

Oct. 1, 1963

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3,105,887

SWITCH AND PARTS THEREOF

Original Filed Oct. 24, 1958

2 Sheets-Sheet 1

FIG. 1

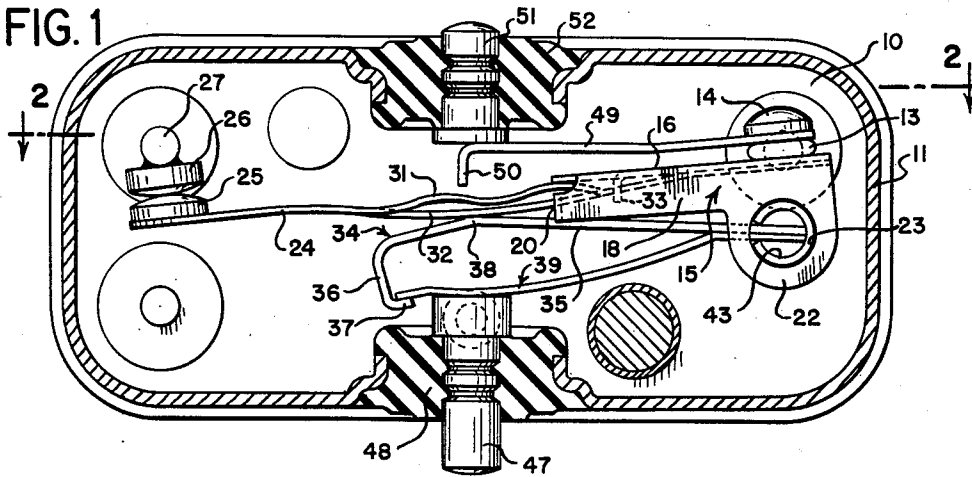


FIG. 2

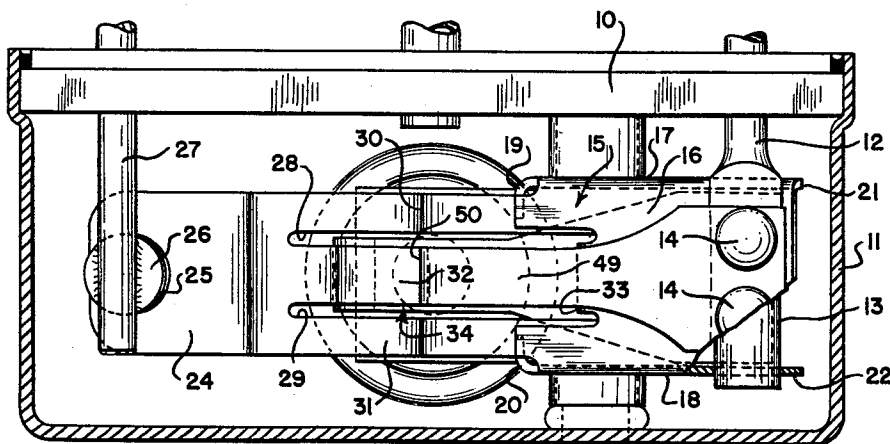
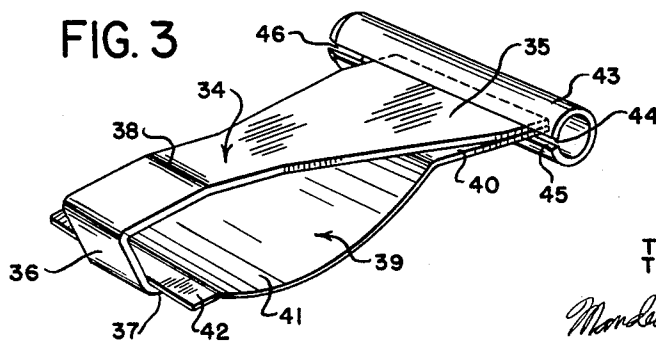


