

May 16, 1939.

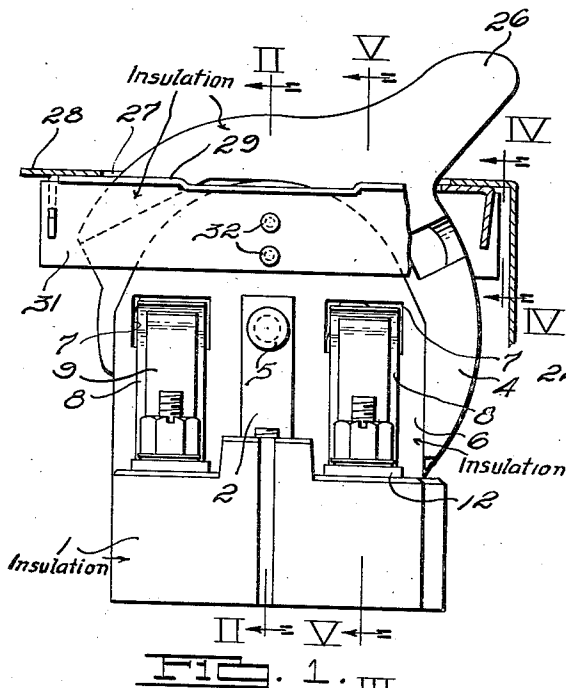
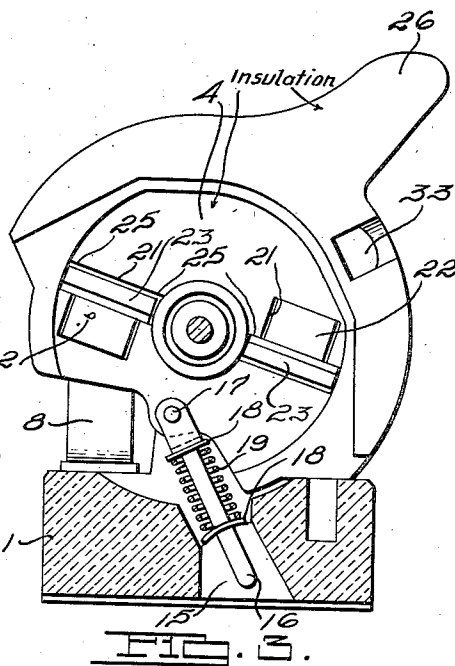
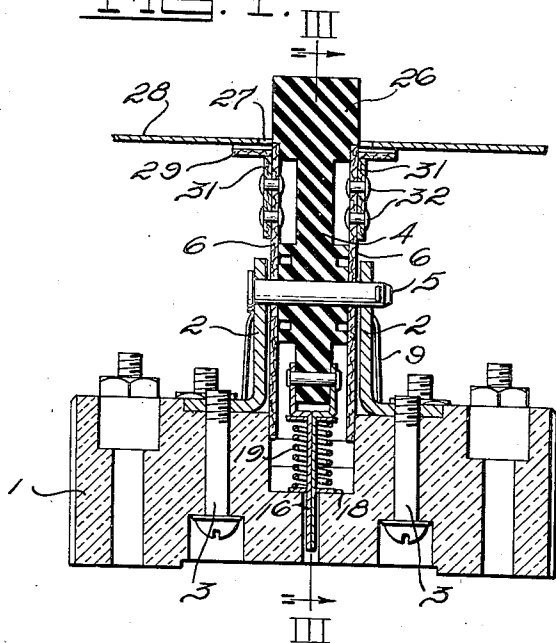
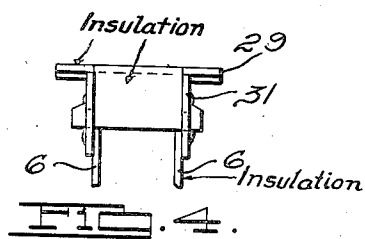
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2,158,369

