a considerable saving and handling alignment and final adjustment is made when the contacts are formed as described herein. A further feature of the present invention is that the armature is balanced, and, in combination with the contact structure formed as described herein, is capable of withstanding high-frequency vibration, shock, and acceleration. The relay in Figure 1 is shown in a de-energized position, with the spring pulling up on the armature so that it closes the contacts on the left side of the drawing. Because of this balanced armature construction, forces which are applied thereto are neutralized. A positive force is provided by the returned spring 20, which holds the contacts closed in the de-energized position. Although the relay illustrating the invention has four double-pole, double-throw positions, it will be appreciated that as many more or less, as are desired, may be used without departing from the spirit of this invention.

I claim:

1. A relay comprising a header, a first plurality of aligned contact pins extending through a central portion of said header, second and third pluralities of aligned contact pins extending through said header and respectively positioned on either side of said first plurality of contact pins, a stationary contact for each of said second and third pluralities of contact pins each including a contact spring, a contact button mounted on one end, means for fastening the other end to a one of said second or third pluralities of contact pins, a movable contact for each of said first plurality of contact pins, each of said movable contacts including a contact spring extending between contact buttons of said fixed contacts on either side and adjacent to said movable contact, a pair of contact buttons, one in each end of said movable contact opposite to the contact buttons in each adjacent stationary contact, and means to fasten said fixed contact at its center to a contact pin, each said movable contact spring being curved upward away from said stationary contacts on either side, an armature pivotally supported above said movable contacts, and means to pivot said armature against one or the other side of said movable contacts to close them to one or the other of said stationary contacts.

2. A relay as recited in claim 1 wherein said means to pivot said armature includes a spring mounted above and attached to one side of said armature to urge the other side downward upon one side of said movable contacts whereby said movable contacts are in contact with said stationary contacts mounted on said first plurality of contact pins, and solenoid coil means positioned over the other side of said armature for moving it upward, thus urging the other side of said movable contacts downward in contact with said fixed contacts mounted on said second plurality of contact pins.

3. A relay as recited in claim 1 wherein said means to fasten each said fixed contact and said means to fasten each said movable contact each includes a bushing attached to said contact spring, and each contact pin on which a contact is mounted has the end portion flattened to securely engage the bushing inserted thereon.

4. A hermetically sealed relay comprising a header and a hollow can having one end closed and the other end sealed to the edge of the header, the inside of said can containing a solenoid coil attached to the closed end of said can at one side, a torsion spring attached to the closed side of said can at the other side, a pivoted armature having one end connected to said torsion spring other end and its opposite side in operative relation with said solenoid coil, a plurality of movable contacts, means for mounting said plurality of movable contacts to be pivoted with said armature including for each movable contact a contact pin extending through said header and having a flattened portion, a bushing to which said movable contact is attached at its center, said bushing fitting over said flattened end portion and being held thereby, each of said movable contacts being curved away from said contact pins, a plurality of stationary contacts and means to position a different one of said stationary contacts adjacent each end of each of said movable contacts to be respectively contacted thereby when said armature pivots said movable contacts, said means including for each stationary contact a contact pin extending through said header and having a flattened end portion, and a bushing to which said stationary contact is attached, said bushing fitting over said flattened end portion and being held thereby.

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