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ELECTRIC SWITCH

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This invention relates to electric switches and has to do with perfecting terminal constructions and contact engagement in switches of small mass and of relatively large number of circuit connections.

One object of the invention is to provide an electric switch of the type described that will be simple in construction and certain of function though small in physical extent.

A further object of the invention is to provide a switch construction adaptable to close a plurality of circuits through a small range of actuated movement.

Another object of the invention is to provide a switch construction of simple design in which positive contact engagement and separation is effected without the necessity of detent engagement.

Another object of the invention is to provide a terminal construction for an electric switch with means for making firm engagement between the contacts without conducting the current through the means perfecting the contact engagement.

Another object of the invention is to provide a terminal construction in which the relatively fixed contacts are yieldably urged into engagement with a contact actuator assembly with means for conducting current to the relatively fixed contacts without subjecting the yieldable means to current conduction.

A further object of the invention is to provide a terminal structure for a switch in which relatively fixed contacts are yieldingly supported independent of current conducting means thereto.

The above stated objects and others are accomplished by providing a guide means for reciprocatably retaining a contact actuator assembly in contacting engagement with a plurality of contacts supported by a switch back. The switch back supports in spaced relation thereto a terminal board comprising laminae of apertured insulating plates, between which are clamped and anchored conductive straps having permanent engagement with contact elements projectable through apertures of the switch back, by yielding means disposed between the switch back and the terminal board, the yieldable means performing no function as to current conduction.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 is a plan view of one face of the switch construction embodying the present invention, it being a view substantially as indicated by the arrow 1 of Fig. 2.

Fig. 2 is a side elevation of the same substantially as indicated by the arrow 2 of Fig. 1.

Fig. 3 is a transverse sectional view somewhat as indicated by the line and arrows 3—3 of Fig. 1.

Fig. 4 is a longitudinal sectional view substantially as indicated by the line and arrows 4—4 of Fig. 1.

Fig. 5 is a plan view of the contact actuator assembly substantially as indicated by the line and arrows 5—5 of Fig. 3, with a schematic illustration of circuit connections imposed thereon.

With particular reference to the drawing, 10 indicates a supporting means, comprising a flat wall 12 with side walls 14, the edges of which have tangs 16 adapted for keeping a switch back in engagement therewith as is usual practice. At each end of the plate portion 12, and oppositely extending from the wall portions 14, there are attaching members or brackets 18 which may be apertured at 20 for convenience of affixing the structure to a support. The bottom wall 12 is also provided with a slot 22 along which there is movable an actuating pin 24 rigidly secured in a contact actuator plate 26, adapted to slide over the inner surface of the wall 12 and between the wall portions 14. Contributing to ease of movement of the actuator plate 26, the same is embossed to provide spherical like extrusions 28 that engage the surface of the plate 12 and thereby hold the main portion of the plate 26 in spaced relation to the wall 12, in consequence of which much friction is reduced. The actuator plate 26 is preferably rectangular in plan and of such dimension that its longer sides extend parallel with the walls 14 of the supporting member.

Each end of the plate 26 is provided with an upstanding lug 30, adapted as a keeper to engage the ends of a pair of insulators 32 and 34 carried by and movable with the plate 26. The plate 32 is conveniently recessed at 38 to make clearance for the riveted end of the actuating pin 24 where it is secured to the plate 26. The insulator plate 34 has a plurality of apertures for the reception of conductive elements substantially as illustrated in the form shown in Fig. 5, the conductive elements comprising a pair of short rectangles 40, a long rectangle 42, and a U-shaped member 44, fashioned in the form of inlays of substantially the same thickness as the plate 34, and frictionally retained within the apertures

provided for them. The conductors or inserts present a smooth surface contour with the surface of the plate 34, and are movable therewith along the channel provided by the walls 14, whenever the pin 24 is moved from one end of the slot 22 to the other. The tangs 30 of the plate 26 are of sufficient extent to project beyond the meeting plane of the insulators or plates 32 and 34, such that movement of the plate 26 will always positively actuate both of the plates from end to end.

