April 26, 1949. R. N. ROWE 2,468,463

ELECTRIC SWITCH ACTUATING MECHANISM

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Fig. 1

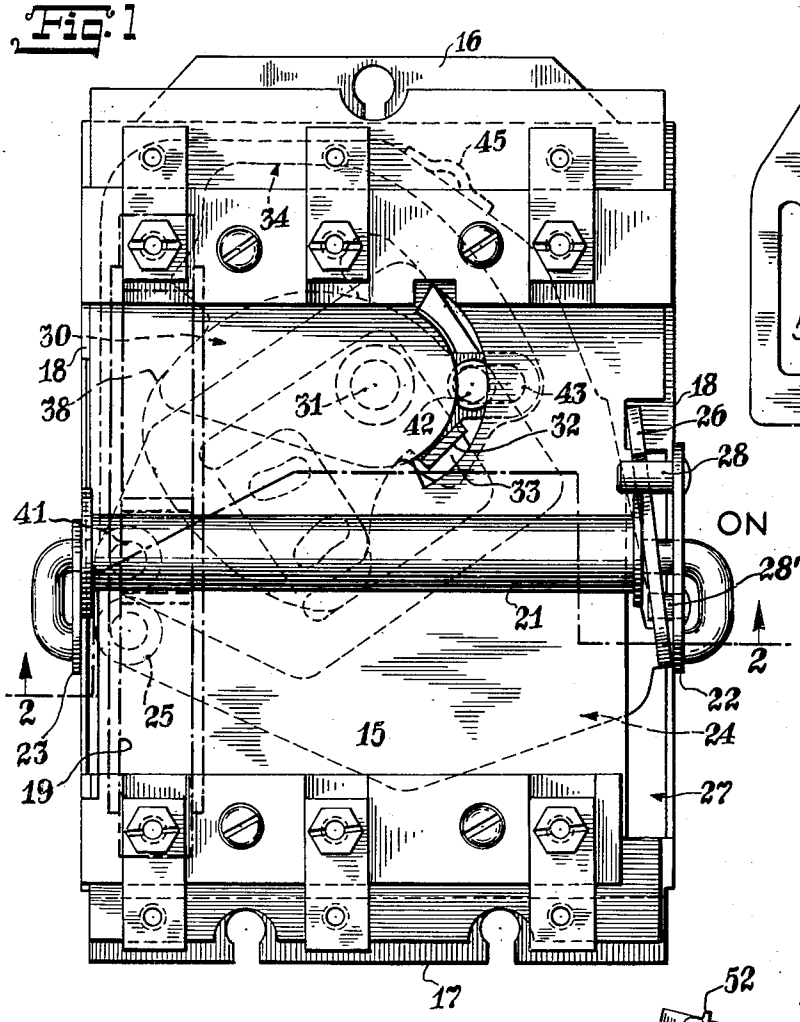


Fig. 5

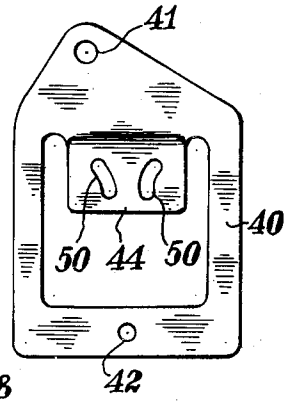


Fig. 6

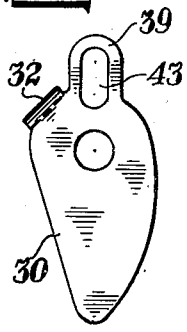


