April 6, 1937. H. A. DOUGLAS 2,076,073

RECIPROCATING ELECTRIC SWITCH

Filed Jan. 18, 1934 2 Sheets-Sheet 1

Fig. 1.

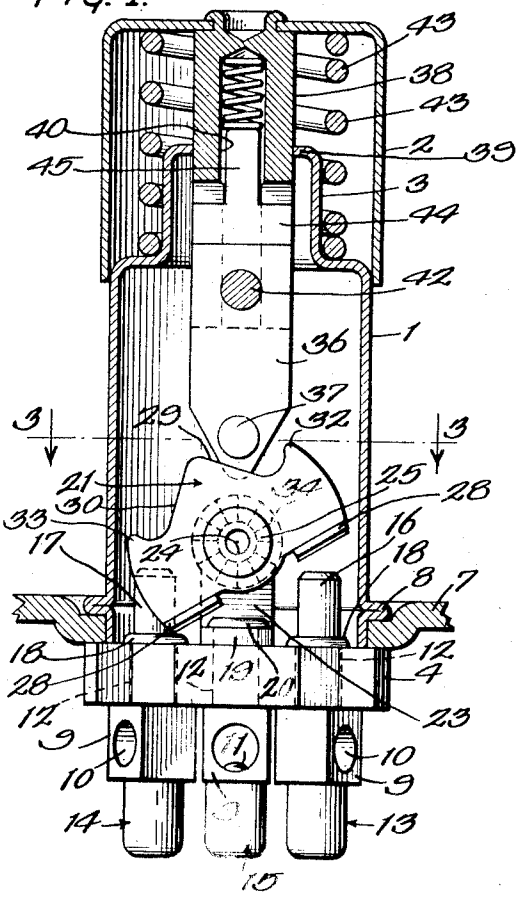


Fig. 2.

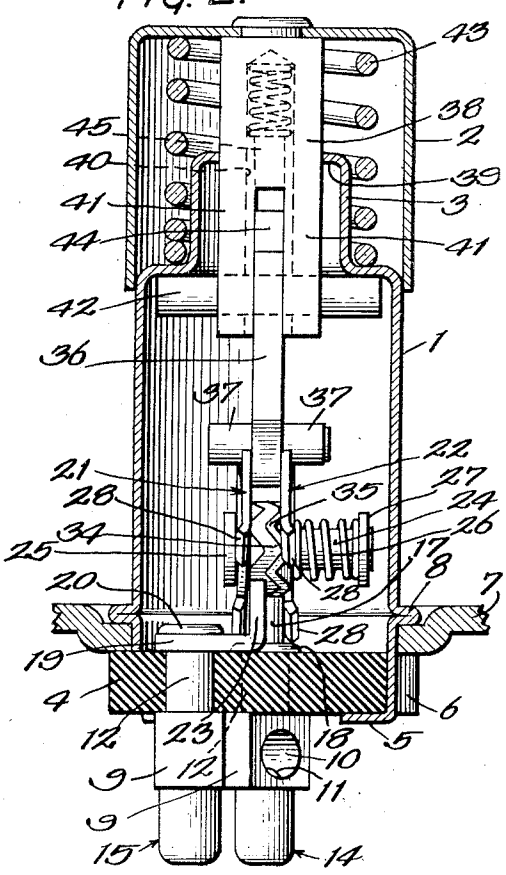


Fig. 3.

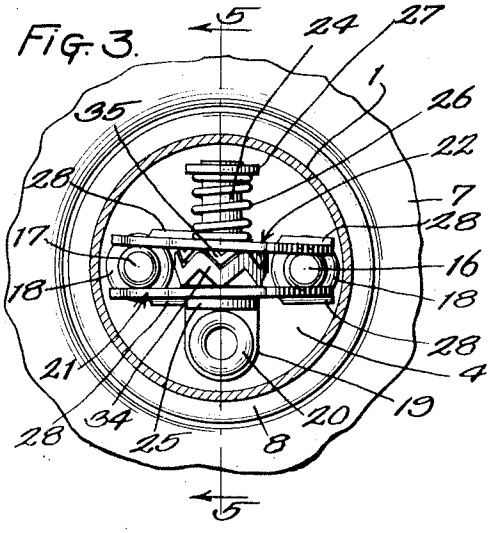
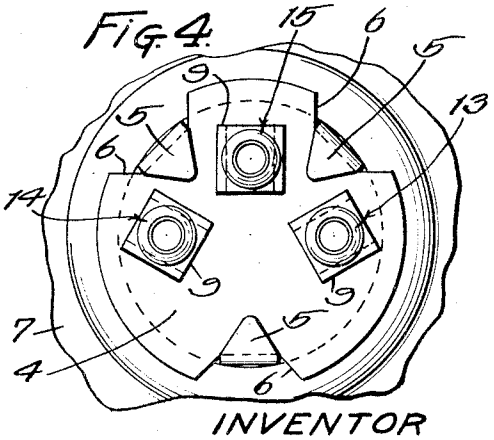


Fig. 4.



