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2,868,925

ELECTROMAGNETIC RELAY

Filed June 3, 1958

2 Sheets-Sheet 1

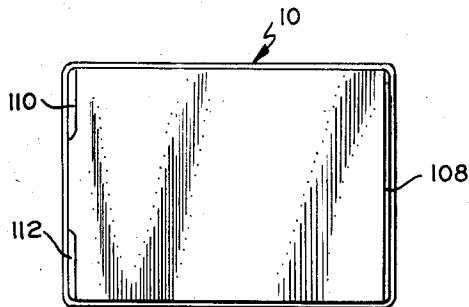


FIG. 2

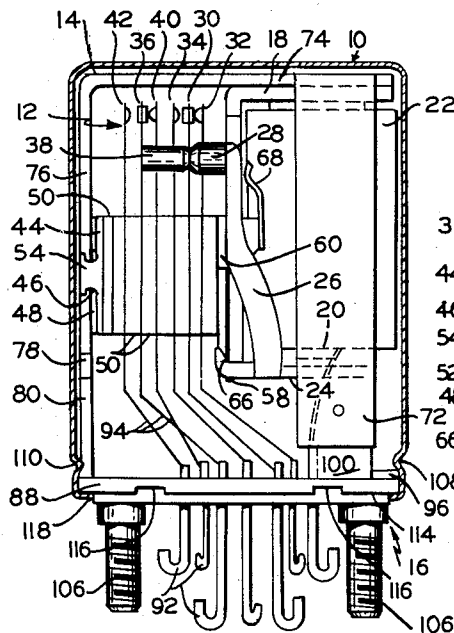


FIG. 1

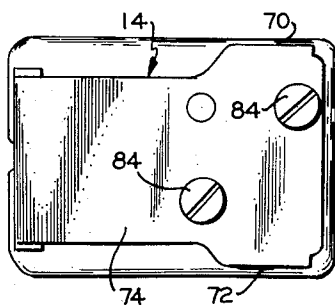


FIG. 4

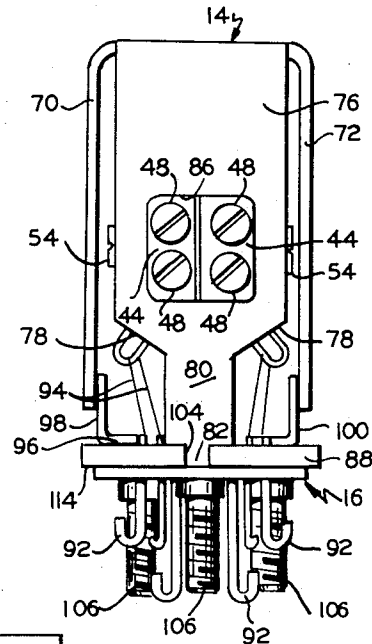


FIG. 3

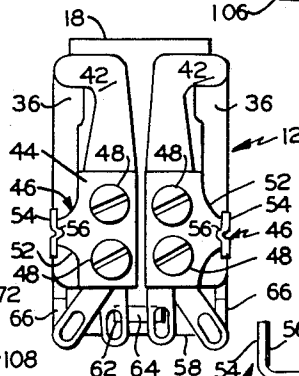


FIG. 5

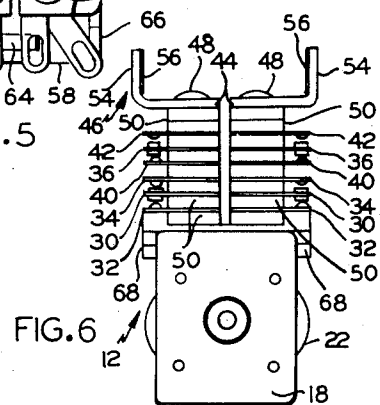


FIG. 6

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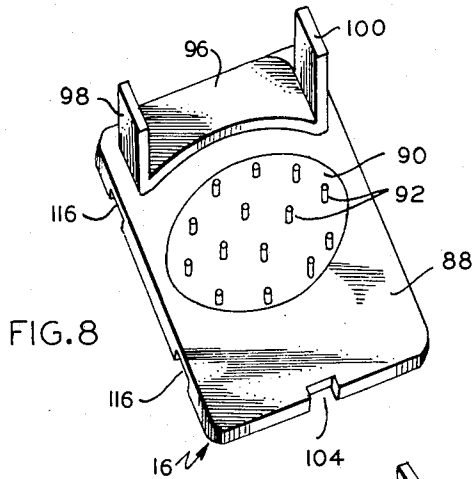
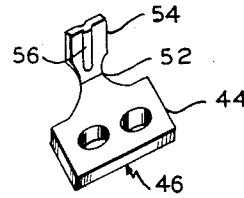
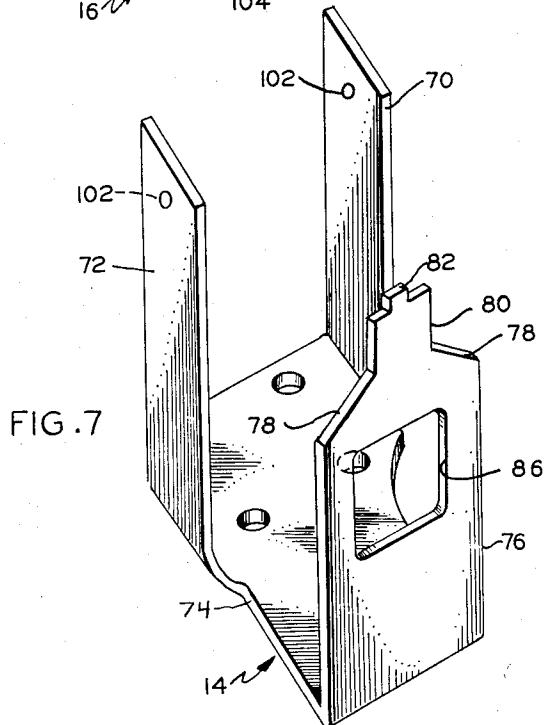
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ELECTROMAGNETIC RELAY

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5 Claims. (Cl. 200—104)

This invention relates to electromagnetic relays and more particularly to an improved construction for supporting the operating parts of a multi-contact relay such as within a dust-tight or hermetically sealed enclosure. This invention is particularly applicable for use with hermetically sealed relays of the telephone type.

The conventional telephone type relay comprises a frame structure including a core provided with a winding, a movable armature carried by the frame structure, and one or more sets of switch springs carried by the frame structure and operatively associated with the armature. To obtain reliable operation of these relays under adverse atmospheric conditions, they are commonly enclosed in thin metal enclosures with electrical connections brought to the outside through a terminal header assembly. The relay is usually supported upon the end of the enclosure remote from the header assembly by means of screws passing through the enclosure and secured in the relay frame structure. Since the hermetically sealed relay assembly is usually attached to a supporting member at the header assembly end, the operating parts of the relay suspended from the remote end of the thin and relatively flexible enclosure are particularly vulnerable to shock and vibration. Malfunctioning of the relay such as the temporary opening or closing of the switch contacts may occur.

Another difficulty has been experienced with hermetically sealed relays of the above type where a large number of switching circuits are required. The switch springs are connected to the header terminals by means of wires soldered to the switch springs and the header terminals. These wires individually are somewhat flexible but as a group have sufficient stiffness to resist a change in the relative positions of the header terminals and the connected ends of the switch springs. Since the switch springs are not supported upon the same portion of the relay frame structure which is secured to the relay enclosure, the relay frame is often bent or distorted when the header terminal assembly is positioned in the open end of the enclosure and secured thereto. This disturbs the relay adjustments which must be made before enclosure of the relay. Such misadjusted relays may not have the desired operating characteristics and must be rejected, or they may fail to perform satisfactorily after a relatively few switching operations.

It is therefore an object of the present invention to provide improved means for supporting a relay of conventional construction to withstand adverse shock and vibration conditions.

Another object of the invention is to provide an improved means for supporting a relay of conventional construction such that enclosure of the mounted relay will not disturb its adjustments.