Seated against the edge of the walls 14 and disposed within the extent of the tangs 16, there is a terminal support construction comprising a switch back 50 of insulation, where it is retained by bending over the tangs 13. The switch back 50 has an extension 52 carrying an aperture 54 for reception and support of a pilot or indicator lamp, and is severally apertured as at 56 (Fig. 3) to allow for the passage of relatively fixed contact elements. These contact elements are seven in number, and are situated in a group comprising three rows, with three contact elements in each row substantially as illustrated in Fig. 5 of the drawing. In one row, there are the contact elements 58, 60 and 62, and in a second row parallel therewith there are the elements 64, 66 and 68, while associated with adjacent contacts of the two rows so far mentioned, there is the seventh contact 70, forming a third row comprising the contacts 58, 64 and 70.

The specific construction of the fixed contact members 58 to 70 inclusive, is illustrated in Fig. 3, and comprise a pin like construction having a rounded tip 72 projecting through the aperture 56 into engagement with the contact actuator assembly, the opposite end being reduced to provide a shoulder 74 for reception of the apertured end of a connector strap 76 against which the body of the pin is peened over or staked as at 78. Extending away from the shoulder and peened portion, there is a reduced shank 80 that acts as a pilot about which is disposed a helical spring 82.

Mounted upon the switch back 50, there is a terminal board of composite construction, comprising two plates or laminae of insulation 84 and 86, that are clamped together and secured to the switch back by means of a tubular rivet 88 counter sunk in the switch back as indicated at 90, Fig. 4, and thence passing through a spacer 92 and each of the plates 84 and 86 to be riveted or turned over at 94 against a washer 96. It is obvious that a shouldered stud may be used for the same purpose.

Specifically, the connector straps 76 for the contact elements 58 to 70 inclusive, are indicated respectively at 98 to 110 inclusive. All of the connector straps are the same and comprise a strip of soft bendable metal, such as hard copper, preformed to provide the general configuration illustrated in Figs. 2 and 3, in that they are generally of U-shape, having one leg 112 apertured as aforesaid for reception of the shoulder portion 74 of one of the contact elements, the opposite leg 114 having a secondary loop 116, the leg 114 finally ending with a deflected solder lug portion 118. Being of this construction, the connector straps are adapted for anchorage in the terminal board, and for attachment to circuit connections for conducting current to the respective contact element. The plate 84 of the terminal board has a plurality of apertures 120, for receiving each a secondary loop 116 of the connector straps, which thereby prevents rotation of the straps out of their desired positions.

The plate 86 of the terminal board is provided with a plurality of slots 122, 124 and 126 substantially as shown in Fig. 1, allowing for passage for the deflected portions 118 substantially as shown in Fig. 3. The apertures of the plate 84 are out of alignment with the apertures or slots in the plate 86, and the construction is such that before the terminal board is assembled with the switch back, the connector straps 76 are assembled with the plate 84 by passing the secondary loops 116 down through the apertures 120, so that the legs 114 rest against the upper surface of the plate 84. Thence, the plate 86 is passed over the deflected portions 118, so as to be received by the slots 122 to 126 inclusive, after which the plates 84 and 86 are threaded over the tubular rivet 82 where they are secured in clamping relation by the turned over portion 94 of the tubular rivet. That provides a construction in which the legs 114 of the connector straps are securely clamped between the plates 84 and 86, with the secondary loops 116 nested in the apertures 120, and the deflected portions 118 projecting from the slots of the plate 86.

The plate 84 has a plurality of apertures 128 in alignment with the shanks 80 of the contact elements for reception of one end of the springs 82 that rest against the body of the plate 86 as indicated in Fig. 3. The contact elements 58 to 70 inclusive are thus each individually urged, or yieldingly projected, through the apertures 56 of the switch back 50 by the springs 82, which keeps them constantly in engagement with the contact actuator assembly, so that either the plate 34 or the inlay contacts carried thereby are engaged by the relatively fixed contacts.

