

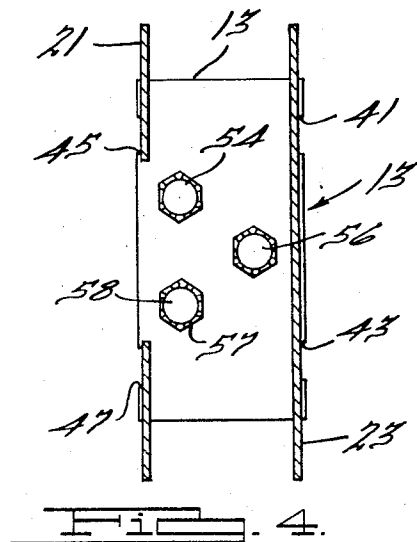
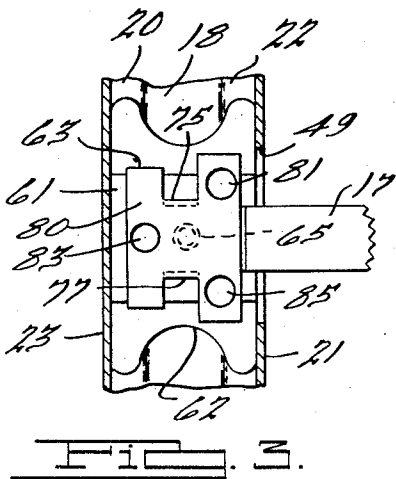
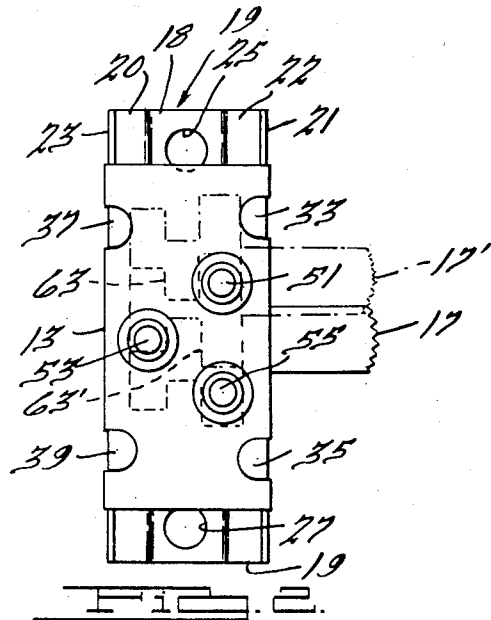
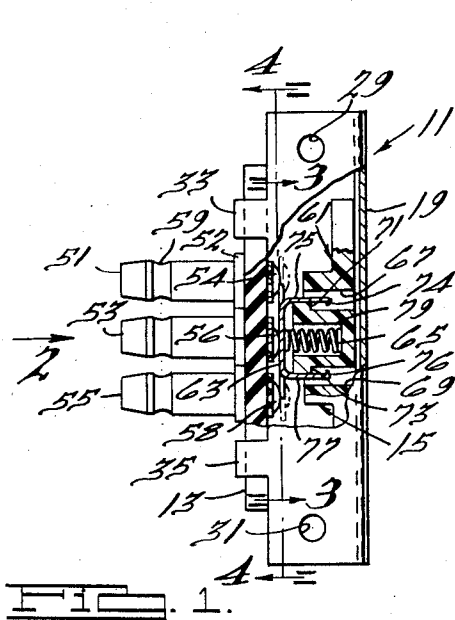
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E. J. LAETE  
SWITCH ASSEMBLY