A further object of the invention is to provide an improved means for supporting a relay of conventional construction within a dust-tight or hermetically sealed enclosure involving only an inconsequential increase in cost, weight, and size.

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In a preferred embodiment of the invention as applied to a telephone type relay, the frame structure of the relay is secured to a supporting bracket formed with a plurality of legs surrounding the operating parts of the relay and attached to the terminal header assembly. Attached to the switch structure of the relay is a clamp plate having an arm secured to an adjacent leg of the supporting bracket. The legs of the supporting bracket are disposed such that the parts of the relay are readily accessible for adjustment after the supporting bracket is attached to the header assembly. A suitable housing fitting over the supporting bracket is provided to enclose the relay and may be soldered to the terminal header assembly if hermetic sealing of the relay is required.

For a better understanding of the invention together with other objects and features thereof, reference is made to the following description and the accompanying drawings in which:

Figure 1 is an elevational view of an enclosed relay embodying the invention with a side of the enclosing housing being cut away to show the construction;

Figure 2 is a plan view of the interior of the relay housing as seen from the bottom of Figure 1;

Figure 3 is an elevational view of the relay as seen from the left side of Figure 1 with the enclosing housing being removed;

Figure 4 is a plan view of the relay as seen from the top of Figure 3;

Figure 5 is an elevational view of the relay corresponding to Figure 3 with the supporting bracket and terminal header assembly removed;

Figure 6 is a plan view of the relay as seen from the top of Figure 5;

Figures 7, 8, and 9 are perspective views, respectively, of the supporting bracket, the terminal header assembly, and one of the clamp plates.

Referring to the drawings, the relay is shown as comprising in addition to its enclosing housing or cover 10, a telephone type relay assembly 12 secured to a supporting bracket 14 which is attached to a terminal header assembly 16. The relay assembly 12 and the supporting bracket 14 are easily and simply secured together and attached to the header assembly 16 such that the relay assembly 12 is supported to withstand adverse shock vibration conditions.

The relay assembly 12 is of generally conventional form and includes a substantially L-shaped frame 18, a magnetic core 20 secured to the frame 18 and carrying a coil 22, and a movable armature 24 cooperating with an adjacent end of the core 20. The armature 24 is provided with a pair of spaced apart and longitudinally extending arms 26 each carrying an insulator 28 for actuation of the movable contact springs 30. Contact springs 30 cooperate with the normally closed stationary contact springs 32 and with the normally open stationary contact springs 34. Each of a second pair of movable contact springs 36 carry an insulator 38 which engages the adjacent contact spring 30 on the opposite side thereof from the insulator 28 such that movement of contact springs 30 upon engagement by insulator 28 is transmitted through insulator 38 to contact springs 36. Contact springs 36 cooperate with normally closed stationary contact springs 40 and with normally open stationary contact springs 42. The contact springs are held in pile-up assemblies between the frame 18 and the base 44 of a clamping plate 46 by screws 48, the contact springs being spaced apart and insulated from each other by the insulators 50. The contact springs are, of course, suitably insulated from screws 48. The base 44 of each clamping plate 46 is connected by a neck portion 52 of reduced width to an arm 54 extending substan-

3 tially normal to the base 44. The arms 54 extend from the spring pile-up assemblies of the relay assembly 12 in parallel spaced relation and have oppositely disposed embossed portions 56 for purposes which will be subsequently explained.

Interposed between the spring pile-up assemblies and the frame 18 are an armature retaining plate 58 and an armature stop member 60. The retaining plate 58 has an opening 62 into which the armature extension 64 projects which together with the armature hooks 66 hold the armature 24 in bearing engagement with the edge of the frame 18. The armature stop member 60 has two adjustable arms 68 extending substantially parallel with the armature arms 26 to limit the extent to which the armature 24 may pivot on the frame edge away from the core 20 under the influence of springs 30 and 36 in the normally deenergized position.

When the coil 22 is energized, the armature 24 is attracted to the core 20 causing the armature arms 26 to move toward the movable springs 30. The insulators 28 engage the springs 30 which transfer the movement of the armature arms 26 through the second insulators 38 to the movable springs 36. The stationary contact springs are off-set to permit the free movement of the insulators 28 and 38.

