Sept. 28, 1965 T. J. OBSZARNY 3,209,095

SPRING-BIASED CLAPPER TYPE INDUSTRIAL POWER RELAY

Filed Dec. 1, 1961 2 Sheets-Sheet 1

Fig. 1

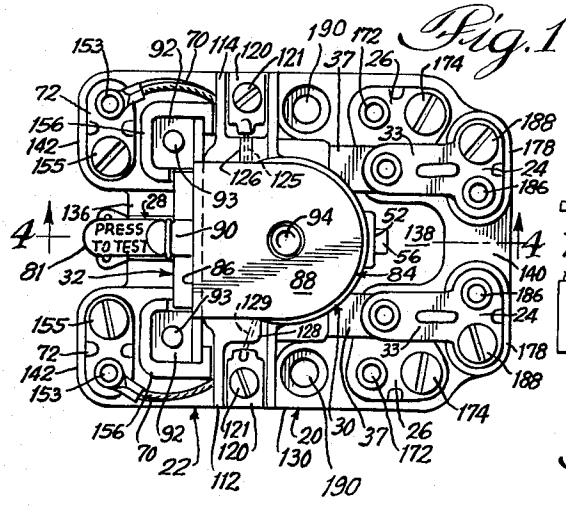


Fig. 2

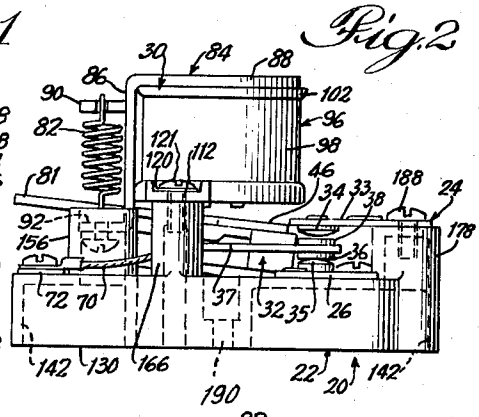


Fig. 3

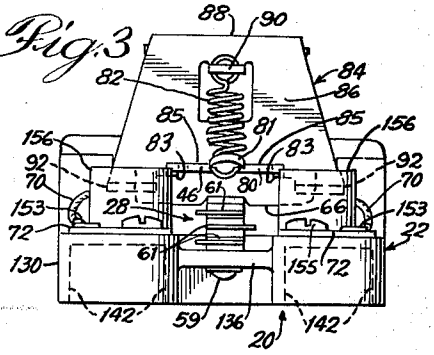
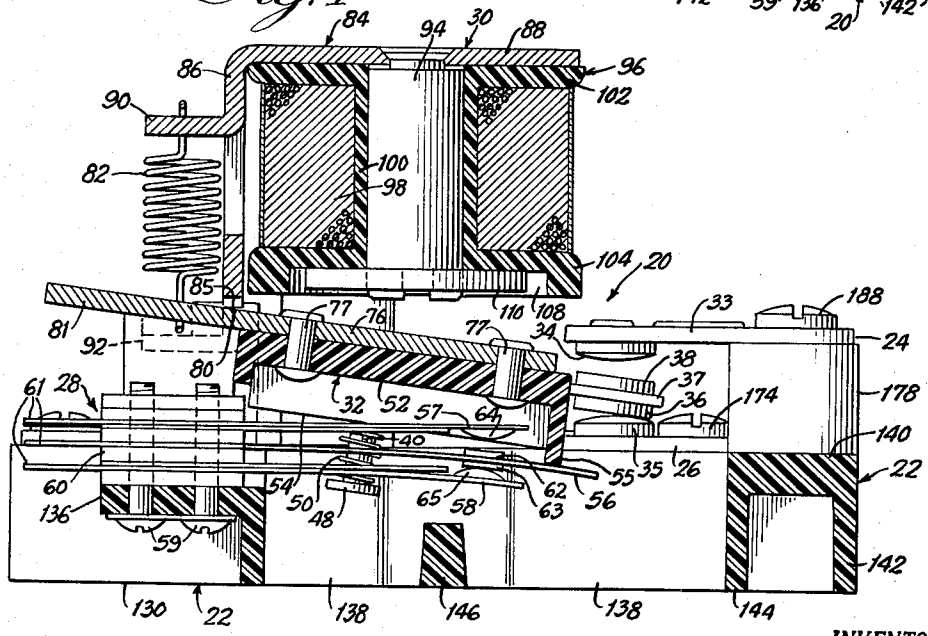