FIG. 3



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FIG. 4

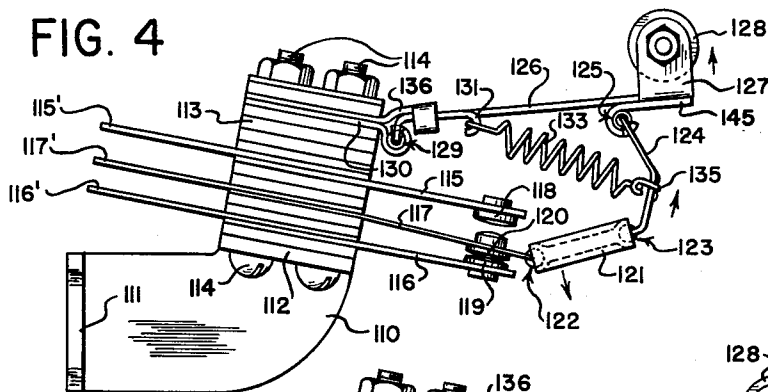


FIG. 5

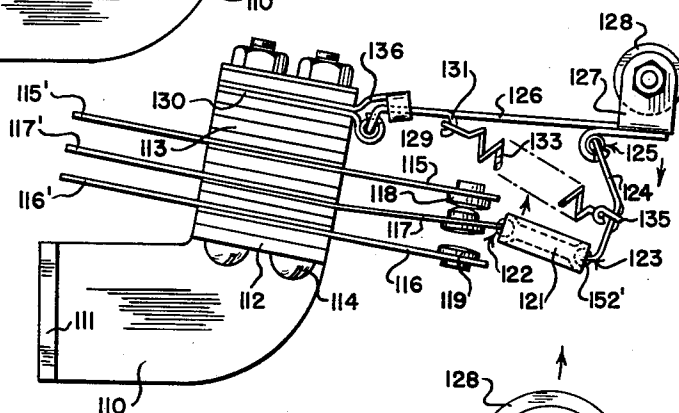


FIG. 6

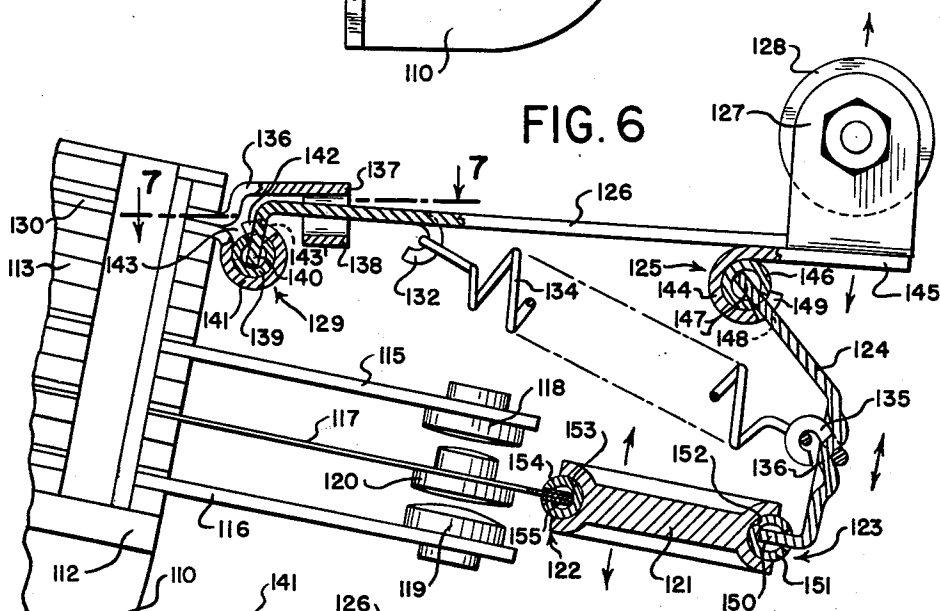
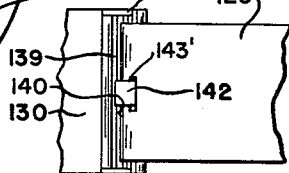


FIG. 7



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3,105,887

SWITCH AND PARTS THEREOF

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Original application Oct. 24, 1958, Ser. No. 769,469, now Patent No. 3,062,932, dated Nov. 6, 1962. Divided and this application Jan. 22, 1962, Ser. No. 167,588
16 Claims. (Cl. 200—67)

The present invention relates to electrical switches, and more particularly to improvements in snap action switches and in certain of the components thereof. This application constitutes a division of our copending application Serial No. 769,469, filed October 24, 1958, now Patent No. 3,062,932.