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Fig. 6.

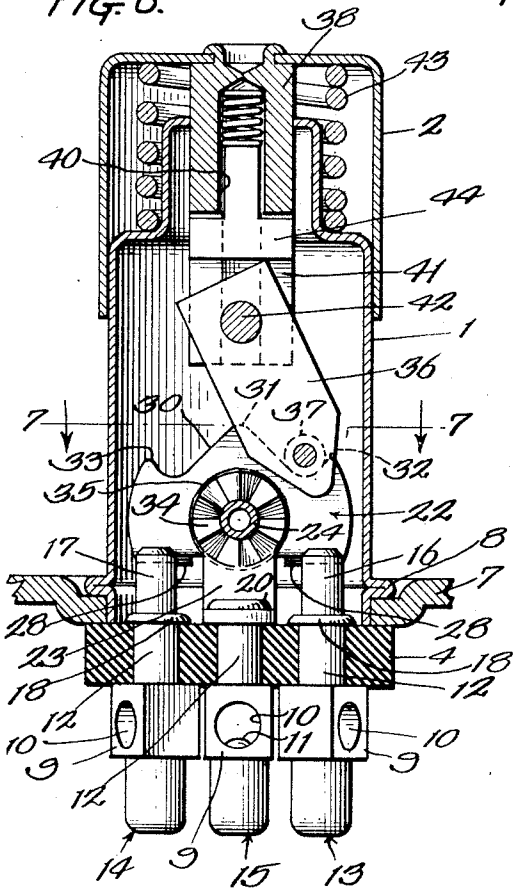
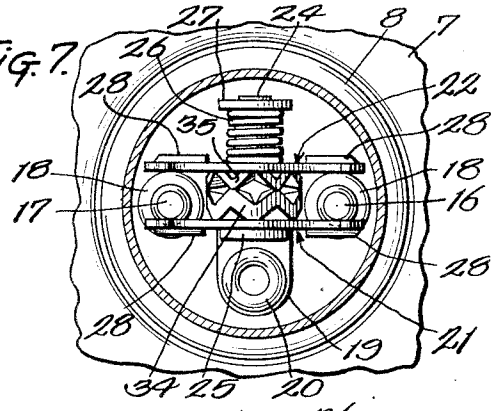


Fig. 7.



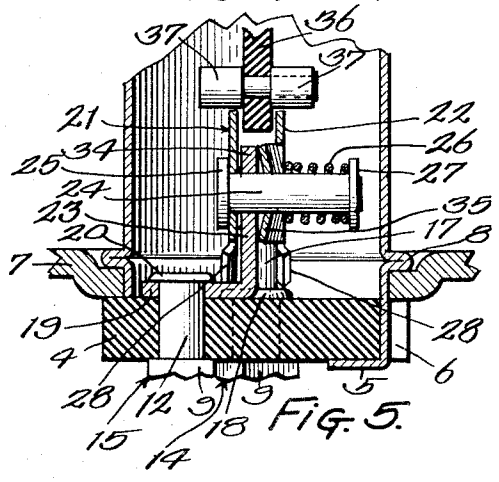
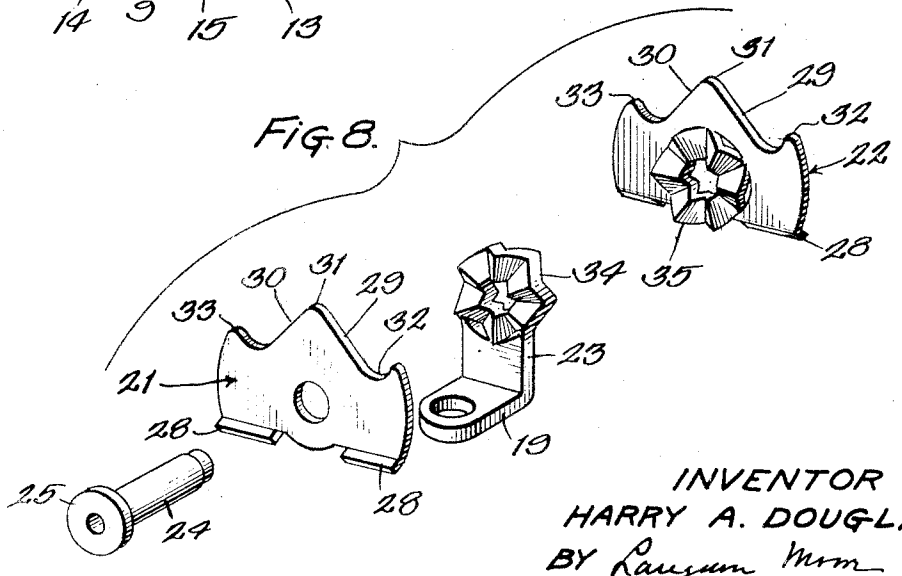