Fig. 4



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Fig. 5

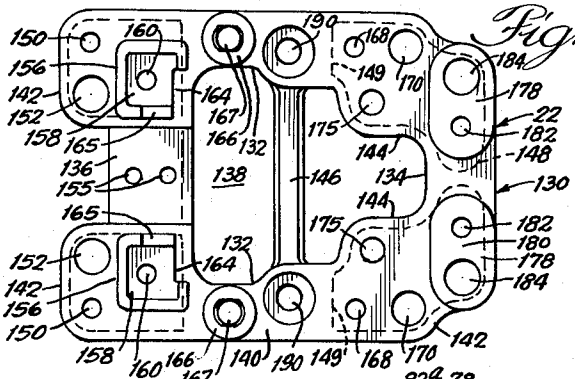


Fig. 6

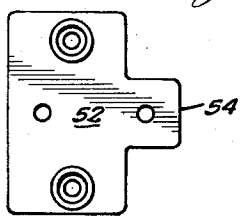


Fig. 7

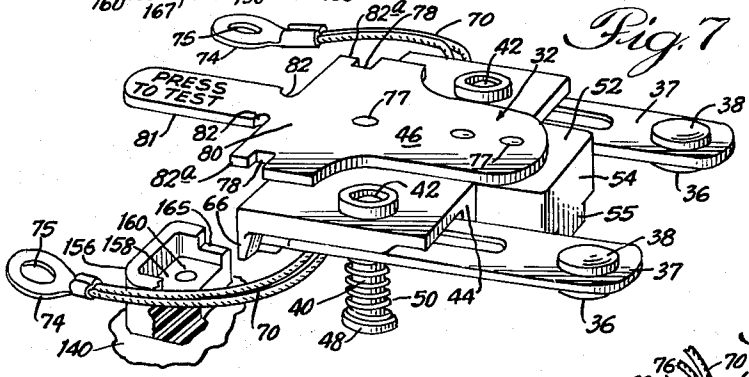


Fig. 7a

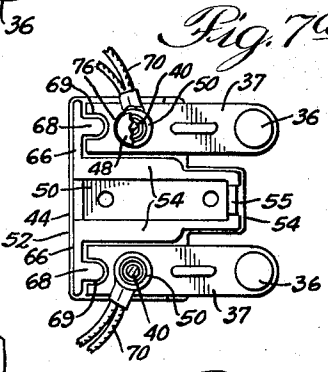


Fig. 8

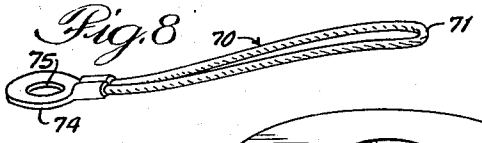


Fig. 9

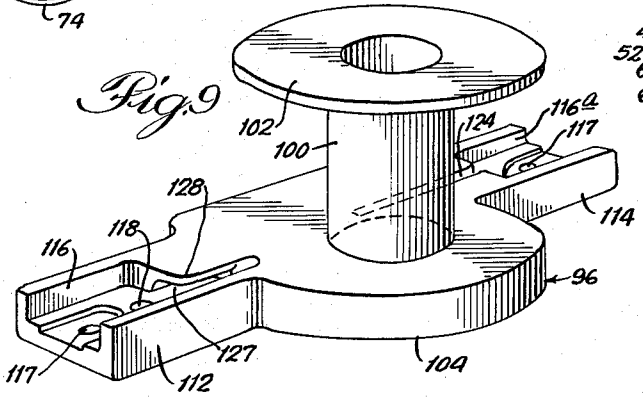
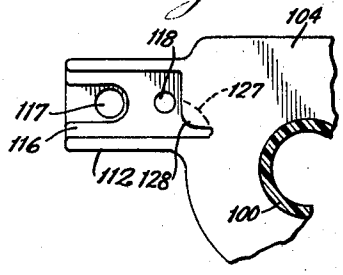


Fig. 10



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United States Patent Office 3,209,095 Patented Sept. 28, 1965

3,209,095

SPRING-BIASED CLAPPER TYPE INDUSTRIAL POWER RELAY

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Filed Dec. 1, 1961, Ser. No. 156,544
11 Claims. (Cl. 200—87)

This invention relates in general to industrial power relays, and more particularly to a power relay of the clapper type.

Since power relays are constructed with the objective of controlling circuits carrying heavy currents and in which the components are subject to rugged usage, it is a matter of significant concern to construct such a relay in a manner which will enable an effective reduction in the overall size of the relay, while maintaining efficiency and still permit facile assembly of the components, together with an economical and versatile mounting and wiring arrangement.

