

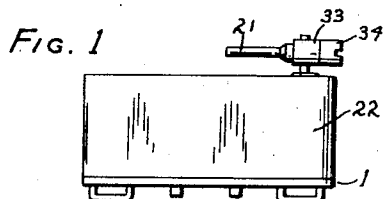
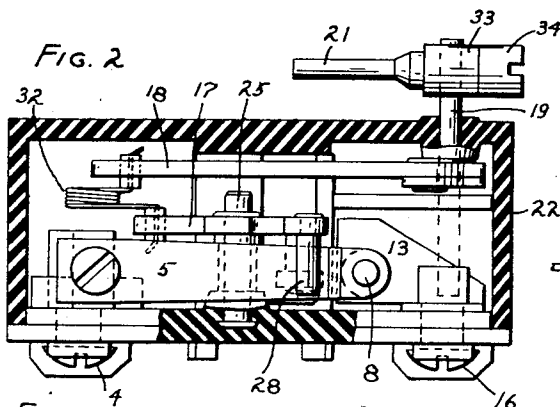
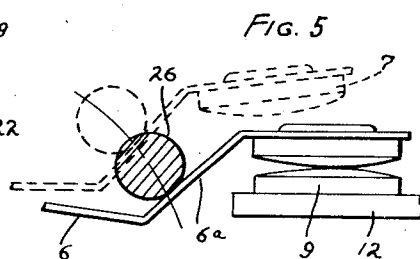
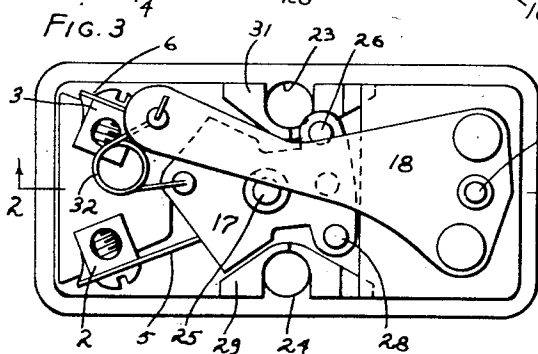
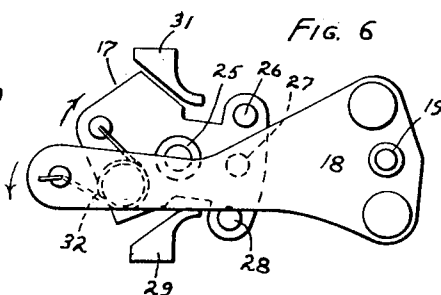
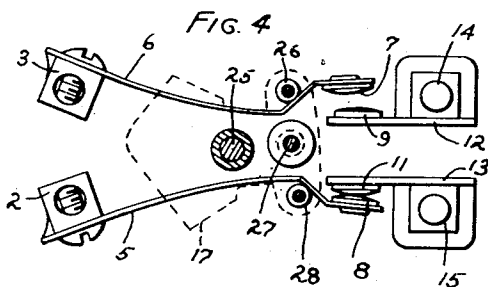
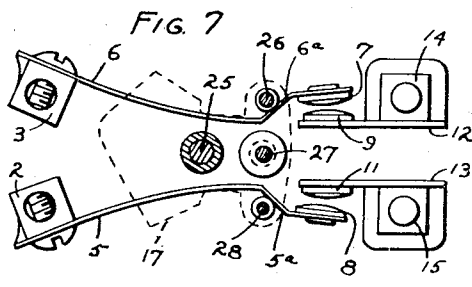
Aug. 24, 1948.

A. L. RICHE

2,447,871

SWITCH MECHANISM

Filed Aug. 14, 1944



INVENTOR  
Arthur L. Riche  
BY  
McCanna and Mousbach  
ATTYS

## UNITED STATES PATENT OFFICE

2,447,871

## SWITCH MECHANISM

Arthur L. Riche, Freeport, Ill., assignor to First Industrial Corporation, Wilmington, Del., a corporation of Delaware

Application August 14, 1944, Serial No. 549,354

4 Claims. (Cl. 200—67)

1

This invention relates generally to snap switches and more particularly to improved mechanisms for preventing arcing and failures due to welding.