ELECTRIC SWITCH

Filed March 25, 1935

2 Sheets-Sheet 1



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ELECTRIC SWITCH

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2 Sheets-Sheet 2

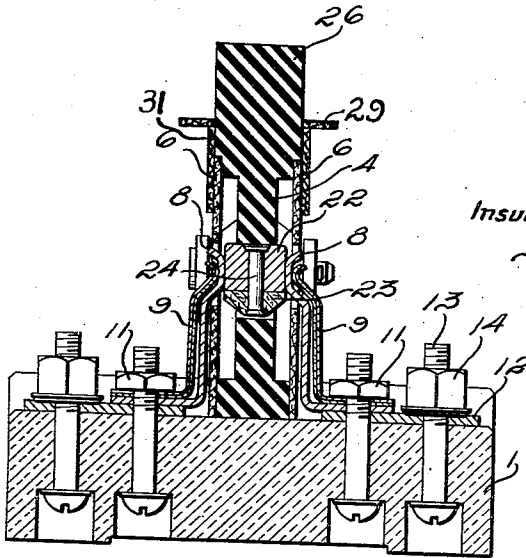


FIG. 5.

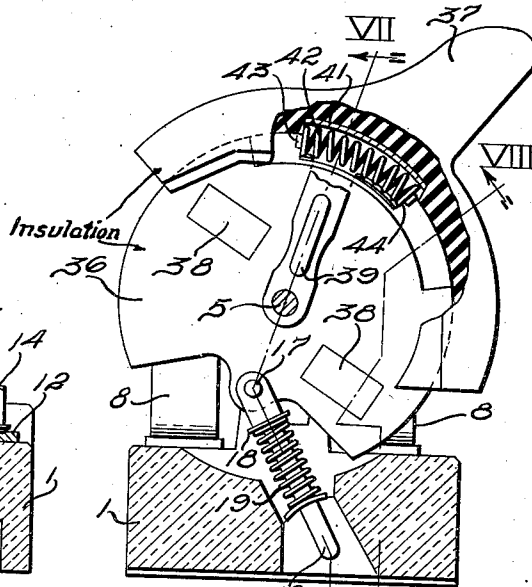


FIG. 6.

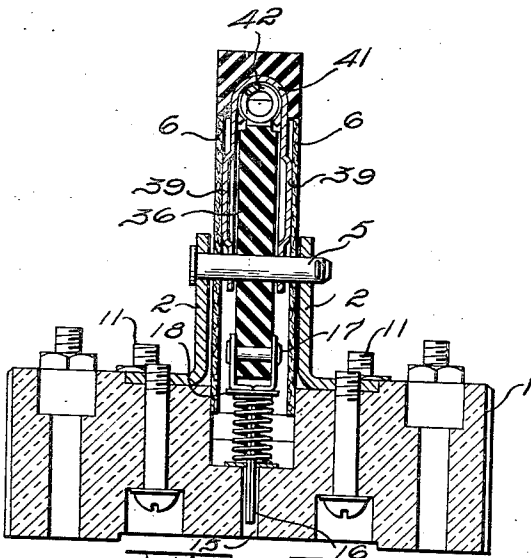


FIG. 7.

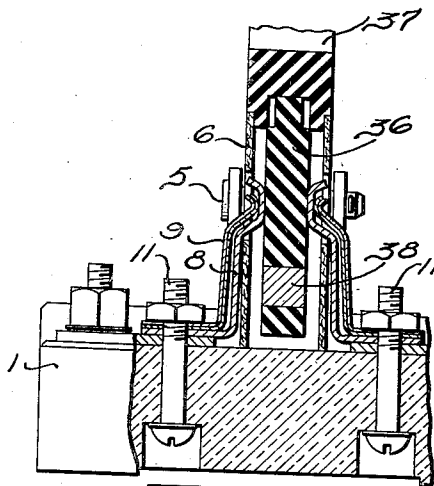


FIG. 8.

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ELECTRIC SWITCH

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Application March 25, 1935, Serial No. 12,799

13 Claims. (Cl. 200—67)

This invention relates to electric switches and more particularly to electric switches of the rotor or disc type.

One object of this invention is to provide an electric switch of the rotor type with an improved top shield.

Another object of this invention is to provide an electric switch of the rotor type with improved means for effecting quick "make" and quick "break" operation.

Another object of this invention is to provide an electric switch of the rotor type with a floating contact carrying insulating formations co-acting with the cooperating contacts to produce snap engagement thereof.

Another object of this invention is to provide an electric switch with an improved snap acting mechanism tripping free of the operating handle.

Another object of this invention is to provide an electric switch of the rotor type with a separate handle engaging the rotor through a compression spring which pushes the rotor past the dead center position independently of the handle.