2,880,284

Filed Nov. 5, 1956

2 Sheets-Sheet 1



INVENTOR  
Edward J. Laete

BY

Harness, Dickey & Pene  
ATTORNEYS

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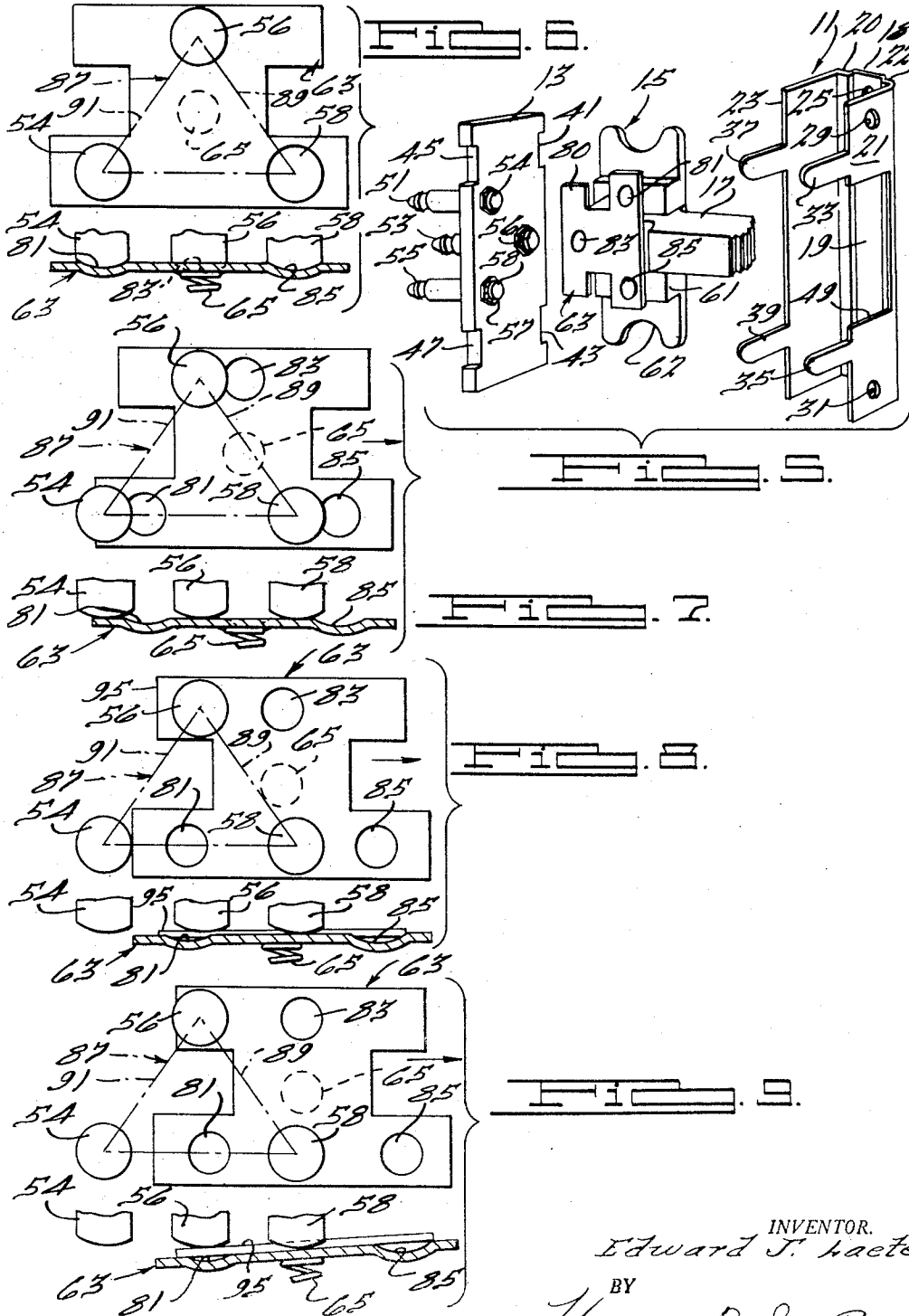
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INVENTOR.

Edward J. Laete

BY

Hornes, Dickey & Pence  
ATTORNEYS.

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## SWITCH ASSEMBLY

Edward J. Laete, Sturgis, Mich., assignor to Wade Electric Products Co., Sturgis, Mich., a corporation of Michigan

Application November 5, 1956, Serial No. 620,300

13 Claims. (Cl. 200—16)

This invention relates to electrical switches and more particularly to electrical switches of the reciprocating type capable of controlling a plurality of electrical circuits.