For certain types of switches it is advantageous to use a resilient contact bearing arm, employing the resilience of the arm for effecting either a quick opening or quick closing of the circuit. Where the resilient arm is biased to close the switch contacts there will often be an inclination for the contact carried by the resilient arm to bounce upon closing. Under certain circumstances bouncing of the moving contact on the stationary contact may cause arcing, and arcing may produce small welds which would interfere later with the quick or certain opening of the same contacts.

Having in mind these and other problems, I have devised a switch in which it is an objective to provide a resilient arm carrying a moving contact, with this arm normally biased toward the contacts open position and further provide with means for positively preventing bounce of the moving contact once it has been brought into contact with the cooperating stationary contact.

It is a further object of my invention to provide a resilient contact bearing arm normally biased toward open position and snap action means arranged for positively moving the contact to closed position and for imposing a clamping action on the closed contacts.

A further object is to provide a snap switch having a driving element for closing a switch contact arm arranged whereby the driving element maintains pressure on the arm continuously during and following a closing movement.

The above and other objects and advantages of the invention will be more readily appreciated upon examination of the illustrative embodiment of the invention shown in the accompanying drawing.

In the drawing Fig. 1 is a side elevation showing a switch case containing a switch made in accordance with this invention.

Fig. 2 is a sectional view taken approximately upon the plane of the line 2—2 of Fig. 3 showing the switch mechanism mounted within the casing.

Fig. 3 is a top view of the switch mechanism with the cover removed.

Fig. 4 is a skeleton view of a portion of the switch mechanism removed from the casing, showing one switch contact closed and the other switch contact open.

Fig. 5 is an enlarged detail view showing two

2

positions of the movable contact and the corresponding driving pin showing the manner in which the pin operates on the contact arm, the dotted lines showing the contact open, the full line position showing it closed.

Fig. 6 is a detail view showing a portion of the snap action mechanism.

Fig. 7 is a skeleton view showing both contacts open, as might occur during an intermediate position of the snap action mechanism.

Referring further to the drawing, the switch mechanism is supported on a base plate 1 which is made preferably of some non-conducting composition material having good insulating qualities. Supported on a raised portion of the base and extending therethrough is a pair of conducting members 2 and 3, each of which has a screw such as 4 mounted in its outer end for securing a conductor lead brought to the outside of the case. Secured in any suitable manner to the inner ends of these conductor posts are resilient contact arms 5 and 6 made of some suitable metal spring material having also good electrical conducting qualities. At the opposite end of each of the spring arms are the moving contact elements 7 and 8, which are intended to make contact with the stationary contact elements 9 and 11, the latter being supported on metal brackets 12 and 13 carried upon the metal binding posts 14 and 15, which extend through the insulating base 1. Each of these binding posts has a screw such as 16 for securing conductor leads upon the outside of the switch casing.

The mechanism for closing and opening the switch contacts includes an oscillatable operating member 17, a snap action lever 18, a shaft 19, and an operating arm 21, the shaft 19 extending to the exterior of the casing 22, which preferably is a box-like structure of rectangular cross section having good electrical insulating qualities and which may be set down over the switch mechanism to rest upon the base 1. The casing 22 may be secured to the base in any suitable manner. In this instance there is provided in the base a pair of holes 23 and 24 and a corresponding pair of holes in the top of the casing 22 through which bolts (not shown) may be passed for securing the casing upon the base.

The operating member 17 directly acting on the contact mechanism is a plate preferably made of some rigid material having excellent electrical insulating properties such as any of the composition materials used for that purpose and is mounted to oscillate upon a post 25 and itself carries three posts 26, 27, and 28, each of which may

be provided with a roller. Whether these pins carry rollers is a matter of mechanical expediency, but for simplicity they will be referred to here as pins, it being understood, however, that the center pin 27 should either have a roller of insulating qualities, or itself be a good insulator in order not to cause a short circuit between the two metal contact arms.