Another object of this invention is to provide an electric switch of the rotor type having an over-center operating spring providing a dead center position with a separate operating handle engaging the rotor through a compression spring which serves to move the rotor and spring through the dead center position independently of the handle, the over-center spring serving to push the rotor to full "open" and "closed" position.

Another object of this invention is to provide an electric switch of the rotor type in which the movement of the rotor to extreme position is cushioned.

Further objects and features of this invention will be readily apparent to those skilled in the art from the following specification and appended drawings illustrating certain preferred embodiments of the invention.

This application is a continuation in part of my co-pending application, Serial No. 620,932, filed July 5, 1932, now Patent No. 1,999,695, issued April 30, 1935.

In the drawings:

Figure 1 is a front elevational view of an electric switch according to the present invention, with the cover of an enclosing box shown in section along the slot through which the operating handle extends.

Figure 2 is a sectional view taken on the line II—II of Figure 1.

Figure 3 is a view taken on the line III—III of Figure 2 with the rotor or disc shown in elevation.

Figure 4 is a detail end view of the top shield and the supporting elements therefor taken along the line IV—IV of Figure 1 with the switching elements omitted.

Figure 5 is a sectional view taken along the line V—V of Figure 1.

Figure 6 is a view similar to that shown in Figure 3 but of a modified form of switch construction and with a portion of the operating handle broken away to show internal parts.

Figure 7 is a sectional view taken on the line VII—VII of Figure 6 with certain parts shown in elevation.

Figure 8 is a sectional view taken on the lines VIII—VIII of Figure 6.

Referring now to the drawings, the switch shown in Figures 1 to 5 inclusive embodies a base 1 having a pair of opposed standards or angle brackets 2 rigidly secured thereto as by studs 3. Between these brackets a rotor or disc 4 is pivotally supported as by shaft 5. On opposite sides of the disc 4 are disposed a pair of insulating plates 6 having windows 7 disposed therein. Oppositely disposed, stationary contact members 8 equipped with steel or other spring material backing members 9 are rigidly secured to the base 1 as by the nut and bolt connection 11. The free ends of the contacts 8 extend through the windows 7 in the plates 6 and are resiliently held therein by the spring backing members 9. Conducting bars 12 are disposed beneath the secured ends of the contacts 8 and extend toward the ends of the base and are there connected with studs 13 on which are screwed nuts 14 for retention of conductors connected to the switch.

A slot 15 is disposed in the central portion of the base 1 and within this slot is disposed a spring guide 16, the upper end of which is pivotally mounted on the disc 4 as by means of a pivot 17. A pair of washers 18 are disposed on this spring guide and between these washers a compression spring 19 is mounted.

The disc 4 is provided with openings 21 each of which is disposed between a pair of opposed stationary contacts when the switch is in "on" position. Within these openings 21 are loosely mounted contacts 22 which in the closed position of the switch are adapted to bridge the stationary contacts as more particularly shown in Figure 5. The contacts 22 are composite and include a conducting portion to which is rigidly secured an insulating formation 23 as by rivets

24. The contacts 22 and their insulating formations 23 are appreciably wider than the portion of the disc 4 in which they are mounted and the insulation formations 23 are disposed on the side of the contacts which first engage the stationary contacts in movement to the "on" position. The insulating formations 23 are sloped away from the stationary contacts to lessen the abruptness of the surface over which they must ride when the switch is closed. The portion of the disc within which the contacts 22 are mounted and toward which the stationary contacts 8 are directed is cut away to provide the necessary clearance for the enlarged contacts 22.

15 The openings 21 are T-shape and the insulating portions 23 extend within the widened parts 25 of the openings as more particularly shown in Figure 3. This prevents insertion of the contacts 22 except with the insulation in the proper direction to produce snap engagement of the cooperating contacts. The formations 23 also serve to interpose an insulating barrier between the contacts when they are separated.