Fig. 5.

Fig. 8.



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RECIPROCATING ELECTRIC SWITCH

Harry A. Douglas, Bronson, Mich.

Application January 18, 1934, Serial No. 707,133

24 Claims. (Cl. 200—15)

This invention relates to electric switches, and it is an object of this invention to provide an electric switch which will be positive in operation and efficient, particularly under conditions of rough usage.

In the drawings accompanying this specification and forming a part of this application I have shown, for purposes of illustration, one form which the invention may assume.

In the drawings—

Figure 1 is a view in central vertical section of a preferred embodiment of this invention, with parts shown in elevation.

Figure 2 is a view in section taken transversely of Figure 1.

Figure 3 is a view in section taken on the line 3—3 of Figure 1, looking in the direction of the arrows.

Figure 4 is a bottom plan view.

Figure 5 is a view in section taken on the line 5—5 of Figure 3, looking in the direction of the arrows.

Figure 6 is a view similar to Figure 1, illustrating the position of the circuit continuing means in the act of discontinuing one circuit and continuing another circuit.

Figure 7 is a view in section taken on the line 7—7 of Figure 6, looking in the direction of the arrows.

Figure 8 is a projected view in perspective, of the circuit continuing means.

The illustrated embodiment of this invention includes a cylindrical metallic casing 1, mounting at one end a plunger cap 2 surrounding a restricted portion 3 of the casing 1 to reciprocate thereover, and closed at the other end by a contact carrier 4 of insulating material. The contact carrier is preferably in the form of a disc of slightly greater diameter than the open end of the casing, and is secured thereto by extending the wall to form preferably three depending fingers 5 which pass through circumferential notches 6 provided therefore in the edge of the contact carrier and then are bent over to engage the exterior surface thereof. The switch is supported by a mounting plate 7 having an aperture for snugly receiving the casing 1 and clamped between the closure 4 and an integral annular flange 8 formed on the case 1, as by striking out and folding together a portion of the wall as shown. When it is desired to mount this switch upon the floor board of an automobile, an aperture is provided therefore and the casing passed therethrough with the plunger cap convenient to the foot of the driver, the mounting plate being attached to the floor board in any desired manner.

The carrier plate 4 mounts three metallic circuit continuing connectors each having a rectangular portion 9 provided with a transverse bore 10 and a spring pressed detent 11 extending into said bore to form a socket for receiving a snap terminal, not shown, such as described in this applicant's prior copending application, Serial No. 565,127, filed Sept. 25, 1931. Each rectangular portion 9 is provided with an integral reduced cylindrical portion 12 extending therefrom and adapted to pass through an aperture provided therefore in the insulated carrier disc 4. The connectors 13 and 14 are arranged on a diameter of the carrier 4 equidistantly from the center and the connector 15 on a diameter at right angles thereto, as shown in Figure 4. The connectors 13 and 14 are each extended above the inner surface of the contact carrier 4 to form circuit continuing abutments or contact posts 16 and 17 circumferentially chamfered at their inner ends and expanded or riveted into a circumferential flange 18 engaging the inner surface of the contact carrier 4 to hold the shouldered rectangular portion 9 against the exterior surface of the contact carrier 4. The cylindrical portion 12 of the connector 15 passes through an aperture provided therefor in the base 19 of a metallic L-shaped bracket and is secured thereto by riveting or spinning the metal of the end 20 thereover to hold the shouldered rectangular portion 9 against the exterior of the contact carrier 4 and the base 18 of the bracket upon the interior of the contact carrier 4.

