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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to Electrical Switch Structures

We, TEXAS INSTRUMENTS INCORPORATED, a Company organised and existing in accordance with the Laws of the State of Delaware, United States of America, of 13500 No. Central Expressway, Dallas 21, Texas, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an electrical switch structure, and more particularly, to such a structure which includes a base or casing carrying one or more electrical terminals.

An object of this invention is the provision of such a switch structure, the component parts of which can be rapidly and easily assembled into and retained in operative condition.

A further object of this invention is the provision of such a switch structure which is compact, dependable in use, and economical to manufacture.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises an electric switch structure comprising a casing having first and second casing members, means on the interior of each of the casing members providing complementary, mutually interfitting, interengaging surfaces which, when in interfitting interengagement, prevent relative movement between the casing members in at least one plane, and means for retaining the members in interfitting engagement, the interfitting surfaces of the members defining at least one guideway extending from the interior to the exterior of the casing, at least one of the casing members providing a recess opening to the guideway, an electrical terminal disposed in the guideway and confined against lateral movement by the guideway and a projection carried by one of the casing members which extends through and interfits with an aperture provided in the terminal and then into interfitting engagement with the recess whereby the terminal is confined against movement with respect to the casing and the terminal and the casing are aligned with each other.

In the accompanying drawings, in which one of the various possible embodiments of the invention is illustrated:

Fig. 1 is a perspective view of an electrical switch embodying the present invention;

Fig. 2 is a plan view thereof;

Fig. 3 is a plan view similar to Fig. 2, but with one of the casing members removed;

Fig. 4 is a sectional view on a slightly enlarged scale and taken along line 4, 4 in Fig. 2;

Fig. 5 is a sectional view taken along line 5, 5 in Fig. 4;

Fig. 6 is a sectional view taken along line 6, 6 in Fig. 2;

Fig. 7 is a fragmentary sectional view taken along line 7, 7 in Fig. 6;

Fig. 8 is a sectional view on a slightly reduced scale and taken along line 8, 8 in Fig. 4;

Fig. 9 is a fragmentary sectional view taken along line 9, 9 in Fig. 8; and

Fig. 10 is an exploded perspective view of the electrical switch shown in Fig. 1.

Referring to Fig. 1, an electrical switch embodying the present invention is shown as being generally indicated by the reference numeral 20. Switch 20 takes the form of an electromagnetic relay and includes a pair of base or casing members 22 and 24, respectively. Casing members 22 and 24 are secured in interfitting engagement with each other by means of a stem 26 having a head 28, the headed stem interfitting with apertures 27 and 29 provided by casing members 22 and 24, respectively, and being retained by a quick-attachable, push-on fastener 30. Fastener 30 may be of the well known type manufactured by Tinnerman Products, Inc., Cleveland,

[*Price 3s. 6d.*]

Ohio, and includes a pair of jaws 32, 32 which bite into and prevent unintended retraction of the fastener from post 26 when the fastener is pressed thereover to the position shown in Fig. 1.

Mounted for slidable movement along stem 26 is a sleeve 34 formed of a suitable electrically insulating material such as nylon. Sleeve 34 provides flanges 36 and 38, respectively, at its opposite ends for a purpose later to become apparent. Mounted for slidable movement on sleeve 34 is a hollow, cylindrical plunger weight 40 formed of a suitable magnetic material. A movable, bridging contact member 42 provides an aperture 44 within which sleeve 34 is loosely disposed. Bridging contact member 42 is formed of a suitable, electrically conductive material such as phosphor bronze. A compression spring 46 resiliently biases plunger weight 40 away from the bridging contact member 42 and against flange 38 carried by sleeve 34. Spring 46 also resiliently biases bridging contact member 42 against washer 48 which, in turn, is biased against flange 36 provided by sleeve 34 as best shown in Figs. 4 and 5. Sleeve 34, plunger weight 40, bridging contact member 42, spring 46 and washer 48 together form a plunger subassembly 49 which can be preassembled before assembling of the remaining parts of switch 20.

Plunger subassembly 49 is actuated by means of a coil 50 formed by a plurality of mutually insulated turns of electrically conductive wire. When coil 50 is electrically energized, weight 40 is moved upwardly as viewed in Figs. 4 and 5 thereby to compress spring 46 whereby bridging contact 42 is moved upwardly to bring movable contacts 52 and 54 into engagement with fixed contacts 56 and 58, respectively. It is noted that the contacting surfaces of movable contacts 52 and 54 are curved about an axis lying at 90° to the axis of the curve of the contacting surfaces of fixed contacts 56 and 58 whereby single point engagement is made between the respective contacts.