Fig. 2

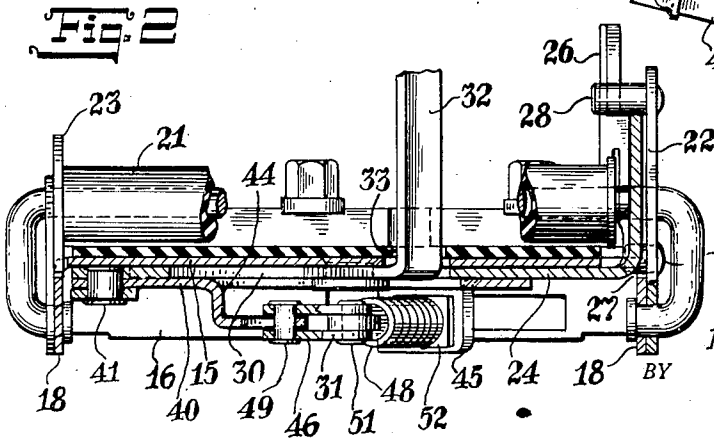
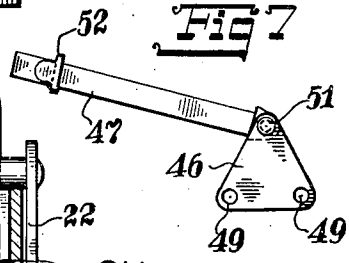


Fig. 7



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Fig. 3

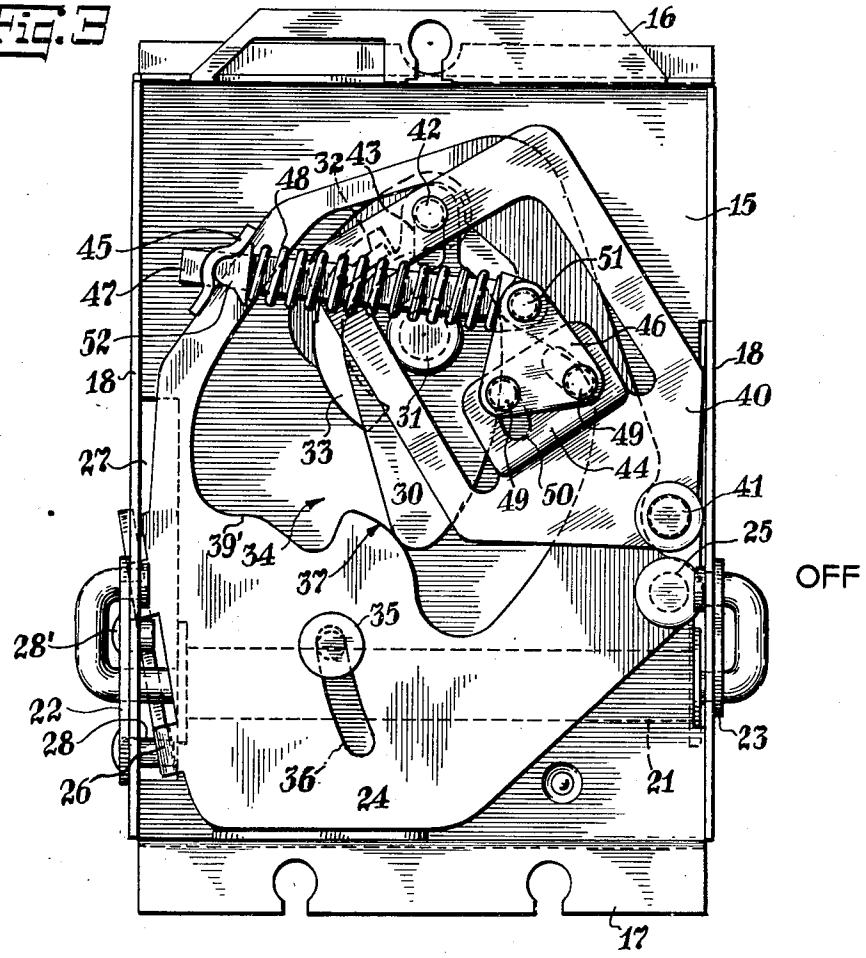
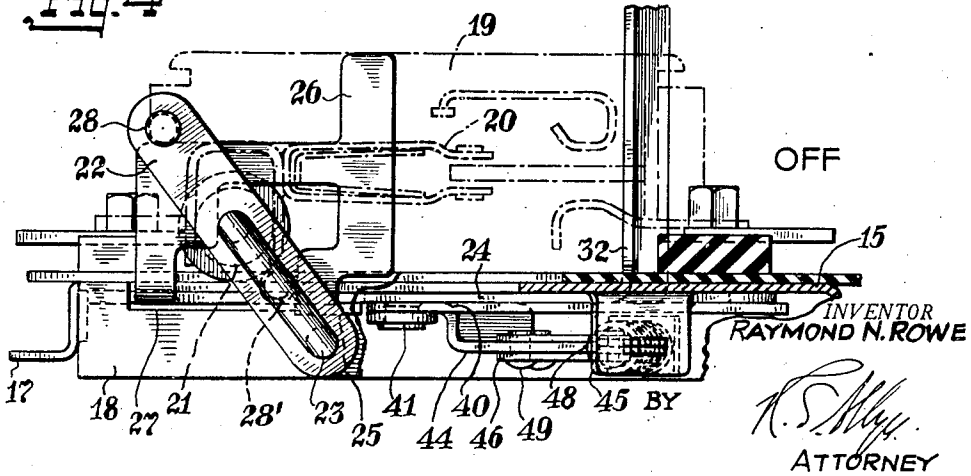


