Sept. 18, 1934. R. POPP 1,974,054

SWITCH MECHANISM

Filed Jan. 21, 1933

Fig. 1.

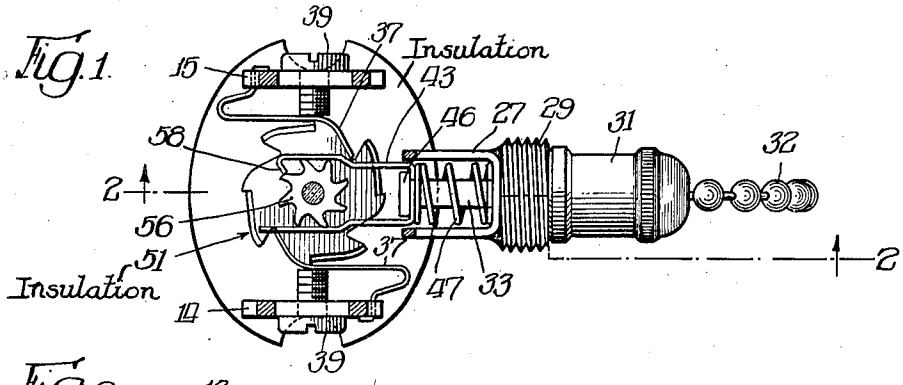


Fig. 2.

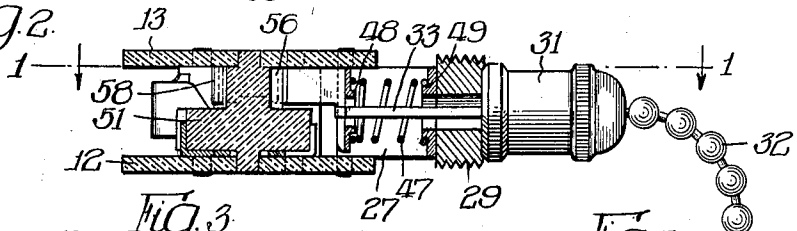


Fig. 3

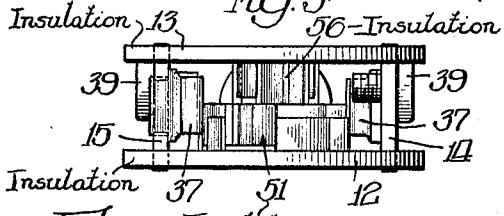


Fig. 4.

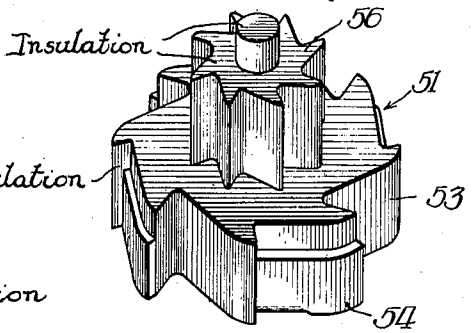


Fig. 5.

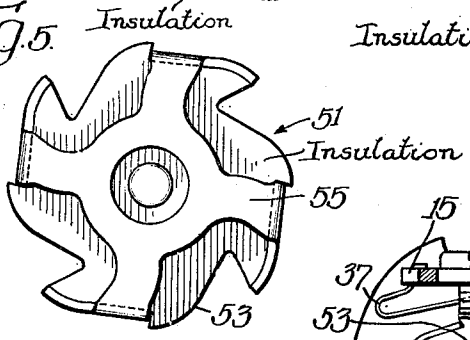


Fig. 6.

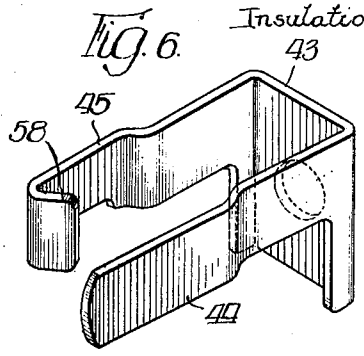
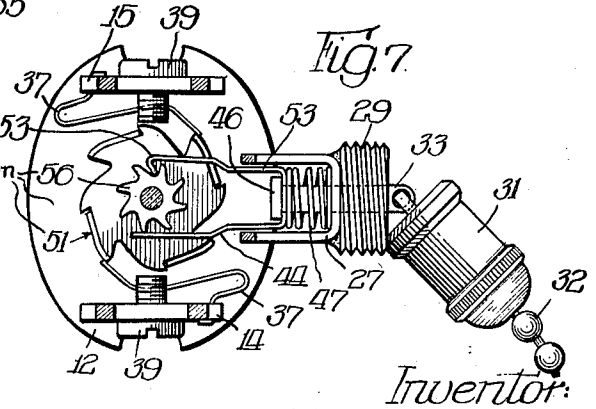


Fig. 7.