Fixed contacts 56 and 58 are carried by terminals 60 and 62, respectively, each of the latter being formed of a suitably electrically conductive material. Terminal 60 is provided with an aperture 64 within which a projection 66 is disposed. Projection 66 is fixedly carried by casing member 24 and extends from the bottom of guideway 68 (see Fig. 1) provided by the interfitting surfaces of casing members 22 and 24, extends through aperture 64 in terminal member 60 and into interfitting engagement with a recess in the form of a socket 70 provided by casing member 22. It will be noted that projection 66 facilitates alignment of terminal 60 and casing member 22 with casing member 24 when these parts are assembled together. Also, projection 66 prevents longitudinal movement of terminal 60 within guideway 68.

Guideway 68 includes a pair of upstanding side walls 72, 72 which interfit with the respectively adjacent side portions of terminal 60 thereby to prevent substantial rotation of terminal 60 about the axis of projections 66. The bottom of guideway 68 is formed by a surface 74 provided by casing member 24 and the top of guideway 68 is formed by a surface 76 provided by casing member 22, all as viewed in Fig. 6. Surfaces 74 and 76 interfit with the respectively adjacent portions of terminal 60 and thereby prevent vertical deflection of this terminal as viewed in Fig. 6. Accordingly, it will be apparent that merely by securing together casing member 22 and casing member 24, with terminal 60 therebetween, terminal 60 is securely retained in aligned position with respect to the casing.

A guideway generally indicated by the numeral 78 in Fig. 1 is provided by the interfitting surfaces of casing members 22 and 24 for the reception of terminal 62. A projection 80 is disposed within guideway 78 and extends through an aperture 82 in terminal 62 into interfitting relation with a recess in the form of a socket 84 provided by casing member 22. Guideway 78, projection 80, aperture 82 and socket 84 are identical in structure and function with guideway 68, projection 66, aperture 64, and socket 76, respectively, and therefore, no further description of the details of these parts for the reception of terminal 62 is necessary.

Casing member 24 provides a pair of exterior slots 86 and 88, respectively, slot 86 opening to guideway 68 and slot 88 opening to guideway 78. Terminal 62 fixedly carries a return-bent portion 90. Return-bent portion 90 may be secured to terminal 62 by welding the latter to leg 92 of the former. Preferably, return-bent portion 90 is secured to terminal 62 before assembly with the remaining parts of switch 20. The distal end of return-bent portion 90 is formed by a leg 94 which, as shown in Figs. 1, 2, 3 and 8 is disposed in interfitting engagement with the bottom of slot 88. Return-bent portion 90 is provided with a threaded aperture 96 for the reception of a lead-securing screw (not shown). It will be clear that, with leg 94 disposed in the bottom of recess 88, member 90 and terminal 62 are reinforced against deflection due to the torque thereon developed by tightening of a screw in threaded aperture 96.

By way of example, terminal 60 is illustrated in the drawing as being connected to a lead in a manner different from that of terminal 62. In this regard, a ferrule 98 which has been secured about the bared end of a lead 100 is welded to the protruding end of the terminal 60. It will be realized, of course, that terminal 60 could be provided with a return-bent portion in the same manner and for the same purposes as that described above with respect to terminal 62.

Referring particularly to Figs. 1, 4, 9 and

10, an additional terminal 102 is shown as being incorporated by switch 20. As best shown in Fig. 9, terminal 102 is provided with a head 104, a portion of which lies in each of recesses 106 and 108, respectively. Recess 106 is provided by casing member 22 and communicates with a slot 110 which extends to the exterior of the casing. Recess 108 is provided by casing member 24 and communicates with a slot 112 which likewise extends to the exterior of the casing. As best shown in Fig. 10, slot 110 extends to the lowermost edge of casing member 22 to permit the assembly of casing member 22 with casing member 24 after positioning terminal 102 within recess 108 and slot 112 of casing member 24. It will be apparent that merely assembling and retaining casing members 22 and 24 with terminal 102 therebetween results, as with terminals 60 and 62, in terminal 102 being fixedly retained in operative relation with the remainder of the switch structure. Terminal 102 may be provided with a slot 114 for the reception of a lead 116 extending from one end of coil 50 as shown in Figs. 1, 2, 3, 4, 6, 8 and 10. Alternatively, the end of lead 116 may be welded to terminal 102, and a separate lead otherwise suitably connected to terminal 102.

Referring to Fig. 3, casing member 24 provides a plurality of projections 118 which are engageable with and guide bridging contact member 42, and prevent the latter from substantial rotation about the axis of stem 26.