The invention is particularly concerned with a clapper type relay in which the armature is pivotally mounted on the heelpiece by means of an edge juncture about which the armature pivots and which usually is subject to easy displacement. To protect the armature and coil from accidental physical contact by objects, tools, etc., which might injure or misalign parts, an upside down mounting for the coil, heelpiece and armature is provided in which the armature is suspended between the coil and a mounting base with the heelpiece partially enclosing the coil to protect it.

Displacement of the armature often occurs during manual testing and prodding of the armature in order to ascertain the manner in which the components are functioning. The mounting base, therefore, incorporates a configuration or stop which cooperates with the armature to prevent displacement, while the armature is provided with an extension or tab that permits manual movement of the armature without the use of either a digit or instrument into the confined space beween coil and base. This novel arrangement serves to eliminate the hazard of electrical shock and the cooperative action of the stop and armature serve to avoid displacement of the armature.

The armature is provided with an insulator plate carrying a pair of movable contact blades for making contact with either of two respective stationary blades or switch members supported by the mounting base. A unique assembly of the blades on the insulator permits a wiping contact to be achieved. In addition, the insulator plate is arranged to operate a set of control contacts or auxiliary switch assembly, mounted on the base so that a compact, efficient arrangement is provided for controlling one or more auxiliary circuits.

In order for electrical connections to be established by the blades carried by the insulator plate, a novel terminal arrangement is provided in which separate looped wires are joined to the respective blades at their looped end and secured at their other ends to fixed terminals mounted on the base.

Likewise, the bobbin carrying the coil incorporates a novel coil terminal arrangement. Formerly the coil connections usually were extended to projecting lugs on the bobbin or seated against the coil winding, and the lugs were subject to being broken off or being pressed against the coil windings, causing breaking or short circuiting of the coil. The present invention incorporates laterally projecting arms on the bobbin for supporting the coil terminates in a flush position. These arms also incorporate means for protecting the lead in wires to the coil.

It will be appreciated that electrical terminals for the various components are fixed to the base; however, each

incorporates a scerw fastener for fixing external electrical connections to the respective terminals. By constructing the base so that screw fasteners may be inserted from either side of the base, the problem of wiring the relay is considerably simplified and the relay is rendered extremely versatile.

It is, therefore, an object of the present invention to provide a clapper type relay having an improved and more economical construction.

It is another object of this invention to provide a clapper type relay in which the armature is supported between a coil and a mounting structure or base and in which the armature is protected from displacement.

It is another object of this invention to provide a clapper type power relay of compact design and which is capable of facile manual test to ascertain its condition with minimum electrical shock hazard.

It is another object of this invention to provide a power relay in which the components are protected from mechanical abuse and/or displacement.

It is a further object of this invention to provide a clapper type power relay having a base upon which auxiliary contacts are mounted for operation by the armature of the relay.

It is still another object of this invention to provide a mounting structure for a power relay which facilitates assembly of the relay to the mounting structure, and which permits a versatile wiring procedure.

It is still a further object of this invention to provide an improved bobbin structure for supporting the electrical connections to a coil carried by the bobbin.

It is still a further object of this invention to provide a clapper type power relay in which the armature carries an electrical contact that is wipingly engaged with another contact on movement of the armature.

A still further object is to provide a novel mounting and association of an auxiliary switch, such as for operating signal lights, counting devices, interlock arrangements with coils of other relays, with the relay in a compact arrangement, requiring a reduced amount of space, and in a relatively simple manner, requiring a reduced number of parts.

Other objects and advantages of this invention will appear from the following description, taken in connection with the accompanying drawings, in which:

FIGURE 1 is a top plan view of the relay assembly embodying the present invention;

FIGURE 2 is a side elevational view of the relay assembly;

FIGURE 3 is a front elevational view of the relay assembly;

FIGURE 4 is an enlarged, cross-sectional view of the relay, taken along the line 4—4 in FIGURE 1;

FIGURE 5 is a top plan view of the mounting base only;

FIGURE 6 is a top plan view of the insulator plate carried by the armature;

FIGURE 7 is a perspective view of the armature assembly;

FIGURE 7*a* is a bottom view of the insulator plate;

FIGURE 8 is a perspective view of a loop wire connection utilized for the blades carried by the armature;

FIGURE 9 is a perspective view of the bobbin for the coil;

FIGURE 10 is a partial view of one of the bobbin arms.