The supporting bracket 14 is preferably formed from steel by a stamping operation and comprises two like legs 70 and 72 extending in the same direction at substantially right angles from opposite edges of one end of a base portion 74. The opposite end of the base portion 74 has an integral leg 76 extending at substantially a right angle to the base portion 74 in the same direction as legs 70 and 72 but at right angles to their major planes. The free end of leg 76 has converging edges 78 terminating in a reduced width end portion 80 which is provided at its extremity with a tongue 82.

The frame 18 of the relay assembly 12 is secured to the base portion 74 of the supporting bracket 14 intermediate legs 70 and 72 by means of screws 84. When the relay assembly 12 is mounted upon the base portion 74 of the supporting bracket 14, the arms 54 of the clamp plate 46 are positioned upon either side of the leg 76 and may be welded or otherwise fixed thereto. Leg 76 is provided with an opening 86 positioned opposite the heads of screws 48 through which opening the tightness of the screws 48 may be adjusted.

The terminal header assembly 16 comprises a generally rectangular plate 88 having a central opening filled by a disc 90 of insulating material such as glass. A plurality of spaced terminals 92 extend through disc 90 to provide for external connections to the relay. The ends of the terminals 92 extending upon one side of the plate 88 may be connected by lead wires 94 to the relay coil 22 and the terminal end of the various contact springs. A bracket 96 secured to one end of plate 88 is provided with two upstanding spaced arms 98 and 100. The arms 98 and 100 are spaced apart a certain distance substantially equal to the separation of the free ends of legs 70 and 72 of bracket 14. The free ends of legs 70 and 72 are each provided with a spherical boss or projection 102 to facilitate welding of the legs 70 and 72, respectively, to arms 98 and 100. A notch 104 is cut in the opposite edge of plate 88 to receive the tongue 82 of leg 76 which may be welded or otherwise fixed in position. Also attached to the header plate 88 are three studs 106 which may be used in mounting the relay.

As shown in Figure 1, the various parts of the relay are enclosed in a rectangularly-shaped housing 10 preferably formed of sheet metal. The narrow sides of the housing 10 are provided with inwardly embossed portions 108, 110, and 112 near the open end of the housing. When the housing 10 is slipped over the supporting bracket 14 and the edges of the header plate 88, embossed portion 108 abuts against bracket 96 while

4 embossed portions 110 and 112 abut against the header plate 88 on either side of the end portion 80 of the supporting bracket leg 76 such that the edge of the open end of the housing 10 is substantially flush with the shoulder 114 of the header plate 88. Inasmuch as the housing does not support any part of the relay, it need not be crimped to the header plate 88 but may be secured in place by indenting at spaced intervals the lower edge of the housing 10 into recesses 116 provided in the edges of the header plate 88. The housing 10 may be sealed to the header plate 88 by applying solder 118 to the shoulder 114 of header plate 88 and the adjacent edge of the housing 10. When it is required that the relay enclosure be filled with a gas, such gas may be introduced into the relay through a hole in the housing which may then be closed by solder in a manner well known in the art. Or if the relay need be enclosed in only a dust-tight manner, indenting and soldering of the lower edge the housing 10 to the header plate 88 may be omitted, the housing being attached to the relay frame 18 or the supporting bracket 14 by a screw or other suitable means.

From the foregoing description, it can be seen that the relay may be easily and simply assembled and adjusted. The supporting bracket 14 is secured to the header assembly 16 by welding legs 70 and 72 to the respective arms 98 and 100 of bracket 96, tongue 82 of bracket leg 76 positioned in notch 104 of the header plate 88 also is welded in place. Relay assembly 12 which is assembled in a well known manner is then positioned within legs 70, 72, and 76 of the supporting bracket 14 attached to the base portion 74 by screws 84. After arms 54 of clamp plates 46 are welded to leg 76 of the supporting bracket 14 and the projecting portions are removed as by grinding, the coil 22 and the terminal ends of the contact springs are connected to the header terminals 92 by lead wires 94. Since the relationship of the assembled relay parts will not be disturbed by the remaining assembly operations, the relay parts are now adjusted and the relay is tested. With its parts assembled as described, the assembly of the relay is completed by securing housing 10 in place over bracket 14 and soldering it to the header plate 88.