Fig. 4



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Fig. 8

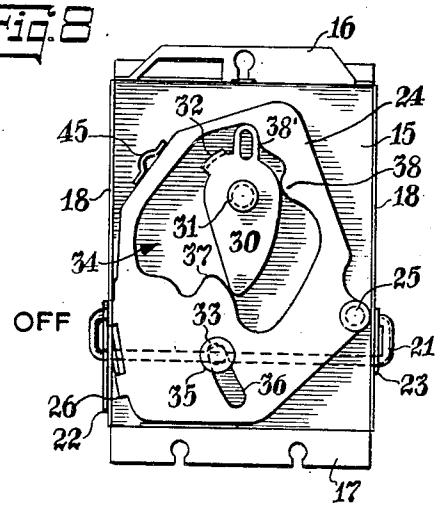


Fig. 9

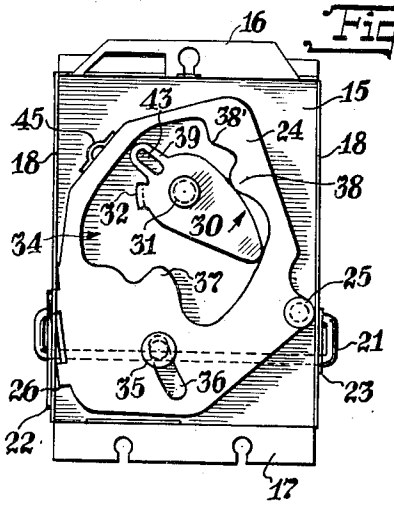


Fig. 10

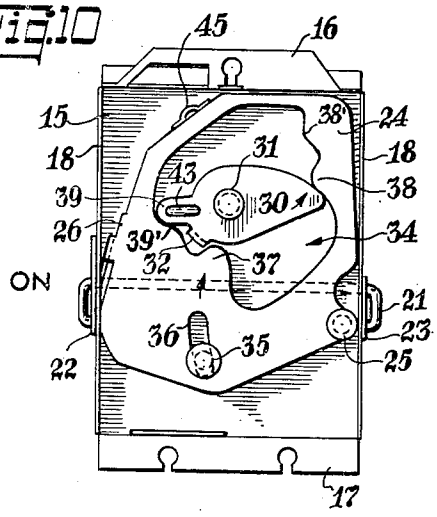


Fig. 11

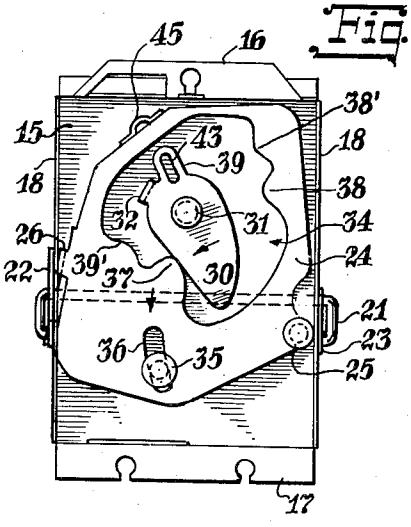


Fig. 12

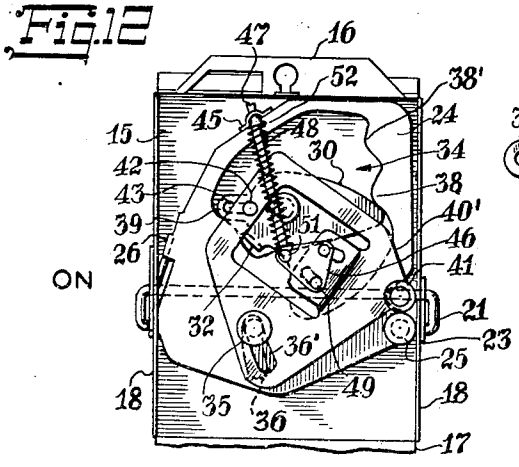
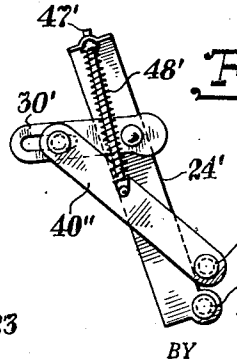


Fig. 13



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ELECTRIC SWITCH ACTUATING MECHANISM

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Application October 8, 1947, Serial No. 778,693

16 Claims. (Cl. 74—97)

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My invention relates particularly to manually operable switches of the spring action or quick-make-and-break variety and has for its main object the provision in such a switch of actuating mechanism which can be operated manually in case the spring action sticks or becomes disabled.

A special object is to provide mechanism by which cam action can be gradually applied in order to force the movement of the movable switch parts.

Another object is to provide a powerful compact and simple but reliable snap action mechanism for opening and closing a circuit through suitable contact devices.

Details of a switch contact unit shown herein are more fully shown and claimed in my application Serial Number 708,375 filed Nov. 7, 1946.

The present invention is an improvement in the type of mechanism shown and claimed in my application Serial Number 713,194 filed Nov. 30, 1946, and broadly claims the actuating mechanism shown and described in my application Serial Number 768,399 filed August 13, 1947.

In the form shown, a movable switch member is actuated by an oscillatable swinging or tiltable plate within which a cam member is mounted to manually operate the plate. Snap action mechanism is interposed between the manually operable cam member and the tiltable actuator and normally actuates the plate.

In the drawings

Fig. 1 is a front view of mechanism embodying one form of my invention showing one of the switch units in dot and dash lines and the actuating mechanism in dotted lines at the rear in the "on" position.