In FIGURES 1–4 a relay assembly is indicated by the reference character **20**. It comprises a base **22**, preferably of Bakelite or similar material, upon which is mounted a plurality of pairs of contact terminal structures **24** and **26**, together with an auxiliary switch assembly **28** and coil and heelpiece assembly **30**. An armature assembly **32**, carried by the heelpiece assembly **30**,

is adapted to control the contact or switch assembly **28** for the making of auxiliary electrical circuits and for establishing test checking and interlocking circuits through the terminal structures **24** and **26**.

The main power circuits are controlled by duplicate sets of switching structures, and for convenience one set will only be referred to in detail.

The terminal structure **24** comprises a suspended cantilever blade or switch member **33** projecting in parallel relationship toward the coil and heelpiece assembly **30**. Each blade **33** carries a contact **34** suspended above and aligned with a similar contact **35** carried by a respective terminal structure **26**. A contact **36** carried at one end of a blade or switch member **37** forming part of the armature assembly **32** is adapted to normally engage with a respective contact **35**, as will be explained. A contact **38** on the other side of the blade **37** is adapted to engage with a respective contact **34** when the armature assembly is operated, as will be explained. These contacts are of comparatively large size, rated to carry heavy currents such as, for example, 10 amperes at 230 volts, 60 cycles, or 15 amperes at 115 volts, 60 cycles.

An aperture adjacent the other end of each cantilever blade **37** permits it to be slidably mounted on a respective post **40**, as seen in FIGURES 4, 7 and 7*a*. The posts **40** each have their ends flattened to form a shoulder at **42** and the posts are received in respective apertures adjacent opposite sides of an insulator plate **44**, carried by an armature **46**. The other end of each post **40** is also provided with a shoulder **48** and a spring **50** is mounted between the shoulder **48** and a respective blade **37**, serving to bias the blade toward the insulator **44**. When the insulator **44** is in its normal position, each blade **37** slopes downward, as seen in FIGURE 4, so that contact **36** on each blade is engaged with a respective stationary contact **35**. When the insulator plate **44** is operated incident to actuation of the armature, it carries blades **37** upward to separate contacts **35** and **36** and engages each contact **38** with a respective stationary contact **34**, as will be explained.

The insulator plate **44** is formed of Bakelite or similar material and it has a central rib portion **52** located between the apertures in which the posts **40** are received. A depending flange or wall section **54** is formed on the central rib for the purpose of improving the stress characteristics of the insulator plate **44**, and a depending extension **55**, on wall **54** adjacent the front of rib **52**, serves to control the auxiliary switch assembly **28**.

This extension **55** is engaged with an actuator blade **56** of the switch assembly **28**. The assembly **28** is a conventional spring pile up comprising cantilever spring blades or switch members **57** and **58** located respectively above and below blade **56**. The blade **56** is a cantilever spring whose free end is biased upwards against the projection or extension **55**. The blades **56**, **57** and **58** are fixed in position on the base **22** by the screws **59**, which clamp the blades to the base adjacent one end, together with insulators **60** separating the blades. A respective lug **61** projecting from the clamped end of each blade **56**, **57** and **58**, permits an electrical connection to be established to the respective blade.

A pair of contacts **62** and **63**, on opposite sides of blade **56** and adjacent its free end, are adapted to be brought into engagement with either contact **64** or **65** respectively carried by spring blades **57** and **58** respectively. Normally, the projection **55** on insulator plate **44** engages spring **56** to maintain contact **63** engaged with contact **65**, as seen in FIGURE 4, and as will be explained. However, when the projection **55** is moved away from blade **56**, as will be explained, the spring tension in blade **56** causes it to follow the projection **55**. Contact **63** will then move away from contact **65** and contact **62** will engage contact **64**.

The insulator plate **44** is also provided with a pair of oppositely extending, depending flanges or rib sections **66**, projecting along the rear edge thereof, as seen in FIGURE 7*a*. The sections **66** are aligned and extend transverse to the longitudinal axis of the respective switch blades **37**, and each section has a projection **68** thereon, which extends into a notch or recess **69**, in the end of a respective blade **37**. This arrangement prevents excessive rotational movement of each blade **37** about its post **40**.

Each of the blades **37** also has associated therewith a braided wire loop **70** having a looped end **71**, as seen in FIGURE 8, extending about a respective post **40**. Each wire loop **70** serves to extend an electrical connection from a terminal structure **72**. The free ends of the loop **70** are clamped between the bent over ends of a conventional eyelet terminal piece **74** having an aperture **75** for fastening to the terminal structure **72**, mounted on base **22**. The looped end **71** of the wire loop **70** is held in engagement with the respective blade **37**, adjacent post **40** by a suitable dished ring **76** seen in FIGURE 7*a*.