The upper portion of the disc 4 is provided with an extension 26 which serves as an operating handle. This extension is adapted to project through a slot 27 in a cover 28 of an enclosing box in which the switch is disposed. The slot 27 is preferably made considerably larger than the portion of the handle which projects there-through due to the fact that with a narrow slot great care in mounting the switch is required since if slightly out of position the cover when closed will engage the extension 26 and considerable difficulty has in the past resulted from this occurrence, and the consequent breaking of the extension or handle 26 from the rest of the disc. This same difficulty might also occur even with accurate positioning due to a slight warping of the cover. To obviate this difficulty, the slot 27 is made considerably larger than the portion of the disc 4 which projects therethrough and a top shield or seal is provided. This top shield 29 has a snap-in connection through cooperating slots and grooved tongues with a pair of insulating plates 31 which are attached to side plates 6 as by rivets 32. The shield 29 is thus detachable and while in position serves to space apart and hold together the insulating plates 6. If desired, the plates 6 may have integral extensions to which the shield 29 is attached. The shield 29 closely engages the projecting portion of the disc and is disposed closely adjacent to the closed position of the cover so as to seal the slot 27 therein.

55 An opening 33 is provided adjacent to the edge of disc 4 in a position to be exposed on the outside of an enclosing cover when the switch is in the "off" position and this opening may serve for cooperation with an interlock or with a means to lock the disc in its "off" position.

The operation of the switch just described is as follows:

The compression spring 19 is arranged to be in dead center position when the cooperating contacts are first engaged. In moving the operating handle 26 in a counterclockwise direction as shown in Figures 1 and 3 from the "on" position therein shown the spring 19 will pass through dead center position just before or at the point of separation of the cooperating contacts and the rotor or disc 4 will be quickly moved to its "off" position by the energy stored in the spring 19. By this movement of the disc the barriers formed by the insulating formations 23 will be interposed between the cooperating contacts

and in connection with the surfaces of plates 6 and the rotor will act to efficiently quench any arc formed between the separated contacts. When moving the switch to "on" position the handle 26 is easily moved clockwise until the insulating formation 23 on the contacts 22 engages the ends of the resiliently pressed stationary contacts 8. As the contacts 22 and their attached insulation are broader than the portion of the disc 4 in which they are disposed, the ends of the contacts 8 must ride up over the inclined surfaces of the insulating formations and the contacts must be separated to provide for the increased width. This results in a considerable force which must be overcome by pressure on the operating handle, which force is suddenly relieved when the contacts separate and the disc or rotor is thus quickly snapped into full "on" position with the cooperating contacts engaged. As the contacts 22 are loosely disposed within the openings 21 in the disc 4, they are free to adjust themselves relative to the opposed stationary contacts 8 to equalize the pressure thereon and to some extent the surface over which it is exerted.

A modified form of switch is shown in Figures 6 to 8 inclusive. This switch may be identical with that disclosed in Figures 1 to 5 inclusive with the exception of the rotor or disc 36 and the operating handle 37. The disc 36 is here of uniform thickness and the contact 38 disposed therein may be of the same thickness, as its width is no longer relied upon to secure snap engagement of the contacts. The operating handle 37 in this modification is separate from the disc 36 and is mounted on the common shaft 5 by means of arms 39 disposed between the disc 36 and the fibre plate 6. These arms are extended at their connection to the operating handle to form a compression spring guide 41 although it is obvious that this guide may be separately mounted on the operating handle or that it may be mounted on the disc, this being a simple interchange of parts. In the construction as herein illustrated, the spring guide or retainer 41 is securely attached to the operating handle and within it is disposed a compression spring 42. The spring retainer 41 has central openings at both ends which are adapted to move over opposite abutments 43 and 44 on the disc 36. These abutments are here shown as in the form of ends of an arcuate slot formed in the periphery of the disc 36. The peripheral edges of the disc 36 at the abutments 43 and 44 is formed of reduced thickness to permit movement within the spring guide or retainer 41 and consequent compression of the spring 42 upon movement of the handle 37. The construction of the other parts of the switch shown in Figures 6 to 8 inclusive is the same as that of the switch specifically described in Figures 1 to 5 inclusive except that the dead-center position of spring 19 in this modification may be moved outwardly.