Fig. 2 is an end view and partial section on the plane of the line 2—2 of Fig. 1.

Fig. 3 is a rear view of the mechanism in the "off" position.

Fig. 4 is a side view and partial section and showing elements of the contact elements in dot and dash lines in the "off" position.

Fig. 5 is a detail view of one of the parts of the throwing mechanism.

Fig. 6 is a detail view of the actuating cam.

Fig. 7 is a detail view of another part of the throwing mechanism.

Fig. 8 is a rear view of the actuating mechanism showing the oscillating plate moved to the "off" position by the cam and omitting the quick-make-and-break elements.

Fig. 9 is a similar view to Fig. 8 but with the

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cam in position to start moving the oscillating plate to the "on" position.

Figure 10 is another rear view of the actuating mechanism with the oscillating plate moved by the cam into the "on" position.

Fig. 11 is a view similar to Fig. 10 but showing the cam starting to move the oscillating plate from the "on" toward the "off" position.

Fig. 12 is a rear view of the actuating mechanism with the quick-make-and-break elements in the "on" position and with a modified form of rocker.

Fig. 13 is a view showing diagrammatically parts of the throwing mechanism.

The actuating mechanism is all mounted within a hollow base comprising a main base plate 15 which has end flanges 16 and 17 by which it may be supported and has side flanges 18, 18.

Switch units such as 19 are mounted on the front of the base in any suitable manner and each has a slidable switch member 20 moved by a crank shaft 21 carried by arms 22 and 23 pivoted to the side flanges 18, 18.

An actuating plate 24 is pivoted at 25 to the base plate 15 so that it can tilt or oscillate between the base flanges. At the side opposite the pivot 25, this plate 24 has an outwardly projecting post 26 which extends through the slot 27 in the base plate and engages studs 28 and 28' on an extension of arm 22 when the plate 24 is tilted so as to move the crank shaft 21 up or down with the movable switch member and close or open the circuit as the case may be.