The connector 15 is engaged by the terminal of a conductor leading from a battery or other source of electricity, not shown, and the circuit is completed therefrom to either the contact post 16 or the contact post 17 by means of spaced apart contact continuing plates or bridges 21 and 22 which are arranged on opposite sides of a right angular bracket arm 23 extending upward from the base 19 and are mounted for axial oscillation about a pivot 24 passing through said plates and bracket arm, the pivot 24 having an enlarged head 25 at one end adapted to engage the exterior of the plate 21 and being surrounded at the other end by a coil spring 26 between the exterior of the plate 22 and an anchor 27 upon the extremity of the said pivot. The circuit controlling plates or bridges 21 and 22 are each preferably formed from a circular disc of metal apertured centrally to receive the pivot 24 and then cut away on a chord of

the circle therebelow with the lower margins on each side of the center struck outwardly to form guides 28. The upper edge of each disc is cut away on each side of the diameter perpendicular to the bottom, to form oppositely disposed sloping surfaces 29 and 30 forming substantially a right angle with each other at the apex 31 and continued on tangential arcs to the periphery to form shouldered stops 32 and 33. The bracket arm 23 terminates in a circular portion concentric with the pivot receiving aperture and the metal thereof is struck out from one side to form a plurality of similar angular protuberances on the other side about the pivot aperture thus forming a continuous undulating surface or track 34 to be engaged by the plate 22, as shown in Figure 8, and the metal surrounding the pivot aperture on the plate 22 is similarly struck out from the opposite side to form a complementary undulating surface or track 35. The plate 21 is normally held against the adjacent flat surface of the bracket arm 23, with the surfaces of the complementary undulating tracks 34 and 35 contacting each other throughout, by the tension of the spring 26 on the pivot 24. The plates 21 and 22 are caused to oscillate in unison about the pivot 24 by a reciprocating actuator 36 formed of insulating material, mounted for swinging movement between the upper portions of said plates, and provided adjacent its lower end with a transverse metallic stud 37 extending from both sides thereof and adapted to engage and travel over the sloping surfaces 29 and 30 of said plates until engaged by the shoulder 32 or 33 thereon. When the bottoms of the plates 21 and 22 are parallel to the adjacent surface of the contact carrier 4, the relation of the undulating tracks 34 and 35 is such that the high points of one engage the high points of the other, separating the plates 21 and 22 against the tension of the spring 26, with the plates parallel to each other and the bottoms of each at each end embracing the tops of the contact posts 16 and 17, as shown in Figures 6 and 7. When the plates 21 and 22 are rotated about the pivot 24 to the left, as shown in Figures 1, 3, and 5, the high points of the track 35 of the plate 22 travel over the inclined portion of the track 34 of the bracket arm 23 until the undulating surfaces of one track continuously engage the entire surface of the other track and allows the spring 26 to press the plate 22 nearer the arm 23. During this movement the adjacent sides of the plates 21 and 22 pass downwardly in contact with the opposite sides of contact post 17 under tension of the spring 26, which tilts the corresponding opposite sides of the plates to approach each other, as shown in Figure 5, thereby connecting the circuit from the battery connector 15 through bracket 18—23 and circuit continuing plates 21 and 22 to the contact post 17. When the plates are rotated about the pivot 24 in the opposite direction, the outturned guides 28 on the right engage the chamfered end of the contact post 16, and as the plates 21 and 22 pass from engagement with the contact post 17, the high points of the track 35 pass over the high points of the track 34 upon the bracket 23, and the spring 24 causes the plates 21 and 22 to engage the contact post 16 continuing the circuit from the battery connector 15 through bracket 18—23 and the circuit continuing plates 21 and 22 to the contact post 16. The undulating track 35 traveling over the stationary track 34 not only separates the plates 21 and 22 when they are oscillated to embrace either the contact posts 16 or 17, but under the tension of the spring 24 maintains the electrical connection therewith and returns said plates in the proper positions. The actuator 36 is reciprocated by a plunger 38 of rectangular cross-section and connected at its upper end to the closure of the cap 2, and the metal about the upper end of the restricted portion 3 of the casing is continued inward to form a similar rectangular bore 39 therefor. The plunger 38 is provided with an axial bore 40 terminating adjacent its upper end, and is provided with a central transverse slot forming two similar depending legs 41 for receiving the upper end of the actuator 37 therebetween. The actuator is mounted upon a transverse pivot pin 42 passing centrally through the legs 41 and extending into the casing 1 below the shoulder formed by the restriction of the part 3 to limit the upward movement of the plunger 38 under the impetus of a coil spring 43 surrounding the plunger 38 and the restricted casing portion 3 between the shoulder formed thereby and the interior of the cap 2. A detent 44 is mounted in the transverse slot between the legs 41 above the flat top of the actuator 36 and is provided with a central upstanding guide pin 45 entering the bore 40 with its end engaged by a coil spring disposed in said bore contacting the end of said pin. The actuator is of such length that when the plunger is extended upward the stud 37 at the lower end will clear the apexes of the circuit continuing plates 21 and 22 and be normally maintained in axial alignment with the plunger by the spring pressed detent 44, with the stud 37 lying over one of the sloping surfaces of said plates. Upon depressing the cap 2 when the parts are in the position shown in Figure 1, the stud 37 of the actuator engages the sloping surface 29 of the current continuing plates, and travels therewith into engagement with the stop 32 at the end, as shown in Figure 6, and in continuing the movement, rotates the track 35 over the track 34 to snap the plates into connection with the contact post 16. Upon the release of the cap to extend the plunger 2, the actuator 36 returns to its normal axial position, so that upon the next depression of the cap 2, the stud 37 engages the opposite sloping surface 30 and the stop 33 on the other side of the plates 21 and 22, to snap said plates out of engagement with the contact post 16 and into engagement with the contact post 17.

