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QUICK MAKE AND BREAK SWITCH

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Fig. 1

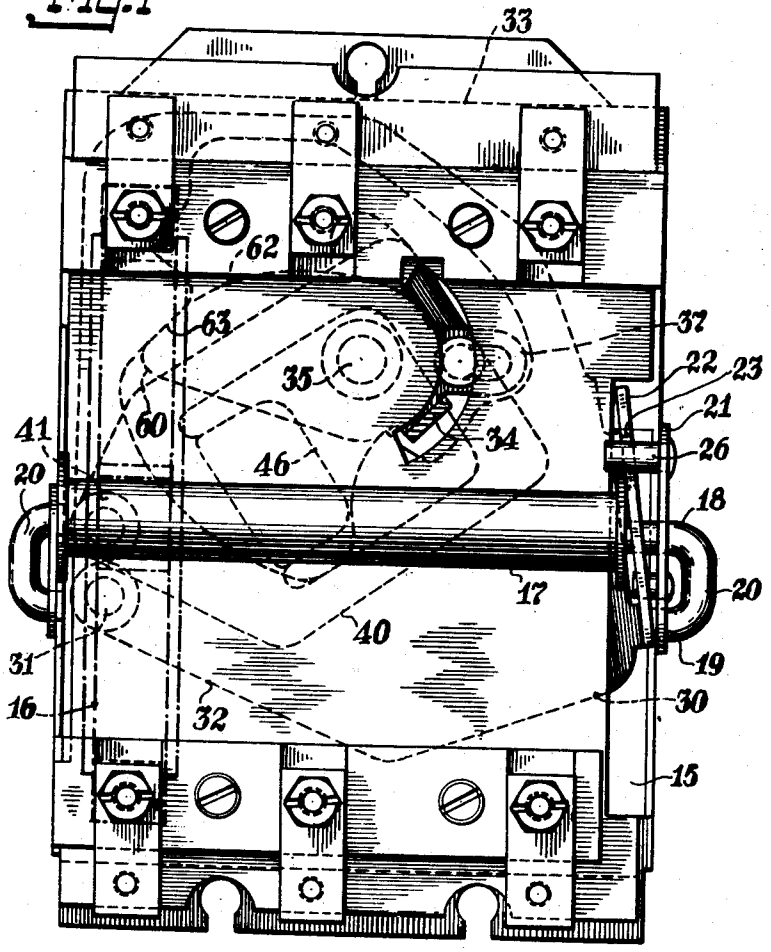
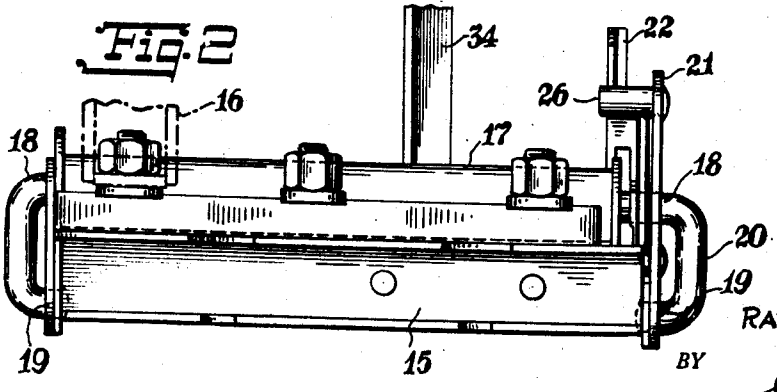