The movement of the plate 24 may be affected directly by the cam 30 which is pivoted at 31 and has an arm 32 projecting through slot 33 in the base plate and by which it may be turned. Such turning movement of plate 24 is limited by parts of the base plate. The plate 24 has a large opening 34 eccentric to the pivot 25 and is guided by a headed stud 35 which is secured to the base plate 15, there being a curved slot 36 in plate 24 to allow for its tilting movement about pivot 25. The inner edge of opening 34 has two cam or abutment shoulders 37 and 38 with which the cam 30 can coact.

To move the plate 24 from the "off" positions of Figs. 3, 4, 8 and 9 to the "on" positions of Figs. 1, 10 and 12, the cam 30 is turned anti-clockwise as viewed in Figs. 3 and 8 until the edge of the cam engages the cam edge 38 of plate 24 as shown in Fig. 9. Continuation of such movement of the cam tilts the plate 24 from the position of Fig. 9 to that of Figs. 10 and 12, the edge of the plate 24 striking a flange of plate 15.

The tail end 39 of the cam may strike the shoulder 39' of plate 24, at or near the end of the movement.

To return the plate to the "off" position, the cam is turned clockwise as viewed in Fig. 11 so that the cam 39 engages the cam shoulder 37 of the plate and moves the plate to the positions of Figs. 3 and 8. The tail end of the cam member may also engage the plate at 39' at or near the end of the movement.

The snap action or quick-make-and-break is effected by a spring and throwing elements shown in Figs. 3, 4 and 12 and in detail in Figs. 5, 6 and 7.

The transmitting member 40 is hinged to the base plate at 41 above pivot 25 and underlies the pivoted actuating plate 24 and the cam 30. It has a pin 42 which extends into a slot 43 in the cam 30 so that when the cam is turned it tilts the hinged member 40. The hinged member 40 has an offset 44 and is connected to the offset 45 on plate 24 by a double action toggle device consisting of a rocker 46, a rod 47 and a spring 48. The rocker 46 has two spaced pins 49 which travel in slots 50 in the offset part 44 of hinged member 40 and is hinged to rod 47 at 51. Spring 48 is mounted on rod 47 between the head near the hinge pin 51 and a bearing or hinge piece 52 which is seated in the offset 45 of plate 24. Rod 47 slides through bearing 52 and offset 45 as the spring is compressed. It will be noted that the pins or bearings 49, 49 and 51 of the rocker 46 are disposed at the points of a triangle in which the bearings 49, 49 are at the corners of the base and the bearing 51 is at the apex.

When the hinged member 40 is turned from either the "off" or the "on" position toward the other position, the rocker 46 turns with it and compresses the spring 48 until the bearing 51 passes the line of center from bearing 52 to the pin 49 which is nearer the hinge 41. Instantly the rocker turns and the bearing 51 is thrown to the other side of the center line 52 to 49. This action applies the full force of the spring to move the rocker 46 from one side of the center line between 52 and 41 and thus turns the hinged member on its axis entirely beyond the control of the operator.

In the "on" position of Fig. 1, the spring 48 exerts pressure in one direction to hold the main actuating plate 24 against some part of the base plate such as the upper flange 16 and exerts pressure in the other direction against the rocker 46 which presses against the hinged member 40 so that the pin 42 presses against the cam 30 which in turn presses against the edge 38 of plate 24. In this position, the spring 48 is acting below the line of centers 52 to 41.

In the "off" position of Fig. 3 of the switch, the spring 48 is compressed between the bearing 45 of plate 24 which presses in one direction against the base for instance at the bottom flange 17 and the rocker 46 which in turn presses against the hinged member 40 and presses it against some part of the base or attached stationary parts. In this position, the spring 48 is acting above the line of center from 52 to 41.

When the cam 30 is turned from the "off" position of Fig. 3 anti-clockwise it tilts the hinged member 40 and the connected rocker 46 anti-clockwise, thus compressing spring 48 until hinge pin 51 passes the line of center between 52 and the right hand pin 49 whereupon the rocker 46 will suddenly tilt from the position of Fig. 3 to that of Fig. 12. This action applies the full force

of the spring to move the rocker from the upper side of the line connecting 52 and 41 to the lower side of said line and then suddenly snaps the hinged transmitting member 40 to the left (Fig. 3) and compels the bearing parts 52, 45 to turn plate 24 clockwise to the "on" position entirely free from the control of the operator.