While I have described one particular embodiment my invention may assume, it will be understood that this description is illustrative only, and that my invention is not limited thereto.

What I claim is:

1. An electric switching mechanism including a contact carrier, a plurality of electrical contacts mounted thereon, a current continuing member having a flat surface perpendicular to said carrier connected to one contact, a plurality of contacts having members extending at right angles to the same face of said carrier on opposite sides of said first member and equally spaced therefrom, a current continuing bridge pivotally mounted upon said first member, means for oscillating said bridge about its pivot, means upon the bridge coacting with means upon the first member acting upon rotation of the bridge to continue rotation to cause the bridge to engage the extension of a contact to establish a circuit therethrough.

2. The structure of claim 1 in which the last

named means maintains such engagement until the bridge is rotated in the opposite direction.

3. The structure of claim 1 wherein the current continuing bridge includes two similar spaced apart plates to embrace the extension of a contact when engaged therewith.

4. The structure of claim 1 wherein the current continuing bridge includes two similar spaced apart plates mounted on opposite sides of the first member to embrace the extension of a contact when engaged therewith.

4. The structure of claim 1 wherein the current continuing bridge includes two similarly spaced apart plates mounted on opposite sides of the first member to embrace the exterior of a contact when engaged therewith, and means carried on the first member to resiliently maintain the embraced engagement.

6. An electric switching mechanism including a contact carrier, a plurality of electrical contacts mounted thereon, a current continuing member having a flat surface perpendicular to said carrier connected to one contact, a plurality of contacts having members extending at right angles to the same surface of said carrier on opposite sides of said first member and equally spaced therefrom, a current continuing bridge pivotally mounted upon said first member, a plunger mounted for reciprocation above said first member, a pivotally mounted operator carried by said plunger, means carried on the operator to engage and oscillate said bridge upon reciprocation of the plunger, means upon the bridge coacting with means upon the first member acting upon rotation of the bridge to continue the rotation to cause the bridge to engage the extension of a contact to establish a circuit therethrough.

7. The structure of claim 6 wherein the current continuing bridge includes two similarly spaced apart plates mounted on opposite sides of the first member to embrace the extension of a contact when engaged therewith, and means carried on the first member to resiliently maintain such embracing contact.

8. The structure of claim 1 wherein said last named means includes an undulating circular track upon said first member and a similar track upon the bridge cooperating therewith.

9. The structure of claim 1 wherein the current continuing bridge includes two similar spaced apart plates to embrace the extension of a contact when engaged therewith, and wherein the last named means includes an undulating circular track upon said member and a similar track upon one of the bridge plates coacting therewith.

