

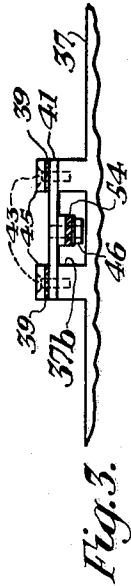
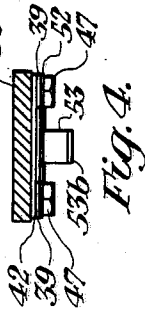
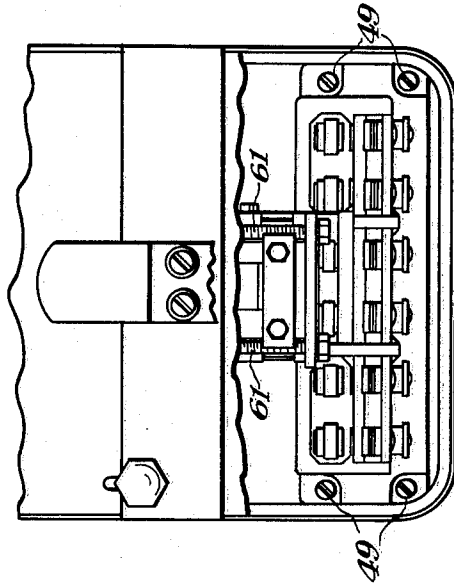
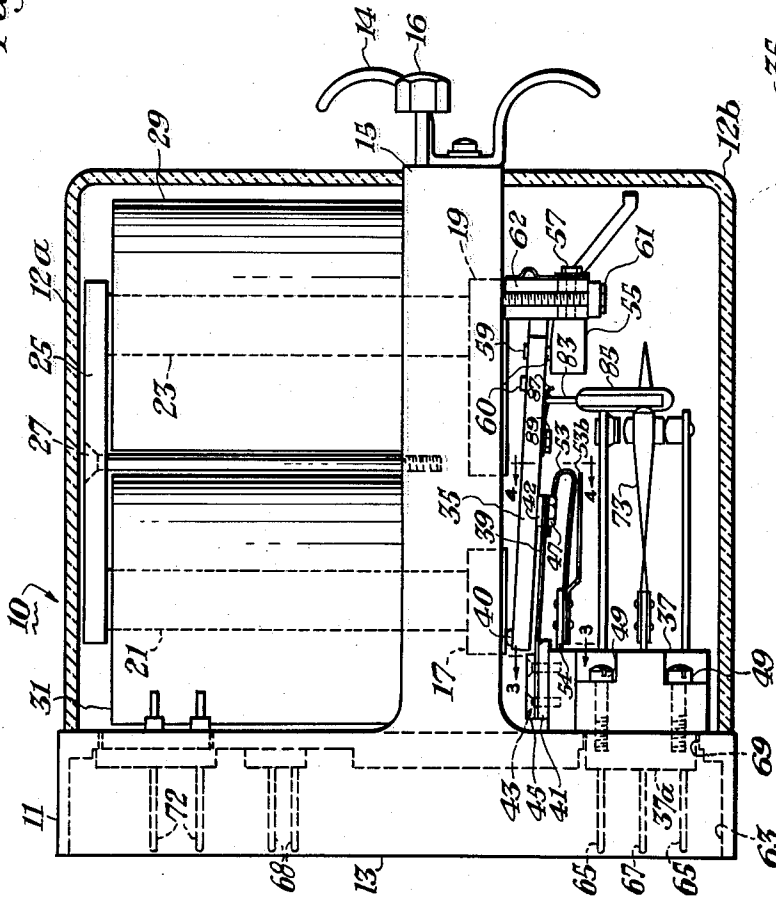
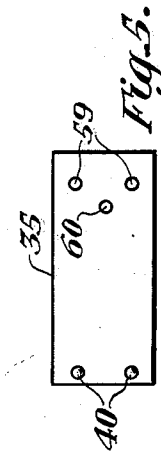
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ELECTRICAL RELAY ARMATURE ASSEMBLY

Filed June 23, 1959



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ELECTRICAL RELAY ARMATURE ASSEMBLY
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My invention relates to electrical relays and more particularly to novel means for mounting the armature of a relay.