One of the specific features of the invention resides in the provision, in a snap action switch, of improved and simplified means for effecting actuation of the switch, providing for substantial overtravel in the movement of an actuating element without causing damage to the switch mechanism. In this respect, the invention resides, in part, in the provision of a novel actuator assembly interposed between a switch blade and a movable actuating plunger, whereby movement of the plunger is transmitted to the blade for effecting the actuation thereof, while excessive movement of the plunger is taken up in the deformation of a pre-stressed resilient member. The pre-stressed member is arranged to effect switch actuation without deformation, so that actuation is sensitive and accurate, while at the same time, overtravel of the actuator, which would otherwise cause excessive force to be applied to delicate parts of the switch mechanism, is isolated by the pre-stressed member.

A more specific feature of the invention resides in the provision of an actuating means comprising an actuating arm and a leaf spring member attached to the arm and held thereby in a pre-stressed condition. Actuating force is applied to the arm through the spring, whereby actuating movement of the arm may be effected until the resisting forces exceed the pre-stress in the spring, and following which the spring merely deforms if further actuating force is applied.

One of the important features of the invention resides in the provision of a novel and improved pivot joint which, while it finds especially advantageous use in switches of the type contemplated herein, is suitable for use in a variety of applications other than switches. The improved joint comprises a split roll pin which receives and grips, between opposed edges formed by the split, one of a plurality of pivotally connected members. The roll pin is, in turn, journaled for rotary movement in another of the connected members to form a pivot joint which is simplified in nature, yet which has advantageous characteristics.

In the improved switch, mentioned above, the new pivot joint finds particularly advantageous application in the mounting of an actuating assembly comprising an actuating arm and a leaf spring. The arm and spring have flat end portions, which are placed face to face and, together, are received and clamped between opposed edges of the pin.

The invention is also directed to an improved form of toggle switch, incorporating a plurality of pivotally connected parts, some or all of which are engaged at a roll pin pivot joint of the general type mentioned above. In this respect, the new joint provides for the economical use, in a toggle switch assembly, of one or more pivot joints having a large bearing area and, consequently, adapted for very long operating life.

For a better understanding of the invention, reference

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should be made to the following detailed description and to the accompanying drawings, in which:

FIG. 1 is a longitudinal, cross-sectional view of a snap action switch incorporating the improved feature of the invention;

FIG. 2 is a cross-sectional view taken generally along line 2—2 of FIG. 1;

FIG. 3 is a perspective view of an improved actuating means for the switch of FIG. 1, incorporating improved pivot mounting means;

FIGS. 4 and 5 are elevational views of an improved toggle switch of the invention;

FIG. 6 is an enlarged, fragmentary view of the switch of FIGS. 4 and 5, partly in section, illustrating features of the improved pivot joint used therein; and

FIG. 7 is an enlarged, fragmentary, sectional view, taken generally on line 7—7 of FIG. 6.

In the switch illustrated in FIGS. 1—3, the reference numeral 10 designates a frame plate which, in combination with a cover 11, forms a substantially enclosed switch housing. Mounted on the plate 10, adjacent one end of the housing, is an anchor pin 12, which projects outward from the plate 10 and has a flat portion 13 at its outer end. The anchor pin 12 has secured thereto, as by rivets 14, a blade mount 15 formed of sheet material. In the illustrated form of the invention, the blade mount 15 has a flat upper wall 16 and depending side walls 17, 18. The side walls 17, 18 have portions 19, 20 at their outer ends which are turned inwardly and lie beneath the top wall 15, in spaced relation thereto. And the back portions of the side walls project downwardly, as at 21, 22 and have openings 23 forming spaced journal means.

