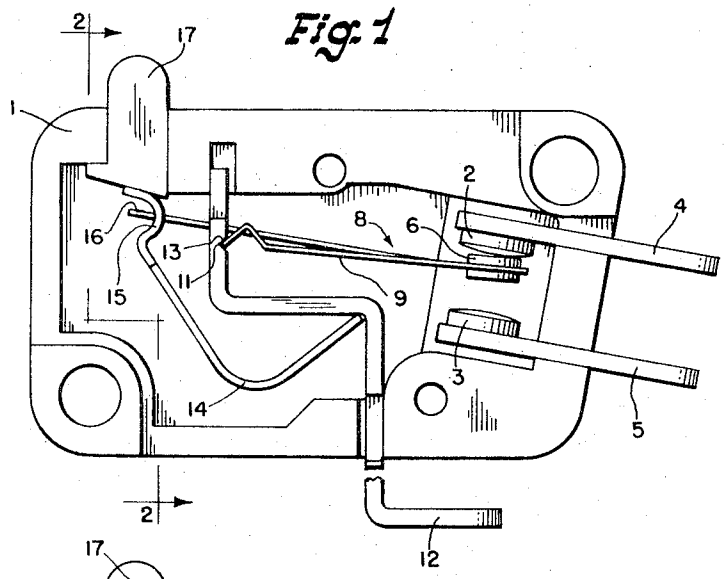
Aug. 15, 1967 J. R. ASHMAN 3,336,449

SNAP ACTION SWITCH MECHANISM WITH IMPROVED MOVABLE CONTACT ASSEMBLY

Filed Dec. 8, 1965

Fig. 1



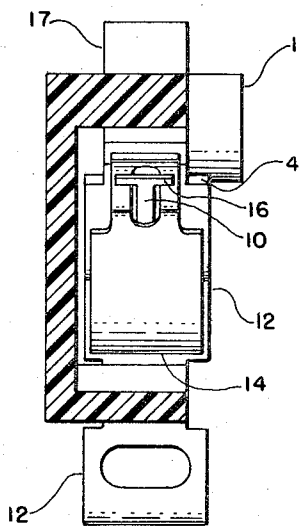


Fig. 2

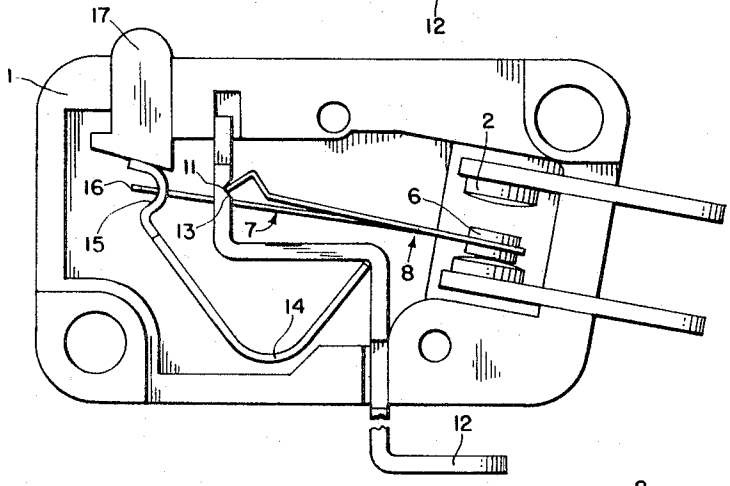


Fig. 3

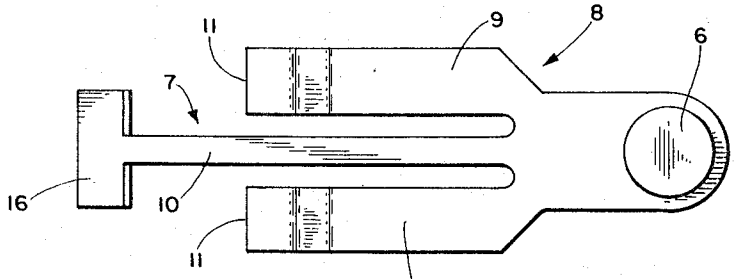


Fig. 4

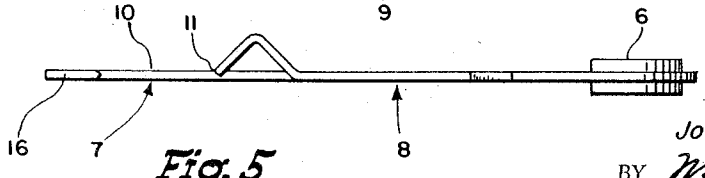


Fig. 5

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SNAP ACTION SWITCH MECHANISM WITH IMPROVED MOVABLE CONTACT ASSEMBLY

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1 Claim. (Cl. 200—67)

The present invention relates to snap action mechanisms for electric switches, and is an improvement in or modificaion of the type of snap action mechanism disclosed and claimed in copending application Ser. No. 311,284, filed Aug. 20, 1963, now Patent No. 3,248,959, which is assigned to the same assignee of the present invention.