Because both branches of the relay frame 18 are secured to the supporting bracket 14 which in turn is rigidly attached to the header assembly 16, firm mounting of the relay assembly 12 is assured even under adverse shock and vibration conditions. Since adjustment of the relay is performed after completion of all assembly operations which might disturb the relationship of the relay parts, the enclosed relay will also be properly adjusted. It is to be particularly noted that the housing 10 may be securely fastened to the header assembly 16 without the usual crimping operation which can easily disturb the dimensional relationship of relay parts that must be maintained to close tolerances.

From the foregoing, it will be evident that the invention provides an improved relay construction involving only an inconsequential increase in cost, weight, and size, which is easily adjusted and assembled, and which lends itself equally well to either dust-tight enclosure or hermetic sealing.

While the invention has been illustrated and described in its preferred embodiment and has included certain details, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways falling within the scope of the invention as claimed.

What is claimed is:

1. In an electromagnetic relay of the type having a magnetic core carrying a coil attached to one branch of an L-shaped magnetic frame and two contact spring pile-up assemblies mounted upon the other branch of the frame for operation by a movable armature, the combination of a header terminal assembly and a supporting bracket

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having two like legs extending in the same direction at substantially right angles from opposite edges of one end of a base portion and having a third leg extending from the edge of the opposite end of the base portion in substantially the same direction as said two legs but at right angles to their major planes; the free ends of said legs of the bracket being secured to the terminal header assembly; said one branch of the frame being secured to the base portion of the bracket, each of said contact spring pile-up assemblies including a clamp plate having a projecting arm; said projecting arms being secured to opposite edges of the third leg of the bracket.

2. The relay as defined in claim 1 wherein the edge at one end of the header terminal assembly is provided with a notch and the opposite end of the header terminal assembly is provided with two upstanding arms spaced apart a distance substantially equal to the separation of the free ends of said two legs of the bracket, said two legs of the bracket being attached to said arms of the header terminal assembly; and said third leg of the bracket having a reduced width portion terminating in a narrow tongue secured to the header terminal assembly in said notch.

3. The relay as defined in claim 2 and further characterized by a housing enclosing said parts of the relay and forming a closure therefore with said header terminal assembly; one side of the housing having an inwardly embossed portion near the open end of the housing adapted to abut said header terminal assembly adjacent said arms of the header terminal assembly; and the opposite side of the housing having two inwardly embossed portions near the open end of the housing adapted to engage the header terminal assembly on opposite sides of the reduced width portion of said third leg of the bracket.

4. In an electromagnetic relay of the type having a magnetic core carrying in coil attached to one branch of

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an L-shaped magnetic frame and a contact spring pile-up assembly mounted upon the other branch of the frame for operation by a movable armature, the combination of a base plate and a supporting bracket having a plurality of legs extending in the same direction at substantially right angles from the edges of a base portion; the free ends of said legs of the bracket being secured to the base plate; said one branch of the frame being secured to the base portion of the bracket; and said contact spring pile-up assembly including a clamp plate having a projecting arm secured to one of said legs of the bracket.

5. In an electromagnetic relay of the type having an L-shaped magnetic frame with a magnetic core carrying a coil attached to a branch of the frame and with a contact spring pile-up assembly mounted upon another branch of the frame for operation by a movable armature, the combination of a base plate and a supporting bracket having a base portion and a plurality of legs extending in the same direction at substantially right angles from the edges of the base portion and secured at their free ends to the base plate, one of said branches of the frame being secured to one of the legs of the supporting bracket, the second of said branches of the frame being secured to the base portion of the supporting bracket, said branch of the frame upon which the contact spring pile-up assembly is mounted being secured to said supporting bracket by a clamp plate fixed to the spring pile-up assembly and having a projecting arm fixed to the supporting bracket.

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