It is an important object of the present invention to provide an electrical switch embodying improved means for effecting a quick opening and closing action for controlling electrical circuits.

It is another object of the present invention to provide an electrical switch including contact means and movable bridging means having improved means for operatively urging the bridging means to slide and tilt in its movement with respect to the contact means to quickly open and close electrical circuits.

It is another object of the present invention to provide an electrical switch embodying improved means for retaining the actuated means in its several selectively settable positions.

It is another object of the present invention to provide improved means for resiliently associating the bridging means to the actuated means.

It is still another object of the present invention to provide an improved electrical switch having relatively few parts which may be economically manufactured and assembled on a mass production basis.

The above and other objects of the present invention will be apparent during the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Figure 1 is a side elevation, partly in section, of the switch embodying the present invention;

Fig. 2 is an elevational view from the left of the structure shown in Fig. 1;

Fig. 3 is a sectional view along the line 3—3 of Fig. 1 viewed in the direction indicated;

Fig. 4 is a sectional view along the line 4—4 of Fig. 1 viewed in the direction indicated;

Fig. 5 is an exploded view of the several parts of the switch embodying the present invention; and

Figs. 6, 7, 8 and 9 are diagrammatic views in plan and elevation showing the operation of the switch embodying the present invention.

The switch includes generally a housing 11, an insulated mounting 13 carrying contact means, actuated means generally designated 15 carrying bridging means for cooperation with the contact means, and operating means in the form of a lever 17 for moving the actuated means.

Referring to the figures in more detail, the housing 11 has a bottom wall section 19 and side wall sections 21, 23. The bottom wall section 19 has a central depression 18 forming ledges 20, 22. The actuated means supported away from the bottom wall 19 slides on the ledges 20, 22 in its travel in the housing 11. The bottom wall section 19 has a pair of mounting holes 25, 27. Likewise, the side wall section 21 has a pair of mounting holes 29, 31 which may be used for mounting the switch in a num-

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ber of different positions. The switch is suited for mounting on the dashboard or other supporting structure of an automotive vehicle and is particularly adapted for controlling the front and rear speakers of a dual speaker audio system incorporated in the radio of such vehicle. The housing has four tangs 33, 35, 37, 39 which cooperate with notches 41, 43, 45, 47 formed in the insulator mounting 13. The tangs are bent over the back of the insulator mounting as shown in Fig. 2 for rigidly securing the insulator mounting 13 to the housing 11. The side wall 21 of the housing has a centrally located slot 49 through which the lever 17 protrudes, the slot defining the length of travel of the lever within the housing. The insulator mounting 13 carries stationary contact means in the form of three terminal contacts 51, 53, 55 extending through the insulator mounting. One extremity of each of the terminal contacts is staked over, as at 57, for cooperating with the enlarged flange portions, as at 52, for anchoring the terminal contacts to the insulator mounting. Contact bosses 54, 56, 58 protrude from the surface of the insulator mounting. Near the other extremity of the terminal contacts are annular grooves, as at 59, for cooperating with a conductor receptacle to bring current into and away from the terminals.