In the above mentioned patent application, a snap action mechanism is disclosed as having an arm mounted for pivotal movement between the first and second stop positions, a link pivotally connected to the arm at a location spaced from the pivot of the arm, and a compression spring tensioning the link in such a manner that upon producing relative movement between the arm and the link to cause the line of action of the tension force in the link to pass through the pivot axis of the arm, the arm is caused to move from one stop position to the other with a snap action movement.

The link member in the above mentioned copending application comprises a separate member which is pivotally connected to the arm at a location spaced from the pivot thereof. The present invention is directed toward a snap action mechanism of the type described, but having the link formed integrally with the arm so that it is capable of flexing at the point of connection or juncture therewith while the remainder of the arm remains essentially rigid in character. According to the present invention, the arm with the integral link is formed to provide three parallel strips, the two outermost strips defining the arm and terminating short of the middle or third strip constituting the link to thereby provide a composite link/arm construction. The specific construction, location and operation of the composite link/arm relative to the other operating components of a switch mechanism will be described in detail below.

It is an object of the present invention to provide a snap action mechanism of the aforementioned type which uses a minimum number of parts, thereby facilitating assembly of switch devices at a low cost.

A further object of the present invention is the provision of a snap action mechanism of the type described which can be operated reliably over long periods and without any material change in the nature or character of contact pressure in a switching device caused by friction and the like.

Yet another object of the present invention is to provide a low travel switch mechanism or device in which the inertia of the movable parts of the switch mechanism is kept as low as possible.

Other objects and advantages will become apparent from the following description when read in connection with the accompanying drawings wherein:

FIG. 1 is a side elevational view of a push button snap action switch mechanism or device with the cover plate thereof removed, and showing the movable components of the switch prior to actuation of the push button;

FIG. 2 is an end elevation view of the switch mechanism or device shown in FIG. 1 as viewed along line 2—2 thereof;

FIG. 3 is a side elevational view of the switch mechanism or device shown in FIG. 1 with the push button thereof depressed;

FIG. 4 is a top plan view of the composite link/arm used in the snap action mechanism of the switch shown in FIGS. 1–3; and

FIG. 5 is a side elevational view of the composite link/arm in unstressed condition.

The switch illustrated in FIGS. 1–3 of the drawing comprises a hollow insulating body **1**, preferably formed from a suitable plastic material, which accommodates the various switch components or parts to be described in detail below. The concavity of the switch body **1** is designed to be closed by cover plate (not shown) to define a closed switch housing which is conventional.

The switch of the present invention is designed to afford a change over switching action between moving and fixed contacts. The fixed contacts of the switch are identified **2, 3** respectively, and are carried by metal bars or strips **4, 5** which are received within suitable complementary shaped openings formed in the wall or flange of the switch body **1**. The moving contact of the switch comprises a double-sided or back-to-back contact **6** which is carried at the end of a moving arm **7** of an over-center snap action mechanism, the contact **6** engaging either of the fixed contacts **2, 3** in one of its positions as will become apparent.

According to the present invention, the moving arm **7** forms part of a composite arm/link structure **8**, the preferred construction of which can be clearly seen in FIGS. 4–5. The composite arm/link is preferably formed from a suitable corrosion-resistant material such as Phosphor bronze or beryllium copper. As best seen in FIG. 4, the composite arm/link **8** includes three parallel strips. The two outer strips **9** are wider than and terminate short of the center or third strip **10** constituting the link member. This link **10** can flex at the connection or junction between it and the arms **9** to provide a pivotal connection therebetween. The link is thus designed to be flexible whereas the remainder of the arm is of relatively rigid construction.

The free end or terminal edges of the outer strip **9** are V-shaped in construction so as to provide edges **11** capable of pivotally mounting the strips **9** within the recesses **13** of the fulcrum bracket **12**. The fulcrum bracket **12** is fixedly attached to the switch body **1**, and has several right-angle bends so as to provide a convenient mounting for various other components of the switch. This fulcrum bracket also constitutes an electrical terminal for making connections with the moving contact **6** through the composite arm/link **8**.