Fig. 2




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Fig. 3

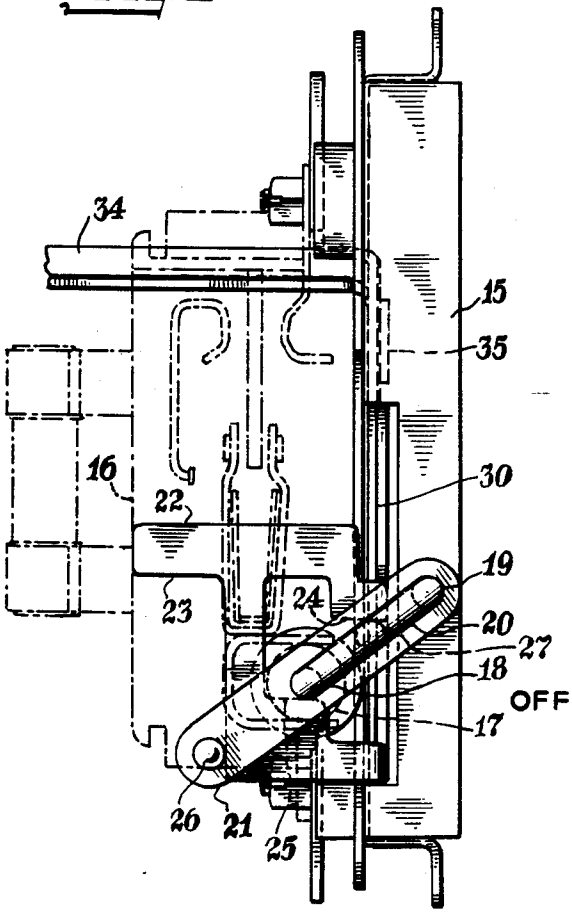



Fig. 4

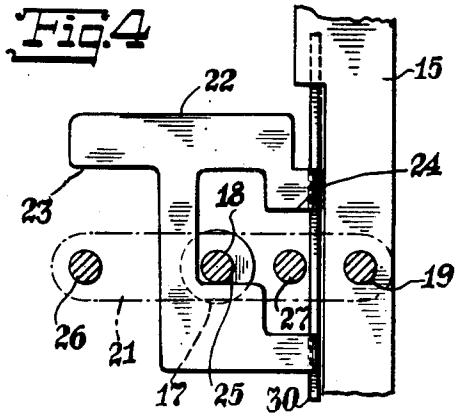



Fig. 5

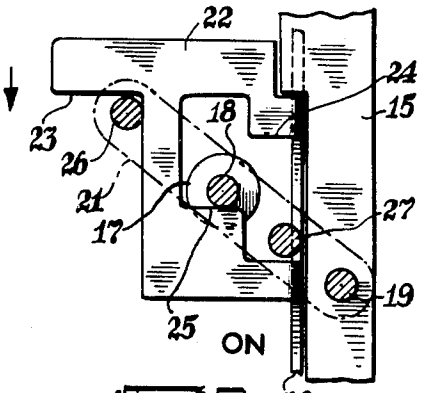



Fig. 6

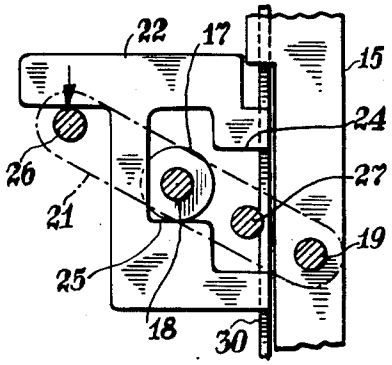
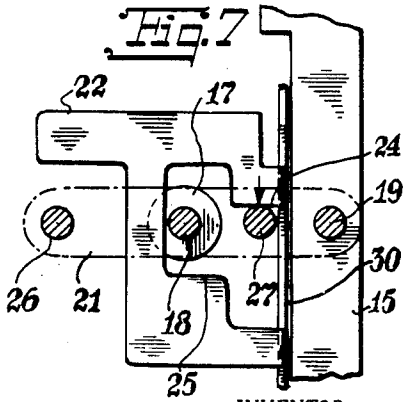