The actuated means 15 includes a slide block 61 preferably formed of molded insulating material for carrying bridging means 63 in the form of an I-shaped plate, and resilient means 65 in the form of a compression spring. The base of the slide block includes extended feet, as at 62, for stability which feet are arcuately shaped so that they will be spaced from the mounting holes 25, 27 in the extreme positions of the slide block in the switch housing. The slide block 61 has a pair of open-ended rectangular shaped apertures 67, 69 (permitting molding by a simple mold having axially extending core pins) formed with shoulder portions 71, 73 which cooperate with depending legs 75, 77 on the bridging means 63 in a manner to be hereinafter described. The slide block 61 also has a well 79 for receiving the resilient means 65. The bridging means 63 is stamped from sheet metal and has a flat surface portion 80 and legs 75, 77, outwardly bent from the flat surface portion 80 to form the flat surface portion into an I shape. The flat surface portion 80 serves to bridge two or more of the contact bosses to conduct current between those making contact with the same. The legs 75, 77 have inwardly turned hooks 74, 76 formed at the extremities. The flat surface portion 80 has depressions 81, 83, 85 formed therein and disposed at the apices of a triangle. The depressions 81, 83, 85 cooperate with the contact bosses 54, 56, 58, which are likewise triangularly disposed in the insulator mounting 13. In assembling the actuating means 15, the resilient means 65 is placed in the well 79 of the slide block 61 and the legs 77, 75 of the bridging means 63 are inserted into the apertures 67, 69 of the slide block at an angle to place the inwardly turned hooks 74, 76 on the legs of the bridging means beyond the shoulder portions 71, 73 on the apertures 67, 69 so that they cooperate to retain the bridging means on the slide block 61, this feature forming a part of the invention described and claimed in a copending application Serial No. 610,582, filed September 18, 1956, of Jasper Long assigned to the assignee hereof. The remainder of the assembly is completed by placing the insulator mounting 13 over the actuated means with the contact bosses 54, 56, 58 engaging the surface portion 80 of the bridging means so as to align with the depressions 81, 83 and 85. The tangs 33, 35, 37, 39 on the housing are then bent over to secure the insulator mounting to the housing. The slide block 61, the resilient means 65, and the bridging means 63 are retained as a unit and slide within the

housing 11 as such. The resilient means 65 urges the bridging means 63 against the contact bosses 54, 56, 58 mounted on the insulator housing and urges the slide block 61 against the bottom wall section 19 of the housing 11. The resilient means 65 is freely guided in the well 79 and produces a yieldable force at nearly point contact on the flat surface portion 80 of the bridging means and is not affixed either to the slide block 61 or to the bridging means 63. It is retained between the bridging means and the slide block in the free position by the coaction of the hooks 74, 76 against the shoulders 71, 73 of the apertures in the slide block 61 to facilitate assembly. In its operative position within the switch housing, it is retained under compression within the well 79 of the slide block through the coaction of the latter against the switch housing and the bridging means against the contact bosses on the insulator housing. The bridging means 63 is floatably carried by the manner of its retention within the slide block 61 and is free to tilt about substantially any line lying in the plane of its surface portion 80. Fig. 2, in dotted lines, shows an intermediate position as at 63 and one extreme position as at 63' of the bridging means within the switch housing. The slide block 61 is manually actuated by the lever 17 which is molded integral with the slide block 61. It will be apparent that other operating means may be employed for moving the actuated means other than a lever integral with the slide block. The operating means shown is the preferred one, but, for example, a toggle type lever could be used to move the actuated means.

Figs. 6, 7, 8 and 9 diagrammatically show the operation of the switch and in each of the figures there is shown a plan and elevational view of the bridging means 63, the contact bosses 54, 56, 58, and the resilient means 65. Fig. 6 shows the intermediate position of the bridging means wherein the depressions 81, 83, 85 mate with the contact bosses 54, 56, 58. The resilient means 65 is disposed substantially centrally of the triangle 87 defined by the location of the contact bosses 54, 56, 58. The imaginary triangle 87 has one leg 89 joining the contact bosses 56, 58 and another leg 91 joining the contact bosses 54, 56. Each of the legs 89, 91 is disposed at an angle to the direction of movement of the bridging means. In the operation of the switch, the contact bosses remain stationary and the actuated means, including the resilient means 65 and the bridging means 63, move relative to the contact bosses. In the position shown in Fig. 6 the coaction of the contact bosses and the depressions in the bridging means serves to yieldably retain the bridging means in the intermediate position. When the bridging means is moved to either extreme position with respect to the contact bosses, the bridging means is immediately depressed as the contact bosses ride up the sides of the depressions and immediately the bridging means snaps back into a raised position, such as shown in Fig. 7, all the time maintaining contact with the three contact bosses. Fig. 7 shows the relation of the bridging means to the contact bosses when the bridging means has been moved slightly to the right toward one of its extreme positions just after the bridging means has been depressed by the action of the contact bosses moving out of the depressions on the bridging means. The center of the resilient means 65 is still within the triangle 87 and the contact bosses have been continually engaging the bridging means so that no tilting action occurs. Fig. 8 shows the relative positions of the contact bosses and the bridging means when the bridging means have been moved to a position still further to the right. The resilient means 65 has now passed beyond the leg 89 of the triangle 87 joining contact bosses 56, 58. Substantially immediately as the resilient means passes beyond the leg 89 of the triangle 87 there is created unbalanced forces and the bridging means is tilted about an axis defined by the leg 89 of the triangle. The bridging means quickly disengages from contact boss 54. The contact