As best seen in FIGS. 1 and 3, the edges **11** of the outer strips **9** rest within the generally V-shaped recesses **13** of the fulcrum bracket **12** while the link **10** is placed under tension by the compression spring **14** as will now be described. In its unstressed condition, the link **10** and the pivoting edges **11** of the outer strips **9** normally lie in the general plane of the composite arm/link as seen in FIG. 4, but when the composite arm/link **8** is mounted within the switch body **1**, the link **10** is flexed upwardly above the edges **11** by the leaf spring **14**, also preferably made from Phosphor bronze or beryllium copper. The leaf spring at one end thereof engages the centrally positioned right-angle bend of the fulcrum bracket **12**, and at its other end has a bifurcated curvilinear end part **15**, as seen in FIG. 2, for engaging the cross or T-shaped member **16** formed at the free end of link **10**. The leaf spring **14** is held in compression between link **10** and the fulcrum bracket **12**, and thus puts the link **10** under tension. The curvilinear end part **15** of the leaf spring **14** also loads an actuating plunger or stud **17** formed from a suitable insulating material.

In operating the push-button snap action switch mechanism of the present invention, the actuation or depression of the spring loaded plunger **17** exerts a downward force on the leaf spring **14**, and by so doing, the free end of link **10** is carried downward by the leaf spring. When the line of action of the tensile force in the link **10** passes from above the edges **11** to below these edges, the arm **7** and its moving contact **6** will snap over from the fixed contact **2** as seen in FIG. 1 to the fixed contact **3** in FIG. 3 of the drawing. Stated in a slightly different manner, the actuation of the spring loaded plunger **17** moves the end portions of the leaf spring **14** away from each other, thereby reducing part of the compressive forces thereof and thus acting to release the tension in the link **10** during the downward movement of the same to provide the snap action movement of the composite link/arm assembly in moving the contact **6**. When the plunger **17** is released, the leaf spring **14** constrains or forces the link **10** to snap back over center from the position shown in FIG. 3 to that illustrated in FIG. 1.

The composite link/arm **8** of the present invention affords a reduction in the number of switch components by obviating the need for a separate link member, thus facilitating the assembly of the switch as well as reducing its overall cost. In addition, rubbing contact between a separate link where it would be latched or connected to the arm to provide the required pivotal connection is avoided. Such rubbing contact tends to elongate the link latching hole in the arm which has the undesirable side effect of reducing contact pressure. Furthermore, the composite link/arm component enables the simultaneous manufacture of the link and arm by stamping or other suitable methods from a corrosion-resistant material which is particularly important when the switch is contemplated to be used under humid climatic conditions. It will also be recognized that the loading of the link by the leaf spring according to the present invention is achieved through line rather than point contacts to improve the force transmitting ability of the spring to the link.

Although the link **10** of the composite link/arm **8** according to the preferred embodiment of the present invention is formed as the center or middle strip, it is contemplated that outer strips may define the link while the center strip, would would be shorter than the outer strips in such a case, would define the pivoted arm for the moving contact of the switch.

The specific embodiment of the invention as shown and described herein is for illustrative purposes only. Various changes in structure will no doubt occur to those skilled in the art of the type disclosed in the preceding paragraph, and will be understood as forming a part of the invention insofar as they fall within the spirit and scope of the appended claim.

What is claimed is:

A snap action mechanism for electrical switches comprising a hollow switch body having a support element mounted in the concavity thereof, one end of said support element extending beyond said switch body to provide a first terminal member, second and third terminal members mounted to said switch body each having an inner end extending within the concavity thereof and an outer end projecting outside said housing, a one-piece blade element having two substantially parallel strip members pivotally mounted on said support member and a flexible arm extension thereof movable between the inner end of said second and third terminal member, said blade element also including a T-shaped tension element having a cross bar and stem portion located intermediate said strip members and being integrally joined thereto at a point spaced from the pivotal mounting of said strip member to said support element, and a compression spring having one end pivotally mounted to said support element and its other end being provided with an opening for receiving the cross bar of the T-shaped element, the cross bar of the T-shaped tension element having aligned knife edge portions on opposite sides of the stem portion each of a width greater than spacing between the stem portion and one of said strip members, the relationship of the cross bar of the T-shaped tension element to the compression spring and the opening at one of its ends being such that the knife edge portions of the cross bar engage opposite marginal portions of the one end surrounding the opening to afford line contact therebetween providing uniform force transmitting characteristics between the compression spring and T-shaped tension element through the path of least mechanical resistance while maintaining the T-shaped tension element under tension, said T-shaped tension element normally being urged by said compression spring to a position above the pivotal mounting of said strip member to said support element, but capable of being moved below the pivot mounting whereby upon producing relative movement between the tension element and the flexible arm, the line of action of the tension force in the tension element passes through the pivot point of the blade element with the support element to move the flexible arm in a snap action manner between the inner ends of the second and third terminal members and thereby switch current between the second and third terminal members and said first terminal member.

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