Secured to the blade mount 15, advantageously by the rivets 14, is an elongated, flat blade 24 carrying at its outer end a contact 25 adapted for coaction with a contact 26 mounted in fixed relation to the frame plate 10 by a post 27. The switch blade 24 is advantageously divided over a portion of its length by longitudinal slots 28, 29 to form, at the inner end of the blade, outer blade sections 30, 31 and a central blade section 32. The outer blade sections 30, 31 may be deformed, somewhat in the manner illustrated in FIG. 1, and the central blade portion 32 is engaged by a tap 33 projecting downward from the upper wall 16 of the blade mount, so that the blade section 32 is maintained under compression. Accordingly, the blade 24 will tend to have stable operating positions, in which the central blade portion 32 lies on one side or the other of the general plane of the blade. Thus, when the blade section 32 lies below the plane of the blade, substantially as shown in FIG. 1, the blade is bowed upward, causing the contact 25 to move upward into engagement with the contact 26. On the other hand, when the blade section 32 lies above the plane of the blade, the blade is bowed downward, and the contact 25 is spaced away from the contact 26 (and engages a second fixed contact, not shown, in a double throw switch).

In accordance with one aspect of the invention, an improved switch actuating means is provided which includes an actuating arm 34 formed of flat, sheet material and advantageously of relatively rigid construction. In the illustrated apparatus, the actuating arm 34 has a wide, flat end portion 35, which may be referred to as the inner end of the arm, and the outer end of the arm, includes a hook-like portion 36 forming a tab 37 which projects back toward the inner end of the arm. Advantageously, the main portion of the arm is bent to form a bearing ridge 38 adapted to engage the center portion 32 of the blade. And, in this respect, the outer portions of the arm are of such width that they may be received between the outer blade sections 30, 31, substantially in the manner indicated in FIG. 2.

Coacting with the actuating arm 34 is a spring member

39 having a wide, flat base portion 40, which may be referred to as its inner end, and having an arcuate outer end portion 41 terminating in a tab 42 adapted to be received in the hook portion of the actuating arm and engaged by the tab 37 thereof. In accordance with one aspect of the invention, when the inner end portions 35, 40 of the actuating arm 34 and spring 39 are placed in flat, face-to-face relation, the tab end of the spring is urged outwardly, so that the tabs 37 and 42 are in engagement and the spring 39 is under a predetermined tension or pre-stress.

As one of the important features of the invention, the actuating assembly, comprising the arm 34 and spring 39 is mounted for pivotal movement in the switch assembly by means of a roll pin 43, best illustrated in FIG. 3. The roll pin per se is a conventional, commercially available element, and is made out of sheet material rolled into cylindrical form and having a split along one side, where the opposed edges of the sheet material meet face to face. Such pins are commonly used in the same capacity and in the same manner as are solid pins, i.e., as pivot means. However, in accordance with the present invention, the roll pin 43 is employed in a novel and advantageous manner, in that, in an assembly of members, one of which pivots with respect to the other, the roll pin 43 is journaled in one of the members and grips the other members between the opposed edges formed by the split. Thus, in the illustrated device, the inner end portions 35, 40 of the actuating arm 34 and spring 39 are placed face to face and are inserted between the opposed edges 44, 45 formed by the split 46 in the roll pin. The combined thickness of the arm and spring portions is greater than the initial or normal width of the split 46, so that the opposed edges 44, 45 must be separated to receive the elements 34, 39. Accordingly, the elements 34, 39 are firmly gripped by the pressure of the edges 44, 45 tending to close to their normal or initial spacing. Moreover, as shown best in FIG. 1, the edges of the roll pin, being square before the pin is rolled or formed, lie at angles to the arm and spring elements 34, 39 and form sharp ridges which enhance the gripping action.

In the illustrated apparatus, the roll pin 43 is of greater axial length than the width of the arm and spring elements 34, 39, so that portions of the pin project from the opposite sides of the actuating assembly comprising the arm and spring. The projecting ends of the pin are received in the openings 23 in the side wall portions 21, 22 of the blade mount 15, the pin being freely received in the openings, whereby the actuating assembly may pivot freely with respect to the blade mount. The location of the openings 23 is such that the bearing ridge 38 of the arm 34 is adapted to bear against the central blade section 32 near the midpoint thereof.