10. The structure of claim 1 wherein the current continuing bridge includes two similar plates spaced apart by said member both of which are mounted upon a pivot carried by said member, said pivot having a shoulder in engagement with the exterior of one plate and a spring mounted on the other end of the pivot in engagement with the exterior of the other plate.

11. The structure of claim 1 wherein the current continuing bridge includes two similar plates spaced apart by said member both of which are mounted upon a pivot carried by said member, said pivot having a shoulder in engagement with the exterior of one plate and a spring mounted on the other end of the pivot in engagement with the exterior of the other plate, and wherein an undulating track is provided upon one side of said member and a similar track normally in engagement therewith is provided on the spring pressed bridge plate.

12. An electric switching mechanism including a cylindrical casing having a portion of reduced diameter, a plunger cap covering said reduced portion mounted for reciprocation over the casing, a contact carrier mounted to close the other end of the casing, an electrical contact mounted upon the casing including a flat current continuing member arranged at right angles to the carrier and extending axially thereof within the casing, a pivot pin mounted transversely adjacent the inner end of said member, a uniformly undulating track formed in said member about the pivot pin, similar current continuing bridges mounted on the pivot pin on opposite sides of the member, means upon one bridge cooperating with said track and means yieldingly holding the bridge together, contacts mounted on the carrier having extensions entering the case parallel to said member and adapted to be alternately embraced between said bridges upon oscillation thereof.

13. The structure of claim 12 wherein said pivot is provided with a shoulder in engagement with the exterior of one of the bridges and a spring exerting tension upon the other bridge, and wherein the spring engaged bridge is provided with a similar undulating track normally in engagement with the track upon the said member, said tracks upon oscillation of the bridge adapted to travel one over the other to snap the bridges into engagement with a contact extension against the tension of said spring.

14. An electric switch, comprising: a relatively stationary contact; a movable switch member, movable into a first position in contact with said relatively stationary contact, and into a second position out of contact with said relatively stationary contact; resilient means for biasing said movable switch member in a direction transversely of its path of movement between said positions; and means constructed and arranged to effect lateral retraction of said switch member, in a direction against the bias of said biasing means, to cause said switch member to break contact with said relatively stationary contact as a result of said lateral retraction.

15. An electric switch, comprising: a relatively stationary contact; a movable switch member, movable from a first position in contact with said contact, into a second position out of contact with said contact; and means constructed and arranged to withdraw said member, laterally of the general direction of the movement of said member from said first position to said second position, laterally away from said contact, into a position out of contact with said contact.

16. An electric switch, comprising: a relatively stationary contact; a pair of movable switch members, movable from a first position in which said members are in contact with said contact closing a given circuit into a second position in which said members are out of contact with said contact not closing said circuit; means constructed and arranged to effect lateral retraction of one of said members upon movement of said one member from said first position to a position intermediate said first position and said second position; and means acting on said one member after said one member passes said intermediate position, constructed and arranged to snap said members to said second position after said one member passes said intermediate position; the parts being so constructed and arranged that the second of said members maintains said circuit

closed at least until such snap movement has begun.

17. An electric switch, comprising: a plane base; a pair of terminal studs, and a third terminal stud, all projecting on one side of said base; each of said studs being provided with a transverse aperture for the reception of a snap plug terminal and comprising means for holding such a terminal in said aperture; contacts disposed on the other side of said base, electrically connected to said studs; the axis of the aperture of said third stud being disposed substantially in a first plane substantially normal to and substantially bisecting the line joining the centers of said pair of studs; said third stud being spaced from said line; the axis of the aperture of one of said pair of studs being disposed substantially in a plane substantially normal to said base and extending at an angle to said first plane; the axis of the aperture of the other of said pair of studs also being disposed substantially in a plane substantially normal to said base and extending at an angle to said first plane; and movable switch means coacting with said contacts.

18. An electric switch, comprising: a base; a pair of alternate contacts, and a third contact, all mounted on said base, on one side of said base; a bridge, mounted for pivotal movement between a position establishing electrical connection between said third contact and one of said alternate contacts and a position establishing electrical connection between said third contact and the other of said alternate contacts; said third contact being mounted at a lesser radial distance from the pivot of said bridge than either of said alternate contacts; and conductor means, each electrically connected to one of said contacts, and each comprising a stud projecting from the other side of said base; each of said studs being provided with an aperture for the reception of a snap plug terminal and comprising means for holding such a terminal in said aperture; said studs being so constructed and arranged that the axes of the apertures of said studs diverge on the entrance side of said apertures, to enable insertion of such terminals in said apertures.