Casing member 22 provides a pair of projections 120 and 122. Projection 120 interfits within an aperture 124 provided by casing member 24. Projection 122 interfits with a slot 126 provided by casing member 24, which slot opens to one side of this casing member. These projections and openings in the casing members aid in the alignment of the latter members during assembly thereof, and aid in preventing laterally relative movement between these casing members. A pair of shoulder-providing members 128 and 130 aid in retaining coil 50 about cylindrical portion 132 of casing member 24. Shoulder-providing member 128 includes a relieved portion 134 as shown in Figs. 5 and 10, for the reception of one of the end turns of coil 50. Reference numeral 136 refers to the opposite end of coil 50 from that to which lead 116 is connected.

Provision is made for the mounting of additional terminals on the casing and for the mounting of the switch on its supporting structure, but since these features do not form a part of the present invention, no detailed description thereof is required.

Referring to Fig. 10, switch 20 may be assembled as follows. First, pin 26 is inserted into casing member 24 to bring the head 28 thereof against the lowermost edge of cylindrical portion 132. Plunger subassembly 49, having been pre-assembled, is then sleeved onto stem 26. The respective widths of aperture 124 and slot 126 in casing member 24 are less than the width of bridging contact member 42 whereby unintentional disorientation of the bridging contact member with respect to the rest of the switch 20 is avoided. Terminals 60, 62 and 102 are then assembled with casing member 24 in the positions described above, after which casing member 22 is disposed in interfitting engagement with the previously assembled structure. Fastener 30 is then pressed along stem 26 into engagement with the adjacent surface of casing member 22. Without more, casing members 22 and 24, terminals 60, 62 and 102, and the plunger assembly including plunger weight 40, sleeve 34, spring 46, and bridging contact member 42 are all securely and effectively retained in operative relationship as viewed in Fig. 1. It will be clear that connection of lead 100 to terminal 60 may be effected either before or after assembly of terminal 60 with the remaining structure of switch 20. Likewise, coil 50 may be wound and connected as desired to terminal 102 before or after assembly of switch 20 is completed.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

WHAT WE CLAIM IS:—

1. An electric switch structure comprising a casing having first and second casing members, means on the interior of each of the casing members providing complementary, mutually interfitting, interengaging surfaces which, when in interfitting interengagement, prevent relative movement between the casing members in at least one plane, and means for retaining the members in interfitting engagement, the interfitting surfaces of the members defining at least one guideway extending from the interior to the exterior of the casing, at least one of the casing members providing a recess opening to the guideway, an electrical terminal disposed in the guideway and confined against lateral movement by the guideway and a projection carried by one of the casing members which extends through and interfits with an aperture provided in the terminal and then into interfitting engagement with the recess whereby the terminal is confined against movement with respect to the casing and the terminal and the casing are aligned with each other.

2. An electric switch structure according to Claim 1 wherein at least one of the casing members provides a slot opening to the guideway and to the exterior of the casing and the terminal extending from the interior of the casing is provided with a return-bent portion adapted to be secured in the slot whereby the terminal is reinforced against substantial deflection perpendicular to the plane in which the terminal lies.

3. An electric switch structure according to

* C L M S *

10, an additional terminal 102 is shown as being incorporated by switch 20. As best shown in Fig. 9, terminal 102 is provided with a head 104, a portion of which lies in each of recesses 106 and 108, respectively. Recess 106 is provided by casing member 22 and communicates with a slot 110 which extends to the exterior of the casing. Recess 108 is provided by casing member 24 and communicates with a slot 112 which likewise extends to the exterior of the casing. As best shown in Fig. 10, slot 110 extends to the lowermost edge of casing member 22 to permit the assembly of casing member 22 with casing member 24 after positioning terminal 102 within recess 108 and slot 112 of casing member 24. It will be apparent that merely assembling and retaining casing members 22 and 24 with terminal 102 therebetween results, as with terminals 60 and 62, in terminal 102 being fixedly retained in operative relation with the remainder of the switch structure. Terminal 102 may be provided with a slot 114 for the reception of a lead 116 extending from one end of coil 50 as shown in Figs. 1, 2, 3, 4, 6, 8 and 10. Alternatively, the end of lead 116 may be welded to terminal 102, and a separate lead otherwise suitably connected to terminal 102.

Referring to Fig. 3, casing member 24 provides a plurality of projections 118 which are engageable with and guide bridging contact member 42, and prevent the latter from substantial rotation about the axis of stem 26.

Casing member 22 provides a pair of projections 120 and 122. Projection 120 interfits within an aperture 124 provided by casing member 24. Projection 122 interfits with a slot 126 provided by casing member 24, which slot opens to one side of this casing member. These projections and openings in the casing members aid in the alignment of the latter members during assembly thereof, and aid in preventing laterally relative movement between these casing members. A pair of shoulder-providing members 128 and 130 aid in retaining coil 50 about cylindrical portion 132 of casing member 24. Shoulder-providing member 128 includes a relieved portion 134 as shown in Figs. 5 and 10, for the reception of one of the end turns of coil 50. Reference numeral 136 refers to the opposite end of coil 50 from that to which lead 116 is connected.