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Patented Sept. 18, 1934 1,974,054

UNITED STATES PATENT OFFICE

1,974,054

SWITCH MECHANISM

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Application January 21, 1933, Serial No. 652,823

7 Claims. (Cl. 200—64)

My invention relates to a switch mechanism and more in particular to the type of switch mechanism in which a reciprocating motion is converted to rotary motion of a bridging contact.

In my copending application, Serial No. 536,834, I disclosed a switch mechanism of the general character set out. This switch mechanism included an integral bridging contact unit eliminating many parts required in former constructions and secured many advantages over switch constructions known in the past. I have found, however, that the switch shown in my prior application can be improved to provide improved operating characteristics, longer life and other advantages which will be set out in the body of the description.

The principal object of my invention is the provision of an improved switch mechanism.

Another object is the provision of an improved and simplified switch mechanism in which the contact between the stationary contacts and bridging contacts is broken sharply to avoid arcing, that is a more effective snap action.

Another object is the provision of a very simple switch mechanism capable of production at a minimum cost and still obtaining very sharp breaking action between the stationary and bridging contacts.

Other objects and features of the invention will appear from a consideration of the following detailed description taken with the accompanying drawing, wherein

Fig. 1 is a plan view partially in section taken along the line 1—1 of Fig. 2;

Fig. 2 is a side elevation partly in section taken along the line 2—2 of Fig. 1;

Fig. 3 is an end view of the device shown in Fig. 2;

Fig. 4 is an enlarged perspective view of a bridging contacting unit employed in the switch;

Fig. 5 is a bottom view of the bridging contacting member shown in Fig. 4;

Fig. 6 is an enlarged perspective of a pawl employed in the switch; and

Fig. 7 is a view similar to Fig. 1 but showing the parts in the position which they assume just before the bridging contact unit snaps in breaking the circuit.

One of the principal features found in my present invention is a construction and combination of the bridging contact member and pawl which increases the snap action both when the contact between the stationary contacts and bridging contact is made and broken. This function is particularly valuable as those skilled in the art will understand when the contact is broken thereby cutting down arcing very greatly and prolonging the life of the switch. The structure which secures this function will be apparent from the detailed description.

Referring now more in particular to the drawing, the switch mechanism is mounted between a pair of insulating plates or frame members 12 and 13. These plates are formed of any suitable material preferably a material which can be stamped out of a sheet. The plates are spaced apart and held in position by a pair of posts 14 and 15 which have portions extending through the plates and upset at their upper and lower ends to clamp the plates and hold them in position.

A U-shaped member 27 is supported between the plates 12 and 13 and has projections extending through these plates to hold the member in position. These projections also may be upset above and below the plates 12 and 13. The U-shaped member 27 has a round collar 29 attached to the center portion of the U upon which a lever 31 is adapted to rock when tension is applied to a chain 32. Lever 31 is connected to a stem 33 by a universal connection whereby the rocking of lever 31 in any direction will pull the stem to the right as viewed in Figs. 1 and 2. Stem 33 is provided with a head 46 and carries a U-shaped pawl 43 having parallel arms 44 and 45. Surrounding steam 33 is a helical spring 47 which rests at one end against the U-shaped member 27 while the other end rests against pawl 43, normally holding the pawl and stem in extended position as shown in Figs. 1 and 2. The pawl 43 is provided with a collar 48 which assists in centering the spring. The collar 29 also has an annular projection 49 which serves the same purpose.