The contact arms 5 and 6 are formed and mounted upon their supporting posts 2 and 3 respectively, in such a manner that they are biased to swing outwardly away from their cooperating stationary contact elements. Accordingly, when either arm is free to open its associated contacts it will do so normally under its own spring action. However, should any previous arcing have produced a slight weld between the contacts, the center post 27 will serve to give the contact arm such a kick as may be expected to break the weld and open the contacts promptly.

As will be observed in Figs. 4 and 5, when one of the contact arms such as 6 is standing in the open position, the driving pin 26 will be held in contact with a sloping portion 6a of that arm, due to the resilience of the spring. When the snap action operation of the switch occurs to close this contact, in a manner which later will be explained, the contact 7 is closed against the contact 9 only by the propelling force of the pin 26, and as the contact arm 6 is swung toward closed position the pin 26 will slide or roll, if a roller is provided, down the slopping portion 6a. Immediately after the making of the two contacts, as shown in Fig. 5, this pin 26 will continue for a short distance to slide down the slope 6a, thereby producing a clamping or "pinching" action upon the contact 7, effectively preventing it from rebounding. Thus, after the movable contact engages the stationary contact the action of the pin 26 is to reduce the effective length of the resilient arm and consequently the tendency of the contact to rebound. The arm is also flexed toward the stationary contact in a progressive fashion to produce a slight rocking of the stationary contact and thus absorb the energy normally producing rebound. During the closing and after the closing of the contacts, the contact arm is at all times under pressure from the pin 26, the resilience of the whole arm being utilized to maintain the pressure contact between the arm and pin and the slopping resilient portion 6a being further used particularly to effect the clamping action on the contacts.

Obviously, the other contact arm 5 and its cooperating pin 28 operate in a similar manner.

When the switch is reversed to open the contacts 7 and 9, whose closing has just been described, the oscillation of the operating member 17 in the opposite direction causes the pin 26 to recede and the spring arm 6 to follow it, and since the snap action is rapid and the resilience of the arm 6 adequate, the opening of the switch contacts will occur with the necessary speed to prevent arcing under normal operating conditions. However, if a weld had occurred, the center pin 27 is available to bump the contacts open, and thereafter is in position to prevent them from accidentally closing so long as the operating member 17 remains in the position required for holding this pair of contacts open.

The central pin 27 obviously acts with the contact arm 5 in a similar manner.

Referring now to the snap action mechanism disclosed herein: It is apparent that a number of suitable snap action devices may be employed

in connection with the closing and opening of the switch contact arms as above described. One form which I may employ consists of the operating member 17, whose oscillations in either direction are limited by the engagement of pins 26 and 28 against the contact arms, and the oscillatable lever 18, the latter being fixed on the shaft 19. An overcenter spring 32 is connected with the member 17 and lever 18 in the manner shown and its function to snap the operator 17 one way or the other depending upon the position of the lever 18 will be apparent from a comparison of Figs. 3 and 6. The limit of oscillation of lever 18 may be determined by upstanding shoulders 29 and 31 integral with the base 1, which may extend from the base nearly to the top inside surface of the casing 22.

It is desirable to provide a construction whereby the arm 21 may be adjustably secured on the shaft 29 at various selected angular positions relative to the center line of the lever 18, so that this switch may be more conveniently connected with whatever external mechanism causes its operation. For this purpose the arm 21 may carry a sleeve 33 which is perforated, as is the arm 21, to receive the shaft 19. One end of the arm is threaded and carries the nut 34, which may be tightened against the sleeve 33 to clamp the same and the arm in any preferred position on the shaft 19.