bosses 56, 58 have never lost contact with the bridging means during this tilting action. The elevational view in Fig. 8 showing the bridging means in the tilted position is exaggerated to show that the front surfaces of the bridging means, as at 97, are lower than the back surfaces, as at 95. Contact boss 56 of course, contacts the rear surface of the bridging means, while contact boss 58 contacts the front surface of the bridging means, as clearly shown in Fig. 8. Fig. 9 shows the bridging means after having been moved to one of the extreme positions. The bridging means is further tilted from the position shown in Fig. 8 due to the greater leverage action of the yieldable force of the resilient means tilting the bridging means about an axis joining the contact bosses. This tilting of the bridging means as it moves to its extreme positions serves the additional useful function of aiding in yieldably retaining the actuated means in its extreme positions. Only slight force is required to move the actuated means back to the intermediate position and in so doing the reverse action takes place; that is, the resilient means 65 moves toward the leg 89 of the triangle 87 as the actuated means is moved to the left. The tilt of the bridging means is gradually decreased as it passes through the position shown in Fig. 8 until the point is reached where the center of the resilient means passes under the leg 89 of the triangle 87. At this point, the bridging means quickly assumes the position shown in Fig. 7 due to the unbalanced force exerted on the bridging means by the resilient means to engage the contact boss 54. Further movement of the actuated means to the left causes the bridging means to snap into the intermediate position shown in Fig. 6. The cooperation of the contact bosses with the depressions in the bridging means yieldably retains the bridging means in the intermediate position and further movement of the actuated means to the left causes a similar action to that shown in Figs. 6-9, except that the tilting of the bridging means occurs in a clockwise direction. That is, the bridging means 63 would be tilted about an axis defined by the leg 91 of the triangle 87 substantially immediately as the resilient means passes beyond the leg 91 to effect a quick break of the bridging means 63 from the contact boss 58 in this instance and contact bosses 54 and 56 would continue in their engagement with the bridging means.

It will be evident that the switch can control a plurality of circuits, an example being dual speakers in the audio circuit of an automobile radio. In operating the front and rear speakers on an automotive vehicle, the switch would be mounted on the dashboard, for example, and the central terminal 53 would be connected by a conductor to one side of the battery. The other two terminals 51, 55 would be connected by suitable conductors to one side of the front and rear speakers. The other sides of the front and rear speakers would both be electrically connected to the other side of the battery, i.e., the side which is not connected to the central terminal 53. The switch of course would be employed in conjunction with the on-off switch of the radio and with the latter switch on and with the actuated means 15 of the switch of the present invention in the intermediate position both speakers would be operating simultaneously. Manual actuation of the lever 17 to one extreme position of the switch would quickly disengage the rear speaker, for example, while the front speaker continued to operate. Actuation of the lever 17 to the other extreme position would first quickly engage the rear speaker at the intermediate position of the switch before disengaging the front speaker. Continued actuation of the lever 17 to the other extreme position would quickly disengage the front speaker while the rear speaker continued to operate. In addition to controlling dual speakers in the audio section of a radio, the switch may be employed to control a variety of different electrical circuits, as it will be observed that the contact boss 54 on the central or inter-

mediate terminal 53 is electrically bridged with the bosses 54, 58 on the end terminals 51, 55 in the intermediate position of the actuated means and is electrically disconnected with one and then the other in the extreme positions. Likewise, the contact bosses 54, 58 on end terminals 51, 55 are electrically bridged in the intermediate position and are electrically disconnected from each other in the extreme positions of the actuated means. It will be apparent that one of the terminals need not be connected to a conductor at all but may be a dummy terminal, in which case it would be used purely for its mechanical function of cooperating with the other contact means to act in concert with the bridging means to effect an efficient tilting action to quickly open and close the circuits and to aid in retaining the actuated means in its extreme positions.