Rotatably mounted between the plates 12 and 13 is a unitary contact bridging member 51 having integral trunnions or stub shafts journaled in apertures in the plates 12 and 13. The bridging contact member has a large toothed wheel 53 provided with alternately deep and shallow teeth. The shallow teeth are provided with contacting faces 54 all of which are interconnected by a spider 55 (Fig. 5). Adjacent the wheel 53 and integral therewith is a ratchet wheel 56 having teeth corresponding in number to the teeth of the larger wheel 53. When the device is employed, the arms 44 and 45 straddle the ratchet gear 56, and arm 45 is provided with a lateral projection 58 which engages behind the teeth of the ratchet wheel 56. The entire bridging contact member may be cast in a mold and

formed of bakelite, hard rubber or other suitable di-electric material. Further details of the structure of the bridging contact member and its co-operation with the pawl 43 will be pointed out hereinafter.

Each of the posts 14 and 15 carries a stationary contact member 37 formed of resilient material. These contact members are so bent as to have inwardly curved contacting portions lying opposite each other for engaging the movable contact bridging member and have a substantially straight portion which is rebent upon itself to give additional resiliency. At the end of the rebent portions, the members are bent at a right angle, and the right angular portions secured in slots provided in the posts 14 and 15. When the stationary contact members 37 pass from the deep cut insulating teeth of the bridging member to the shallow contact carrying teeth, the drop is small and the tension of the springs is only slightly released, thus preventing rebound of the stationary contact members when they strike the contact carrying teeth. In one position of the movable contact member, both of the stationary contact members will rest upon and be bridged by teeth having a conducting face in which position posts 14 and 15 will be electrically connected. Each of the posts 14 and 15 carries a screw 39 by means of which conductors may be connected to the posts for placing the switch in an electrical circuit.

Referring now more particularly to the bridging contact unit and the pawl which operates it, these are constructed to provide a sharper snap action with quicker breaking between the stationary contact members and the bridging contact. As Figs. 1, 3 and 7 show clearly, the arm 44 rests on one side of the ratchet 56 while the arm 45, equipped with the projection 58, bears against the other side. The member 43 carrying these arms is formed of resilient material so that the two arms always bear resiliently against the ratchet wheel 56 but are both capable of expansion laterally when the switch is operated. I so position the teeth on the ratchet wheel 56, however, that the tension applied to the arm 44 can be taken advantage of to promote a quick final action of the bridging contact unit. As shown in Fig. 7, the contact is just in a position to break and the arm 44, now under tension by reason of its having been expanded, is bearing against one of the teeth of the ratchet wheel. At this position, as shown, the tooth is beyond the center line coinciding with the axis of the ratchet wheel, and as soon as this position is reached the tension of the arm 44 will assist in completing the movement of the bridging contact unity. This action is similar to the action obtained in the over-center type of switch in which tension is built up in a spring to a certain point and then this tension depended upon to throw a switch member with a sharp action.

In the present instance, this effect is obtained by means of two structural features. It will be noted that the teeth of the ratchet wheel are set substantially half way between the teeth on the bridging wheel 53. In my prior patent, the teeth were substantially in alignment on these two portions of the unit. This relative position of the teeth depends, of course, on the position of the two stationary contacts. In the present case they are in the same position as in my copending application.

I also slope back the teeth on the ratchet wheel slightly more than is customary to improve this action. It will be noted that if the ratchet teeth were slanted further forward, a snap action also would occur but not at the proper instant. I have found that if the teeth of the briding wheel and ratchet wheel are so arranged that the arms 44 and 45 engage square across the ends of two teeth, as shown in Fig. 1, when the bridging contact members occupy a full toothed space on the bridging wheel 53, (that is when the parts are at rest) then the snap action will occur at the right instant, namely, just as the stationary contact members are about to drop from one set of teeth to the other on the bridging wheel.

It is obvious that I may resort to many modifications in structure and detail in this type of switch and still obtain the same final result. My invention, therefore, is limited only by the scope of the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. In a switch mechanism, a pair of bearing members, a pair of stationary contact members formed of spring material, a bridging contact member comprising a toothed bridging wheel and a ratchet wheel journalled in said bearing members, a pawl having a pair of spring pressed substantially parallel arms engaging said ratchet wheel, an inturned projection on one of said arms adapted to engage a tooth on the ratchet wheel, and means for reciprocating said pawl to cause rotation of said ratchet wheel and bridging contact member, each of said arms engaging against two teeth of the ratchet wheel when said ratchet wheel is in a stationary position, whereby the action of the arms against a pair of teeth imparts a final sharp movement to the ratchet wheel to cause a quick make and break of the bridging and stationary contacts.