When mounting the armatures of prior art relays in their adjusted position an excessive amount of time must be spent and considerable care must be exercised due to the small tolerances which must be maintained; consequently adding substantially to the manufacturing expenses encountered in these prior art relays.

Accordingly, it is a principal object of my invention to provide a novel pivoting assembly for a relay which assembly is relatively self-adjusting.

Another object of my invention is to provide a relay having an armature pivoting assembly consisting of a few and simple parts which are relatively inexpensive to manufacture and assemble.

In the attainment of the foregoing objects of my invention I provide a relay of the plug-in type having a one piece frame constructed as by casting. The relay includes a pair of pole pieces which are machined and die cast into a plate which in turn is bolted to the frame. The armature is affixed to a leaf spring which in turn has one end portion affixed to an insulative block attached to the relay frame. The armature is mounted intermediate its ends on the free end portion of the leaf spring and is pivoted thereon. Two buttons of insulative material having a low coefficient of friction are formed on the upper side of the armature of one end thereof. As the armature is attracted to the pole pieces the buttons engage against a pole piece to provide a pivot for the armature assembly.

Other objects and advantages of my invention will become apparent from the following description and the accompanying drawings in which like reference characters refer to like elements throughout, and in which:

FIG. 1 is a side view partly in cross section, showing one form of plug-in relay embodying my invention;

FIG. 2 is a front view, partly in cross section of the relay of FIG. 1;

FIG. 3 is a front view, partly in cross section, taken along the lines 3—3 of FIG. 1;

FIG. 4 is a front view, partly in cross section, taken along the lines 4—4 of FIG. 1; and

FIG. 5 is a top view of the armature of FIG. 1.

Referring to the drawings, the relay 10 comprises a frame member 11 of suitable non-magnetic material such as die cast aluminum. Frame member 11 consists of a vertical portion 13 and a horizontal forwardly expanding portion 15. Two plastic covers 12a and 12b are affixed to the frame member 11 to enclose the operating parts of the relay and to provide a weathertight seal therefor. Secured to the forward end of frame member 11 is a relay handle member 14 and a latch actuating rod 16 which cooperates with a latch member, not shown, to secure the relay 10 on its mounting panel.

Horizontal portion 15 includes two pole pieces 17 and 19 of magnetizable material which are preferably machined then die cast into a plate, not shown, which plate is then mounted on, and forms a part of the horizontal portion 15 of the frame member 11. The two core members 21 and 23 are welded in a vertical position to the two pole pieces 17 and 19. Cores 21 and 23 pass through and support energizing coils 31 and 29, respectively. A backstrap 25 is secured to the upper ends of the cores 21

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and 23 as by screws 27 which engage the die cast plate in horizontal portion 15.

The vertical portion 13 of the frame member 11 is provided with a rearwardly facing terminal-receiving opening 63 for receiving the plug-in ends of the fixed contact members 65, the movable contact base members 67, the indexing pins 68 and the coil energizing terminals 72. Located within the vertical portion 13 and the opening into the terminal opening 63 is an opening 69 for receiving an extending portion 37a of contact support block 37. The fixed contact members 65 and the movable contact members 67 pass through apertures in support block 37 and are secured therein by means such as disclosed and claimed in Wells Patent 2,830,139, for Electrical Relay Contact Support and Relay Indexing, which patent is assigned to the assignee of the present application. Each of the movable contact base members 67 are secured as by rivets to their associated movable contact leaf spring 73.