The operation of the modified form of switch is as follows:

With the parts in the "off" position as shown in Figure 6, movement of the operating handle in a counterclockwise direction will cause the spring guide 41 to move over the abutment 43 and the spring 42 to be compressed against the resistance offered by the over-center operating spring 19. In the initial movement, the resistance offered by spring 19 will cause a definite compression of the spring 42 before the disc 36 will be rotated. From the nature of an over-center spring, as the disc 36 approaches dead

center position the force necessary to move it past the dead center position decreases rapidly due to the acute angle or small moment arm through which the resistance of the compression spring 19 must act in resisting rotation of the disc. When the point is reached at which the energy stored in the spring 42 and its moment arm is equal to the resistance of the force of spring 19 and its moment arm, the spring 42 will quickly move the spring 19 through its dead center position independently of further movement of the operating handle and the further movement of the disc 36 to its "on" position will be aided by the spring 19 and this spring will serve to move the disc to its full "on" position regardless of further pressure on the operating handle. When the switch is to be moved to "off" position the handle 37 is rotated clockwise whereupon the abutment 44 in a similar manner compresses the spring 42 from the opposite end and moves the over-center spring 19 through its dead center position when the energy components are equal. In this movement the disc 36 is rapidly accelerated by the force exerted by the spring 19 until the opposite abutment 43 engages the spring 42, at which point, by the inertia of the operating handle, or by the retention thereof, the extreme movement of the disc 36 is cushioned through the medium of the spring engagement, thus preventing a sharp blow being struck by the rapidly moving disc when in its extreme "off" position.

While the top shield construction has not been shown in this modification for the purposes of simplicity in the drawings, it is obvious that one will be used in a manner similar to that disclosed in Figures 1 and 2.

In this modification it is noted that the over-center spring will start to flip through its dead center position independently of the handle a considerable distance before it approaches its actual dead center position, this being effected by the energy stored in the spring 42. As this "effective" dead center position thus occurs at two rather widely separated points, a desirable quick make and quick break free of the operating handle results. It is to be noted that the disc 36 trips in the same direction as the operating handle 37 is moved and that should either or both of the springs be broken the handle 37 will definitely push the disc 36 to its "on" and "off" positions.

While certain preferred embodiments of this invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the scope of the following claims:

What is claimed is:

1. In an electric switch, a base, a rotary plate-like member pivotally mounted on said base, plates of insulating material associated with said base and disposed on opposite sides of said rotary member, contact means carried by said rotary member, stationary contact means adapted to cooperate therewith, an operating handle extending beyond said insulating plates, and a top shield comprising an insulating plate having a slot closely receiving said operating handle extension and supported on said first mentioned plates by tongue and slot connections providing ready demountability.

2. In an electric switch, a base, a rotary plate-like member pivotally mounted on said base, plates of insulating material associated with said

base and disposed on opposite sides of said rotary member, contact means carried by said rotary member, stationary contact means adapted to cooperate therewith, an operating handle extending beyond said insulating plates and a top shield comprising an insulating plate supported by said first mentioned insulating plates and having a slot closely receiving said operating handle extension, said top shield being disposed closely adjacent to the under surface of the cover of a switch enclosing box and serving to seal a slot in said cover through which said handle projects.

3. In an electric switch, a base, a plate-like member mounted for limited rotary movement in opposite directions on said base, plates of insulating material associated with said base and disposed on opposite sides of said rotary member in close proximity thereto, said plates having openings therein, electric contact means carried by said base and having yieldable end portions extending through said openings, electric contact means loosely mounted in said rotary member, said second contact means carrying insulating formations adapted to cooperate with said first contact means to cause said contact means to engage with a snap action.

4. In an electric switch, a base, a plate-like member mounted for limited rotary movement in opposite directions on said base, plates of insulating material associated with said base and disposed on opposite sides of said rotary member in close proximity thereto, said plates having openings therein, electric contact means carried by said base and having yieldable end portions extending through said openings, electric contact means carried by said rotary member, said second contact means carrying insulating formations rigid therewith and adapted to cooperate with said first contact means to cause said contact means to engage with a snap action, said second contact means being movable relative to said member to provide for automatic adjustment relative to the first mentioned contact means when disposed in cooperation therewith.

5. In an electric switch, a base, a plate-like member mounted for limited rotary movement in opposite directions on said base, plates of insulating material associated with said base and disposed on opposite sides of said rotary member in close proximity thereto, said plates having openings therein, electric contact means carried by said base and having yieldable end portions extending through said openings, electric contact means carried by said rotary member, an operating handle mounted on a common shaft with said rotary member, a compression spring forming the operating connection between said handle and said member, means compressing said spring against said member upon movement of said handle in either direction, and means cooperating with said spring to cause snap actuation of said rotary member in both "make" and "break" directions.