Fig. 7




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Fig. 8

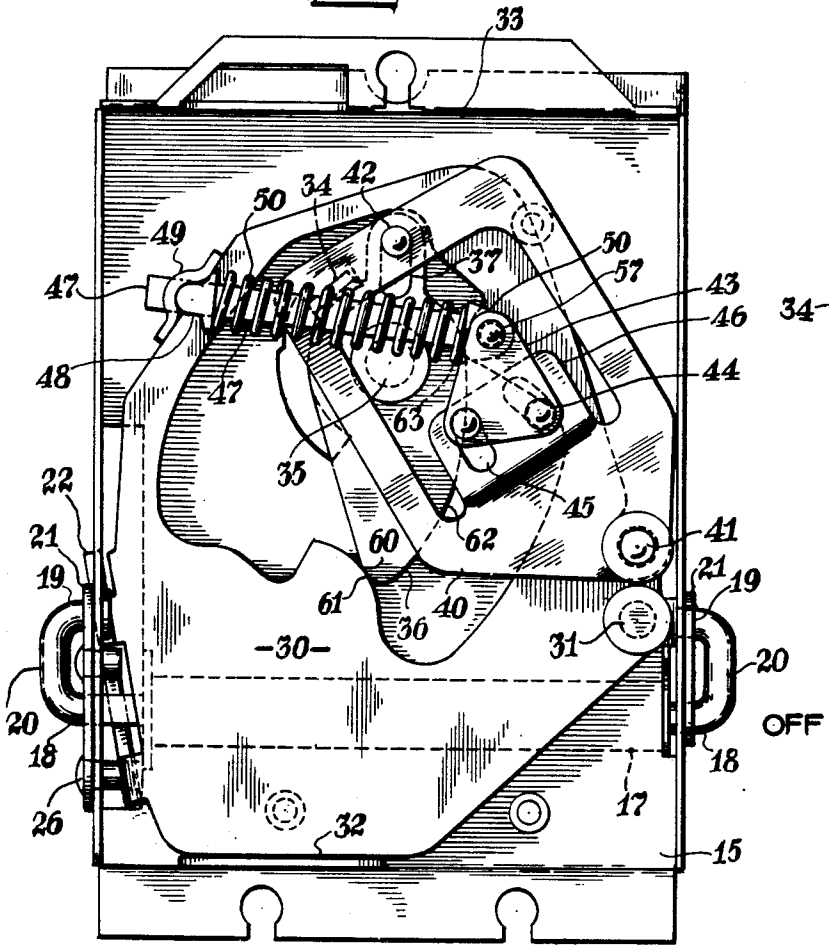



Fig. 9

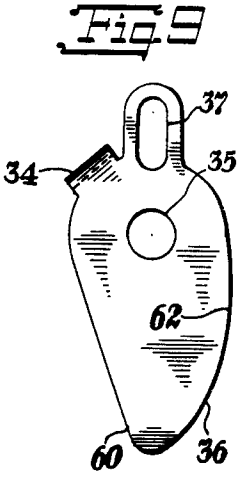



Fig. 10

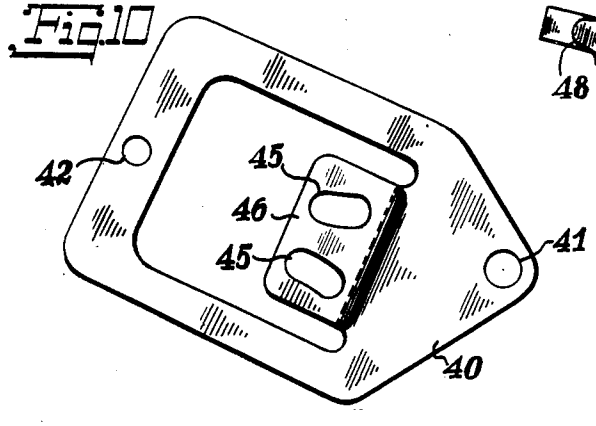
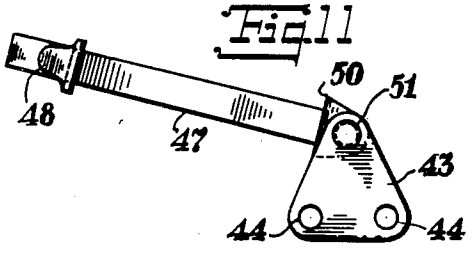



Fig. 11




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# UNITED STATES PATENT OFFICE

2,479,266

## QUICK MAKE AND BREAK SWITCH

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Application August 13, 1947, Serial No. 768,399

8 Claims. (Cl. 200—67)

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My invention relates to improvements in mechanisms for transmitting force from the operating handle of a switch to the electrical contacts, such for instance as shown and described in my application Serial Number 713,194, filed November 30, 1946. It is designed to give easier operation of the switch handle, to minimize hazards from sticking contacts and otherwise improve the electrical performance of the switch, and to prolong the mechanical life of the contact-operating mechanism.

These objects, and others, are obtained by a new arrangement in the mechanical linkage between the switch operating handle and the bar or yoke which moves the movable switch contacts. An improved over-center spring action is used for the usual quick-make and quick-break motion. This is supplemented by an assembly which varies the mechanical advantage of the power of the throwing spring during different portions of the switch contact movement.

It is especially important to have high mechanical advantage when the mechanism is "breaking" the contacts during contact opening. This ensures added mechanical power applied to the contacts to prevent their sticking or welding during the natural arcing which results from the interruption of heavy power circuits. However, the throwing distance of neither the switch contact nor the operating handle should be great, otherwise the space occupied by the parts and mechanism would be enlarged over those at present known.

My improved mechanism will increase the mechanical advantage from the handle and throwing spring to the switch contact during opening movement by shifting the point of application of force during this movement. During closing movement of the contacts, when the mechanical advantage is of less importance, the point of application of force is shifted so that the advantage is constant. This relieves the parts of the mechanism from unnecessary stresses and strains during this part of the cycle of operation of the switch.