The particular manner in which the slide block 61 carries the bridging means 63 is such that the bridging means is free to tilt about substantially any line in the contacting surface of the bridging means. This is accomplished by providing a nearly point contact resilient support for the bridging means and by forming the rectangular apertures 67, 69 in the slide block so that they are oversize with respect to the size of the leg portions 75, 77 on the bridging means. The walls of the apertures 67, 69 loosely guide the legs 75, 77 in their movement within these apertures. This is the preferred construction of the actuated means. The hooks 74, 76 formed on the ends of the leg portions 75, 77 aid in the assembly of the switch by cooperating with the shoulder portions 71, 73 on the apertures 67, 69 to retain the bridging means 63 on the slide block 61 as a unitary subassembly. It will be apparent that the rectangular apertures 67, 69 could be formed so that the length of the rectangular cross section of the apertures would closely approach the width of the leg portions of the bridging means. Two of the walls of each of the apertures 67, 69 would then act as restraining guides on the leg portions 75, 77 of the bridging means and prevent the bridging means from tilting about a longitudinal axis and allow it to tilt only about a transverse axis. The preferred construction above described wherein the bridging means is free to tilt about substantially any axis lying in the plane of its operating surface contributes to the exceptionally quick make and break action of the bridging means with respect to one and the other of the end contact bosses. The manner of thus mounting the bridging means on the slide block so that it is able to freely tilt about the resilient means increases the speed of the make and break action between the bridging means and the contact means by reason of the shorter distance that the resilient means has to pass beyond the legs of the imaginary triangle above referred to before the unbalanced force created by the resilient means causes the bridging means to tilt about two of the contact means. The end portion of the bridging means then dips away from the end contact means disposed at the apex of the triangle with respect to the axis of tilting, and the speed of the make and break action is enhanced by virtue of the increased distance of the end portion of the bridging means from the axis of tilting, the linear velocity of the end portion being proportional to this distance and the angular velocity of the bridging means about the axis of tilting. While it has been shown that the preferred disposition of the contact bosses are at the apices of a triangle, it will be apparent that the contact bosses could be arranged in other ways and likewise more than three contact bosses could be employed. It will be equally apparent that while the bridging means preferably is formed with depressions to create a snap action between the contact means and the bridging means during the movement of the actuated means through the intermediate position and for aiding in retaining the actuated means in the intermediate position, the bridging means may be formed with a smooth surface. However, an especially quick and efficient snap action is effected if the

diameter of the depressions on the bridging means is appreciably less than the radius of curvature of the contact bosses so that substantially line contact only is provided between the contact bosses and the bridging means in the intermediate position of the actuated means whereby the snap action is emphasized.

While the preferred embodiment of the invention has been shown and described, it is to be understood that various modifications, changes in size, shape and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. In an electric switch, spaced apart contact means including an intermediate contact means, and end contact means, yieldably mounted bridging means having an intermediate position engaging said intermediate contact means and each of said end contact means, operating means including resilient means cooperative with said contact means to slide said bridging means in one direction from said intermediate position to tilt said bridging means about said intermediate contact means and one of said end contact means to quickly disengage said bridging means from the other of said end contact means and to slide said bridging means in the opposite direction from said intermediate position to tilt said bridging means about said intermediate contact means and said other contact means to quickly disengage from said one contact means.