19. An electric switch, comprising: a relatively stationary contact; a movable switch member, movable from a first position in contact with said contact, into a second position out of contact with said contact; control means, affecting the path of movement of said member from said first position to said second position; said member and said contact being so constructed and arranged that except for said control means the movement of said member from said first position to said second position would be along a given path; and said control means being so constructed and arranged that it positively effects lateral retracting movement of said member, out of said path, as said member moves from said first position to said second position, to cause said member to break contact with said relatively stationary contact as a result of and during said lateral retracting movement.

20. An electric switch, comprising: a relatively stationary contact; first and second movable switch members, movable from a first position in contact with said contact, into a second position out of contact with said contact; control means, affecting the path of movement of said first member, but not of said second member, from said first position to said second position; said first member and said contact being so constructed and arranged that except for said control means the movement of said first member from said first position to said second position would be along a given path; and said control means being so constructed and arranged that it positively effects lateral retracting movement of said first member, out of said path, as said first member moves from said first position to said second position, to cause said first member to break contact with said relatively stationary contact as a result of and during said lateral retracting movement, while leaving said second member in engagement with said contact at least during said retracting movement.

21. An electric switch, comprising: a relatively stationary contact; first and second movable switch members, movable from a first position in contact with said contact, into a second position out of contact with said contact; control means, affecting the path of movement of said first member, but not of said second member, from said first position to said second position; said first member and said contact being so constructed and arranged that except for said control means the movement of said first member from said first position to said second position would be along a given path; resilient means for biasing said members laterally toward each other; and said control means being so constructed and arranged that it positively effects lateral retracting movement of said first member, out of said path, against the bias of said resilient means, as said first member moves from said first position to said second position, to cause said first member to break contact with said relatively stationary contact as a result of and during said lateral retracting movement, while leaving said second member in engagement with said contact at least during said retracting movement.

22. An electric switch, comprising: a relatively stationary contact; a movable switch member, movable from a first position in contact with said contact, into a second position out of contact with said contact; control means, affecting the path of movement of said member from said first position to said second position; said member and said contact being so constructed and arranged that except for said control means the movement of said member from said first position to said second position would be along a given path; resilient means for biasing said member in a direction transversely of said path; said control means being so constructed and arranged that it positively effects lateral retracting movement of said member, out of said path, against the bias of said resilient means, as said member moves from said first position to said second position, to cause said member to break contact with said relatively stationary contact as a result of and during said lateral retracting movement; and said resilient means and said control means being so constructed and arranged that they cooperate to snap said member into said second position upon completion of said lateral retracting movement.

23. An electric switch, comprising: a relatively stationary contact; a movable switch member, movable from a first position in contact with said contact, into a second position out of contact with said contact; and control means, affecting the path of movement of said member from said first position to said second position; said member and said contact being so constructed and arranged that except for said control means the movement of said member from said first position to said second position would be along a given path; resilient means for biasing said member in a direction transversely of said path; said control

means being so constructed and arranged that it positively effects lateral retracting movement of said member, out of said path, against the bias of said resilient means, as said member moves from said first position to said second position, to cause said member to break contact with said relatively stationary contact as a result of and during said lateral retracting movement; said resilient means and said control means being so constructed and arranged that they cooperate to snap said member into said second position upon completion of said lateral retracting movement; and means for maintaining electrical connection between said member and said contact at least until such snap movement has begun.

24. An electric switch, comprising: a relatively stationary contact; first and second movable switch members, movable from a first position in contact with said contact, into a second position out of contact with said contact; means for actuating said members to move said members from said first to said second position; control means, affecting the path of movement of said first member, but not of said second member, from said first position to said second position; said first member and said contact being so constructed and arranged that except for said control means the movement of said first member from said first position to said second position would be along a given path; resilient means for biasing said first member in a direction transversely of said path; said control means being so constructed and arranged that it positively effects lateral retracting movement of said first member, out of said path, against the bias of said resilient means, as said first member moves from said first position to said second position, to cause said first member to break contact with said relatively stationary contact as a result of and during said lateral retracting movement, while leaving said second member in engagement with said contact at least during said lateral retracting movement; and said resilient means and said control means and said actuating means being so constructed and arranged that they cooperate to snap said first and second members into said second position upon completion of said lateral retracting movement.

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