For effecting actuating movement of the actuating assembly, there is provided a plunger 47 mounted in a diaphragm 48, formed of silicone rubber or other suitable material. The diaphragm 48 is bonded at its periphery to the casing 11, forming a seal therewith, so that movement of the plunger 47 may be accommodated even though the interior of the switch assembly is completely sealed. A portion of the plunger 47 projects into the interior of the switch casing and is adapted to engage the spring element 39, adjacent the outer end thereof. Accordingly, upon inward movement of the plunger 47, the actuating assembly, comprising the arm 34 and spring 39, is pivoted in a counterclockwise direction, causing the bearing ridge 38 to move upward against the central blade section 32, whereby the blade is actuated from one operative position to the other. Thus, in the illustrated device, upward movement of the plunger 47, with the apparatus conditioned as shown in FIG. 1, causes the switch blade 24 to snap to a downwardly bowed position, opening the contacts 25, 26.

As one of the features of the invention, the pre-stress in the spring 39, occasioned by the fact that the tab 37

limits outward movement thereof, is such that the actuating assembly as a whole is moved by the plunger to effect actuation of the switch. That is, the force required to snap the blade 24 is less than the force required to overcome the pre-stress in the spring 39. However, if inward movement of the plunger 47 continues, after actuation of the blade 24, the application of excessive forces to the blade and to related parts of the switch is avoided by deflection of the spring 39. The improved arrangement is advantageous, in that the required movement of the plunger 47 necessary to effect switch actuation may be accurately predetermined, while substantial overtravel is provided for to accommodate inaccuracies in the external actuating mechanism, for example.

The illustrated switch apparatus incorporates a switch blade having two stable operating positions. Accordingly, means must be provided for resetting the blade at desired times, following actuation thereof to an open condition by the plunger 47. To this end, a resilient reset arm 49 may be secured at one end to the anchor pin 12, so that an end 50 thereof overlies the central blade section 32. Directly above the outer end of the reset arm 49 is a reset plunger 51 carried by a diaphragm 52 bonded to the switch casing in the usual manner. The plunger 51 bears against the arm 49 and is adapted, when depressed, to move the reset arm downward and snap the central blade section 32 from its upper position (not shown) to its lower position, as illustrated in FIG. 1.

One of the important features of the invention is the improved pivot means, comprising a roll pin journaled for rotational movement and a member received and gripped between the opposed edges of the roll pin. The new arrangement greatly simplifies and facilitates the assembly of small devices, such as switches, since a flat, pivoted member may be readily inserted in the split roll pin to form a complete assembly. In addition, the gripping action of the roll pin may be utilized to assemble a plurality of parts forming a pivoting assembly. Thus, in the switch device illustrated in FIGS. 1-3, the actuating arm 34 and spring 39 are held in the desired, assembled relation by the gripping action of the roll pin 43.

Another advantageous feature of the invention resides in the improved actuating arrangement of the switch of FIGS. 1-3, including a pivoted actuating arm and spring, arranged so that actuating force or movement is applied through the pre-stressed spring. The pre-stress in the spring is sufficient to enable normal switch actuation to occur without deflection of the spring. However, excessive overtravel of the actuating plunger, which might otherwise cause excessively high forces to be applied to the switch parts, is absorbed by spring deflection as soon as the actuating force exceeds the pre-stress.

In the form of the invention shown in FIGS. 4-6, a single-pole, double-throw toggle switch is provided with an actuating mechanism including a plurality of the improved roll pin pivot joints, whereby the operating life of the switch is greatly increased. The second illustrated form of the switch comprises a mounting post 110 adapted to be secured by a flange 111 to a suitable housing or casing (not shown) and having a supporting flange 112 upon which are mounted a plurality of insulating elements 113. The insulating elements 113 are secured by bolts 114 and serve to clamp, in spaced relation, a pair of fixed contact members 115, 116 and a switch blade 117. The members 115, 116 carry contacts 118, 119, respectively, and the switch blade 117, positioned between the contact members, carries adjacent its free end a contact 120 adapted to engage alternatively the fixed contacts 118, 119. Portions 115'-117' of the contact members and switch blade extend to the rear of the insulating elements 113 and form terminal connections.