These and other objects and advantages, together with the details of preferred mechanisms for reaching them will be clearer with reference to the following detailed specification and the accompanying drawings in which:

Fig. 1 is a front view of switch actuating mechanism embodying one form of my invention the parts being in the position they occupy when the electric current is closed and showing the throwing mechanism in dotted lines.

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Fig. 2 is an end view of the mechanism of Fig. 1.

Fig. 3 is a side view of the same but with the parts in the "off" position.

Fig. 4 is a side view showing the power applying parts in the position they occupy at the moment when the switch is to snap from the "off" to the "on" position of the switch.

Fig. 5 is a side view showing the power applying parts in the "on" position of the switch contacts.

Fig. 6 is a similar view showing the parts as they have started to move from the "on" toward the "off" position.

Fig. 7 shows the mid position of the parts in passing from the "on" to the "off" position of the switch contacts.

Fig. 8 is a rear view showing the snap action throwing mechanism in the "off" or open circuit position of the switch.

Figs. 9, 10 and 11 are detail views of parts of the snap action mechanism.

The base 15 of the construction may be of any suitable form adapted to support one or more switch units 16 with stationary and movable contacts which may be of any suitable form such, for instance, as shown in my patent No. 2,468,235, April 26, 1949.

For the operation of the movable switch member I provide a cross bar 17 which has a shaft 18 and is carried by a yoke pivoted at 19 and having side arms 20. The arm 21 is hinged at 19 and provided with means for engaging a plate 22 which has a reciprocating movement at one side of the base of the mechanism. Plate 22 has three shoulders 23, 24 and 25 adapted to coact with the projections 26 and 27 which extend substantially parallel with the pivot axis and with the shaft 18 of the cross bar 17 as will be later understood.

The plate 22 is formed as a part of a projection forward from the operating lever 30 hinged at 31 in the back of the base of the mechanism. This lever is adapted to swing or reciprocate with plate 22 in the base between open and closed position of the switch and abuts against the shoulder 32 when the switch is in the "off" position and against the shoulder 33 when the switch is in the "on" position. The operating lever member moves in a path extending substantially at right angles with the axis of the arm and at an acute angle with the arm when the arm is in the closed circuit position.

The actuating shaft 34 is pivoted to the base on the axis 35 and is connected to the cam 36

which is oscillatable within an opening in the lever **30**. This cam **36** has a slotted extension **37** by which it is connected to the swing plate **40** hinged at **41** to the base. This plate **40** has a pin at **42** which extends into the slotted extension **37** so that the plate **40** is tilted by the turn of the cam member **36**. The throwing or snap action mechanism includes a tilting piece **43** which has two pins **44, 44** which operate in slots **45, 45** in the offset lug **46** of the plate **40**. The throwing rod **47** has a bearing **48** at one end pivoted in the lug **49** which extends rearwardly at one edge of the lever **30**. The other end **50** is pivoted at **51** to the tilting piece **43** and a compression spring **52** is mounted on the rod **47** between the head of the rod **50** and the bearing **48**.

In the position shown in Fig. 8 it will be seen that the pressure of the spring **52** pushes the lever **30** in a counterclockwise direction so that the plate **22** is held in the lower position shown in Fig. 3 at which time the cross bar **17** is in the "off" or open circuit position of the switch.

To close the circuit the actuating shaft **34** is turned in a clockwise direction as viewed from the front or counterclockwise direction as viewed from the rear, as shown in Fig. 8. The rotation of the cam member **36**, by reason of the slotted connection with the pin **42**, tilts the plate **40** from the position shown in Fig. 8 to that shown in Fig. 1 and thus compresses the spring **52** and throws over the lever **30** from the "off" to the "on" position. In this action the movement of the plate **22** causes the shoulder **25** to engage the shaft **18** of the cross bar and thus applies a rotative force to the cross bar about the axis of the pivots **19**.

To open the circuit, the shaft **34** is rotated in a counterclockwise direction as viewed from the front which reverses the action of the snap action mechanism during which action the lever **30** is turned in a clockwise direction as viewed from the front and moves the plate **22** from the position of Figs. 1 and 5 toward the position of Fig. 3. At the beginning of this movement the shoulder **23** of the plate **22** engages the projection **26** on the arm **21** and thus applies a maximum leverage to the arm **21** for the purpose of moving the switch actuating cross bar **17**. As the plate **22** moves downward the shoulder **24** on the plate engages the projection **27** on the arm **21** which being much closer to the axis of the pivot **19** applies less power to the switch actuating yoke and cross bar at which time less force is required.