One circuit installation by which the switch may be made use of is illustrated in Fig. 5, where adaptation is made to a combined stop light and direction indication signalling system. In that circuit installation, the contact elements 58 and 62 are led to direction indicating lamps 130 and 132 at the front of the vehicle, while the contact elements 64 and 68 are led to rear signal lamps 134 and 136 respectively at the rear of the vehicle, each of the lamps being grounded at 138. The contact elements 60 and 70 are each connected to an output terminal of a flasher mechanism 140, the input of which is fed by a battery 142 having a common ground 138, and which battery also has communication through a stop light switch 144 with the remaining contact element 66.

The contact actuator assembly as shown in Fig. 5 is in the neutral position, which is substantially the mid-position illustrated in Fig. 4. Under those circuit conditions, closure of the switch 144, which may be coincident with the application of the brakes of the vehicle, completes a circuit from the battery 142 to the contact element 66 and thence by inlay contact 42 to the contact elements 64 and 68, which lead to the rear signal lamps 134 and 136 thus displaying a stop light signal. Assuming that the operator desires to indicate intention to turn, the contact actuator is moved to one of the positions which will close the desired circuit. Let it be assumed that the contact actuator assembly is moved to the dotted line position, under which conditions the battery 142 will be connected through the flasher to the lamp 132 by way of the contact elements 60, 62 and inlay contact 42, and will also be connected to the lamp 136 through the flasher by way of the contact elements 70 and 68 and the inlay contact 44, under

which conditions the lamps 132 and 136 on one side of the vehicle will be caused to alternately, or intermittently, glow and darken by reason of the flasher 140. Assuming that after partially completing the turn, or while the direction indicating switch is retained in the designated position, it is desired to bring the vehicle to rest and the brake is applied for accomplishing the same. The stop light signal is still available for signal indication because the circuit connections heretofore set up by the direction signalling switch does not disqualify the stop light signal. Closing of the stop light signal 144 under those conditions conducts current from the battery 142 to the contact element 63, and thence by inlay contact 42 to contact element 64 which communicates with the remaining rear signal lamp 134 and causes it to glow continuously. Thus the indication of direction change will be indicated by the flashing of the lamps on one side of the vehicle, and the intention to stop will be indicated by the continual illumination of the other of the rear signal lamps.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In an electric switch, the combination comprising, an apertured switch back, a terminal board supported in spaced relation therefrom, fixed contacts comprising round pins loosely projecting through the apertures of the switch back, and having reduced shanks, connectors secured to the said shanks, and helical springs engaging the shanks and seated against the terminal board to yieldably project the fixed contacts through the switch back.

2. In an electric switch, a terminal supporting structure comprising in combination, a plate of insulating material having a plurality of apertures therethrough, a terminal board supported in parallel spaced relation from said plate, con-

ductive straps anchored intermediate their length in the terminal board and having free ends extending on opposite sides thereof, one of the free ends being bent to project between the plate and terminal board, contact members secured to the said bent ends and disposed in the apertures of said plate for limited movement therethrough, and additional means disposed between the plate and board yieldably urging the contacts in one direction through said plate.

3. The combination set forth in claim 2, wherein the terminal board comprises a pair of insulated plates riveted together in clamping engagement upon portions of said conductive straps and have apertures for reception of folded portions of the straps.

4. The combination set forth in claim 2, wherein the conductive straps comprise generally U-shaped elements, one leg of which provides an inwardly directed loop, and in which the terminal board has apertures within which are disposed the said loops of the conductive straps, said conductive straps being the sole means by which current is conducted to the contact members.

5. The combination set forth in claim 2, wherein the contact urging means comprise helical springs disposed about a portion of the contacts, and said terminal board is recessed for seating one end of said springs.

6. In an electric switch, a terminal board comprising in combination, a pair of insulating plates, each of which has a plurality of apertures but misaligned with the apertures of the other, thin strip like connectors having an intermediate portion extending between the insulating plates and a folded loop disposed in an aperture of one plate, an angled portion of the strip like connector on one side of the loop passing through a respective misaligned aperture of the other plate, and means rigidly clamping the plates together so as to retain the connectors in predetermined relation.

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