An armature 35 is pivotally secured to and supported by a pair of hinged leaf springs 39 which are horizontally disposed on the underside, as oriented in the drawings, of the armature. Referring now to FIG. 3, as well as FIG. 1, one end of each of the hinged springs 39 rests on a spacer washer 41 which washer extends across and is mounted on the top surface of a double humped projection on support block 37. Screws 43 and cap plates 45 affix springs 39 and washer 41 to block 37. Support block 37 is in turn secured to the frame 11 by screws 49, see also FIG. 2. An end of washer 41 protrudes from the edge of block 37 and provides support for the end of the armature 35 when the armature is deenergized; the end of washer 41 being beveled to permit ready flexure of springs 39, as best seen in FIG. 1. Referring now also to FIG. 4, leaf springs 39 are affixed by screws 47 to the under surface of armature 35 at a point intermediate the ends of the armature and support the armature in spaced relation with respect to pole pieces 17 and 19. Washer 42 spaces the springs 39 from the armature 35.

The straight end portion of a J-shaped leaf spring 53 is mounted on a stiffening member 54 which member is received in channel 37b formed in block 37, and is affixed to washer 41 by screw 46. The free or curved end of spring 53 bears against a plate 52 secured beneath the armature by screws 47 which plate extends the width of armature 35. Spring 53 provides a means for adjusting the calibration values of the relay and also provides additional support for the armature 35. A reinforcing extension 53b for spring 53 is mounted on stiffening member 54 and acts as a stiffener in case of shock to spring 53.

Attached to the one end of the armature 35 is an inverted U-shaped contact drive wire 83. The ends of the drive wire 83 are molded into a contact actuating member 85 and the bight portion of wire 83 is engaged by a clip 87 mounted on the armature 35 as by screws 89. Contact actuating member 85 engages and drives movable contact springs 73. An armature hold-down pole piece member 55 is secured by means of screws 57 to permanent magnet 62. The permanent magnet 62 is secured to the pole piece 19 by magnetizable bolts 61 which also act as a shunt to prevent the demagnetization of the permanent magnet 62 should the magnet be subjected to any stray flux surges. The hold-down pole piece 55 also serves as a back stop to limit movement of the armature away from the pole pieces 17 and 19. The armature hold-down assembly is explained in detail in Patent 2,836,774 issued to H. E. Ashworth on May 27, 1958, for Magnetic Hold-Down Devices which patent is assigned to the same assignee as the present invention.

The armature 35 is provided with the usual upper and lower non-magnetic core pins 60 to prevent the armature from sticking to the pole piece 19, or to the hold-down

pole piece 55. The usual second or safety non-magnetic pins 59 which are of lesser height than upper pin 60 are provided to prevent the armature from sticking to the pole piece 19, in case pin 60 wears down, see FIG. 5.

Two spaced, aligned buttons 40 of insulative material, such as nylon or the like are formed on the upper surface of the armature 35 on one end thereof, see FIGURE 5. The buttons 40 provide a pivot point or line for the armature 35 as will be described hereinbelow. A single button might be used, however, the use of two spaced buttons prevents any tendency of the armature to wobble or turn on the pivot point. Further, a single raised ridge across the edge of the armature might be employed, however to minimize frictional and wear effects buttons are preferred.

In the deenergized condition of relay coils 29 and 31 the armature 35 may be in a position in which the buttons actually bear against pole piece 17 as shown in FIG. 1, or the armature may be in a position such that small air gap or space exists between the buttons and pole piece 17. The deenergized position of armature 35 depends on the bias of spring 39 and the amount of force needed from spring 53 for calibration purposes. Regardless of the deenergized condition of armature 35, that is, whether a space does or does not exist between buttons 40 and pole piece 17 the operation of the pivot assembly is similar in both cases. Upon energization on the relay coils 29 and 31 the armature 35 is attracted toward the pole pieces 17 and 19. The entire armature 35 is moved upwardly such that insulating buttons 40 bear against the pole piece 17. At this point the buttons act as a sliding pivot for the armature and the other end of the armature is moved the remaining distance until its top core pin 60 bears against the pole piece 19. There is an appreciable horizontal movement of the armature as it is pivoted, in one embodiment of my pivot assembly, buttons 40 actually slide about $\frac{1}{64}$ " horizontally along the bottom surface of pole piece 17. Thus, although buttons 40 can be of any type non-magnetizable material they are of an insulative material preferably of a nylon, Teflon, or similar material to provide a lubricating action to minimize frictional effects.