It will thus be seen that the mechanical advantage is varied during the movement of the mechanism corresponding to the opening of the circuit of the switch. It is important to have high mechanical advantage when breaking the circuit but also desirable to have a short throwing distance in order that the mechanism may be as compact as possible. By shifting the point of application of force as above mentioned this is accomplished.

By the construction of the snap action mechanism herein shown and described I am enabled to obtain a quick-make and quick-break by the use of a single spring.

In case of a broken spring the movement to open the circuit is effected as the cam shoulder **60** engages the shoulder **61** on the lever **30** and thus moves the lever toward the "off" position of Fig. 3 after the cam tilts plate **40**.

In moving from "off" to "on" the cam shoulder **62** engages shoulder **63** on the lever **30** and presses it toward the position of Fig. 1.



The construction and operation of the tilting piece **43** with respect to the plate **40** are such that it is practically impossible for the parts to get stuck on a dead center.

The quick make and break mechanism herein shown is more fully set forth and claimed in Patent No. 2,368,463, April 26, 1949.

I claim:

1. In a quick make and break switch, a hinged actuator, manually operable snap action mechanism including a plate having stepped shoulders, said actuator including a hinged arm having a number of projections at different distances from the hinge of said actuator coacting sequentially with said shoulders in moving said actuator from "on" to "off" position.

2. In a quick make switch, a hinged arm, a switch actuator shaft carried by said arm, said arm having an outer projection further than said snaft from said hinge and another inner projection between said shaft and said hinge and a throwing plate having shoulders coacting sequentially with said outer and inner projection in moving from an "on" to an "off" position of said switch.

3. In a quick make switch, a hinged arm, a switch actuator shaft carried by said arm, said arm having an outer projection further than said shaft from said hinge and another inner projection between said shaft and said hinge and a throwing plate having shoulders coacting sequentially with said outer and inner projection in moving from an "on" to an "off" position of said switch and a third shoulder coacting with said shaft in moving from an "off" to an "on" position.

4. An electric switch comprising a hinged arm having an operative member for reciprocating a switch member, manually actuated means for throwing said arm, including a member having a stepped plate, said arm having a projection near its outer end and another projection nearer its hinged end adapted to be engaged sequentially by said plate when moving said switch member from its "off" to its "on" position.

5. In an electric switch, a frame for moving a switch member, said frame having a hinged side arm with two projections at different distances from the axis of said hinge, manually actuated snap action mechanism having a plate with shoulders adapted first to engage the projection at the greatest distance from the axis of the hinge of said frame at the first part of the movement of the snap action mechanism and then to engage a projection nearer the axis of the hinge as the mechanism is moved to open the circuit through said switch member.

6. In an electric switch a base for supporting contact mechanism, a movable switch member, means for actuating said member, including a hinged arm having projections at two different distances from its axis, a hinged lever carried by the base and having a projection with stepped shoulders for sequentially engaging said projections, a rotatable cam having means for engaging said lever for actuating the same, a plate hinged to said base and having a sliding connection with said cam and a throwing arm having a tilting connection with said plate and a rocking connection with said lever.

7. An electric switch comprising cooperating switch contacts, one of which is movable, a pivotally mounted arm, means connecting said arm to said movable contact for movement thereof by said arm between open and closed circuit po-

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sitions, inner and outer projections on said arm, said inner projection being between the pivot axis of said arm and said outer projection, an operating member for said arm mounted for reciprocating movement transversely of said pivot axis, and shoulder portions on said operating member extending substantially at right angles with said pivot axis and positioned first to engage said outer projection for maximum leverage to initiate opening movement of said arm and thereafter engage said inner projection for decreased leverage during the completion of the movement of said arm to said open position.

8. An electric switch comprising cooperating switch contacts, one of which is movable, a pivotally mounted arm, means connecting said arm to said movable contact for movement thereof by said arm between open and closed circuit positions, inner and outer projections on said arm extending in a direction substantially parallel with the pivot axis of said arm, said inner portion being between said pivot axis and said outer projection, an operating member for said arm mounted for reciprocating movement in a path



extending substantially at right angles with said pivot axis and at an acute angle with said arm when said arm is in said closed position, and shoulder portions on said operating member extending substantially at right angles with said pivot axis and said path and positioned first to engage said outer projection for maximum leverage to initiate opening movement of said arm and thereafter engage said inner projection for decreased leverage during the completion of the movement of said arm to said open position.

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## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS


| Number | Name | Date |
|---|---|---|
| 1,664,380 | Meyers | Mar. 27, 1928 |
| 1,786,727 | Adam | Dec. 30, 1930 |
| 1,799,099 | Johnson | Mar. 31, 1931 |
| 1,814,777 | Wurdack | July 14, 1931 |