2. In an electric switch, a mounting member and spaced apart contact means affixed to said mounting member and projecting above the surface thereof, bridging means with depressions to receive and engage the contact means, reciprocating means for moving said bridging means with respect to the contact means, and resilient means yieldably pressing the bridging means against the contact means and cooperating with the contact means to tilt said bridging means about an axis joining two of the said contact means as the said bridging means is reciprocated.

3. In an electric switch, actuated means including resilient means and bridging means yieldably mounted on said resilient means with respect to said actuated means, said bridging means slidably engaging said contact means upon movement of said actuated means, and operating means for moving said actuated means to an extreme position, said resilient means and said contact means functioning to tilt said bridging means about an axis joining two of said contact means to yieldably retain said actuated means in said extreme position.

4. In an electric switch, a housing, actuated means slidably carried by said housing, bridging means carried by said actuated means, resilient means for yieldably mounting said bridging means on said actuated means, spaced apart stationary contact means, said bridging means having an intermediate position and an extreme position, and operating means to move said bridging means from said intermediate position to said extreme position to cause said bridging means to slidably engage said contact means, said resilient means cooperating with said contact means to tilt said bridging means at a predetermined distance in the movement of said bridging means toward said extreme position, the arrangement of said contact means and said resilient means being such that the tilting of said bridging means occurs about two of the contact means disposed so as to define an axis of tilting which makes an angle with the direction of movement of said bridging means.

5. In an electric switch, a housing, actuated means slidably carried by said housing, bridging means carried by said actuated means, resilient means making nearly point contact with said bridging means for yieldably mounting the same on said actuated means, a mounting member secured to said housing, spaced apart contact means extending through said mounting, said bridging

means continually engaging one of said contact means, and means for moving said bridging means to an extreme position, said resilient means cooperating with said contact means to tilt said bridging means about said one contact means and another of said contact means after a predetermined distance in the movement of said bridging means toward said extreme position, said one contact means and said other contact means being disposed to define an axis of tilting which is at an angle to the direction of movement of said bridging means.

6. In an electric switch, a housing, actuated means slidably carried by said housing, bridging means yieldably mounted on said actuated means, operating means for moving said actuated means to cause said bridging means to move in one direction and in the opposite direction, and spaced apart contact means for slidably engaging said bridging means including two contact means disposed along a line at an angle with respect to said one direction of movement of said bridging means and two contact means disposed along a line at an angle with respect to said opposite direction of movement of said bridging means, the yieldable action of said bridging means functioning to tilt the same about said first mentioned two contact means when said actuated means is moved in said one direction and to tilt said bridging means about said second mentioned contact means when said actuated means is moved in said opposite direction.

7. In an electric switch, spaced apart contact means, bridging means for slidably engaging said contact means, resilient means for yieldably mounting said bridging means, and means for moving said bridging means in one direction to an extreme position, said contact means including two contact means disposed along a line at an angle to the direction of movement of said bridging means, said resilient means cooperating with said contact means to cause said bridging means to tilt about said two contact means at a predetermined distance in the movement of said bridging means toward said extreme position.

8. In an electric switch, spaced apart contact means, bridging means for slidably engaging said contact means, resilient means for yieldably mounting said bridging means at nearly point contact, and means for moving said resilient means and said bridging means in one direction to an extreme position, said contact means including two contacts disposed along a line at an angle to the direction of movement of said bridging means, said resilient means functioning to tilt said bridging means about said two contact means substantially immediately as said point contact passes by a straight line joining said two contact means in the movement of said bridging means toward said extreme position.