The armature **46** is fastened to the central rib **52** of insulator plate **44** by means of rivets **77**. The armature **46** comprises a flat, soft iron element having notches or recesses **78** on opposite sides, adjacent its back end, to form a neck portion **80** between the recesses. A tab or projection **81** extends from the back end of armature **46** along its central axis, and a notch **82** is provided on opposite sides of the tab **81** to enable one end of a coil spring **82** to suitably engage and bias the armature **46**. A ledge **82***a* is formed behind each notch, and this has the function of engaging a stop on the base.

The notches **78** receive correspondingly shaped horizontal projections **83** indicated in FIGURE 3, adjacent one end of a heelpiece or field piece **84**. The projections **83** prevent excessive front to back movement of the armature **46**, and an edge **85** of the heelpiece, as seen in FIGURE 3, engages the neck portion **80** of the armature **76** between projections **83** to serve as a pivot for the armature.

The heelpiece **84** is preferably of soft iron and is formed in an L shape indicated by the legs **86** and **88**. The leg **86** has a tine or tab **90** punched out therefrom, adjacent the juncture with leg **88**, and the other end of spring **82** is mounted thereon. Thus, the armature **46** is biased for movement about edge **83** in a clockwise direction, as seen in FIGURE 4, by the spring **82**, in a conventional manner to hold the switch blade in the described position. The tab **81** extending from the rear edge of the armature, however, permits the armature to be easily actuated manually in either direction for testing the operation of the relay and the circuits controlled thereby.

The leg **86** of the heelpiece is provided with a pair of right angle horizontal flanges **92** at the end opposite leg **88**. These flanges **92** are located at opposite sides of leg **86** and are each provided with a threaded aperture **93** to permit the heelpiece to be mounted on base **22**, as will be explained.

The leg **88** is connected to a soft iron core **94** upon which is mounted a bobbin **96** carrying a coil **98**. The bobbin **96** is formed of insulating material such as plastic or ceramic, and includes a hollow cylindrical portion **100**, having discs **102** and **104** on opposite ends thereof. The coil **98** is wound on the cylindrical portion **100** between discs **102** and **104** for creating a magnetic field through the heelpiece **84** and core **94** to attract the armature when the coil **98** is energized. The core **94** extends through the cylindrical portion **100** and is fastened at one end to the leg **88**. The other end of the core projects through the disc **104**. The projecting end of the core **94** is split and a locking member **110** forced into the split to secure the core, bobbin and heelpiece together as an assembly. The disc **104** also has formed thereon a pair of outwardly extending horizontal arms **112** and **114**, as best seen in FIGURE 9.

Arms 112 and 114 of the bobbin each has a recess 116 and 116a in its top wall, adjacent a respective end. The bottom wall of each recess 116 and 116a is provided with a pair of apertures 117 and 118. The apertures 118 permit terminal lugs 120 to be fastened to each arm 112 and 114, totally confined within said recesses 116 and 116a, while the apertures 117 each permit a screw 121 on the terminal lug to be tightened down against an external electrical connection established to the terminal lug 120. The terminal lugs 120 are thus supported on the bobbin arms 112 and 114 so that they cannot be damaged, broken off, or displaced by physical abuse.

A long slot 124 extends from recess 116a, in arm 114, to a substantially tangential position with respect to the cylindrical portion 100. This permits a wire lead 125 to be soldered, for example, to a respective terminal 120 after being encased in a short sheath 126 as seen in FIGURE 1, and brought into engagement with the portion 100 for winding the initial coil layer with minimal danger of subsequent snagging, breaking or abrasion of the coatings on the wire of the coil. The lead in end of coil wire is attached, as by soldering, to a terminal lug 120.

The recess 116 in the other arm has a short slot 127, seen in FIGURES 9 and 10, that ends adjacent the outermost layer of coil 98. A short overhang or lip 128 extends over a portion of slot 127 and accommodates a bend in the terminal portion of the coil wire, as indicated at 129, and seen in FIGURE 1, in its extension from the outermost coil layer to the respective terminal lug 120. The wire 129 is snugly looped under the lip 128, thereby minimizing the danger of exposing the connection, and is attached to the adjacent terminal lug 120 by soldering, for example.