In opening the circuit, the operation is reversed so that the switch is thrown "off" with a powerful snap action.

The hinge 41 for the transmitter member 40 is located somewhat eccentric to the pivot 25 of the actuator 24 so that in moving the parts from the "on" to the "off" position, the pivot 51 of the spring member will have passed the dead center position of pivots 52, 49 and 25 by the time it reaches the dead center of pivots 52, 49 and 41. Hence when the toggle breaks it will not have to start from a near dead center position in order to throw the actuator 24.

In other words, the switch is provided with a quick-make-and-break and yet it can be operated manually by the cam action in case the spring action should be disabled.

Fig. 12 shows the hinged member 40' with an extension guided by the headed stud 35, previously described as guiding plate 24, passing through a slot 36' in member 40' and the corresponding slot 36 in plate 24.

Fig. 13 shows a modified action in a diagrammatic form. Arm 24' corresponds with plate 24 and is pivoted at 25'. The transmitting member 40'' is hinged at 41'. The actuator 30' has a pin and slot connection with the member 40'' and a spring 48' is mounted on a rod 47' which is pivoted to hinged member 40'' and has a sliding connection with the outer end of the member 24'. The toggle action of such an arrangement will be obvious from the foregoing but it lacks the tilting free action of the rocker 46 previously described.

I claim:

1. In an electric switch, a supporting base plate having a slot, an actuating plate pivoted on said base plate and having an opening, a cam pivotally mounted on said base plate in said opening and disposed in the plane of said actuating plate, an arm on said cam extending through the slot in the base plate outwardly thereof for manually moving said cam, a transmitting member hingedly mounted on said base plate and operatively connected to said cam and a quick-make-and-break connection between said transmitting member, said cam and said actuating plate.

2. In an electric switch, a pivoted plate for moving a switch contact member, a manually operable member, a hinged transmitting member connected to said manually operable member, a rocker having two pin-and-slot connections with said hinged transmitting member, a thrust rod hinged to said rocker and having a sliding connection with said pivoted plate and a spring mounted on said rod, said pivoted plate and manually operable member having coacting elements whereby said pivoted plate may be actuated directly by said manually operable member in case the spring fails to act.

3. In an electric switch, a supporting base plate, an actuating plate pivotally mounted on said base plate and having an opening, a cam pivotally mounted on said base plate in said opening and disposed in the plane of said actuating plate, a transmitting member hingedly mounted on said base plate, a slot-and-stud connection between said cam and said transmitting member and a

quick-make-and-break connection between said transmitting member, said cam and said actuating plate.

4. In an electric switch, a base plate, an actuating plate carried thereby for moving a switch contact member, a manually operable member carried by said base plate, a hinged member connected to said manually operable member, a rocker having a pin-and-slot connection with said transmitting member, a thrust rod hinged to said rocker and having a sliding connection with said actuating plate and a spring mounted on said rod for moving said rocker, said actuating plate and said manually operable member having coacting elements whereby said actuating plate may be actuated directly by said manually operable member in case the spring and rocker fail to act.

5. Electric switch actuating mechanism including a base plate, a swinging plate mounted thereon, a manually operable member for swinging said latter plate, a hinged member connected to said manually operable member, a rocker having two loose hinged connections with said hinged member, a thrust rod hinged to said rocker and having a sliding connection with said swinging plate and a spring mounted on said rod between said swinging plate and said rocker.

6. In an electric switch, a supporting base plate, an actuating plate pivoted on said base plate and having a central opening, a cam pivotally mounted on said base plate in said opening and disposed in the plane of said actuating plate, a member hingedly mounted on said base plate, a slot-and-stud connection between said cam and said member, a rocker hingedly connected to said hinged member, a rod having one end hingedly connected to said rocker and its other end slidably connected to said actuating plate and a compression spring on said rod between its connected ends.

7. In an electric switch, a supporting base plate having flanges, an actuating plate pivoted to said base plate and adapted to be turned between said flanges for moving a switch member and having an opening, an actuating cam movable within said opening of said actuating plate, edges of the opening in said actuating plate having cam portions with which said cam coacts for moving said latter plate, a transmitting member hinged to said base plate and connected to said cam and toggle means for connecting said transmitting member and said actuating plate.