In its general operation, the switch of FIGS. 1-6 is conventional, and includes a toggle element 121, which engages the outer end of the switch blade 117 and extends generally outward therefrom. The toggle element

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121 is urged generally toward the switch blade, but the outer end of the element is manipulated to lie either above or below the plane of the switch blade, whereby the contact 120 is held in engagement with one or the other of the fixed contacts 118, 119. Thus, when the outer end of the toggle element is moved from a position above the plane of the blade, as illustrated in FIG. 4, to a position below the plane of the blade, as illustrated in FIG. 5, the inward pressure of the toggle element on the blade causes the blade to snap from one operative position to the other with an over-centering or toggle action.

In accordance with the invention, the toggle element 121 is engaged with the end of the switch blade 117 at a pivot joint 122, to be described in greater detail, and the outer end of the toggle element is engaged at a pivot joint 123 with a toggle link 124. The link 124 extends upward from the toggle element 121 and is connected at a pivot joint 125 with the outer portion of an actuating arm 126. The actuating arm 126 may have a U-shaped bracket 127 at its outer end, which journals a suitable roller 128, and the inner end of the arm is connected at a pivot joint 129 to a support 130 clamped by the insulating elements 113. The actuating arm 126 is advantageously formed of sheet or strip material, and is shaped to provide a pair of hooks 131, 132 at opposite sides thereof adapted to engage springs 133, 134, respectively, which extend generally forward and are engaged with the toggle link 124 by means of a yoke 135 received in a suitable indentation 136 in the toggle link.

Actuation of the switch is effected by pivotal movement of the actuating arm 126 between limit positions determined by a stop member 136, which is clamped by the insulating elements 113 and has portions 137, 138 lying above and below the actuating arm 126 to limit the pivoting movement thereof in either direction. The springs 133, 134 tend to pivot the toggle link 124 in a clockwise direction, to maintain the desired inward pressure upon the toggle element 121, and the force of the spring is applied in such a direction that, in all positions of the actuating arm 126, the springs tend to urge the arm to its upper limit position. The normal condition of the switch is thus as illustrated in FIG. 4, with the contact 120 of the switch blade 117 engaging the lower fixed contact 119.

When the actuating arm 126 is depressed, as by the action of a cam, for example, on the roller 128, the outer end of the toggle element 121 is carried below the plane of the blade 117, and the blade is snapped upwardly, so that the contact 120 engages the upper fixed contact 118. Upon subsequent release of the actuating arm 126, the springs 133, 134 return the arm to its upper position, and effect the reclosure of contacts 119, 120.

In accordance with the invention, the various pivot joints 122, 123, 125 and 129, or some of them, include, as one element of the joint, a split roll pin which is journaled for rotary movement and receives and grips one of the parts of the joint between opposed edges formed by the split in the pin. The roll pins per se may be of a commercially available type, and are usually formed by rolling or otherwise bending a flat section of sheet material into cylindrical form, providing a slight space or split between opposed edges of the material. The material of which the pins are formed is usually a good grade of steel, providing sufficient resilience to accommodate limited expansion or contraction of the pin.

In the pivot joint 129, at the base of the actuating arm 126, a split roll pin 139 receives and grips between its opposed edges the flat end portion 140 of the actuating arm which, in the illustrated device, is bent substantially at right angles to the main portion of the arm and extends downward. The dimensions of the roll pin 139 are such, in relation to the thickness of the end portion 140, that the split in the pin is opened somewhat by insertion of the end portion 140 therein. Accordingly,

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the portion 140 is tightly gripped by inner corners of the opposed edges of the pin.

The assembled roll pin 139 and actuating arm 126 constitute one part of the joint 129, the other part being constituted by journal means for the roll pin. To this end, the support 130 is advantageously formed of sheet or strip material and has an end portion 141 bent to form a socket shaped like a partial cylinder. The socket is of such diameter as to receive loosely the roll pin 139 and is open at both ends to accommodate axial insertion of the pin, and the arc covered by the socket is such as to provide an open side sufficient to accommodate the contemplated range of pivotal movement of the actuating arm 126. Advantageously, the end portion of the actuating arm, the roll pin 139 and the socket 141 are of substantially the same width, although this is by no means necessary.

To prevent relative axial movement between the movable parts of the joint 129, the socket 141 is provided at its end extremity with a tongue 142, of limited width, which continues the cylindrical outline of the socket, leaving sufficient space, however, as at 143, to permit insertion of the end 140 of the actuating arm. The tongue 142 is received in an opening 143' in the arm end portion 140, so that the arm and tongue are engaged throughout the contemplated range of movement of the arm, preventing relative axial displacement between the arm and the socket 141.