9. In an electric switch, a housing having a back wall and spaced side walls integral with said back wall, an insulator mounting secured to said side wall so as to be disposed in faced opposed relation to said back wall having contact bosses protruding from the surface of one face thereof, said contact bosses being arranged at the apices of a triangle, a slide block slidably carried by said housing having a lever adapted to be actuated for moving said slide block from an intermediate position to extreme positions in opposite directions, mounting apertures in said back wall adjacent the ends of said housing, said slide block having a base slidably supported by said back wall including a raised central body portion with a top surface raised from said base and a foot member integral with and extending from each end of said base, a well centrally formed in said body portion and a pair of open-ended rectangular apertures each of which is spaced from and disposed on one side of said well, each of said apertures being formed by coaxial rectangular openings of different sizes, the largest of said openings extending inwardly into said body portion from said base, the smaller of said openings extending inwardly into said body por-

tion from the top surface thereof, whereby shoulder portions are formed in each of said apertures at the junction of each of said openings, bridging means including a flat surface I-plate and a pair of intumed legs each of which is integral with one side of the web of said I-plate, said pair of legs terminating in hooks to cooperate with the shoulder portions in said pair of apertures so as to retain said bridging means affixed to said slide block, the width of each of said legs being less than the width of each of said apertures, a compression spring disposed in said well so as to yieldably urge said I-plate against said contact bosses and to yieldably urge the base of said slide block against said back wall, the yieldable action of said compression spring against said I-plate functioning upon actuation of said lever to tilt said I-plate at a predetermined distance in the movement of said slide block in one of said opposite directions about a first and second of said contact bosses to quickly disengage said I-plate from a third of said contact bosses and to tilt said I-plate at a predetermined distance in the movement of said slide block in the other of said opposite directions about said first and third contact bosses to quickly disengage said I-plate from said second contact boss.

10. In an electric switch, a housing having a back wall and spaced side walls integral with said back wall, a centrally located slot in said side wall, said back wall having a longitudinally extending central depression formed therein and a pair of parallel ledges on one face thereof spaced from said central depression, an insulator mounting secured to said side walls so as to be disposed parallel to said back wall and having one face in face opposed relation with said one face of said back wall, three terminal contacts secured to and extending through said mounting and disposed at the apices of a triangle, each of said terminal contacts having a contact boss protruding from the surface of said one face of said insulator mounting, a slide block slidably carried by said housing having a base including extended feet slidably supported by said pair of parallel ledges so as to be spaced from said central depression, said slide block having a well centrally formed therein and a pair of open-ended rectangular apertures spaced from said well and formed with shoulder portions, bridging means having a flat surface portion and a pair of legs outwardly bent from said flat surface portion each of which is loosely disposed in one of said rectangular apertures and terminates in a hook to cooperate with the shoulder portion in said one aperture to retain said bridging means on said slide block, three depressions formed in one face of said flat surface portion and disposed at the apices of a triangle so as to mate with said contact bosses, a compression spring disposed in said well so as to yieldably urge said one face of said flat surface portion against said contact bosses and to yieldably urge the base of said slide block against said one face of said back wall, a lever integral with said slide block adapted to protrude through said slot in said one side wall for moving said slide block from an intermediate position in opposite directions, the yieldable action of said compression spring against said flat surface portion functioning upon actuation of said lever at a predetermined distance in the movement of said slide block in each of said opposite directions to snap said flat surface portion out of said intermediate position to a raised level position while maintaining said flat surface portion in mechanical and electrical contact with each of said contact means, and thereafter to tilt said flat surface portion at a further predetermined distance in the movement of said slide block in one of said opposite directions about a first and second of said contact bosses to quickly disengage said flat surface portion from a third of said contact bosses and to tilt said flat surface portion at a further predetermined distance in the movement of said slide block in the other of said opposite directions about said first and third contact bosses to quickly disengage said flat surface portion from said second contact boss.

11. In an electric switch, a housing having a floor with a pair of contacts therein, a conductive bridge having a portion parallel to said floor and slidable thereon, said bridge being rockable about an axis substantially parallel to the floor, a spring pressing said bridge portion against said floor, said spring being located so that the force applied by it to said bridge goes across the line of centers between said contacts when said bridge is moved between positions in which it interconnects and does not interconnect said contacts, and means rockably supporting said bridge so that it tilts about said axis when said spring force crosses said line of centers.

12. The invention set forth in claim 11 wherein said contacts project above said floor and said bridge portion

has depressions therein facing said floor and spaced to receive and engage said contacts.

13. The invention set forth in claim 12 wherein said depressions are smaller than said contacts.

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