The base 22 comprises an integrally formed body 130 having a basically U-shaped configuration defined by legs 132 and a back 134 at one end of the legs, as seen in FIGURE 5. A flat, depressed rib 136 joins the opposite ends of legs 132 and a central aperture 138 is defined thereby. It will be noted that the body 130 does not comprise a solid block but instead is provided with a top wall 140 from which a depending marginal flange 142 extends to provide strength and rigidity. The depending flange 142 extends about the major portion of the periphery of the base, and another depending flange 144 extends about the periphery of aperture 138, and a depressed rib 146 extends across the aperture 138 between portions of flange 144. Flanges 142 and 144 are joined by ribs 148 and 149 located at the mid portion of back 134 and the respective legs 132 respectively. Elimination of the central portion of body 130 defined by aperture 138 and the portions between the peripheral flanges 142 and 146 permits a savings both in material and reduction in weight.

One end of each leg 132 adjacent to rib 136 is provided with a pair of apertures 150 and 152. Aperture 150 permits the terminal structure 72 and terminal piece 74 to be fastened to the top wall of base 22 by means of an eyelet or rivet 153, which also firmly secures the eyelet end of the looped wire 70 to the base. The terminal structure 72 threadingly carries a screw 155 which may extend into aperture 152 for the purpose of fastening an external electrical connection to the terminal 72, and by wire 70 to the blade 37. The rib 136 has a pair of apertures 155 which permit the auxiliary switch assembly 28 to be mounted on base 22, by the screws 59.

Projecting upwardly from the top wall 140, and adjacent each set of apertures 150 and 152, is a hollow rectangular post 156 on respective legs 132. The posts 156 each have a recessed top wall 158, spaced above wall 140, and upon which the flanges 92 of the heelpiece 84 rest. The top wall 158 has an aperture 160 so that the heelpieces and coil assembly may be fastened thereon by a screw threaded into apertures 93 on flanges 92. The rectangular nature of the post wall aids in preventing rotation of the flanges 92, while a notch 164 therein permits the flanges 92 to be inserted, within the confines of the post. It will be noted that the wall of each post 158 is provided with a notch 165, above which the armature ledges are located when the relay is assembled, and which also serves to limit or stop excessive displacement of the armature 46 away from its pivot edge 85.

In addition, there is located on each leg 132 a hollow post 166, which supports the bobbin arms 112 and 114 when the field piece flanges 92 are resting on walls 158, with said arms at a level above wall 140. The posts are hollow and the top wall thereof is provided with an aperture 167 so that the screws 121 associated with the terminal lugs 120 may be adequately tightened for securing an external electrical connection thereto. The terminal lugs 120 are each provided with a threaded formation to receive the screws, and these formations extend into the apertures 117 for tight engagement with the respective arms 112 and 114. It will be noted that the wire loop 70 passes between a respective pair of posts 156 and 166 so that it is protected from inadvertent damage by physical contact. The surfaces of these posts are smooth so that unnecessary abraiding of the wire loop 70 does not occur.

The legs 132 are each provided with suitable apertures 168 and 170. The aperture 168 permits the terminal structures 26 to be mounted on wall 140 by means of a respective eyelet or rivet 172. The aperture 170 permits a screw 174 to be tightly threaded through terminal structure 26 for fastening an electrical connection thereto. An aperture 175 permits the back of contact 35 to be received in the top wall 140 so that the bottom wall of terminal structure 26 is flush with the wall 140.

The back end 134 of base 22 is provided with a hollow post 178 adjacent each of the respective opposite corners. These posts are provided with top walls 180 above wall 140 and in which apertures 182 and 184 are provided. Aperture 182 permits the terminal structure 24 to be fastened to the post 178 by means of an eyelet or rivet 186. Aperture 184 permits a screw 188 threadingly carried by structure 24 to be tightened for completing an electrical connection to the contact 34.

The legs 132 are also each provided with a suitable aperture 190 adjacent the rib 146 to permit the base 22 and the assemblies carried thereby to be secured to a suitable mounting. It will be noted that the aperture 190 extends completely through the body 130 of base 22 and that apertures 152, 167, 170 and 184 each communicate with opposite sides of the base 22. Thus, if base 22, together with the relay coil and heelpiece assembly and the various terminal structures 24, 26, 72, and terminal lugs 120, are mounted on a supporting panel, electrical connections to the various terminal structures may be established by screws threaded into the respective terminal structures from the opposite or bottom side of base 22. This considerably facilitates and eliminates wiring problems. Thus the relay 20, together with numerous others, may be assembled on a common panel in which suitable apertures are provided. In the installed position one side or the other of the terminal structures may be inaccessible or difficult to reach. By designing the base to enable wiring from either side thereof, the wiring problem is substantially reduced.