The pivot joint 125 is advantageously substantially similar to the joint 129 and includes a socket 144 in the form of a partial cylinder bent from a section 145 of strip material, which may be integral with or attached to the actuating arm 126. The socket 144 is adapted to receive loosely a roll pin 146, which receives and grips between opposed edges formed by the split therein a flat end portion 147 of the toggle link 124. The end portion of the link 124 is provided with an opening 148 in which is received a tongue 149, which projects from one edge of the socket and continues the cylindrical outline thereof.

At the lower end of the toggle link 124 there is a flat end portion 150, which is bent in toward the end of the switch blade 117 and is received and gripped between opposed edges formed by the split in a roll pin 151. The pin 151, forming part of the pivot joint 123, is received in a socket 152, in the form of a partial cylinder, provided in the end of the toggle element 121. Advantageously, the toggle element 121 is formed of a self-lubricating plastic material, such as Nylatron G. S., manufactured by the Polymer Corporation, Reading, Pennsylvania, or Teflon, manufactured by Du Pont. The element 121 may be of molded construction, and the socket 152 provided in the outer end thereof is closed at each end by end walls 152'. Advantageously the socket 152 covers an arc slightly less than 180°. The radial and axial dimensions of the socket are, of course, such that the roll pin 151 may pivot freely therein.

The joint 122 is substantially similar to the joint 133 and includes a socket 153, in the form of a partial cylinder closed at both ends, which is molded in the toggle element 121. A roll pin 154 is received in the socket and grips between its opposed edges the outer end portion of the switch blade 117. In this respect, the thickness of the switch blade 117 may be less than is desired for proper gripping action between the opposed edges of a commercially available roll pin. Accordingly, a U-shaped shim 155 may be placed over the end of the switch blade 117, so that the nominal thickness of the blade and shim assembly is slightly greater than the normal spacing between the opposed edges of the roll pin.

The improved switch of FIGS. 4-6, while being of relatively inexpensive design, is characterized by its extremely long operating life achieved by the use of roll pin pivot connections. Thus, the various roll pins, journaled for limited rotary movement in cylindrical sockets, provide a large bearing area at each pivot con-

nection and thereby reduce wear between moving parts to a practical minimum.

In switches of known design, the provision of a plurality of bearing joints for connecting moving parts of the switch would render the cost of the switch prohibitive. However, the improved roll pin joint is capable of easy and economical assembly and utilizes low cost, commercially available components (i.e., the roll pins) so that the improved joints may be used extensively without incurring excessive expense.

It should be understood that the specific forms of the invention herein illustrated and described are intended to be representative only, as certain changes may be made therein without departing from the clear teachings of the disclosure. Accordingly, reference should be made to the following appended claims, in determining the full scope of the invention.

We claim:

1. In a switch of the type having a switch blade adapted for actuation between operative positions, an actuating member operatively related to said switch blade and movable for effecting actuation of said blade, and pivot means for pivotally mounting said member for actuating movement, said pivot means characterized by said actuating member having a flat end portion, and comprising a split roll pin receiving the flat end portion of said actuating member and gripping said end portion between opposed edges formed by the split, said opposed edges yieldably closing upon said end portion to maintain said roll pin and member in assembled relation, and means journalling said split roll pin for pivoting movement with said actuating member; the improvement in said pivot means comprising journal means provided for said roll pin, said journal means comprising a socket formed by an element of flat material having an end bent to form a partial cylinder and receiving said roll pin over a substantial portion of its length.

2. The improvement of claim 1 in which the bent end of the journal element has a tongue projecting therefrom, and said actuating member has a recess in which said tongue is received.

3. In a switch of the type having a switch blade adapted for actuation between operative positions, an actuating member operatively related to said switch blade and movable for effecting actuation of said blade, and pivot means for pivotally mounting said member for actuating movement, said pivot means characterized by said actuating member having a flat end portion, and comprising a split roll pin receiving the flat end portion of said actuating member and gripping said end portion between opposed edges formed by the split, said opposed edges yieldably closing upon said end portion to maintain said roll pin and member in assembled relation, and means journalling said split roll pin for pivoting movement with said actuating member; the improvement in said pivot means comprising journal means provided for said roll pin, said journal means comprising a socket in the form of a partial cylinder receiving said roll pin over a substantial portion of its length.