Provision is made for the mounting of additional terminals on the casing and for the mounting of the switch on its supporting structure, but since these features do not form a part of the present invention, no detailed description thereof is required.

Referring to Fig. 10, switch 20 may be assembled as follows. First, pin 26 is inserted into casing member 24 to bring the head 28 thereof against the lowermost edge of cylindrical portion 132. Plunger subassembly 49, having been pre-assembled, is then sleeved onto stem 26. The respective widths of aperture 124 and slot 126 in casing member 24 are less than the width of bridging contact member 42 whereby unintentional disorientation of the bridging contact member with respect to the rest of the switch 20 is avoided. Terminals 60, 62 and 102 are then assembled with casing member 24 in the positions described above, after which casing member 22 is disposed in interfitting engagement with the previously assembled structure. Fastener 30 is then pressed along stem 26 into engagement with the adjacent surface of casing member 22. Without more, casing members 22 and 24, terminals 60, 62 and 102, and the plunger assembly including plunger weight 40, sleeve 34, spring 46, and bridging contact member 42 are all securely and effectively retained in operative relationship as viewed in Fig. 1. It will be clear that connection of lead 100 to terminal 60 may be effected either before or after assembly of terminal 60 with the remaining structure of switch 20. Likewise, coil 50 may be wound and connected as desired to terminal 102 before or after assembly of switch 20 is completed.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

WHAT WE CLAIM IS:—

1. An electric switch structure comprising a casing having first and second casing members, means on the interior of each of the casing members providing complementary, mutually interfitting, interengaging surfaces which, when in interfitting interengagement, prevent relative movement between the casing members in at least one plane, and means for retaining the members in interfitting engagement, the interfitting surfaces of the members defining at least one guideway extending from the interior to the exterior of the casing, at least one of the casing members providing a recess opening to the guideway, an electrical terminal disposed in the guideway and confined against lateral movement by the guideway and a projection carried by one of the casing members which extends through and interfits with an aperture provided in the terminal and then into interfitting engagement with the recess whereby the terminal is confined against movement with respect to the casing and the terminal and the casing are aligned with each other.

2. An electric switch structure according to Claim 1 wherein at least one of the casing members provides a slot opening to the guideway and to the exterior of the casing and the terminal extending from the interior of the casing is provided with a return-bent portion adapted to be secured in the slot whereby the terminal is reinforced against substantial deflection perpendicular to the plane in which the terminal lies.

3. An electric switch structure according to

claim 2 wherein the return-bent portion of the terminal is provided with an internally threaded aperture for receiving a lead-securing screw.

4. An electrical switch structure according to any one of the preceding claims wherein each of the casing members provides a recess opening to the interfitting surfaces and a slot communicating with one of the last mentioned recesses and the exterior of the casing and the terminal is headed and provided with a shank, a portion of the head of this terminal lying in each of the last mentioned recesses and a portion of the shank lying in each of the last mentioned slots, the shank extending from the head to the exterior of the casing.

5. An electrical switch structure according to any one of the preceding claims wherein the means for retaining the members in interfitting engagement comprises a headed stem extending through both of the members.

6. An electric switch structure according to claim 5 wherein the headed stem carries a contact movable above the stem into and out of engagement with a fixed contact carried by the terminal.

7. An electric switch structure according to claims 5 or 6 wherein the headed stem passes through apertures formed in each of the members in alignment with each other, the head of the stem abutting on outer surface of one of the casing members and a push-on fastener disposed about the stem adjacent the other end thereof and abutting an outer surface of the other member whereby the members are retained in interfitting engagement with each other.

8. A switch according to claim 4 in which the shank of the terminal includes electrical conductor fastening means in the form of an open-ended slot.

9. A switch according to claim 6 in which the movable contact comprises a bridging contact plunger subassembly comprising a sleeve, a conductive bridging contact member slidably supported thereon, magnetic armature means slidably supported on the sleeve and adapted upon energisation by a surrounding coil to cause the movable contact to engage the fixed contact, and resilient means on the sleeve for transmitting motion from the magnetic armature to the bridging contact member.

10. A switch according to claim 9 in which the bridging contact subassembly is guided by and confined in a hollow cylindrical housing formed on one of the casing members.

11. A switch according to claim 10 in which the hollow housing carries externally the energisation coil of the magnetic armature means.

12. A switch according to claim 11 in which the housing is formed with an external shoulder recessed to receive one end of the energisation coil.

13. An electrical switch structure substantially as described with reference to the accompanying drawings.

ABEL & IMRAY,
Chartered Patent Agents,
Quality House, Quality Court,
Chancery Lane, London, W.C.2.

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