6. In an electric switch, a base, a plate-like member mounted for limited rotary movement in opposite directions on said base, plates of insulating material associated with said base and disposed on opposite sides of said rotary member in close proximity thereto, said plates having openings therein, electric contact means carried by said base and having yieldable end portions extending through said openings, electric contact means carried by said rotary member, an operating handle mounted on a common shaft

with said rotary member, a compression spring carried by said handle between abutments on said rotary member, movement of said handle in either direction causing said spring to engage an abutment and be compressed, and an over-center spring operatively associated with said rotary member and moved through dead-center position by the energy stored in said compression spring to effect snap actuation of said rotary member free of the operating handle.

7. In an electric switch, a base, a plate-like member mounted for limited rotary movement in opposite directions on said base, plates of insulating material associated with said base and disposed on opposite sides of said rotary member in close proximity thereto, said plates having openings therein, electric contact means carried by said base and having yieldable end portions extending through said openings, electric contact means carried by said rotary member, an operating handle mounted on a common shaft with said rotary member, a compression spring carried by said handle between abutments on said rotary member, movement of said handle in either direction causing said spring to engage an abutment and be compressed, and an over-center spring operatively associated with said rotary member and moved through dead-center position by the energy stored in said compression spring to effect snap actuation of said rotary member free of the operating handle, said over-center spring serving to move said rotary member to its extreme positions, said compression spring acting to cushion the extreme movement of said rotary member by the engagement of an abutment with said compression spring and the lessening of the momentum of the plate-like member by the inertia of the operating handle.

8. In an electric switch, a base, a rotary plate-like member pivotally supported on said base, plates of insulating material associated with said base and disposed on opposite sides of said rotary member, said plates having openings therein, stationary contact means carried by said base and having end portions projecting through said openings, movable contact means carried by said rotary member and adapted to cooperate with said stationary contact means in one position of said member, said movable contact means being loosely disposed in T-shaped openings in the rotary member, said movable contact means having a conducting portion disposed in the body of the opening and an insulating portion disposed in the widened part of the opening, said T-shape providing for insertion of the contact with the insulation in one direction only.

9. In an electric switch, a base, a plate-like member mounted for limited rotary movement in opposite directions on said base, stationary contacts carried by the base on either side of said member, contact means carried by said member and adapted to bridge the stationary contacts on opposite sides of said member in one position,

an operating handle mounted at an edge of said member and in the plane thereof, said handle being movable relative to said member, a recess in the periphery of said member, and a compression spring carried between opposite abutments on said handle and disposed in said recess, said spring being compressed between an abutment and an end of said recess by movement of the handle in either direction to move said member.

10. In an electric switch, a base, a plate-like member mounted for limited rotary movement in opposite directions on said base, stationary electric contact means carried by the base and having yieldable end portions disposed on opposite sides of said member, electric contact means carried by said rotary member and adapted to bridge said end portions, an operating handle mounted on a common shaft with said rotary member, a compression spring carried by said handle between abutments on said rotary member, movement of said handle in either direction causing said spring to engage an abutment on the rotary member, and an over-center spring connected to said rotary member and movable through its dead center position by the energy stored in said compression spring to effect snap actuation of said rotary member free of the operating handle.

11. In an electric switch, opposed stationary contacts, an insulating, plate-like member mounted between said contacts for limited movement in opposite directions, electric contact means and insulating formations loosely carried by said member and movable relative thereto for adjustment to said stationary contacts, the insulating formations being located in the direction of separation of the cooperating contacts to facilitate the suppression of arcs drawn therebetween.

12. In an electric switch, opposed stationary contacts, an insulating, plate-like member mounted between said contacts for limited movement in opposite directions, electric contact means and insulating formations loosely carried by said member, said means and formations being thicker than said member and the spacing between said stationary contacts, the formations being located forward of the contact means to initially engage said stationary contacts and cause their engagement with the contact means to be snap-like in action.

13. In an electric switch, opposed stationary contacts, an insulating, plate-like member mounted between said contacts for limited movement in opposite directions, said member having a T-shaped slot therein adapted to locate with said stationary contacts, and a movable contact loosely disposed in said slot and comprising a conducting portion in the body of the opening and an insulating portion in the widened part of the opening.

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