In operation the coil 98 is energized by the completion of a circuit to the terminals 120 to thereby create a magnetic circuit through the core 94, heelpiece 84 and the armature 46. As the armature 46 is attracted to the core 94, the insulator plate 44 moves therewith to carry switch blades 37 upward against the bias of spring 82. The contacts 36 separate from the contacts 35 to open any circuit therethrough and, in turn, the contacts 38 are brought into engagement with contacts 34 to prepare or complete a circuit therethrough.

As the contacts 38 are engaged with contacts 34 before the armature encounters the core 94, the blades 37 cease their upward movement, while the armature continues to carry the insulator plate 44 and posts 40 upward while relieving tension on springs 50. As the insulator plate

44 continues to pivot upwards, while blades 37 remain substantially stationary, the posts 40 bear against the edges of the aperture in blades 37 while the insulator plate 44 may bear against the back end of blades 37. This causes a slight translational movement of the blades 37 in a forward direction about posts 40 to thereby move contact 38 across contact 34 and create a wiping engagement or contact which insures providing good contact and completion of an electrical circuit.

Also, as the insulator plate 44 moves it carries projection 55 away from spring blade 56 of the auxiliary switch 28. The tension in the blade 56 causes it to follow the movement thereby separating contact 63 from 65 and engages contact 62 with contact 64, thereby controlling any auxiliary circuits connected thereto.

On de-energization of the coil 98, the magnetic field is of course terminated and the armature 46 is now pivoted by spring 82 to move the switch blades 37 back to their normal position with contact 36 engaged with the contact 35. Likewise, the downward movement of projection 55 moves the spring 56 of the auxiliary switch back to normal so that the contact 63 is re-engaged with contact 65.

To test the operation of the relay 20 without energizing the coil, the tab 81 is manually pressed downward against the tension of spring 82. This rotates the armature 46 as on energization of the coil. Due to the relationship of the ledges 82*a* and the setback or stop 165 on posts 156, the armature 46 will not be separated from the heelpiece 84 but, instead, the armature will rotate to simulate its operated condition without need for the operator to insert any instrument between the armature and base to operate the armature directly, thereby avoiding contact with the blades and the danger of electrical shock while displacement of the armature from the heelpiece is prevented.

The relay embodying the present invention, in addition to the advantages above set forth, is of reduced size and weight, durable and efficient in use, and is relatively economical to manufacture.

Although I have herein shown and described a preferred embodiment of my invention, it manifestly is capable of modification and rearrangement without departing from the spirit and scope thereof. I do not, therefore, wish to be understood as limiting the invention to the precise form herein disclosed, except as I may be so limited by the appended claims.

I claim:

1. A relay assembly comprising an insulating base, a bobbin having a core inserted therethrough and a coil wound thereon, an L-shaped heelpiece with one leg carrying said core and said bobbin above said base, the other leg arranged parallel to said core and having a pair of right angle flanges extending below said bobbin for attaching said heelpiece to said base, an armature pivotally mounted on an edge of the other leg intermediate and positioned between said core and base and biased for movement away from said core, an insulating member carried by said armature for movement therewith, a pair of switch blade members carried by said insulator and adapted to move longitudinally with respect to said insulator, means for biasing said switch blade members against said insulator, a pair of stationary contact members for each switch blade, said contact members being mounted on said base with one contact member mounted above and the other contact member below a respective blade, means for biasing each switch blade into contact with a respective one of said contact members and permitting the blades to be moved into a wiping engagement with a respective one of the other contact members in response to movement of said armature, a loop wire having its loop end in contact with a respective switch blade for establishing an electrical connection thereto, a terminal clamp for the other end of each loop wire, said clamp being mounted on said base, an auxiliary switch adapted to be operated by said insulator, and a tab projecting from said armature, above said base, for manually pivoting said armature, insulator and switch blades.

2. For use with a relay comprising a base, a heelpiece mounted on the base, a coil mounted on the heelpiece, an armature mounted on the heelpiece and being pivotable thereon in response to energization and de-energization of the coil, the improvement comprising cooperating means on said armature, on said heelpiece and on said base for positively retaining said armature in position on said relay while permitting pivotable movement thereof on said heelpiece, said cooperating means including a confined space defined between and by said base and said heelpiece for receiving said armature, and spaced recesses within said armature for providing pivoted locking engagement with said base and said heel piece when said armature is positioned within said base.