The operation of the device preferably is as follows:

Assuming that the lever 18 is in the position shown in Fig. 3, deflection of arm 21 a sufficient distance will rotate shaft 19 in a counterclockwise direction (as Fig. 3 is viewed) until lever 18 has passed the dead center position for the overcenter spring 32. The switch contacts which had previously been in the position shown in Fig. 4 will immediately snap to the opposite position, the pin 26 closing element 7 against element 9, while the pin 28 will recede and permit contact 8 to move away from contact 11. A reversal of the shaft 19 past the dead center of the position of spring 32 will then restore the switch contacts to the position shown in Fig. 4, in this instance the pin 28 rolling down the incline 5a of the resilient arm 5 clamping the contact 8 against the stationary contact 11.

The construction and arrangement of parts herein shown and described is at present the preferred form of this invention, but it should be understood that some modification in the parts and in the details of construction are contemplated, and may be employed, without departing from the spirit and scope of the invention defined in the following claims.

Having shown and described my invention, I claim:

1. In an electric switch, a stationary contact, a movable contact, a resilient contact arm having one end anchored at a fixed point and carrying said movable contact, an actuator oscillatable about an axis at one side of said resilient arm, snap action means for oscillating said actuator in either direction, means including a post on said actuator for striking said arm for positively opening and holding open said contacts upon movement of the actuator in one direction, and means including a second post in spaced relation with the first post on said actuator to engage said arm upon movement of the actuator in the opposite direction for closing said contacts and for pressing upon the arm close to said movable con-

5

tact for positively retaining it in closed contact position.

2. In an electric switch, a pair of resilient arms arranged in side by side relationship, adjacent ends of said arms being anchored at fixed points, a mobile contact carried at the other end of each arm, stationary contacts positioned for engagement by the mobile contacts, an actuator mounted to span the space between the arms to one side thereof for oscillation about an axis disposed between the arms, an overcenter spring for alternately driving the actuator in opposite directions, means including a post on the actuator for engaging one of the arms adjacent the contact upon movement of the actuator in one of said directions to propel the arm continuously from open to closed position and imposing a clamping action thereon at closed position, and means including a second post on said actuator for engaging the other arm upon said movement in the opposite direction to positively drive the same to open position.

3. In an electric switch, a pair of resilient arms arranged in side by side relationship, adjacent ends of said arms being anchored at fixed points, a mobile contact carried at the other end of each arm, stationary contacts positioned for engagement by the mobile contacts, an actuator mounted to span the space between the arms to one side thereof for oscillation about an axis disposed between the arms, an overcenter spring for alternately driving the actuator in opposite directions, means including spaced posts on the actuator for engaging remote sides of said arms to alternately drive said arms from open to closed position, and means including a post intermediate said spaced posts on said actuator between the arms for moving one arm to open position when the other is driven to closed position.

6

4. In an electric switch, a pair of resilient arms arranged in side by side relationship, adjacent ends of said arms being anchored at fixed points, mobile contacts carried on the other ends of said arms on the inner sides thereof, spaced stationary contacts disposed between the arms for alternate engagement by the mobile contacts, an actuator mounted to one side of said arms in a position to span the space between the arms oscillatable about an axis disposed between the arms, an overcenter spring for driving the actuator, a post on the actuator disposed between the arms for alternately engaging the arms in response to oscillation of the actuator to flex the arms and move alternate mobile contacts away from the stationary contacts, and posts disposed in spaced relation to the first mentioned post for the reception of the arms therebetween to alternately engage remote sides of said arms in response to oscillation of the actuator to drive the arms from open to closed position.

ARTHUR L. RICHE.

#### REFERENCES CITED

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

#### UNITED STATES PATENTS

| Number    | Name      | Date          |
|-----------|-----------|---------------|
| 994,952   | Rhoades   | June 13, 1911 |
| 1,231,264 | Kettering | June 26, 1917 |
| 1,408,967 | Arnold    | Mar. 7, 1922  |
| 1,494,221 | DeReamer  | May 13, 1924  |
| 1,862,738 | Douglas   | June 14, 1932 |

#### FOREIGN PATENTS

| Number  | Country       | Date          |
|---------|---------------|---------------|
| 77,002  | Sweden        | Apr. 19, 1933 |
| 508,390 | Great Britain | June 30, 1939 |