The height of the buttons 40 determines the spacing between the armature and the pole piece 17. It is a decided advantage of my pivoting assembly in that no adjustment is needed other than that of making or forming buttons 40 to the required height.

An even more important advantage of my pivoting assembly is that no adjustment for air gap spacing is necessary after the armature is mounted in the relay.

While my invention has been described with reference to a particular embodiment thereof, it will be understood that various modifications may be made by those skilled in the art without departing from the invention. The appended claims are therefore intended to cover all such modifications within the true spirit and scope of the invention.

Having thus described my invention, what I claim is:

1. In a relay having a frame, at least one energizable coil, at least one pole piece and an armature, a pivoting assembly for the armature comprising, leaf spring means mounted on said frame to have extending portions, said armature being affixed intermediate its ends to said extending portions, said extending portions supporting the armature in a position to form an air gap between the pole piece and the armature, and a pair of insulating and self lubricating buttons each having a substantially smooth bearing surface attached to one end of the armature and protruding into said air gap, energization of the coil caus-

ing the entire armature to be attracted toward said pole piece until the bearing surfaces of said buttons engage the pole piece and provide a pivot for permitting the other end of the armature to swing about said pivot.

2. In a relay having a frame, at least one energizable coil, at least one pole piece and an armature, a pivoting assembly for the armature comprising, leaf spring means for supporting the armature, an air gap formed between the pole pieces and the armature, and insulating buttons formed each having a substantially smooth bearing surface attached to one end of the armature and protruding into said air gap, whereby when said coil is energized the entire armature is attracted toward the pole pieces and the bearing surfaces of said buttons engage a pole piece to provide a sliding pivot for the armature for permitting the other end of the armature to swing about said pivot.

3. In a relay including a frame, at least one energizable coil, at least one pole piece and an armature, a pivoting assembly for the armature comprising, leaf spring means mounted on the frame, the armature being supported intermediate its ends by said leaf spring means, the armature and pole pieces having an air gap therebetween, and spaced and aligned insulating buttons each having a substantially smooth bearing surface attached to one end of the armature and protruding into said air gap for forming a pivot for said armature, whereby when the coil is energized the entire armature is attracted toward the pole pieces and the bearing surfaces of said buttons engage a pole piece to provide a pivot for the armature to permit the other end of the armature to swing about said pivot.

4. In a relay having a frame, at least one energizable coil, at least one pole piece and an armature, a pivoting assembly for the armature comprising, leaf spring means mounted on the frame, the armature being supported intermediate its ends by said leaf spring means, the armature and pole pieces having an air gap therebetween, and spaced and aligned insulating buttons each having a substantially smooth bearing surface attached to one end of the armature and protruding into said air gap for forming a pivot for said armature, whereby when the coil is energized the entire armature is attracted toward the pole pieces and the bearing surfaces of said buttons engage a pole piece to provide a pivot for the armature thereby permitting the other end of the armature to swing about said pivot.

5. In a relay having a frame, an energizable coil, a pair of pole pieces and an armature, a pivoting assembly for the armature comprising, a pair of leaf springs mounted on the frame, a portion of each of said leaf springs extending along the under surface of said armature, the armature being affixed intermediate its ends to said leaf springs, said leaf springs supporting said armature in spaced relation from said pole pieces to form an air gap therebetween, and a pair of spaced insulating buttons each having a substantially smooth bearing surface attached to one end of the armature protruding into said air gap for forming a pivot for said armature, whereby when the coil is energized the entire armature is attracted toward the pole pieces and the bearing surfaces of said buttons engage a pole piece to provide a sliding pivot for the armature to permit the other end of the armature to swing about said pivot.

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