2. In a switch mechanism, a pair of bearing members, a rotatable member mounted therein comprising an insulating body having stub shafts journalled in said bearing members, said body comprising a ratchet wheel adjacent one of said stub shafts and a bridging contact wheel adjacent the other stub shaft having interconnected conducting surfaces on alternate teeth, a pawl having a pair of arms straddling said ratchet wheel and yieldingly resting against the teeth thereof, one of said arms having a lateral projection engageable with the teeth of said ratchet wheel, means for actuating said pawl to cause rotation of said rotatable member, and yieldable contact members for engaging said contact surfaces of said bridging contact wheels.

3. In a switch mechanism, a pivoted ratchet wheel, a pair of arms resiliently engaging teeth on said ratchet wheel, a projection on one of said arms adapted to engage one of said ratchet teeth, means for actuating the projection carrying arm to rotate said ratchet wheel, a pair of stationary contacts, and a bridging contact carried by said ratchet wheel, two teeth of said ratchet wheel being engaged by each of said arms when the ratchet wheel is at rest position.

4. In a switch mechanism, a ratchet wheel, a bridging contact member in the form of a toothed wheel adapted to rotate with said ratchet wheel, alternate teeth of said toothed wheel having interconnecting contacting faces, a pair of stationary contact members resiliently bearing against opposite sides of said toothed wheel, an arm resiliently engaging said ratchet wheel at one side thereof, a projection on said arm adapted to engage a tooth of said ratchet wheel, means

for actuating said arm to rotate said ratchet wheel and bridging contact member, and a second arm resiliently engaging the periphery of said ratchet wheel and connected to said first mentioned arm, said arm positioned to be tensioned by engagement with a tooth on first movement of said ratchet wheel, and said tension assisting final movement of said ratchet wheel by pressure on said tooth.

5. In a switch mechanism, a ratchet wheel, a bridging contact member in the form of a toothed wheel adapted to rotate with said ratchet wheel, alternate teeth of said toothed wheel having interconnecting contacting faces, a pair of stationary contact members resiliently bearing against opposite sides of said toothed wheel, an arm resiliently engaging said ratchet wheel at one side thereof, a projection on said arm adapted to engage a tooth of said ratchet wheel, means for actuating said arm to rotate said ratchet wheel and bridging contact member, and a second arm resiliently engaging the periphery of said ratchet wheel and connected to said first mentioned arm, said arm positioned to be tensioned by engagement with a tooth on first movement of said ratchet wheel, and said tension assisting final movement of said ratchet wheel by pressure on said tooth, said arms comprising legs of a substantially U-shaped pawl member formed of resilient material.

6. In a switch mechanism, a ratchet wheel, a bridging contact member in the form of a toothed wheel adapted to rotate with said ratchet wheel, alternate teeth of said toothed wheel having interconnecting contacting faces, a pair of stationary contact members resiliently bearing against opposite sides of said toothed wheel, an arm resiliently engaging said ratchet wheel at one side thereof, a projection on said arm adapted to engage a tooth of said ratchet wheel, means for actuating said arm to rotate said ratchet wheel and bridging contact member, and a second arm resiliently engaging the periphery of said ratchet wheel and connected to said first mentioned arm, said arm positioned to be tensioned by engagement with a tooth on first movement of said ratchet wheel, and said tension assisting final movement of said ratchet wheel by pressure on said tooth, said second mentioned arm at rest position bearing peripherally against a pair of teeth on said ratchet wheel.

7. In a switch mechanism, a ratchet wheel, a bridging contact member in the form of a toothed wheel adapted to rotate with said ratchet wheel, alternate teeth of said toothed wheel having interconnecting contacting faces, a pair of stationary contact members resiliently bearing against opposite sides of said toothed wheel, an arm resiliently engaging said ratchet wheel at one side thereof, a projection on said arm adapted to engage a tooth of said ratchet wheel, means for actuating said arm to rotate said ratchet wheel and bridging contact member, and a second arm resiliently engaging the periphery of said ratchet wheel and connected to said first mentioned arm, said arm positioned to be tensioned by engagement with a tooth on first movement of said ratchet wheel, and said tension assisting final movement of said ratchet wheel by pressure on said tooth, said arms comprising legs of a U-shaped member formed of resilient material, and each of said arms bearing against a pair of teeth on the ratchet wheel when said ratchet wheel is in a stationary position.

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