4. An assembly of members pivotable one with respect to the other, comprising a first member having journal means therein, a split roll pin received in said journal means and adapted for rotational movement therein, and a second member having a flat portion received and gripped between opposed edges formed by the split in said roll pin, said opposed edges yieldably closing upon said flat portion to maintain said roll pin and second member in assembled relation, said journal means comprising means forming a socket receiving said roll pin over a portion of its length and having an open side for receiving said flat portion and accommodating limited rotational movement thereof with respect to said first member.

5. The assembly of claim 4, in which the means forming a socket is formed of a material having properties characteristic of Nylatron and Teflon.

6. The assembly of claim 4, in which the means forming a socket is an element of flat material having an end portion bent to form a partial cylinder.

7. The assembly of claim 6, in which said end portion has a tongue extending therefrom and continuing the outline of the partial cylinder, and said second member has a recess receiving said tongue.

8. In a switch of the type having a combination of a switch blade anchored at one end and having a free portion carrying a contact, a fixed contact, said blade having operative positions in one of which said contacts are engaged and in another of which said contacts are separated, and actuating means for effecting movement of said blade between said operative positions, said actuating means including a toggle element engaging the free end of the blade at a joint and acting on the blade with a force directed generally toward the blade but to one side or the other of the plane of the blade; the improvement in said switch characterized by said joint comprising a split roll pin receiving and gripping the free end of said blade between the opposed edges formed by the split in the pin and means in said toggle element forming a journal for said roll pin.

9. The improvement of claim 8, in which said toggle element has a generally semi-cylindrical socket receiving said roll pin over a substantial portion of its length.

10. The improvement of claim 9, in which said toggle element is formed of a material having properties characteristic of Nylatron GS and Teflon.

11. The improvement of claim 8, in which said actuating means includes a toggle link engaging said toggle element at a second joint and adapted to move the free end of said toggle element through the plane of said blade while urging said toggle element generally toward the blade, said toggle link has a flat end portion, and said second joint comprises a second split roll pin receiving and gripping the flat end of said toggle link between opposed edges formed by the split and second journal forming means in toggle element for receiving said second roll pin.

12. The improvement of claim 11, in which said actuating means includes an actuating arm having a movable portion engaging said toggle link at a third joint and adapted upon movement to effect movement of said toggle link and toggle element to actuate said blade between operative positions, said toggle link has a second flat end, and said third joint comprises a third split roll pin receiving and gripping said second flat end between edges formed by the split and third journal forming means in said actuating arm receiving said third roll pin.

13. The improvement of claim 12, in which said actuating arm has a portion formed of flat material, and said third journal means comprises an end of the flat portion bent to form a partial cylinder, said partial cylinder forming a socket receiving said third roll pin over a portion of its length.

14. The improvement of claim 12, in which said actuating arm extends generally parallel to said blade, said toggle link extends from said arm to a point adjacent the free end of said blade, and spring means acts between said actuating arm and toggle link to urge the toggle link toward the blade.

15. The improvement of claim 12, in which the actuating arm is mounted at a fourth joint for pivoting movement, said arm has a flat end portion, and said fourth joint comprises a fourth split roll pin receiving and gripping said flat end portion between opposed edges formed by the split and journal forming means receiving said fourth roll pin.

16. In a switch of the type having a combination of a blade having a free end portion carrying a contact, a fixed contact, a toggle element engaging the free end of said blade at a joint, a toggle link engaging said toggle element at a joint and adapted for movement with respect

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to said blade to dispose said toggle element at an angle with respect to the plane of the blade, and an actuating arm having a free end portion engaging said toggle link at a joint; the improvement in said switch, in which at least one of said joints comprises a split roll pin receiv-

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ing and gripping one of the parts engaged at the joint between opposed edges formed by the split and journal means in the other part engaged at the joint receiving said roll pin.

No references cited.