3. For use with a relay comprising a base, a heelpiece mounted on the base and having an upright leg, a coil mounted on the heelpiece, and an armature mounted on the heelpiece and being pivotable thereon in response to energization and de-energization of said coil, the improvement comprising a pair of spaced flanges projecting outwardly from said upright leg for mounting said heelpiece on said base, a recess in said heelpiece positioned between said flanges, and spaced recessed portions in said armature carried in said recess for pivotably retaining said armature on said heelpiece, said armature also having one surface thereof in close proximity to the upperside of said base whereby said armature is pivotably locked in position on said relay.

4. For use with a relay comprising a base, a heelpiece mounted on the base and having an upright leg, a coil mounted on the heelpiece, and an armature mounted on the heelpiece and being pivotable thereon in response to energization and de-energization of the coil, the improvement comprising mounting flanges extending outwardly from said leg, means for securing said flanges to the upperside of said base, a recess in said upstanding leg in the space between said flanges, and spaced recessed portions in the pivoted end of said armature being received by said recess and cooperating therewith for pivotably retaining said armature in place on said heelpiece, the lower surface of said armature being spaced in close proximity from the upperside of said base to thereby pivotably lock said armature in place on said relay.

5. The improvement of claim 4 wherein said armature includes a tab extending from the pivoted end thereof for permitting manual operation of said relay.

6. For use with a power relay for carrying heavy current, wherein said relay comprises a base, a heelpiece mounted on the base, a coil mounted on the heelpiece, and an armature mounted on said heelpiece and being pivotable thereon in response to energization and de-energization of said coil, the improvement comprising an armature pivotably locked in place on said heelpiece, an insulator member rigidly mounted on said armature, a rigid blade member mounted on said insulator, said blade member having a contact element at one end thereof spring means for resiliently mounting said blade member on said insulator, and a rigid terminal member rigidly mounted on said base and being in substantial alignment with said contact element whereby said contact element is adapted to contact said terminal member upon pivoting movement of said armature, said blade member being substantially prevented from further pivoting movement after said contact element meets said terminal member while said insulator member continues pivoting movement with said armature, said spring means permitting said continued pivoting movement of said insulator member and said armature to thereby cause slight lateral movement of said blade member whereby wiping contact is provided between said contact element and said terminal member.

7. For use with a power relay for carrying heavy currents, wherein said relay comprises a base, a heelpiece

mounted on the base, a coil mounted on the heelpiece, and an armature mounted on said heelpiece and being pivotable thereon in response to energization and de-energization of said coil, the improvement comprising an insulator member rigidly mounted on said armature, a terminal post mounted on said insulator member, an extended rigid blade member received by said terminal post, a spring member mounted on said terminal post for biasing said blade member towards said insulator member, a contact element at the extended end of said blade member, and a rigid terminal member mounted on said base and being in substantial alignment with said contact element, whereby upon pivoting movement of said armature, as said contact element contacts said terminal member, further pivoting movement of said blade member is substantially prevented while said insulator member continues pivoting movement with said armature to thereby cause lateral movement of said blade member which provides wiping contact between said contact element and said terminal member.

8. The improvement of claim **7** wherein another terminal member is mounted on said base and a flexible electrical connecting member is connected to said another terminal member and to said terminal post to thereby provide electrical connection therebetween.

9. For use with a relay comprising a base, a heelpiece mounted on the base, a coil mounted on the heelpiece, and an armature mounted on said heelpiece and being pivotable thereon in response to energization and de-energization of said coil, the improvement comprising an insulator member rigidly mounted on said armature, a pair of spaced legs provided on said base and defining a space therebetween, an auxiliary switch blade assembly mounted on said base and being positioned in said space, and means on said insulator member for actuating said switch blade assembly in response to pivoting movement of said armature.

10. For use with a relay comprising a base, a heelpiece mounted on the base, a coil mounted on the heelpiece, and an armature mounted on said heelpiece and being pivotable thereon in response to energization and de-energization of said coil, the improvement comprising an insulator member mounted on said armature, an outwardly extended rigid blade member mounted on said insulator member, a contact element at the free end of said blade member, a terminal member in substantial alignment with said contact element whereby an electrical circuit is opened and closed in response to the pivoting movement of said armature, said base having a hollow portion centrally thereof, an auxiliary switch assembly mounted on said base and being positioned within said hollow portion, and a projection on said insulator member for actuating said auxiliary switch assembly in response to pivoting movement of said armature.

11. The improvement of claim **10** wherein said rigid blade member is springably carried by said insulator member to thereby provide for wiping contact between said contact element and said terminal member and said auxiliary switch blade assembly includes a stationary switch blade member and a moving switch blade member, said moving switch blade member being actuated by said projection on said insulator member for opening and closing the auxiliary electrical circuit which includes said stationary switch blade member and said moving switch blade member.

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