8. In an electric switch, a supporting base plate, an actuating plate pivoted to said base plate and adapted to be turned from side to side for moving a switch member and having an opening, an actuating cam mounted on the base plate and movable within the opening of said actuating plate, edges of the opening in said actuating plate having cam portions with which said cam coacts for moving said actuating plate and quick-make-and-break mechanism connecting said cam and said actuating plate.

9. In an electric switch, a supporting base plate, an actuating plate pivoted to said base plate and adapted to be turned from side to side for moving a switch member, an actuating cam hinged to the base plate and movable with respect to said actuating plate, edges of said actuating plate having cam portions with which said cam coacts for moving said actuating plate, a transmitting member hinged to said base plate and having a stud-and-slot connection with said cam and toggle means for connecting said transmitting member and said actuating plate.

10. In an electric switch, a supporting base plate, an actuating plate pivoted to said base plate and adapted to be turned from side to side for moving a switch member, an actuating cam hinged to the base plate, edges of said actuating plate having cam portions with which said cam coacts for moving said actuating plate, a transmitting member hinged to said base plate and connected to said cam and toggle means for connecting said transmitting member and said actuating plate including a rocker having two spaced hinge connections with said transmitting member, a rod hinged to said rocker and having a sliding connection with said actuating plate and a spring mounted on said rod for over-center action on said rocker.

11. In an electric switch, a supporting base plate, an actuating plate pivoted to said base plate and adapted to be turned from side to side for moving a switch member, an actuating cam hinged to the base plate and movable relative to said actuating plate, said actuating plate having cam portions with which said cam coacts for moving said latter plate, a transmitting member hinged to said base plate and connected to said cam and toggle means for connecting said transmitting member and said actuating plate including a rocker having two spaced hinge connections with the transmitting member, a rod hinged to said rocker and having a sliding connection with said actuating plate and a spring mounted on said rod.

12. In an electric switch, a supporting base having abutments, an actuating plate pivoted to said base and adapted to be turned between said abutments for moving a switch member, an actuating cam movable with respect to said plate for moving said plate, a transmitting member hinged to said base and connected to said cam and toggle means including a rocker having two spaced hinge connections with the transmitting member, a rod hinged to said rocker and having a sliding connection with said plate and a spring mounted on said rod.

13. In an electric switch, a pivoted actuating member, a throwing member hinged near the actuating member, a rocker having two spaced pin and slot connections with the throwing member and a bearing related to the two pin connections as the apex of a triangle is to the ends of the base of the triangle and a compression member interposed between said actuating member and said bearing of the rocker.

14. In an electric switch, a swinging actuator, a hinged transmitting member, a double acting toggle connection between said hinged transmitting member and said swinging actuator consisting of a rocker having two spaced connections with the hinged member, a rod hinged to said rocker and having a sliding and hinged connection with the actuator, a compression spring on said rod and means for manually initiating movement of said hinged member.

15. In an electric switch, a pivoted actuator, a transmitting member hinged near the pivot of said actuator, said hinged member having two spaced slots, a rocker having two spaced bearings operable in said slots, a rod hinged to said rocker on a pivot at a point related to said bearings as the apex of a triangle is to the side of the base of which the bearings are at the ends, a compression spring on said rod and interposed between the pivot and the actuator and means for moving said hinged member.

16. In an electric switch, the combination of

two members pivoted so as to move in opposite directions, snap action mechanism connecting said members including a triangular rocker having an apex pivot and two spaced base pivots loosely connected to one member so that said rocker may have a limited pivoted bearing movement about each of the base pivots from an intermediate position to either of two extreme positions, an over-center compression spring pivotally connected between the apex pivot and the second-mentioned pivoted means, the spring connection to the latter pivoted member being in such a position that the rocker when at rest is always in one or the other extreme position and when one pivoted member is moved the spring pivot connection with the second pivoted member and the apex rocker pivot are moved relatively until the spring pivot crosses a line extending through the apex rocker pivot and its then base pivot whereby the rocker is snapped from one position to another and the

apex pivot is moved at high speed to an over-center position with respect to the spring pivot and the pivot of the first-mentioned pivoted member for snap operation of one pivoted member to an opposite position and movement of the rocker to its opposite extreme position.

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